Complete technical Spe is available on NIc portal i.e. 1. https://eprocurebhel.co.in (Tender ID: 2022_BHEL_16447_1)

KHURJA SUPER THERMAL POWER PROJECT
(2 X 660 MW)

TECHNICAL SPECIFICATION
FOR
SEWAGE TREATMENT PLANT

SPECIFICATION NO.: PE-TS-475-673-A001 REV 00

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

CONTENTS

PROJECT INFORMATION

KHURJA STPP (2X660 MW)

1.00.00 BACKGROUND

THDC India Limited (Formerly Tehri Hydro Development Corporation), is a joint venture of Govt. of India & Govt. of Uttar Pradesh. THDC India Limited has been entrusted to execute a Thermal Power Project in Khurja at district Bulandshahar, Uttar Pradesh (UP) along with various other hydro projects.

THDC has placed a Consultancy order to NTPC Ltd for Pre-award to Commissioning activities (consultancy) of Khurja Coal based power project (2x660 MW).

The present proposal is to establish 2X660 MW coal based Khurja Super Thermal Power Project for the benefit of Uttar Pradesh, Rajasthan, Uttarakhand, Himachal Pradesh & Delhi.

2.00.00 CAPACITY

PRESENT PROPOSAL **:** 2 x 660 MW

3.00.00 MODE OF OPERATION

Base Load

4.00.00 LOCATION AND APPROACH

Khurja Super Thermal Power Project is located in Bulandshahar district of Uttar Pradesh, between 28°08'35" to 28°10'25" Northern latitude and 77°53'47" to 77°55'22" Eastern longitude. The site is situated near villages Dushhara-kherli, Jahanpur, Naiphal (Unchagaon) and Rukunpur. The district Headquarters Buland Shahar is about 32 kms. The nearest railway station Danwar on Delhi-Kolkata Section (via Aligarh) is approximately 5 km away from the project site. The nearest major railway station is Khurja at a distance of about 11 kms.

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

Distance of the project site from nearest cities

Khurja	11 kms
Aligarh	36 kms
Delhi	90 kms
Bulandshaher	32 kms

For further information, bidders are also advised to visit the project site and collect data regarding local site conditions.

4.03.00 **AIRPORT**

The nearest commercial airport at Delhi is located at a distance of approximately 120 kms from the project site.

5.00.00 **LAND**

The land requirement for the project has been estimated as 1400 Acres for Main Plant, Balance of Plant including Coal Handling Plant, Ash Disposal Area, Ash Disposal Pipeline Corridors, Construction Stores & Offices, Laydown & Fabrication Yard, and Labor Colony etc. Land has already been acquired through UPSIDC. Additional patches of required land shall be acquired.

6.00.00 **WATER**

The Upper Ganga Canal passes near by the Khurja STPP. The makeup water for the project is proposed to be drawn from Upper Ganga Canal at a distance of about 13 kms.

Quantity of make-up water required for 2X660MW would be about 3265 Cum/hr with ash water recirculation system and 4415 Cum/hr with once through ash water system. Make-up water is proposed to be used for condenser cooling, ash sluicing, coal dust suppression and other plant processes. Make up water shall be drawn from the canal by constructing suitable intake structures. A Raw Water Reservoir is envisaged.

Govt. of UP has conveyed commitment for supply of required quantity of water for the project.

7.00.00 **COAL**

7.01.00 **Coal Requirement, Availability and Linkage**

The daily coal requirement for 2x660 MW units shall be about 15261 tonnes based on Gross Calorific Value of 4200 Kcal/kg and 2248 Kcal/KWh unit heat rate, considering 90% plant load factor.

Annual coal requirement for the plant shall be about 5.57 MTPA considering PLF of 90% and the same is proposed to be met from Amelia Coal Mine in District Singrauli, Madhya Pradesh, allotted to THDCIL by Ministry of Coal, Govt. of India. THDCIL has entered into an agreement with Nominated Authority, Ministry of Coal for the development of Amelia Coal Mine in Synchronization with the implementation of Khurja STPP. The distance between Khurja STPP plant site and Allotted Amelia Mine at Singrauli, Madhya Pradesh is around 900 Kms.

7.02.00 **Coal Transportation**

The envisaged mode of coal transportation from the coal mines to the power plant is through Indian Railways**.**

7.03.00 **Coal Quality**

The primary fuel for the main steam generator shall be coal. The coal quality parameters indicated in **Annexure-II** are to be considered for steam generator design.

8.00.00 **Fuel Oil**

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

9.00.00 STEAM GENERATOR TECHNOLOGY

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

10.00.00 FLUE GAS DESULPHURIZATION SYSTEM (FGD) & SCR:

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

11.00.0 POWER EVACUATION SYSTEM

Power Generated from each 660 MW unit would be stepped up to the evacuation voltage level through suitably rated Generator Transformer and will be evacuated through 400kV transmission systems. Associated Transmission System (ATS) of the project has already taken-up with PGCIL/CEA/UPPTCL and will be finalized soon.

12.00.00 METEOROLOGICAL DATA

The meteorological data from nearest observatory (Aligarh) is placed at **Annexure - VI.**

13.00.00 PLANT WATER SCHEME

The Plant water scheme is described below.

13.01.00 **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.

13.02.00 **Equipment Cooling Water (ECW) System (Unit Auxiliaries)**

The plant auxiliaries of Steam Generator and Turbine Generator shall be cooled by Demineralized (DM) water in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a secondary circuit. The station auxiliaries such as Air compressors, Compressors of ash handling plant, compressor of mill reject system, FGD & SCR system etc. shall also be cooled by Demineralized (DM) water in a closed circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for Steam Generator & auxiliaries and TG & its auxiliaries.

13.03.00 **Other Miscellaneous Water Systems**

CW system blow down water shall be used for the plant service water requirement, dust suppression system of coal handling plant, ash slurry pumps sealing, sealing of Vacuum

pumps (if applicable) of Ash Handling plant, FGD system, make-up to fire water system. The service (wash water) water collected from various areas and coal handling plant shall be treated as per requirement and reused.

FGD waste water shall be diverted to ash system after neutralization.

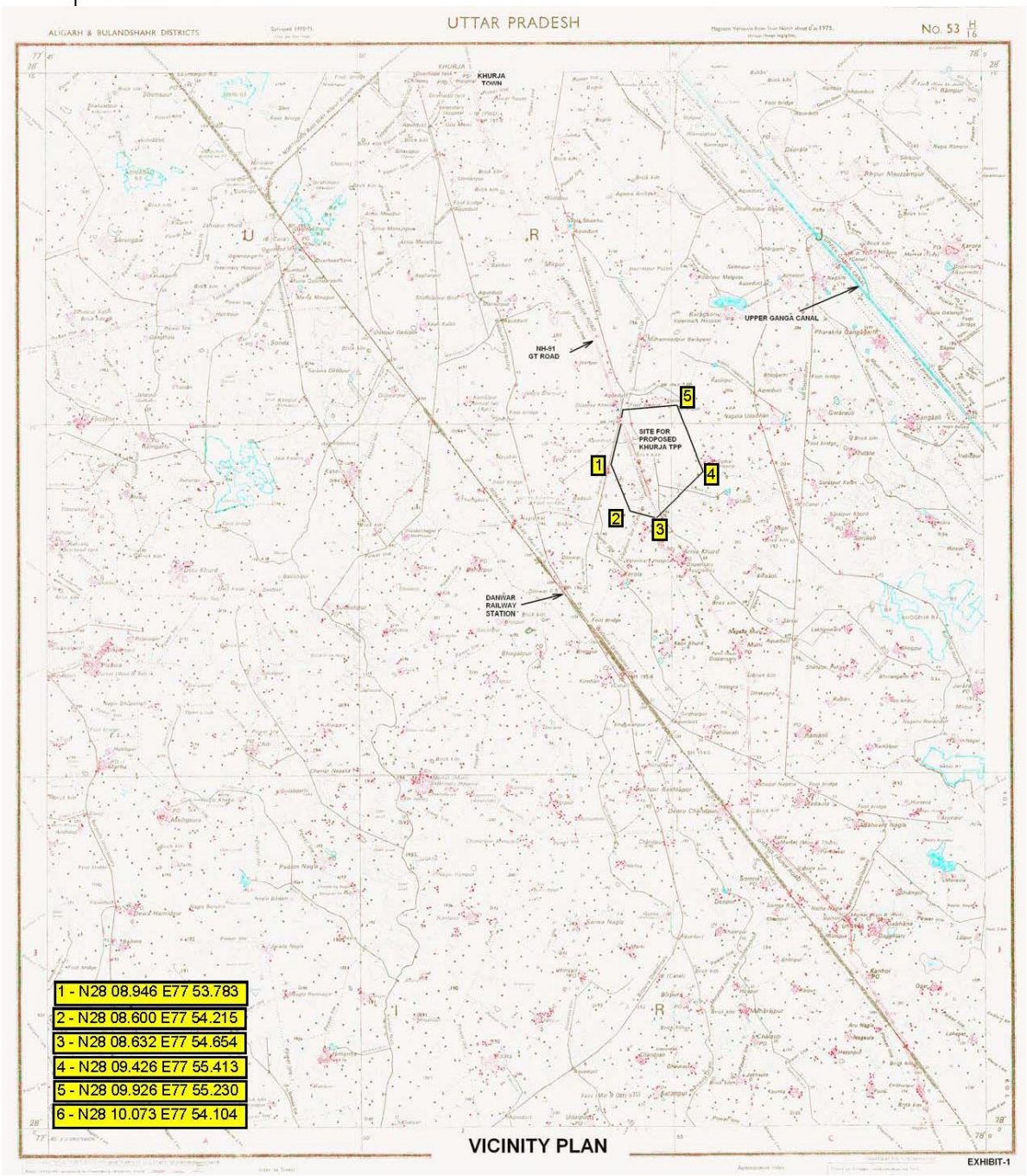
The quality of clarified water & DM water is given in this sub-section at **Annexure-VII-1 & VII-2.**

The Salient data for design and sizing of equipment at BMCR Condition is given in this sub-section at **Annexure-VII-3.**

Salient data for design and sizing of equipment at Pure Sliding Pressure Condition is given in this sub-section at **Annexure-VII-4.**

ANNEXURE-I

VICINITY PLAN



ANNEXURE-II

COAL & ASH CHARACTERISTICS

PROPOSED COAL CHARACTERISTICS FOR KHURJA (2X660 MW)

S.No.	Characteristics (as received basis)	Range of 95 % coal supplies			Range of 5 % coal supplies	
		Column - 1	Column - 2	Column - 3		
		Design	Worst	Best		
1.0	PROXIMATE ANALYSIS					
1.1	Total Moisture (%)	12	14	11.0	11-15	
1.2	Ash (%)	32	35	28	28-36	
1.3	Volatile Matter (%)	24	23	25	22-26	
1.4	Fixed Carbon (%)	32	28	36.0	28-36	
1.5	Total (%)	100	100	100		
2.0	ULTIMATE ANALYSIS					
2.1	Carbon (%)	42.9	37.81	48.01	35.21-45.4	
2.2	Hydrogen (%)	3.2	2.8	3.3	2.9-4.2	
2.3	Sulphur (%)	0.4	0.6	0.3	0.52	
2.4	Nitrogen(%)	1	0.58	1.2	6.86	
2.5	Oxygen(%)(By difference)	8.17	8.77	7.7	0.28	
2.6	Carbonates (%)	0.27	0.38	0.45	0.3	
2.7	Phosphorous(%)	0.06	0.06	0.04	0.04	
2.8	Total Moisture (%)	12	14	11.0	22	
2.9	Ash (%)	32	35	28	39	
	Total	100	100	100		
2.10	GCV (Kcal/Kg)	4200	3650	4700	3600-4800	
2.11	Hard Grove Index	60	52	65	50-65	
2.12	YGP (mg/kg)	70	75	70	85-70	
3.0	ASH ANALYSIS					
3.1	Silica (%)	58.2	59.54	58.00	58.1-63	
3.2	Alumina(%)	28	26.3	27.20	22.2-26.1	
3.3	Iron Oxide (%)	6.1	6.4	7.60	8.3-11.5	
3.4	Titania	1.85	1.72	1.80	0.82-1.2	
3.5	Phosphoric Anhydride (%)	1.91	1.57	0.48	0.48-191	
3.6	Lime (%)	1.7	3.2	3.30	1.78-3.5	
3.7	Magnesia (%)	0.7	0.6	0.50	0.5-0.9	
3.8	Sulphuric Anhydride (%)	0.29	0.25	0.40	0.12-0.43	
3.9	Sodium Oxide (%)	0.3	0.1	0.30	0.1-0.32	
3.10	Potassium oxide	0.95	0.32	0.42	0.1-0.43	
	Total	100	100.00	100.00		
4.0	ASH FUSION RANGE					
	REDUCING ATMOSPHERE					
4.1	Initial Deformation Temp.(oC)	1200	1100	1150	1100	1200
4.2	Hemispherical Temp. (oC)	1400	1300	1350	1200	1400
4.3	Fusion Temperature (oC)	1400	1400	1350	1400	1450

ANNEXURE-III

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

ANNEXURE-IV

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-V

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

ANNEXURE-VI

METEOROLOGICAL DATA

ANNEXURE-VI

BACK

जलवायवी सारणी

CLIMATOLOGICAL TABLE

स्टेशन : अलीगढ़ STATION : Aligarh

अक्षांश LAT. 27°53' देशांतर LONG. 78°04' समुद्री तल माध्य से ऊंचाई HEIGHT ABOVE M.S.L. 187 मीटर METRES

प्रक्षणों पर आधारित BASED ON OBSERVATIONS 1971-2000

माह MONTH		स्टेशन का मानक वात STATION LEVEL PRESSURE एच.पी.ए. hPa	वायु तापमान AIR TEMPERATURE MEAN शुष्क बल्ब DRY BULB डि. से °C	नम बल्ब WET BULB डि. से °C	दैनिक अधिक DAILY MAX डि. से °C	दैनिक चरम DAILY MIN डि. से °C	माह में उच्चतम HIGHEST IN THE MONTH डि. से °C	माह में निम्नतम LOWEST IN THE MONTH डि. से °C	चरम EXTREMES उच्चतम HIGHEST डि. से °C	दिनांक और वर्ष DATE AND YEAR	निम्नतम LOWEST डि. से °C	दिनांक और वर्ष DATE AND YEAR	आर्द्रता HUMIDITY सापेक्ष आर्द्रता RELATIVE HUMIDITY प्रतिशत %	वाष्प दाब VAPOUR PRESSURE एच.पी.ए. hPa	मेघ की मात्रा CLOUD AMOUNTS समस्त मेघ ALL CLOUDS आकाश के अष्टमांश Oktas of sky	निम्न मेघ LOW CLOUDS	वर्षा RAINFALL मासिक योग MONTHLY TOTAL मि.मि. mm	वर्षा के दिनों की संख्या NO. OF RAINY DAYS	वर्षासहित सबसे नम महीने का योग TOTAL IN WETTEST MONTH WITH YEAR मि.मि. mm	वर्षारहित शुष्कतम महीने का योग TOTAL IN DRIEST MONTH WITH YEAR मि.मि. mm	24 घंटों की सबसे भारी वर्षा HEAVIEST FALL IN 24 HOURS मि.मि. mm	दिनांक और वर्ष DATE AND YEAR	पवन गति MEAN WIND SPEED कि.मी. प्र. घं. Kmph
जनवरी JAN	I	996.0	10.8	9.2	20.6	7.4	25.1	3.8	30.7	28 1991	0.6	16 1935	80	10.5	2.5	2.3	15.2	1.5	71.9 1883	0.0	53.8	12 1994	3.1	
	II	993.3	18.2	13.8									60	12.4	2.3	2.0								
फरवरी FEB	I	993.7	13.3	11.1	23.6	9.5	28.8	5.0	33.3	26 1989	1.7	11 1950	75	11.6	2.5	2.2	13.9	1.4	141.0 1928	0.0	71.1	2 1928	3.5	
	II	991.0	21.2	15.4									52	13.0	2.3	2.1								
मार्च MAR	I	990.9	19.3	15.2	30.0	14.1	35.5	8.9	41.7	31 1945	3.9	6 1945	63	14.1	2.3	1.9	8.5	1.0	106.7 1870	0.0	63.5	18 1870	4.2	
	II	988.1	27.2	18.7									41	14.8	2.6	2.1								
अप्रैल APR	I	986.6	26.8	18.9	36.8	20.1	41.5	14.3	44.5	29 1999	10.9	9 1957	45	15.5	1.5	1.2	8.8	0.9	68.1 1909	0.0	30.6	29 1997	4.8	
	II	982.9	34.3	21.3									28	14.7	2.0	1.6								
मई MAY	I	982.5	30.6	21.9	40.1	24.5	43.9	19.9	47.2	28 1988	15.5	3 1987	45	19.2	1.5	1.3	21.0	2.2	75.7 1913	0.0	41.1	20 1913	4.9	
	II	979.1	37.6	24.0									30	18.8	1.6	1.4								
जून JUN	I	978.7	31.2	24.8	39.3	26.6	44.4	22.3	46.7	7 1995	18.6	2 1957	59	26.1	2.8	2.6	68.5	4.1	544.8 1933	0.0	327.2	30 1981	5.6	
	II	975.3	36.5	26.0									44	25.1	3.0	2.8								
जुलाई JUL	I	978.4	29.2	26.3	34.6	26.0	39.4	23.0	44.5	2 1987	19.9	12 1988	79	31.9	6.1	5.9	217.7	10.2	576.1 1958	1.5 1941	164.6	3 1942	4.7	
	II	975.4	32.2	27.3									69	32.0	6.1	5.8								
अगस्त AUG	I	980.0	28.3	26.1	33.2	25.4	36.9	22.9	42.1	11 1987	20.1	13 1957	84	32.1	6.1	5.7	247.4	11.6	529.8 1940	0.0	183.6	15 1964	4.3	
	II	977.3	30.7	27.0									75	32.7	6.1	5.9								
सितम्बर SEP	I	984.6	27.4	24.5	33.8	23.8	36.9	20.7	40.2	1 1979	14.8	16 1984	78	28.6	3.2	2.9	104.1	5.2	590.5 1884	0.0	220.6	26 1964	3.7	
	II	981.5	31.0	25.6									65	28.6	3.2	3.0								
अक्तूबर OCT	I	990.4	23.5	19.8	33.0	18.8	36.2	14.4	41.7	4 1952	11.0	9 1983	69	20.2	1.0	0.9	31.4	1.4	231.1 1955	0.0	138.7	13 1955	2.2	
	II	987.2	29.1	21.8									51	20.4	1.0	0.8								
नवम्बर NOV	I	994.5	17.5	14.4	28.3	12.9	32.1	9.4	36.1	3 1944	5.0	30 1937	69	14.0	0.8	0.7	4.2	0.5	34.8 1904	0.0	26.2	14 1966	2.1	
	II	991.5	24.0	18.2									55	16.4	0.9	0.8								
दिसम्बर DEC	I	996.7	12.3	10.4	22.5	8.5	26.7	5.3	32.8	2 1948	1.2	30 1973	77	11.2	1.7	1.4	11.0	0.8	87.6 1909	0.0	56.2	28 1977	2.7	
	II	993.6	19.5	15.0									59	13.5	1.8	1.5								
वार्षिक योग का माध्य ANNUAL TOTAL OR MEAN	I	987.7	22.5	18.6	31.3	18.1	44.1	3.4	47.2	28	0.6	16	69	19.6	2.6	2.4	751.8	40.7	1342.9	204.5	327.2	30	3.8	
	II	984.7	28.5	21.2					5	1988	1	1935	52	20.2	2.7	2.4			1933	1918	6	1981		
वर्षों की संख्या NUMBER OF YEARS	I	29	29	29	29	29	29	29	68		68		29	29	29	29	28	28	64	64	66		15	
	II																							

27

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : अलीगढ
STAION : Aligarh

मौसम परिघटना / WEATHER PHENOMENA — के साथ दिनों की संख्या / No. OF DAYS WITH

माह / MONTH		वर्षण 0.3 मि.मि.या अधिक / PPT 0.3 mm Or more	ओले / HAIL	गर्जन / THUNDER	कुहरा / FOG	धूल भरी आंधी / DUST STORM	चंड वात / SQUALL
जनवरी JAN	I	2.1	0.1	0.2	3.0	0.0	0.0
	II						
फरवरी FEB	I	2.4	0.1	0.5	1.2	0.0	0.0
	II						
मार्च MAR	I	2.2	0.3	0.7	0.0	0.1	0.0
	II						
अप्रैल APR	I	1.9	0.1	0.9	0.0	0.8	0.0
	II						
मई MAY	I	3.2	0.1	0.9	0.0	2.3	0.0
	II						
जून JUN	I	5.2	0.0	0.5	0.0	1.0	0.0
	II						
जुलाई JUL	I	13.2	0.0	0.6	0.0	0.1	0.0
	II						
अगस्त AUG	I	14.4	0.0	0.8	0.0	0.0	0.0
	II						
सितम्बर SEP	I	7.4	0.0	0.4	0.0	0.0	0.0
	II						
अक्तूबर OCT	I	1.9	0.0	0.5	0.1	0.1	0.0
	II						
नवम्बर NOV	I	0.7	0.0	0.1	0.1	0.0	0.0
	II						
दिसम्बर DEC	I	1.2	0.0	0.1	2.2	0.0	0.0
	II						
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	55.8	0.8	6.1	6.7	4.3	0.0
	II						
वर्षोंकी सं NUMBER OF YEARS	I, II	29					

पवन / WIND — पवन की गती के साथ दिनों की संख्या (कि. मी. प्र. घं.) / No. OF DAYS WITH WIND SPEED (Km. p. h.)

माह / MONTH		62 या अधिक / 62 Or more	20-61	1-19	0
जनवरी JAN	I	0	0	25	6
	II	0	0	23	8
फरवरी FEB	I	0	0	23	5
	II	0	0	23	5
मार्च MAR	I	0	0	27	4
	II	0	0	26	5
अप्रैल APR	I	0	0	26	4
	II	0	0	27	3
मई MAY	I	0	0	27	4
	II	0	0	27	4
जून JUN	I	0	0	26	4
	II	0	0	27	3
जुलाई JUL	I	0	0	26	5
	II	0	0	26	5
अगस्त AUG	I	0	0	25	6
	II	0	0	26	5
सितम्बर SEP	I	0	0	24	6
	II	0	0	23	7
अक्तूबर OCT	I	0	0	20	11
	II	0	0	17	14
नवम्बर NOV	I	0	0	18	12
	II	0	0	12	18
दिसम्बर DEC	I	0	0	21	10
	II	0	0	17	14
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	0	0	287	78
	II	0	0	276	89
वर्षोंकी सं NUMBER OF YEARS	I, II	30			

पवन / WIND — पवन की दिशा के दिनों की संख्या का प्रतिशत / PERCENTAGE No. OF DAYS WIND FROM

माह / MONTH		उ / N	उपू / NE	पू / E	दपू / SE	द / S	दप / SW	प / W	उप / NW	शांत / CALM
जनवरी JAN	I	2	14	10	16	2	11	15	9	21
	II	4	9	6	13	4	5	19	13	27
फरवरी FEB	I	3	14	8	14	2	12	15	14	18
	II	5	8	5	13	1	9	24	15	20
मार्च MAR	I	2	13	8	19	2	12	16	14	14
	II	6	8	6	11	2	10	20	22	15
अप्रैल APR	I	3	15	9	18	2	12	13	15	13
	II	8	7	6	12	4	9	13	30	11
मई MAY	I	3	12	11	13	3	12	15	16	15
	II	7	9	8	12	3	9	16	25	11
जून JUN	I	2	12	13	15	4	14	11	15	14
	II	5	14	11	15	4	13	11	18	9
जुलाई JUL	I	2	13	11	11	3	18	12	15	15
	II	5	14	14	12	4	14	10	12	15
अगस्त AUG	I	2	11	12	12	3	15	13	14	18
	II	5	14	13	10	5	14	13	9	17
सितम्बर SEP	I	2	11	13	15	3	14	13	11	18
	II	7	12	10	11	2	11	13	12	22
अक्तूबर OCT	I	4	8	10	11	3	5	11	10	38
	II	8	6	8	9	2	5	8	10	44
नवम्बर NOV	I	3	7	7	11	2	8	14	6	42
	II	6	2	4	5	1	4	11	7	60
दिसम्बर DEC	I	1	9	7	15	1	9	14	10	34
	II	3	4	3	8	1	4	20	10	47
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	2	12	10	14	2	12	13	12	23
	II	6	9	8	11	3	9	15	15	24
वर्षोंकी सं NUMBER OF YEARS	I, II	30								

मेघ / CLOUD — मेघ मात्रा (सभी मेघ) सहित दिनों की संख्या - अष्टमांश / No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) OKTAS

माह / MONTH		0	ले-2 / T-2	3-5	6-7	8
जनवरी JAN	I	20	1	2	3	5
	II	19	2	2	4	4
फरवरी FEB	I	16	2	3	3	4
	II	17	2	3	3	3
मार्च MAR	I	20	1	3	4	3
	II	17	2	4	5	3
अप्रैल APR	I	21	1	3	3	2
	II	19	2	3	4	2
मई MAY	I	23	1	2	2	3
	II	22	3	2	2	2
जून JUN	I	17	1	3	4	5
	II	15	3	3	4	5
जुलाई JUL	I	4	1	2	6	18
	II	2	2	3	8	16
अगस्त AUG	I	4	0	3	5	19
	II	2	3	3	6	17
सितम्बर SEP	I	16	1	4	3	6
	II	13	5	3	4	5
अक्तूबर OCT	I	26	1	1	1	2
	II	25	2	1	1	2
नवम्बर NOV	I	25	1	2	1	1
	II	25	1	2	1	1
दिसम्बर DEC	I	22	1	2	3	3
	II	21	2	2	3	3
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	224	11	29	38	63
	II	202	28	33	46	56
वर्षोंकी सं NUMBER OF YEARS	I, II	30				

मेघ / CLOUD — निम्न स्तरी मेघ मात्रा सहित दिनों की संख्या - अष्टमांश / No. OF DAYS WITH LOW CLOUD AMOUNT OKTAS

माह / MONTH		0	ले-2 / T-2	3-5	6-7	8	कुहरा 8 / FOG 8
जनवरी JAN	I	20	1	2	3	5	0
	II	20	2	2	3	4	0
फरवरी FEB	I	18	1	2	3	4	0
	II	18	2	2	3	3	0
मार्च MAR	I	22	0	3	3	3	0
	II	19	2	3	4	3	0
अप्रैल APR	I	24	0	2	2	2	0
	II	20	2	3	3	2	0
मई MAY	I	25	0	2	1	3	0
	II	23	2	2	2	2	0
जून JUN	I	17	1	3	4	5	0
	II	16	3	3	3	5	0
जुलाई JUL	I	5	1	2	6	17	0
	II	3	2	3	7	16	0
अगस्त AUG	I	5	1	2	4	19	0
	II	2	3	3	6	17	0
सितम्बर SEP	I	17	1	3	3	6	0
	II	15	4	3	3	5	0
अक्तूबर OCT	I	27	0	1	1	2	0
	II	26	1	1	1	2	0
नवम्बर NOV	I	27	0	1	1	1	0
	II	26	1	1	1	1	0
दिसम्बर DEC	I	25	0	1	2	3	0
	II	23	1	2	3	2	0
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	240	7	24	32	62	0
	II	220	24	27	39	55	0
वर्षोंकी सं NUMBER OF YEARS	I, II	30					

दृश्यता / VISIBILITY — दृश्यता सहित दिनों की संख्या / No. OF DAYS WITH VISIBILITY

माह / MONTH		1 कि.मी. तक / UP TO 1 Km	1-4 कि.मी. / 1-4 Kms	4-10 कि.मी. / 4-10 Kms	10-20 कि.मी. / 10-20 Kms	20 कि.मी. से अधिक / OVER 20 Kms
जनवरी JAN	I	3.3	6.2	16.9	4.6	0.0
	II	1.1	11.5	6.3	12.1	0.0
फरवरी FEB	I	1.9	4.8	14.5	6.8	0.0
	II	0.0	8.4	4.8	14.8	0.0
मार्च MAR	I	0.4	4.7	13.4	12.5	0.0
	II	0.1	6.3	6.6	18.1	0.0
अप्रैल APR	I	0.0	3.6	14.0	12.4	0.0
	II	0.0	5.5	7.0	17.4	0.0
मई MAY	I	0.0	5.6	15.4	9.9	0.0
	II	0.0	5.9	9.2	15.9	0.0
जून JUN	I	0.0	5.4	13.0	11.6	0.0
	II	0.0	5.8	8.9	15.3	0.0
जुलाई JUL	I	0.0	4.6	12.2	14.2	0.0
	II	0.0	5.3	7.7	18.0	0.0
अगस्त AUG	I	0.0	3.3	11.4	16.2	0.0
	II	0.0	5.4	7.6	18.0	0.0
सितम्बर SEP	I	0.0	1.4	10.2	18.4	0.0
	II	0.0	4.6	6.7	18.7	0.0
अक्तूबर OCT	I	0.1	1.6	11.7	17.7	0.0
	II	0.0	7.5	6.1	17.4	0.0
नवम्बर NOV	I	0.1	3.6	16.3	10.0	0.0
	II	0.0	12.2	6.6	11.2	0.0
दिसम्बर DEC	I	1.5	7.7	16.0	5.7	0.0
	II	0.1	14.6	5.9	10.4	0.0
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	7.3	52.6	166.8	138.4	0.0
	II	1.2	91.3	83.3	189.1	0.0
वर्षोंकी सं NUMBER OF YEARS	I, II	30				

28

ANNEXURE-VII-1

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

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

ANNEXURE-VII-2

DESIGN CLARIFIED WATER ANALYSIS

S.No	PARAMETER	UNIT	Clarified Water Analysis
			Calculated
1	pH .	-	6.8-7.3
2	Sp. Cond.	µs/cm	325
3	TDS	mg/l	230
4	Turbidity	NTU	10
5	Total hardness	mg/l As CaCO3	155
6	Calcium	mg/l As CaCO3	148.8
7	Magnesium	mg/l As CaCO3	45
8	Sodium	mg/l CaCO3	45
9	Potassium		
10	P Alkalinity	mg/l As CaCO3	-
11	M Alkalinity	mg/l As CaCO3	125.3
12	Chlorides	mg/l As as CaCO3	42
13	Sulphate	mg/l As CaCO3	71.5
14	Silica (Total)	mg/l As SiO2	21
15	Silica (Reactive)	mg/l As SiO2	20
16	Silica (Collidal)	mg/l As SiO2	1
17	TOC	mg/l	6
18	COD	mg/l	45
19	BOD	mg/l	18
20	Fe	mg/lt	-

Note: Cooling water system is expected to operate at a design minimum cycle of concentration (C.O.C) of about 5 to 5.5.

ANNEXURE-VII-3

Salient data for design and sizing of equipment at BMCR Condition

Sl. No.	Description	BMCR condition, 3% MU, 77 mmHg
1	Steam flow at Superheater Outlet (T/hr)	2100
2	Pressure at SH outlet (kg/cm^2-abs)	279
3	Pressure at Turbine inlet (kg/cm^2-abs)	270
4	Temperature at Superheater outlet (° C)	603
5	Steam flow to Reheater (T/hr)	1670
6	Steam Pressure at HP Turbine Exhaust (Kg/cm^2-abs)	69.3
7	Steam temperature at HP Turbine exhaust (°C)	380.2
8	Steam Temperature at Reheater Outlet (°C)	603
9	Pressure drop through the Reheater including cold and hot Reheat piping (kg/cm^2)	10% of HPT Exhaust Pressure
10	Feed Water Temperature at Economizer inlet (°C)	303.7

Notes :

(1) The parameters given here are tentative and will be finalized after receiving from TG supplier.

(2) Feed Water Temperature at Economiser inlet specified in above table is at Bidder's Feed Water terminal point (Specified Elsewhere in the specification)

ANNEXURE-VII-4

Salient data for design and sizing of equipment at Pure Sliding Pressure Condition

Sl.No.	Description	100% TMCR	60% TMCR MSP condition	528 MW (80%) PSP condition	396 MW (60%) PSP condition	330 MW (50%) PSP condition	660 MW (Both stream of HPHs out of service)
1	Steam flow at Superheater Outlet (T/hr)	1898	1110	1489	1107.1	923.1	1628.4
2	Pressure at Turbine inlet (kg/cm2-abs)	270	166	210	158	132	270
3	Pressure at SH Outlet (kg/cm2-abs)	To be derived by the bidder based on the SH outlet Pressure of 279 kg/cm2 (abs) at BMCR condition					
4	Temperature at Superheater outlet (°C)	603	603	603	603	603	603
5	Steam flow to Reheater (T/hr)	1561.4	950	1248.4	948.3	800.1	1624.4
6	Steam Pressure at HP Turbine exhaust (Kg/cm2-abs)	65	40	52.3	40	33.9	69.3
7	Steam temperature at HP Turbine exhaust (°C)	373.9	385	380.8	387	390.8	390.4
8	Steam Temperature at Reheater Outlet (°C)	603	603	603	603	603	603
9	Pressure drop through the Reheater including Cold and Hot Reheater piping (kg/cm2)	10% of HPT Exhaust Pressure for BMCR condition and correspondingly lower for different conditions					
10	Feed Water Temperature at Economizer inlet (°C)	300	271.9	287.9	271.9	261.9	194

Notes :

(1) The parameters given here are tentative and will be finalized after receiving from TG supplier.
(2) The above parameters are at 0% Make-up with average condenser back pressure of 77 mm of Hg.
(3) The Final Feed Water Temperature during All HP heater out can go down till 176°C.
(4) Feed Water Temperature at Economiser inlet specified in above table is at Bidder's Feed Water terminal point (Specified Elsewhere in the specification)

SECTION-I

SPECIFIC TECHNICAL REQUIRMENT

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

SUB SECTION- IA

SPECIFIC TECHNICAL REQUIRMENT (MECHANICAL)

SUB-SECTION IA
SPECIFIC TECHNICAL REQUIRMENT (MECHANICAL)

1. SCOPE OF SUPPLY

This specification is intended to cover design, engineering, manufacture, fabrication, assembly, inspection & testing at vendor's & sub vendor's works, painting, forwarding, supply and delivery at site including start up and commissioning spares, as required, properly packed for transportation, loading/unloading/ handling and storage at site, in site transportation, assembly, erection and commissioning, trail run, preparation and submission of drawing/documents including "As Built" drawings, site testing, carrying out performance guarantee tests at site and handover in flawless operating condition to end customer the entire Sintex (PWTS-STBF/NBF) or Ion exchange(NGPSTP) make or equivalent skid with tertiary treatment for Sewage Treatment Plant complete with all accessories for thermal power plant in 2X660 MW KHURJA STPP.

2. REFERENCE DOCUMENTS

A. DATASHEET-A
B. PROCESS FLOW DIAGRAM
C. PLOT PLAN

3. SCOPE OF SUPPLY FOR SEWAGE TREATMENT PLANT

3.1 SCOPE OF SUPPLY (MECHANICAL)

3.1.1 One no.(1W) coarse bar screen in S1 sewage sump (Outside STP area).
3.1.2 One no. (1W) of sewage sump S1 below ground (RCC work in BHEL scope) along with valves, piping, fittings, instruments and required accessories.
3.1.3 Two (2) nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S1) complete with all instrumentation, valves, piping, fittings, motor and other accessories.
3.1.4 One (1) no. Of bar screen chamber (RCC work in BHEL scope) along with valves, piping, fittings, instruments and required accessories located inside STP area.
3.1.5 One (1) nos.(1W) coarse bar screen in bar screen chamber (RCC work in BHEL scope) along with, fittings, isolation gates and required accessories.
3.1.6 One (1) no. (1W) of oil & grease trap (RCC work in BHEL scope) along instruments, fittings, valves and required accessories (provide oil skimmer, if required).
3.1.7 One (1) no. (1W) STP SKID (SINTEX (PWTS-STBF/NBF-20) or ION EXCHANGE NGPSTP or equivalent skid) is required along with valves, pipes, fittings, instruments and required accessories.
3.1.8 Two (2) nos. sludge recirculation pumps for STP Skid complete with all instrumentation, valves, piping, motor, etc., if required as per supplier recommendation.
3.1.9 Two (2) nos. (1W+1S) oil free type air blowers with piping, instrumentation, valves, fittings, air diffusers, electric motor drives for supplying air required for STP skid, if required as per supplier recommendation. Each blower shall be complete with motor, v-belt drive with belt guard, inlet filter/silencer, flexible couplings and discharge snubber, all mounted on a single base. Relief valve(s) shall be provided.
3.1.10 One (1) no. filter feed tank for effluent storage after treatment in STP skid along with valves, piping, fittings, instruments and required accessories.
3.1.11 Two (2) nos. filter feed pumps complete with all instrumentation, valves, piping, motor, etc. for feeding water to multi grade filter & activated carbon filter for tertiary treatment.
3.1.12 One no. (1W) (1x100%) multi grade filter along with filter media, media, trap piping, valves, electrically operated multiport valve, fittings, instrumentation and accessories associated with automatic backwash arrangement.

3.1.13 One (1) no. (1W) (1x100%) Activated Carbon filter along with filter media, media, trap piping, valves, electrically operated multiport valve, fittings, instrumentation and accessories associated with automatic backwash arrangement.

3.1.14 One (1) no. (1W) sodium hypochlorite dosing tank for dosing chemical to treated water storage tank feed line, complete with valve, fittings, instrumentation and accessories.

3.1.15 Two (2) (1W+1S) no. Electronic type Sodium hypochlorite dosing pump with auto stroke controller complete with all instrumentation and accessories, valves, piping, motor, etc.

3.1.16 One (1) no. treated water tank for effluent storage after tertiary treatment along with valves, piping, fittings, instruments and required accessories.

3.1.17 Two (2) nos. treated water disposal pumps for treated water tank complete with all instrumentation, valves, motor, piping and required accessories etc.

3.1.18 50-meter hose pipe from treated water disposal pumps for STP shall be provided by bidder for horticulture purpose.

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

3.1.20 All sewage transfer piping from sewage sump up to Sewage treatment plant shall be routed on pedestals/ buried. Wrapping, coating and protection of all the buried pipe is also in bidder's scope & shall be as per AWWA C 203. However, all auxiliary steel structure (U-clamps, nuts, bolts, channels etc.) for fixing pipes on pedestal shall be in bidder's scope. Inputs for pipe pedestals as per requirement and layout shall be furnished.

3.1.21 Wherever terminal points between BHEL and bidder indicated, bidder shall provide pipes with counter flange. All blank flanges/counter flanges, isolations valves, tees etc. to interconnect the pipes at all terminal points.

3.1.22 Bidder to take care of the length of piping as included elsewhere in the technical specification. Pipe routings shall be decided during detailed engineering.

3.1.23 All puddle pipes, bolts, nuts, sleeves, gaskets shall be in bidder's scope.

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

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

3.1.26 All necessary drains, vents, breathers, CO2 absorbers, seal pots, fume absorbers and sampling points with valves as specified and as required are in bidder's scope.

3.1.27 All necessary structural steel for pipe supporting structure, platforms, walkways and access stairs, mechanical plant and equipment, mechanical services and pipe work associated with Package.

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

3.1.29 Monitoring gadgets, instruments and equipment required for maintenance (till demonstration/ PG test and plant handover).

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

3.1.31 Any item/ work either supplies of equipment or erection material which have not been specifically mentioned in but are necessary to complete the works for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification and shall be in bidder's scope and will be supplied by bidder without any commercial, technical and delivery implication to BHEL and customer.

3.1.32 Any statutory requirement / clearance required from government / local body shall be in bidder's scope. Bidder to also comply local body / government norms.

3.1.33 All motorized valves shall be provided with integral starter.

3.1.34 Start-up and commissioning spares as required.

3.1.35 Electrical scope shall be as per 'Electrical Scope between BHEL and Vendor' enclosed elsewhere in the technical specification. Scope of cables indicated in 'Electrical Scope between BHEL and Vendor' is applicable for control and instrumentation cables also. Screen control cable is meant for electrical as well as signal/ instrumentation cables.

3.1.36 Recirculation lines for pumps shall be provided by bidder along with valves, instrumentation, fittings as per system requirement.

3.1.37 Bidder to follow latest version of all codes and standards.

3.1.38 Apart from package specific design requirement indicated in this technical specification, design of various systems/ sub-systems and all equipment/ items will also strictly meet stipulations of General Technical Requirements of Customer's Technical Specification (included in Annexure-X/ Sub Section IA) as relevant to Package.

3.1.39 All Valve, piping, fitting, and instrument shall be of minimum PN 10/ 150 class rating.

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

3.1.41 Diaphragm seal for instruments shall be provided by bidder as per technical requirement.

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

3.1.43 Grouting material required for fixing of equipment/ items.

3.1.44 All documents, including the installation as well as the related software shall be in fluent, legible English.

3.1.45 One (1) no. Chain Pulley Block with tripod arrangement of adequate capacity, to meet the erection and maintenance requirements shall be provided by bidder.

3.1.46 All the fills of consumables and one year's topping requirements of consumables such as greases, oil, lubricants, servo fluids/control fluids, gases 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 supplied by the bidder. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum. Bidder shall supply a quantity not less than 10% of the full charge or one (1) year topping requirement mentioned above (whichever is higher) of each variety of lubricants, servo fluids, gases etc. (as detailed above) used which is expected to be utilized during the first year of operation. This additional quantity shall be supplied in separate containers.

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

3.2 SCOPE OF SUPPLY (ELECTRICAL)

Complete electrical as per specification / details indicated in sub sections IB and IIB.

3.3 SCOPE OF SUPPLY (C&I)

Complete Control and Instrumentation as per specification/ details indicated in sub sections IC and IIC.

Local indication of Pressure shall be provided by bidder in each pump, blower etc. Flow measurement shall be provided by bidder at treated water pump discharge. SEWAGE TREATMENT PLANT System shall be operated from Microprocessor, shall be supplied by bidder. However, the control of sewage pumps in Sewage sump S1 shall be through self-standing local control panel and in Bidder's scope.

4. SCOPE OF SERVICES

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

1) Arrangement of all instruments, reagents, monitoring gadgets for monitoring, & lab facilities to carry out, pre-commissioning, trial run, commissioning, Performance guarantee test & till handover.
2) Complete grouting for equipment, fixing and any concreting inside the vessels and lining.
3) 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.

4) Unloading, Storage, handling and transportation at site.
5) Minor civil work like chipping of foundation, grouting below base plate for all structures, equipment, grouting of anchor bolts wherever these are not placed in the foundation during casting of foundation itself. Vendor shall ensure to supply all foundation bolts timely so as to facilitate placement of these bolts while casting the foundation.
6) Pre-commissioning work such as flushing, hydraulic testing etc. Necessary tools, consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities shall be arranged by the successful bidder at their own cost.
7) Erection and Commissioning of Sewage Treatment Plant.
8) Arrangement of all lubricants, instruments, tools, reagents for carrying out trial run, commissioning and performance guarantee/ demonstration test.
9) Monitoring gadgets, instruments and equipment required for maintenance (till performance guarantee/demonstration test & Plant Hand over).
10) All personnel required during maintenance, commissioning, trial run and performance guarantee/ demonstration test.
11) Trial run for requisite period.
12) Performance guarantee/ demonstration test of Sewage Treatment Plant.
13) Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.
14) Relevant requirements as per GTR, GCC, ECC & SCC etc.
15) Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system as well as to meet any statutory requirement relevant to the package, unless specifically excluded from scope of services.
16) Painting as per enclosed painting schedule ANNEXURE VII/ Sub Section IA. However, any variation in the painting schedule as finally approved by customer / BHEL shall be taken care by bidder without any commercial and delivery implication. Colour-coding scheme shall be intimated to vendor during detailed engineering. Final touch up paint at site.
17) Any statutory requirement / clearance required for package from government / local body shall be in bidder's scope. All Statutory Clearance and permits from concerned local bodies/ authorities, write –up on various statutory requirements and their compliance for Sewage treatment plant shall be in bidder's scope.
18) Bidder to attend regular engineering meeting with BHEL and Customer fortnightly in BHEL or Customer office as decided during detail engineering. Vendor will depute his entire concerned engineering representatives along with the project manager for discussion and approval of engineering drawings/ documents during detailed engineering to meet project's various milestones and completion schedule, without any price implication to BHEL and Customer. Meeting can be held at site also.

5. TERMINAL POINTS

1) Service water connection (50 NB connections) at 5-meter distance from sewage treatment plant area battery limit. However, distribution and piping inside STP area shall be in bidder's scope.

6. EXCLUSIONS

1) All chemicals.

2) 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.

3) Civil design and construction work.

4) MCC

7. PIPING

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

b) Pipe distances are given below:

SL. NO.	FROM	TO	DISTANCE (In meters)
1.	Sewage sump (S1)	STP AREA	385
2.	STP AREA	Nearest Drain	20

Sewage sump, S1 shall be located outside STP area however rest facilities of STP shall be located inside STP area provided in plot plan included in this specification.

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

c) Piping from treated water disposal pumps up to horticulture network 50 meters shall be in bidder's scope. Layout and routing shall be finalized during detailed engineering.

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

8. QP AND SUBVENDOR APPROVAL:

8.1 Minimum QP requirements are specified in Annexure I/ Sub Section IA. However, any additional comments as given by BHEL/Customer shall be adhered by the bidder without any commercial & delivery implication to BHEL.

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

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

9. FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES

Functional Guarantees and liquidated damages shall be as **per enclosed Sub-Section IA ANNEXURE III.**

10. DESIGN/ CONSTRUCTION REQUIREMENTS

In addition to the requirements of Sub-Section IA & IIA, Sub-Section IB & IIB & Sub –Section IC& IIC the following shall also be complied under scope of this specification.

The material of construction specified in Datasheet-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.

10.1 STP's sump depth may vary **from 2.5 to 4.5** meters.

11. MANDATORY SPARES

The Bidder shall include in his scope of supply Mandatory spares. Requirements of mandatory spares indicated in Annexure XI/ Sub Section IA for bidder's adherence.

12. PAINTING

Painting schedule shall be prepared in line with the details indicated in Annexure VII/ Sub Section IA of technical specification. However, any additional comments as given by BHEL/Customer shall be adhered by the bidder without any commercial & delivery implication to BHEL.

Internal painting of the equipment shall be suitable for withstanding effect of fluid being handled. Outer painting shall be as per technical specifications. Supporting documents shall be furnished in support of suitability of the lining offered for the duty conditions by bidder during detailed engineering.

Bidder to note that painting shall be as per approved painting schedule to be finalized during detailed engineering.

13. DRAWING/ DOCUMENTS REQUIREMENT

13.1 For the Drawings/Documents distribution Procedure, please refer attached Annexure-IV/ Sub Section IA. 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. The numbers of soft copies & hard copies of drawing/documents to be submitted by the bidder shall be as per enclosed Annexure-IV/ Sub Section IA.

13.2 After award of LOI/LOA, drawing/documents to be submitted by the bidder for BHEL/Customer approval has been indicated in Annexure IV/ Sub Section IA. 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.

14. CHAIN PULLEY BLOCK

14.1 Manual hoists (hand operated) shall be designed to duty class 2 as per IS 3832.

14.2 The hoist capacity shall be selected considering 25% margin over the weight of heaviest component /equipment to be handled.

15. ADDITIONAL REQUIREMENT

I. Bidder to submit BBU during detailed engineering after approval of basic documents. BBU shall be equal to BOQ for the package and there shall be no price and delivery implication is applicable to BHEL/ customer for the same. None of the items supplied for the project as non-billable. Incomplete BBU shall not be reviewed by BHEL.

II. Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval shall be taken from BHEL. 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.

III. All drawings/documents shall be approved by BHEL/Customer during detailed engineering

stage. Successful Bidder shall comply with the comment of the customer/BHEL without price & delivery implication.

IV. 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.

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

VI. 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.

VII. 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.

VIII. Bidder to adhere Format of operation and maintenance manual requirement as per Annexure V/ Sub Section IA during detailed engineering.

IX. Bidder to adhere site storage and preservation requirement as per Annexure VIII/ Sub Section IA during detailed engineering.

X. Bidder to adhere site General technical requirement as per Annexure X/ Sub Section IA during detailed engineering.

XI. Bidder to refer Plot plan attached in Sub Section IA. Location of sewage collection sump located outside respective area have been also located with tentative routing of sewage transfer piping for bidder's information. All sewage transfer piping from sewage lifting sump up to Sewage treatment plant shall be buried.

XII. Sewage treated water shall be used for irrigation purpose as well as terminated in nearest drain. Hence bidder to provide separate piping with isolation valve for the same.

16. GENERAL TECHNICAL INSTRUCTIONS

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

II. 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.

III. 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.

IV. The general term and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works

covered by this specification 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.

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

VI. Deviations along with cost of withdrawal (positive or negative), 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 tender specification & there is no deviation. (Price to be given in sealed envelope only.)

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

VIII. The equipment covered under this specification shall not dispatch unless the same have been finally inspected, accepted and shipping release issue by BHEL/Customer.

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

17. PLANT OPERATION AND CONTROL

The control philosophy of system is described below. Following basic process related interlocks, alarms/ prewarning signals shall be implemented in the control system as per system requirement.

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

(b) One local control panel at sewage lifting sump location (S1) shall be provided by bidder.

(c) Permissive & Interlocks:

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

(7) Abnormal parameters such as low & high level in tanks/sumps, high pressure at pump discharge, low header pressure, low lubrication water flow to pumps (provided with forced water lubrication system) etc.
(8) Failure of starting of equipment such as pumps, blowers etc. upon start command.
(9) Tripping of equipment due to protection logic.

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

ANNEXURE-I

QAP FOR SEWAGE TREATMENT PLANT

QUALITY ASSURANCE

Items / Components \ Tests/Check	Material Test	WPS/PQR/Welder Qualification	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic / Water Fill	Performance Test	Test as per relevant Std/ Appd. Data Sheets	Other Tests	Remarks
1. Horizontal Centrifugal Pumps				Y	Y			Y^1	Y		**LEGENDS:**
1.1. Casing	Y^a		Y^b				Y				Y Applicable
1.2. Impeller	Y^a		Y^b							Y^d	Y^a One per Heat/Heat Treatment batch./Lot
1.3. Shaft	Y^a		Y						Y^c		Y^b On machined surfaces only. Also 100% on Butt Welds & 10% on Fillet Welds.
2. Vertical Pumps				Y	Y			Y^1	Y		Y^c UT shall be done for shafts with Dia 50 mm or above & Plates of Thickness 20 mm or above.
2.1. Casing	Y^a		Y^b				Y				Y^d Dynamic Balancing per ISO: 1940, Grade 6.3 minimum.
2.2. Impeller	Y^a		Y^b							Y^d	
2.3. Shaft	Y^a		Y						Y^c		Y^1 As per HIS, USA.
2.4. Fabricated Parts	Y^a	Y	Y^b			Y^2	Y				Y^2 10% RT to be conducted on butt welds for Thk ≥10 mm.
3. Dosing/ Metering Pumps	Y^a						Y	Y^1	Y		Y^3 Seat Leakage Test for actuator operated valves shall be done by closing the valve with job actuator.
4. Gate/ Globe/ Check Valves	Y^a		Y^b		Y		Y	Y	Y	Y^8	Y^4 Tests on Rubber Diaphragms per batch of Rubber mix such as Tensile, Elongation, Hardness, Thickness, Bleed Resistance, Flex Test for 1500 cycles etc. shall be conducted. In addition, Type Test for 50,000 cycles for each type of diaphragm shall also be conducted, if not carried out earlier.
5. Dual Plate Check Valves	Y^a		Y^b		Y		Y	Y	Y	Y^{12}	Y^5 Seat Leakage Test is required to be done in both directions. Disc strength test as per relevant code shall be carried out.
6 Diaphragm Valves	Y^a				Y		Y^3		Y	Y^4	Y^8 Blue Matching, Wear Travel for Gate Valves, reduced pressure test for check valves shall be conducted per relevant standards.
6. Butterfly Valves (Low Pr.)				Y	Y		Y^3	Y		Y^5	
7.1Body (Cast)	Y^a		Y^b								
7.2Disc (Cast)	Y^a		Y^b								
7.3 Shaft	Y^a		Y^b							Y^c	
8. Plug/ Ball Valves (Low Pr.)	Y^a		Y^b	Y	Y		Y	Y	Y		
9. Blowers	Y^a		Y^b	Y	Y		Y	Y	Y	Y^{dc}	
10. Atmospheric Storage Tanks/ Pressure Vessels	Y^a	Y	Y^b	Y	Y	Y^g	Y		Y^c	Y^7	

QUALITY ASSURANCE

Items / Components \ Tests/Check	Material Test	WPS/PQR/Welder Qualification	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic / Water Fill	Performance Test	Test as per relevant Std/ Appd. Data Sheets	Other Tests
11. Rubber lining	Y[a]				Y				Y	Y[9]
12. Reactor Clarifier	Y[a]	Y	Y[b]	Y	Y				Y	Y[10]
13. Clariflocculator/ Plate or Tube Settler	Y[a]			Y	Y				Y	
14. Hoists & Cranes	Y[a]	Y	Y[b]	Y	Y	Y[d]		Y	Y	
15. Chlorine Tonner	Y[a]	Y	Y[b]	Y	Y	Y[d]	Y			
16. Chlorine Evaporator	Y[a]	Y	Y	Y	Y	Y	Y			
17. Chlorinator & injector	Y[a]			Y	Y		Y	Y		
18. Agitators /Flash Mixer/ Flocculator	Y[a]	Y	Y[b]	Y	Y			Y		Y[10]
19. Pipes	Y[a]	Y		Y	Y		Y		Y	
20. Ventilation/Exhaust Fan	Y[a]		Y[b]	Y	Y			Y[11]	Y	Y[dc]

After erection, the complete Piping system along with valves & fittings shall be hydraulically tested.

Y[a] 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 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 fir 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] Blue Matching, reduced pressure test for check valves shall be conducted per relevant standards. Dry cycle test on valve spring for 100000 cycles shall be carried out as type test, if not carried out earlier, for the similar MOC, size and type of spring.

Notes:

1. Heat Treatment shall be done as per ASME code.
2. Bleeding Resistance tests shall be done by keeping the sample in 33% HCl, 48% NaOH and DM Water for 72 Hrs.
3. Hydro Test shall be conducted, before Rubber lining.
4. As per code requirements.
5. As per HIS, USA.
6. Hydro test of body before Rubber lining. Seat Leakage test for Actuator operated valves shall be done by closing the Valves with Job Actuator.
7. Tests on Rubber parts such as Diaphragms shall be done per batch of Rubber mix, such as Tensile, Hardness, Adhesion, Spark Test, Bleed Resistance test and Flex test. Life Cycle test for Diaphragms for 50000 cycles etc shall also be done.
8. Hydro Test of Body, Seat & Disc Strength shall be carried out in accordance with latest edition of AWWA C-504 Standard. Proof of Design Test in accordance with latest edition of AWWA C-504 Standard shall also be carried out, if not carried out earlier. Seat Leakage test for Actuator operated valves shall be done by closing the Valves with Job Actuator. Seat leakage test shall be carried out in both directions.
   a) One per Heat/Heat Treatment batch/Lot
   b) On machined surfaces only.
   c) UT shall be done for shafts with Dia 50 mm or above.
9. For all other Misc. items, refer Table on LP piping.
10. Inspection / test / check requirements for pressure vessels other than service vessel are same as for inspection / test / check requirements for service vessel as indicate in table given above.
11. For piping, vales, fillings in service vessel area quality requirements please also refer power cycle piping quality plan.
12. Quality requirements specified here if contradicting as specified elsewhere in this chapter, then stringent quality requirements shall be followed by the bidder for all items without any price and delivery implications to BHEL/customer.
13. The Quality requirements mentioned here in this annexure for different mechanical, electrical & C&I items are bare minimum, if any other quality requirements required for these items as per BHEL & customer during detail engineering the same shall be accepted and provided by bidder without any price 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 = 50 mm
1	100% Hydraulic test shall be carried out. Weld joints not subjected to hydraulic test shall be subjected to 100% RT
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%
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 TIME OF FLIGHT DEFRACTION (TOFD) 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'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 NTPC Engineering. 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 NTPC Engineering.	
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 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 Butter Fly valve being applicable for fabricated butterfly valves, following test shall be done for Fabricated Butter Fly Valve: a. UT as per ASTM A-435 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.	

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))	SYSTEM:	SECTION: II	SHEET 1 of 2

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

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

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
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		3.NAMEPLATE DETAILS	MA	VISUAL	100%	-	IS-325 / IS-12615 / APPROVED DATA SHEET	SAME AS COL. 7	TEST/ INSPN. REPORT	✓	P	V	-	
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / (#)	AS PER MFG. STANDARD / (#).	INSPC. REPORT	✓	P	W	-	(#) REFER NOTE-8

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

LEGENDS:

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

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	Sign & Date	Name		Sign & Date	Name
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Reviewed by:		PRAVEEN DUTTA	Reviewed by:		RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:17.04.2020
		CUSTOMER :		QP NO.: PE-QP-999-Q-007, REV-04	
		PROJECT:		PO NO.:	
		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))	SYSTEM:	SECTION: II	SHEET 1 OF 9

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
1.0	RAW MATERIAL & BOUGHT OUT CONTROL													
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	-	FREE FROM BLINKS, CRACKS, WAVINESS ETC	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	LOG BOOK		P	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	SAMPLE	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	TEST REPORT		P/V	-		
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%	-		FREE FROM CRACKS, UN-EVENNESS ETC.	TEST REPORT		P	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	TC		P/V	-	-	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%	-	MANUFACTURER'S DRG./SPEC	FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK		P/V	-		
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	TC		P/V	-		HEAT NO. SHALL BE VERIFIED
		3.DIMENSIONS	MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG.	MANUFACTURER'S DRG.	LOG BOOK		P/V	-		
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	-	MANUFACTURER'S DRG./SPEC	MANUFACTURER'S DRG./SPEC	LOG BOOK		P/V	-		

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Reviewed by:		PRAVEEN DUTTA	Reviewed by:		R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		P	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	-	MANUFACTURER'S DRG./ SPEC.	MANUFACTURER'S DRG./ STD.	TC		P/V	-		
		3. DIMENSIONS	MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG./ SPEC.	MANUFACTURER'S DRG.	LOG BOOK		P/V	-		
		4.INTERNAL FLAWS	CR	ULTRASONIC TEST	100%	-	ASTM-A388	MANUFACTURER'S STD.	INSPECTION REPORT	✔	P/W	V	-	FOR DIA OF 55 MM & ABOVE
1.6	SPACE HEATERS, CONNEC-TORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	100%	-	MANUFACTURER'S DRG./STD.	MANUFACTURER'S DRG./STD.	INSPECTION REPORT		P/V	-	-	
		2. PHYSICAL COND.	MA	VISUAL	100%	-	MANUFACTURER'S DRG./STD.	NO PHYS. DAMAGE, NO ELECTRICAL DISCONTINUITY	INSPECTION REPORT		P/V	-	-	
		3.DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG./ STD	MANUFACTURER'S DRG. / STD.	INSPECTION REPORT		P/V	-	-	
		4.PERFORMANCE/ CALIBRATION	MA	TEST	100%	-	MANUFACTURER'S DRG./ STD	MANUFACTURER'S DRG. / STD.	TEST REPORT		P/V	-	-	

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					M	C/N				D	M	C	N	
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC.	MA	VISUAL	100%	-	-	NO VISUAL DEFECTS	TEST REPORT		P/V	-	-	
		2.DIMENSION(BORE DIA, WALL THICKNESS, BDV AS RECEIVED, BDV AFTER FOLDING AT 180º	MA	TEST	SAMPLE	-	MANUFACTURER'S STD.	MANUFACTURER'S STD.	LOG BOOK AND OR SUPPLIER'S TC		P/V	-	-	
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND.	MA	VISUAL	100%	-	-	NO VISUAL DEFECTS (FREE FROM BURS)	LOG BOOK		P	-	-	
		2.DIMENSIONS INCLUDING BURS HEIGHT	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG. .	MANUFACTURER'S DRG.	LOG BOOK		P/V	-	-	
		3. ACCEPTANCE TESTS	MA	ELECT. & MECH TESTS	SAMPLE	-	MANUFACTURER'S DRG./ STD.	MANUFACTURER'S DRG./ STD.	TC		P/V	-	-	
1.9	CONDUCTORS	1. SURFACE FINISH	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		*P/V	-	-	* MOTOR MANUFACTURER TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS (10% SAMPLE) AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY
		2.ELECT. PROP, & MECH. PROP	MA	ELECT. & MECH.TEST	SAMPLES	-	MANUFACTURER'S DRG./ SPEC.	MANUFACTURER'S / SPEC.	TC & VENDOR'S TEST REPORTS		P/V	-	-	

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1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLES	-	MANUFACTURER'S DRG./ SPEC.	MANUFACTURER'S / SPEC.	LOG BOOK		P/V	-	-	
									LOG BOOK					
1.10	BEARINGS	1.MAKE & TYPE	MA	VISUAL	100%	-	MANUFACTURER'S DRG./ APPROVED DATASHEET	MANUFACTURER'S DRG./ APPROVED DATASHEET			P/V	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	APPROVED DATASHEET	APPROVED DATASHEET/ BEARING MANUF'S CATALOGUES	LOG BOOK		P/V	-	-	
		3.SURFACE FINISH	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		P/V	-	-	
1.11	SLIP RING (WHEREVER APPLICABLE)	1.SURFACE COND.	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK		P	-	-	
		3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	SAMPLE	-	MANUFACTURER'S STD./ APPROVED DATASHEET	MANUFACTURER'S STD./ APPROVED DATASHEET	LOG BOOK		P/V	-	-	
		4.HV/IR	MA	-DO-	100%	-	MANUFACTURER'S STD./ APPROVED DATASHEET	MANUFACTURER'S STD./ APPROVED DATASHEET	LOG BOOK		P/V	-	-	
1.12	OIL SEALS & GASKETS	1.MATERIAL OF GASKET	MA	VISUAL	100%	-	MANUFACTURER'S DRG/SPECS	MANUFACTURER'S DRG./ SPECS.	LOG BOOK		P	-	-	
		2.SURFACE COND.	MA	VISUAL	100%	-	-	FREE FROM VISUAL DEFECTS	LOG BOOK		P	-	-	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK		P	-	-	

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					M	C/N				D	M	C	N	
2.0	IN PROCESS													
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNESS	MA	VISUAL	100%	-	MANUFACTURER'S DRG	GOOD FINISH	LOG BOOK		P/W	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK		P	-	-	
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-	-DO-	GOOD FINISH	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG	MANUFACTURER'S DRG	LOG BOOK		P	-	-	
		3.SHAFT SURFACE FLOWS	MA	PT	100%	-	MANUFACTURER'S STD./ ASTM-E165	MANUFACTURER'S STD./ APPROVED DATASHEET.	LOG BOOK	✔	P	V	-	
2.3	PAINTING	1.SURFACE PREPARATION	MA	VISUAL	100%	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		3.SHADE	MA	VISUAL	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	SAMPLE	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	

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1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S STD.	MANUFACTURER'S STD.	LOG BOOK		P	-	-	
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-	MANUFACTURER'S STD.	MANUFACTURER'S STD.	LOG BOOK		P	-	-	
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		2.CLEANLINESS	CR	VISUAL	100%	-	MANUFACTURER'S STD./APPROVED DATASHEET	MANUFACTURER'S STD./APPROVED DATASHEET	LOG BOOK		P	-	-	
		3.IR-HV-IR	CR	ELECT. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1	IS-325//IS-12615/IEC-60034 PART-1	TEST/INSPC. REPORT	✔	P	V	-	
		4.RESISTANCE	CR	ELECT. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1	IS-325//IS-12615/IEC-60034 PART-1	TEST/INSPC. REPORT	✔	P	V	-	
		5.INTERTURN INSULATION	CR	ELECT. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1	IS-325//IS-12615/IEC-60034 PART-1	TEST/INSPC. REPORT		P	-	-	
2.6	IMPREGNATION	1.VISCOSCITY	MA	PHY. TEST	AT STARTING	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-	-	
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-	-	
		3.NO. OF DIPS	MA	PROCESS CHECK	CONTINUOUS	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK	✔	P	V	-	THREE DIPS TO BE GIVEN

BHEL					
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1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
		4.DURATION	MA	PROCESS CHECK	CONTINUOUS	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK	✔	P	V	-	
2.7	COMPLETE STATOR ASSEMBLY	1.COMPACTNESS & CLEANLINESS	MA	VISUAL	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-	-	
2.8	BRAZING/COMPRESSION JOINT	1.COMPLETENESS	CR	VISUAL	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	LOG BOOK		P	-	-	
		2.SOUNDNESS	CR	MALLET TEST & UT	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	TEST/INSPC. REPORT	✔	P	V	-	
		3.HV	MA	ELECT. TEST	100%	-	MANUFACTURER'S STANDARD	MANUFACTURER'S STANDARD	TEST/INSPC. REPORT	✔	P	V	-	
2.9	COMPLETE ROTOR ASSEMBLY	1.RESIDUAL UNBALANCE	CR	DYN. BALANCE	100%	-	MANUFACTURER'S SPEC./ ISO 1940	MANUFACTURER'S DWG.	LOG BOOK		P	-	-	
		2.SOUNDNESS OF DIE CASTING	CR	ELECT. (GROWLER TEST)	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	TEST/INSPC. REPORT	✔	P	V	-	
2.10	ASSEMBLY	1.ALIGNMENT	MA	MEAS.	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-	-	
		2.WORKMANSHIP	MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-	-	
		3.AXIAL PLAY	MA	MEAS.	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK	✔	P	V	-	
		4.DIMENSIONS	MA	MEAS.	100%	-	MANUFACTURER'S DRG./ MANUFACTURER'S SPEC.	MANUFACTURER'S DRG./ MANUFACTURER'S SPEC.	LOG BOOK		P	-	-	
		5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK		P	-	-	
		6. RTD, BTD & SPACE HEATER MOUNTING.	MA	VISUAL	100%	-	MANUFACTURER'S SPEC.	MANUFACTURER'S SPEC.	LOG BOOK	✔	P	V	-	

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	PROJECT:		PO NO.:	
	ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))	SYSTEM:	SECTION: II	SHEET 8 OF 9

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS	MA	ELECT.TEST	1/TYPE/SIZE	1/TYPE/SIZE	IS-325//IS-12615/APPROVED DATASHEET	IS-325/IS-12615/APPROVED DATASHEET	TEST REPORT	✔	P	W*	-	* NOTE - 1
		2.ROUTINE TESTS INCLUDING SPECIAL TEST	MA	ELECT.TEST	100%	-	IS-325//IS-12615/APPROVED DATASHEET	IS-325/IS-12615/APPROVED DATASHEET	TEST REPORT	✔	P	V$	- -	$ NOTE - 2
		3.VIBRATION & NOISE LEVEL	MA	ELECT.TEST	100%	-	IS: 12075 / IEC 60034-14 & IS-12065	IS: 12075 / IEC 60034-14 & IS-12065	TEST REPORT	✔	P	V$	-	$ NOTE - 2
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET &	TEST/INSPC. REPORT	✔	P	W	-	
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	-	IEC 60034-5/IS-12615	APPROVED DATASHEET	TC	✔	P	V	- -	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		6. MEASUREMENT OF RESISTANCE OF RTD & BTD	MA	ELECT. & MECH. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1/IS: 12802	IS-325/IS-12615/IEC-60034 PART-1/IS: 12802	TC	✔	P	V$	-	$ NOTE - 2
		7. MEASUREMENT OF RESISTANCE, IR OF SPACE HEATER	MA	ELECT. & MECH. TEST	100%	-	IS-325//IS-12615/IEC-60034 PART-1	IS-325/IS-12615/IEC-60034 PART-1	TC	✔	P	V$	-	$ NOTE - 2
		8. NAME PLATE DETAILS	MA	VISUAL	100%	-	IS-325//IS-12615& DATA SHEET	IS-325//IS-12615 & DATA SHEET	TEST/INSPC. REPORT	✔	P	V$	-	$ NOTE - 2
		9.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	-	IS 2148 / IEC 60079-1	IS 2148 / IEC 60079-1	TC	✔	P	V	-	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	SAMPLE	APPROVED DATASHEET	APPROVED DATASHEET	TC	✔	P	W$	-	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY $ NOTE - 2

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		HEMA KHUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:		PRAVEEN DUTTA	Reviewed by:		R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:17.04.2020
		CUSTOMER :		QP NO.: PE-QP-999-Q-007, REV-04	
		PROJECT:		PO NO.:	
		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))	SYSTEM:	SECTION: II	SHEET 9 OF 9

SI No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD		AGENCY			
1	2	3	4	5	6		7	8	9	*	**			
					M	C/N				D	M	C	N	
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MANUFACT. STANDARD / (#)	AS PER MANUFACT. STANDARD / (#)	INSPC. REPORT	✔	P	W	-	(#): REFER NOTE-8

NOTES:

1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED.

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

3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THE SAME IS VALID FOR 5 YEARS.

4 BHEL RESERVES THE RIGHT TO PERFORM REPEAT TEST, IF REQUIRED.

5 AFTER PACKING AND PRIOR TO ISSUE MDCC, PHOTOGRAPHS OF ITEMS TO BE DESPATCHED SHALL BE SENT TO BHEL PURCHASE GROUP FOR REVIEW.

6 IN CASE , ANY CHANGES IN QP COMMENTED BY CUSTOMER AT CONTRACT STAGE SHALL BE CARRIED OUT BY BIDDER WITHOUT ANY IMPLICATION TO BHEL/ CUSTOMER.

7 PROJECT SPECIFIC QP TO BE DEVELOPED BASED ON CUSTOMER REQUIREMENT.

8 FOR EXPORT JOB, BHEL TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING TO BE FOLLOWED.

9 PACKING SHALL BE SUITABLE FOR STORAGE AT SITE IN TROPICAL CLIMATE CONDITIONS.

10 LATEST REVISION/ YEAR OF ISSUE OF ALL THE STANDARDS (IS/ ASME/ IEC ETC.) INDICATED IN QP SHALL BE REFERRED.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,

** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **C**: CUSTOMER,

P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE

MA: MAJOR, **MI**: MINOR, **CR:** CRITICAL

D: DOCUMENT

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		HEMA KHUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:		PRAVEEN DUTTA	Reviewed by:		R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

QUALITY ASSURANCE

MEASURING INSTRUMENTS (PRIMARY AND SECONDARY) Page- 1/2

TESTS / ITEMS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (if applicable)(R)	Hydro Test(R)	Material Test certificate ®
1. PR Gauge (IS-3624)	Y	Y	Y	Y	Y				
2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
3. Pr./D.P.Switch(BS-6134)	Y	Y	Y	Y	Y	Y			
4. Electronic Transmitter(IEC-60770)	Y	Y	Y	Y	Y	Y			
5. Temp. Switch	Y	Y	Y	Y	Y	Y			
6. Recorder(IS-9319/ANSI C-39.4)	Y	Y	Y	Y	Y	Y			
7. Vertical indicators	Y	Y	Y	Y		Y			
8. Digital Indicators	Y	Y	Y	Y		Y			
9. Integrators	Y	Y	Y	Y					
10. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y			
11. Transducer (IEC-688)	Y	Y	Y	Y	Y	Y			
12. Thermocouples (IEC – 754 / ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y			
13. RTD(IEC-751)	Y	Y	Y	Y	Y	Y			
14. Thermowell	Y		Y				Y	Y	Y

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

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

MEASURING INSTRUMENTS (PRIMARY AND SECONDARY) Page- 2/2

TESTS / ITEMS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	Insulation Resistance (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)
15. Cold junction compensation box	Y	Y	Y	Y					Y			
16. Orifice plate(BS-1042)	Y	Y	Y	Y *	Y	Y **	Y **			Y	Y **	Y
17. Flow nozzle(BS-1042)	Y	Y	Y	Y *	Y	Y	Y			Y	Y	Y
18. Impact head type element	Y	Y	Y					Y				Y
19. Level transmitter/float type switch	Y	Y	Y	Y					Y	Y	Y	Y
20. Analysers	Y	Y	Y	Y								
21. Dust emission monitors	Y	Y	Y	Y								
*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.												
** If applicable												

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

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

PROCESS CONNECTION & PIPING

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

*-applicable for painted junction boxes.

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

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

ANNEXURE-II

SUB-VENDOR LIST

	Project:	PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO. :	CS-9585-001-2		
					AND SUB-SUPPLIER APPROVAL			REV. NO. :			
	Package:	EPC						DATE:	06.04.2017		
	Supplier:	BHEL									
	Contract No.:	CS-9585-001-2			SUB-SYS	STEAM GENERATOR/RAW MATERIALS					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission schedule	Remarks	
1	SEAMLESS TUBES	$				TUBOS REUNIDOS	SPAIN	A		CS,T-11,T-12,22,T-23,T-91	
		$				VALLOREC & MANNESMANN	GERMANY	A		T-92,T-91,T-23,T-22,T-11,T-12,CS	
		$				VALLOREC TUBES	FRANCE	A		T-92,T-91,T-23,T-22,T-11,T-12,CS	
		$				TENNARIS GLOBAL(NKK TUBES)	JAPAN	A		T-91,T-22,T-11,T-12,CS	
		$				HENGYANG VALIN STEEL TUBE CO.	CHINA	A		CS & AS UPTO T-22(with TPI INSPECTION) SUB TO CONDITIONS	
		$				TENNARIS GLOBAL(DALMIN ITALY)	ITALY	A		T-22,T-11,T-12,CS	
		$				JINAGSU CHENGDE STEEL TUBE	CHINA	A		T-92,T-91,T-22,T-11,T-12,CS SUB TO TPIA INSPECTION CONDITIONS	
		$				JEE(KAWASAKI)	JAPAN	A		T-92,T-91,T-22,T-11,T-12,CS	
		$				TENNARIS GLOBAL(SILCO, ROMANIA)	ROMANIA	A		CS,T-11,T-22,T-23,T-91,T-12,	
		$				CHANGZHOU CHANGBAO PRECISION	CHINA	A		CS	
		$				PRODUCTUS TUBLARES	SPAIN	A		T-91,T-22,T-11,T-12,CS	
		$				SUMITOMO METALS	JAPAN	A		T-92,T-91,T-23,T-22,T-11,T-12,CS	
		$				BENTLER	GERMANY	A		T-92,T-91,T-22,T-11,T-12,CS,SS	
		$				IBF	ITALY	A		T-91,T-22,T-11,T-12,CS	
		$				WAYMAN GORDAN	USA	A		T-91,T-22,T-11,T-12,CS,	
		$				BHEL SSTP	TRICHY	A		T-22,T-11,T-12,CS	
		$				JINDAL SAW LTD.	NASHIK	A		CS,T-11,T-22 ,T-12,SUB TO CONDITIONS	
		$				REMI	INDIA	A		CS,T-11,T-22 ,T-12,SUB TO CONDITIONS	
		$				ISMT	AHMEDANAGAR/BARAMATI	A		CS,T-11,T-22 ,T-12,SUB TO CONDITIONS	
		$				MSL	RAJGAD	A		CS SUB TO CONDITIONS	
		$				BAOSHAN IRON & STEEL CO. LTD.	CHINA	A		CS,T-11,T-22,T-12,(WITH TP1) SUBJECT TO CONDITIONS	

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Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh (Jharkhand) * C & M Deptt.

06-04-2017
A. SAKTHI GANESH
Engineer-QA/BHEL-Trichy

Annexure-Q1

	Project:	PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO. :	CS-9585-001-2	
					AND SUB-SUPPLIER APPROVAL			REV. NO. :		
	Package:	EPC						DATE:	06.04.2017	
	Supplier:	BHEL								
	Contract No.:	CS-9585-001-2			SUB-SYS	STEAM GENERATOR/RAW MATERIALS				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission schedule	Remarks
		$				HMT	GUJARAT	A		HOT FINISHED CS GRADE (UPTO 76.2 MM OD & 12 MM THK)
		$				CHANGZHOU CHANGBAO PRECISION	CHINA	A		T-11,12
2	SEAMLESS TUBES(RIFLED)	$				SALZGITTER MANESS/AMANN PRECISION	FRANCE	A		CS
		$				CHANGHOU CHANGBAO PRECISION	CHINA	A		T-11,12
		$				BAOSHAN STEEL	CHINA	DR		
		$				TENNARIS GLOBAL(DALMINE)	ITALY	DR		
		$				SUMITOMO	JAPAN	DR		
		$				TUBOS REUNIDOS	SPAIN	DR		
3	SEAMLESS TUBES(SS)	$				KOBE	JAPAN	A		SS 304,SS347H
		$				POSCO SPL STEEL CO	KOREA	A		SS 304,347H,SUPER 304
		$				TUBACEX	SPAIN	A		
		$				SMST	ITALY	A		SS 304,347H, SUPER 304
	SEAMLESS TUBES(SS)UPTO DIA<76.1MM	$				SUMITOMO METAL IND LTD.	JAPAN	A		SS 304,347H, SUPER 304
	SEAMLESS TUBES(SS) UPTO OD 159.0MM & WT-12.5MM	$				HUADI STEEL GROUP	CHINA	A		SS 304, 304H,347H(WITH TPI) SUB TO CONDITIONS
	SEAMLESS TUBES(SS) UPTO OD 159.0MM & WT-12.5MM	$				ZHEJIANG JIULI HI TECH	CHINA	A		SS 304, 304H,347H(WITH TPI) SUB TO CONDITIONS
						PRODUCTUS TUBLARES	SPAIN	DR		
4	SEAMLESS PIPES	$				TUBACEX	SPAIN	A		SS PIPES
		$				SUMITOMO METALS	JAPAN	A		P-92,P-91,P-22,P-11,P-12,CS
		$				VALLOREC TUBES	FRANCE	A		P-92,P-91,P-22,P-11,P-12,CS

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06-04-2017

2/6

	Project:	PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO.:	CS-9585-001-2	
								REV. NO. :		
	Package:	EPC						DATE:	06.04.2017	
	Supplier:	BHEL								
	Contract No.:	CS-9585-001-2			SUB-SYS	STEAM GENERATOR/RAW MATERIALS				

S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission schedule	Remarks
		$				HENGYANG VALIN STEEL TUBE COL	CHINA	A		CS
		$				BHEL SSTP	TRICHY	A		CS
		$				TUBOS REUNIDOS	SPAIN	A		P-91,P-22,P-11,P-12,CS
		$				VALCONVY TRUB	CZECH REP	A		CS,P-11,P-12,P-22
		$				ACELOR MITTAL	ROMANIA	A		CS
		$				WAYMAN GORDAN	USA	A		P-91,P-22,P-11,P-12,CS
		$				TENNARIS GLOBAL(NKK TUBES)	JAPAN	A		P-91,P-22,P-11,P-12,CS
		$				IBF SPA	ITALY	A		P-92,P-91,P-22,P-11P-12,CS
		$				JFE(KAWASAKI)	JAPAN	A		P-92,P-91,P-22,P-11,P-12,CS
		$				PRODUCTUS TUBLARES	SPAIN	A		P-91,P-22,P-11P-12,CS
		$				VALLOREC & MANNESMANN	GERMANY	A		P-92,P-91,P-22,P-11,P-12,CS
		$				TENNARIS GLOBAL(DALMINE)	ITALY	A		P-91,P-22,P-11,P-12,CS
		$				JINDAL SAW LTD.	NASHIK	A		CS,P-11,P-22 ,P-12,SUB TO CONDITIONS
		$				ISMT	AHMEDANAGAR/BARAMATI	A		CS,P-11,P-22,P-12, SUB TO CONDITIONS
		$				YANGZHOU CHENGDE STEEL PIPE CO. LTD.	CHINA	A		P-92,P-91,P-22,P-11,P-12,CS SUB TO TPIA INSPECTION CONDITIONS
		$				MSL	RAJGAD	A		CS SUB TO CONDITIONS
		$				REMI	BHARUCH	A		CS,P-11,P-22 ,P-12,SUB TO CONDITIONS
		$				RATNAMANI	MUMBAI	DR		CS
		$				ZIZIANG GROSS	CHINA	DR		CS
		$				PRODUCTUS TUBLARES	SPAIN	DR		FOR P92 GRADE
	SEAMLESS PIPES(DIA UPTO 159MM)	$				TENNARIS GLOBAL SILCO TUBES)	ROMANIA	A		P-91,P-22,P-11,P-12,CS
	SEAMLESS PIPES(UPTO 160MM)	$				BENTLER	GERMANY	A		P-92,P-91,P-22,P-11,P-12,CS
	SEAMLESS PIPES(UPTO 219.0MM)	$				JIANGSU CHENGDE STEEL TUBE	CHINA	A		P-92,P-91,P-22,P-11,P-12,CS SUB TO TPIA INSPECTION CONDITIONS

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Patratu Vidyut Utpadan Nigam Limited (Jharkhand) C & M Deptt.

06-04-2017

3/6

	Project:	PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO. :	CS-9585-001-2	
					AND SUB-SUPPLIER APPROVAL			REV. NO. :		
	Package:	EPC						DATE:	06.04.2017	
	Supplier:	BHEL								
	Contract No.:	CS-9585-001-2			SUB-SYS	STEAM GENERATOR/RAW MATERIALS				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submissio n schedule	Remarks
	SEAMLESS PIPES(UPTO 88.9MM)	$				BAOSHAN IRON & STEEL CO. LTD.	CHINA	A		CS SUBJECT TO CONDITION
	SEAMLESS PIPES(UPTO OD 914 X WT 102 MM)	$				RINGMIL	ITALY	A		FORGED CS PIPE
5	PLATES & ROLLED SECTION(UPTO GRADE 91)	$				INDUS STEEL	BELGIUM	A		CS-SA515 AS UP TO GR-91
		$				ILSENBURGER GROBBLECH(SALZGITTER MANESSMANN)	GERMANY	A		CS-SA 299, SA515, BS EN 10025, IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-91
		$				DILLINGER-GTSVENTES	GERMANY	A		CS-SA 299, SA515, BS EN 10025, A36, IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-91
		$				ARCONI D.O.O.	SLOVENIA	A		CS- SA515, BS EN 10025, A36, IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-91
6	PLATES & ROLLED SECTION(UPTO GRADE 22)	$				THYSEEN KRUPP	GERMANY	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES. AS UPTO GR.-22
		$				INDUSTEEL LOIRE	FRANCE	A		CS-SA 299, SA515; AS UPTO GR.-22
		$				ESSAR STEEL LTD.	HAZIRA	A		CS- SA515, BS EN 10025, A36, IS 2062, OTHER STRUCTURAL STEEL GRADES; AS GR.-12 &22
		$				VOESTALPINE GROBBLECH GMBH	AUSTRIA	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-22.
		$				SAIL	BHILAI/SALEM	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-22.
		$				NIPPON STEEL	JAPAN	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-22.
		$				POSCO	KOREA	A		CS- SA515 BS EN 10025 A36 IS 2062 OTHER STRUCTURAL STEEL GRADES; AS UPTO GR.-22.

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Patratu Vidyut Utpadan Nigam Limited C & M Deptt. Distt-Ramgarh(Jharkhand)

06-04-2017

26

	Project:	PATRATU 3x800 MW			LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO.:	CS-9585-001-2	
					AND SUB-SUPPLIER APPROVAL			REV. NO. :	0	
	Package:	Steam Generator Island Package						DATE:	04.04.2017	
	Supplier:	BHEL				BHEL TRICHY				
	Contract No.:	CS-9585-001-2			SUB-SYST	STEAM GENERATOR				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
		I				BHEL HERP	VARANASI			
33	HANGER & SUPPORTS-(OTHER THAN CLH & VLH)	III				MAIN CONTRACTOR'S APPROVED SOURCES				
34	CONVENTIONAL VALVES(GATE,GLOBE & CHECK)									91/92 GRADE CASTINGS FOR CONVENTIONAL VALVES SHALL BE FROM MAIN CONTRACTOR'S APPROVED SOURCES WHICH ARE HAVING ELECTRIC ARC FURNACE, VOD AND LRF FACILITIES
		I				BHEL	TRICHY	A		CONVENTIONAL VALVES(GATE,GLOBE & CHECK) BHEL RANGE, 2/3 WAY VALVES
		I				VELAN	H4T1X8 MONTREAL CANADA	A		GATE/CHECK V/V UPTO 22"CI 2500
		I				LEADER VALVES	JALANDHAR	A		CCS GLOBE V/X 24" CI 600, GLOBE V/V 24"CI 300,CHECK V/V 24"CI 600
		I				CRESCENT VALVES	MUMBAI	A		UPTO NB 300 CL 600
		I				VELAN VALVE CORP	USA	A		GATE V/V 2-24"CI 900-4500,CAST STEEL GATE V/V 18-48"CI150-600
		I				VELAN	UK	A		1) GLOBE V/V 1/4"-2"CI4500 ,2) BONNETLESS GLOBE V/V 1/2-2.5"CI 150-600)
		I				VELAN	QUBEC CANADA	A		GATE/GLOBE/CHECK V/V UPTO 3"CI 2680
		I				L&T VALVES	COIMBATORE	A		1) CAST 2500 CI GATE(CS &AS) UPTO 20" & CHECK(CS&AS) UPTO 16"; 2) FORGED 4500 CI(CS&AS) GATE UPTO 1" & GLOBE/CHECK UPTO 2".

Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited C & M Deptt. Distt-Ramgarh(Jharkhand)

7/14

	Project:	PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO.:	CS-9585-001-2		
					AND SUB-SUPPLIER APPROVAL			REV. NO. :	0		
	Package:	Steam Generator Island Package						DATE:	04.04.2017		
	Supplier:	BHEL				BHEL TRICHY					
	Contract No.:	CS-9585-001-2			SUB-SYST	STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks	
		I				BDK	HUBLI	A		UPTO NB 300 & CL 600,FORGED UPTO NB 50 CL. 800	
		I				FOURESS ENG. INDIA LTD.	MUMBAI	A		UPTO NB 200 CL 600,NB 250-600 CL 300	
		I				NITTON VALVES	AURANGABAD	A		WCB/WCC(GATE VALVE UPTO 36" Cl 600)	
		I				SAMSHIN	SOUTH KOREA	A		2500 CL GATE/GLOBE/CHECK UPTO 24"; CL 3500 GATE UPTO 18" & GLOBE UPTO 6"; 4500 CL GATE UPTO 6" & GLOBE/CHECK/ANGLE UPTO 2"	
		I				VELAN	H4T1G2 MONTREAL CANADA	A		GATE/GLOBE/CHECK UPTO 24"Cl 4500	
		I				VELAN	PORTUGAL	A		CAST STEEL GATE/GLOBE/CHECK 2-12"Cl 150-600	
		I				ROCKWELL	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER	
		I				CRIS	FRANCE	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER	
		I				OKANO VALVES	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER	
		I				RAIMONDI	ITALY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER	
		I				HP VALVES	NEITHERLANDS	A		TRIM VALVES;APPROVAL RANGE AS PER NTPC APPROVAL LETTER	
		I				FLOW SERVE	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER	
		I				DRESSER MASONEILAN	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER	

Bharat Heavy Electricals Limited * PS-MKTG Delhi *

Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh(Jharkhand) * C & M Deptt.

8/14

	Project:	PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN		DOC. NO. :	CS-9585-001-2		
					AND SUB-SUPPLIER APPROVAL		REV. NO. :	0		
	Package:	Steam Generator Island Package					DATE:	04.04.2017		
	Supplier:	BHEL			BHEL TRICHY					
	Contract No.:	CS-9585-001-2			SUB-SYST STEAM GENERATOR					

S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
		1				OKANO VALVES	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				TOA	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				CRIS	FRANCE	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				TYCO SEMPELL	GERMANY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				MIL CONTROLS	KERALA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				FOURESS ENG. INDIA LTD.	INDIA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				DEUTSCHE BABCOCK	GERMANY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				KSB	COIMBATORE	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				SPX PROCESS EQUIPMENTS/COPES VULCAN	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				TOA/MEIWA	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				RAIMONDI	ITALY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				BABCOCK BORSING	ESPANA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		1				DEWARNCE	UK	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
35	SAFETY VALVE(SPRING TYPE)	1				DRESSER	USA	A		
		1				SEMPELL AG	GERMANY	A		
		1				TYCO(PENTAIR VALVES & CONTROLS)	USA	A		
		1				FUKUI	JAPAN	A		
		1				RIENEKE GMBH	GERMANY	A		HYD TYPE

Bharat Heavy Electricals Limited * PS-MKTG Delhi *

Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh (Jharkhand) * C & M Deptt. 9/14

	Project:	PATRATU 3x800 MW			LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO. :	CS-9585-001-2	
					AND SUB-SUPPLIER APPROVAL			REV. NO. :	0	
	Package:	Steam Generator Island Package						DATE:	04.04.2017	
	Supplier:	BHEL			BHEL TRICHY					
	Contract No.:	CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submissio n	Remarks
		I				BOPP & REUTHER	GERMANY	A		HYD TYPE
		I				VALVE TECHNOLOGIES	USA	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		I				MEIWA	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		I				BHEL	TRICHY	A		
36	ERV	I				VALVE TECHNOLOGIES	USA	A		
		I				FUKUI	JAPAN	A		
		I				SEMPELL AG	GERMANY	A		
		I				DRESSER	USA	A		
		I				MEI WA CORP.	JAPAN	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		I				RIENEKE GMBH	GERMANY	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
37	PLUG VALVE	I				FLOW SERVE INDIA CONTROLS	KANCHIPURAM	A		UPTO 150 NB Cl 300,UPTO 400 NB Cl 150
						HAWA VALVES	MUBAI	A		UPTO 8" SIZE AND CLASS 300
		I				3Z CORP.	KOREA	A		UPTO 10" SIZE AND CLASS 300
		I				BDK	HUBLI	A		APPROVAL RANGE AS PER NTPC APPROVAL LETTER
		I				ZED VALVES CO. PVT. LTD.	AHMEDABAD	DR		
38	SAFETY VALVE SILENCERS	III				MAIN CONTRACTOR'S APPROVED SOURCES				

Bharat Heavy Electricals Limited * PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited * C & M Deptt. * Distt-Ramgarh(Jharkhand)

10/14

	Project:	PATRATU 3x800 MW			LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO. :	CS-9585-001-2	
					AND SUB-SUPPLIER APPROVAL			REV. NO. :	0	
	Package:	Steam Generator Island Package						DATE:	04.04.2017	
	Supplier:	BHEL				BHEL TRICHY				
	Contract No.:	CS-9585-001-2			SUB-SYST	STEAM GENERATOR				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submission	Remarks
39	PRIMARY STRUCTURE - CEILING GIRDERS, MAIN COLUMNS, AUX COLUMNS, BUILT UP BEAMS, BOXES, BUCKSTAY, BRACINGS, MILL BAY STR, APH SUPPORT STR, TRANSFER TOWER	I				NTPC APPROVED VENDORS				PROJECT SPECIFIC APPROVAL OF EACH VENDOR TO BE TAKEN BY BHEL FROM NTPC; VENDOR TO MEET TECH. SPEC. REQUIREMENTS FOR STR. FABRICATION
40	BUCK STAY, BRACINGS MFD FROM ROLLED SECTIONS	III				MAIN CONTRACTOR'S APPROVED SOURCES				VENDOR TO MEET TECH. SPEC. REQUIREMENTS FOR STR. FABRICATION
41	SECONDARY STRUCTURE-PLATFORMS , GALLERIES , WALKWAY, STAIRCASE, LADDER, DUCT SUPPORT STRUCTURE, ANCHOR BOLTS ETC	III				MAIN CONTRACTOR'S APPROVED SOURCES				VENDOR TO MEET TECH. SPEC. REQUIREMENTS FOR STR. FABRICATION
42	ELECTROFORGED GRATINGS	II				INDIANA GRATINGS P. LTD.	PUNE	A		
		II				KARDE ANAND UDYOG	PUNE	A		
		II				PREMIER POWER PROJ.	HOWRAH	A		
		II				BHOLA RAM STEEL	PATNA	A		
		II				PINAX STEEL	PATNA	A		
		II				GREATWELD	PUNE	A		
		II				VIN FAB ENGG. PVT. LTD.	MUMBAI	A		
43	STRAINERS	III				MAIN CONTRACTOR'S APPROVED SOURCES				

Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited C & M Deptt. 11/14 Distt-Ramgarh(Jharkhand)

	Project:	PATRATU 3x800 MW			LIST OF ITEMS REQUIRING QUALITY PLAN			DOC. NO.:	CS-9585-001-2	
					AND SUB-SUPPLIER APPROVAL			REV. NO. :	0	
	Package:	Steam Generator Island Package						DATE:	04.04.2017	
	Supplier:	BHEL			BHEL TRICHY					
	Contract No.:	CS-9585-001-2			SUB-SYST STEAM GENERATOR					
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	supplier Details submissio n	Remarks
		I				TECHNO FORGE SPA	ITALY	A		P-91, P-92 FORMED
		I				MEGA SPA	ITALY	A		P-91 FORGED/WELDED
		I				BASSI LLUIGI SPA	ITALY	A		P-91 FORGED/WELDED
		I				IBF SPA	ITALY	A		P-91, P-92 FORMED/FORGED
		I				ALLIED INT. (TACTUBI RACCORDI SPA, VIA ROMA 150, 29027 PODENZANO)	ITALY	A		P-91, P-92 FORMED
		I				BRUCK STRASSE 16 ENSHEIM	GERMANY	A		P-91 FORGED/WELDED
		I				SUNGKWANG BEND CO. LTD.	KOREA	A		P-91/F-91 FORMED/FORGED/WELDED
		I				TK CORP. FORGITAL	KOREA	A		P-91 FORMED
						TIANJIN JINDING PIPING CO. LTD.	CHINA	A		91 FORMED (ELBOW, TEE, REDUCER)
						RINGMILL SPA	ITALY	A		FOR SEAMLESS AS (UPTO 91 GRADE) FORGED PIPE
		I				FORGITAL	ITALY	DR		
		I				DEE DEVELOPMENT	PALWAL	A		91 WITH SIZE/TYPE CONDITIONS AS PER NTPC APPROVAL LETTER
						CHW FORGE LTD.	GHAZAIBAD	A		91 WITH SIZE/TYPE CONDITIONS AS PER NTPC APPROVAL LETTER
						FORGE MONCHIERI SPA	ITALY	A		91 FORGING- WITH SIZE/TYPE CONDITIONS AS PER NTPC APPROVAL LETTER
						VIAR SPA	ITALY	DR		91 FORGINGS
						TIANJINDING PIPING CO. LTD.	CHINA	DR		
		I				AFFLERBACH	GERMANY	DR		
49	FITTINGS(CS,SS & AS UPTO GR 22)	II				MAIN CONTRACTOR'S APPROVED SOURCES				
50	KNIFE EDGE GATE VALVES(Mill Outlet and Burner Inlet)	I				GALAXY CONTROLS PVT LTD	CHENNAI	A		Upto size 26'

Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited Distt-Ramgarh(Jharkhand) C & M Deptt. 13/14

	Project:	PATRATU	3x800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL		DOC. NO. :	CS-9585-001-2	
	Package:	Steam Generator Island Package					REV. NO. :	0	
	Supplier:	BHEL					DATE:	05.04.2017	
	Contract No.:	CS-9585-001-2			SUB-SYST	SG & AUX.-FQP & ERECTION AGENCIES&ESP ERECTION AGENCIES			

S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
		I				POWER MECH PROJECTS PVT. LTD	VIJAYWADA	A		NOTE-1
		I				TEXCEL ENGINEERS	CHENNAI	A		NOTE-1
		I				BRIDGE & ROOF	KOLKATA	A		NOTE-1
		I				KARPARA PROJECTS ENGG. PVT. LTD.	SURAT	A		NOTE-1
		I				SUNIL HI-TECH ENGG.	NAGPUR	A		NOTE-1
		I				IOTEP	MUMBAI	A		NOTE-1
		I				PCP INTERNATIONAL LTD.	CHANDIGARH	A		NOTE-1
		I				LARSEN & TUBRO LTD.	MUMBAI	A		NOTE-1
		I				EDAC ENGG. LTD.	CHENNAI	A		NOTE-1
		I				TATA PROJECTS LTD.	HYDERABAD	A		NOTE-1
		I				BHAWANI ERECTORS	KERALA	A		NOTE-1
		I				U B ENGG.	PUNE	DR		NOTE-1
		I				DOWEL ERECTORS	CHENNAI	A		NOTE-1
		I				GOLDEN EDGE ENGG.	NEW DELHI	A		NOTE-1
3	LP PIPING	I				NOTE-2				
4	HT MOTORS	I				NOTE-2				
5	COMPRESSED AIR SYSTEM	I				NOTE-2				
6	MILL REJECT HANDLING SYSTEM	I				NOTE-2				
7	PASSENGER CUM GOODS ELEVATOR	I				NOTE-2				

Bharat Heavy Electricals Limited * PS-MKTG Delhi *

Patratu Vidyut Utpadan Nigam Limited * C & M Deptt. * Distt-Ramgarh(Jharkhand)

G.V. Rathod 12/04/17

	Project:	PATRATU	3X800	MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC. NO. :	CS-9585-001-2	
	Package:	EPC/SG						REV. NO. :	0	
	Supplier:	BHEL						DATE:	12.05.2015	
	Contract No.:	CS-9585-001-2			SUB-SYST	BHEL PIPING CENTRE, CHENNAI				
S.No.	ITEM	QP/Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks
						CLYDE PUMPS	GHAZIABAD	A		
		I				SULZER	NAVI MUMBAI	A		
36	BUTTERFLY VALVES(upto 1400NB-PN10 & upto 300NB-PN16)					R&D Multiple	Valsad	A		
						Fouress Engg.	Bangalore	A		
						Weir BDK	Hubli	A		UPTO1050NB PN-15
						IL	Palghat	A		
						Intervalve	Pune	A		
						KBL	Kondhapuri	A		
						PENTAIR	Kondhapuri	A		UPTO 900NB PN-16
						FLOSERVE	Coimbatore	A		
						L&T		DR		
37	BOILER FEED PUMP(AUX.BOILER)	III								BHEL Approved Vendors

NOTES :A - APPROVED, DR - DETAIL REQUIRED, N - NOTED. REFER TRICHY BOILER LIST FOR OTHER NOTES.

Bharat Heavy Electricals Limited * PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited * C & M Deptt. * Distt-Ramgarh(Jharkhand)

5/5

NTPC	PROJECT : PATRATU PACKAGE : EPC (FGD) Package MAIN CONTRACTOR : M/s BHEL CONTRACT NO : CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY	REF. NO : REVISION NO : 00 DATE : 16-05-17

No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Place	SS Approval Status	SS Detail Sub. SCH	SS Approval SCH	Remark
1	Slurry re-circulation Pumps	I									Refer Sub.QR List
2	Oxidation Blowers	I									Refer Sub.QR List
3	Wet Limestone Grinding Mill	I									Refer Sub.QR List
4	Slurry Pumps	I									Refer Sub.QR List
5	Agitators	I									Refer Sub.QR List
6	Vacuum Belt Filters	I									Refer Sub.QR List
9	Bucket Elevator	I				Indiana Conveyors Pvt.Ltd.	Jejori, Pune	A			
						Bevcon Wayors Pvt.Ltd	HYDERABAD	DR			
10	Absorber Tank	I				BHEL	Ranipet	DR			
11	Atmospheric Tanks	III				Main Contractor approved sub contractor					
12	Structural Items(Columns,Beams & Bracings) Built up section .					BHEL	Ranipet	DR			
		I				Jindal	Ghaziabad	A			UP TO 350NB (Black & GI)
		III				TATA STEEL	Jamshedpur	A			UP TO 150 NB (Black & GI)
		III				SAIL	Rourkela	A			
		I				Surya Roshni	Bahadurgarh	A			UP TO 400NB (Black & GI)
		I				Welspan	Anjar	A			UP TO 400NB (Black)

Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh(Jharkhand) C & M Deptt.

Bharat Heavy Electricals Limited PS-MKTG Delhi

BHEL
(SASHI KUMAR)

Page 1 of 8

NTPC	PROJECT : PATRATU PACKAGE : EPC (FGD) Package MAIN CONTRACTOR : M/s BHEL CONTRACT NO : CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY	REF. NO : REVISION NO : 00 DATE : 16-05-17

No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Place	SS Approval Status	SS Detail Sub. SCH	SS Approval SCH	Remark
13	MS Pipes (ERW)	I				MSL	Raigad	A			200 to 500 NB (Black)
		I				Indus Tube	G. B. Nagar	A			UP TO 300 NB (Black & GI)
		I				Jindal Industries	Hissar	A			UP TO 300 NB (Black & GI)
		I				APL Apollo	Sikandrabad	A			UP TO 300NB (Black)
		I				Dadu Pipes	Sikandrabad	A			UP TO 300 NB (Black)
		I				ISMT	Ahmedabad	A			
14	Spiral welded upto 1500 mm	I				Ratnamani	Anjar / Chatral	A			
						JCO Gas Pipes	Chindwara	A			
						SAIL	Raurkella	A			
						Surya Global	Kutch	A			
15	LRB Insulation	I				Lloyd Insulation	Chennai	A			
		I				Rockwool Industries	Bhilai / Medak	A			
		I				Minwool Rock Fibres Ltd.	Rajnandgaon	A			
		I				Lapinus Rockwool Ltd.	Gwalior	A			
		I				Punjstar(PIFCO)	Bhilai	A			
		I				Goenka Rockwool	Raipur	A			
		I				Rockwool India Ltd.	Medak-AP	A			
		I				Thermocare Rockwool Pvt.Ltd.	Rajnandgaon	A			
		I				Minsulate Mfg.Co	Jamshedpur	A			
		I				Dhanbad Rockwool	Dhanbad	A			
		I				Hitech RockwoolFibre	Rajnandgaon	A			
		I				Roxul RockwoolInsulation	Dahej(Bharuch)	A			
16	Gates & Dampers	I				Indra Damper	Ranipet	A			
		I				Bachmann	Faridabad	A			
		I				Fouress	Bengaluru	A			
		I				BHEL	Ranipet	A			
		I				Clyde Burgmann Bachmann	USA	A			
17	Valves for FGD application#	I				BHEL	Trichy	A		As per approval (Type/Class/Rating & Material	
		I				Bankim Valves	Howrah	A		CI Gate/Check/Globe upto600NB,PN16.	
		I				H.Sarkar & Co	Howrah	A		CI Gate/Check/Globe upto 700NB,PN16	

Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh(Jharkhand) * C & M Deptt.

Bharat Heavy Electricals Limited * PS-MKTG Delhi

BHEL

NTPC	PROJECT : PATRATU PACKAGE : EPC (FGD) Package MAIN CONTRACTOR : M/s BHEL CONTRACT NO : CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY	REF. NO : REVISION NO : 00 DATE : 16-05-17

No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Place	SS Approval Status	SS Detail Sub. SCH	SS Approval SCH	Remark
		I				Hawa Engineers	Ahmedabad	A		Forged Steel Gate globe check valve upto 50 NB Class 800	
		I									
		I									
18	Flap Gate, R&P Gate,										
		I				TKII	Pune	A			
		I				Mining&Material Handling	Kolkata	A			
						United Technomac	Pune	A			
		I				MBE	Kumardhubi	A			
		I				Prepec	Howrah	A			
						HMTC	Kolkata	A			
		I				Elecon	VV Nagar	A			
		I				Indiana Conveyor	Jejori, Pune	A			
		I						DR			
		I						DR			
		I						DR			
		I				Kirloskar Brothers	Pune	A			
		I				Sam Turbo	Coimbatore	A			
		I				Mather & Platt	Pune	A			
19	Water Pumps(process water)	I				KSB	Pune	A			
		I				Weir Minerals	Bangalore	A			
		I				WPIL	Kolkata/Gaziabad	A			
		I				Kishore	Pune	A			
		I				Flow More	Ghaziabad	A			
20	Metallic Expansion Joints	I				Lonestar Industries	Chennai	A			
		I				Mechwell	Nasik	A			
		I				BHEL	Ranipet	A			
		I				Keld Ellenloff	Chennai	A			
		I				Eagle Burgmann	Chennai / Denmark	A			
		I				HKR	Korea	A			
21	Non-Metallic Expansion Joints for Ducts	I				Safetech	Spain	A			
		I				Bachmann Industries(India) Ltd.	New Delhi	DR			
		I				Elastomeric Engineers	Salem	DR			
		I				Urja Products Pvt.Ltd.	Ahmedabad	DR			

Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh(Jharkhand) * Deptt.

BHEL

NTPC	PROJECT : PATRATU PACKAGE : EPC (FGD) Package MAIN CONTRACTOR : M/s BHEL CONTRACT NO : CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY	REF. NO : REVISION NO : 00 DATE : 16-05-17

No.	Major Equipment	QP Inspection Category	QP No.	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Place	SS Approval Status	SS Detail Sub. SCH	SS Approval SCH	Remark
23	Hydro Cyclone	I				FL Smidth	Chennai	DR			
		I				Weir Minerals	Bangalore	A			
		I				Multo Tech	S.Africa	A			
		I				McNally Bharat	Bangalore	DR			
24	Rubber Lining of Pipes	I				Jasmino Polymertech	Taloja	A			
		I				CORI Engineers	Chennai	A			
		I				Western Rubber	Mumbai	A			
		I				Elastomer Lining	Ambernath	A			
		I				Emkay Rubber	Mumbai	A			
		I				Rishi	Bahalgarh	A			
		I				Poly Rubber	Mumbai	A			
		I				Temsec Rubber	Kolkata	A			
		I				Presidency Rubber	Howrah	A			
		I				Arul Rubber Pvt.Ltd	Hosur	A			
		I				Industrial Moulders	Vadodara	A			
		I				MILL Industries	Chennai	DR			
		I				Lebracs rubber	Pondicherry	DR			
25	FRP PIPE with fittings	III				Main contractor approved source		A		upto 3"	
26	Rubber Lining for Tank and absorber	III				MIL Industries	Chennai	A			
		III				TIP TOP	Germany	A			
		III				Stealuer	Germany	A			
		III				Arul Rubber	Hosur	A			
		III				Temsec Rubber	Kolkata	A			
						Lebracs Rubber	Pondicherry	DR			
						CORI Engineers	Chennai	DR			
27	Ventillation Fans	I				Patel Air	Ahmedabad	A			
		I				Marathan Electric	Kolkata	A			
		I				Howden	Kolkata / Chennai	A			
		I				SK System	Sonepat	A			
		I				Andrew Yule	Kalyani	A			
		I									

Bharat Heavy Electricals Limited ★ PS-MKTG Delhi

Bharat Vidyut Nigam Limited ★ Distt-Ramgarh(Jharkhand) ★ M Deptt.

BHEL

एनटीपीसी NTPC	Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator	Ref No.: 9585-001-02 Revision No.: 00 Date: 05.04.2017

SN	ITEM	QP/ INS-PN CAT *	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
	BWG)					LTD.,					
		I				*M/s. Neotiss Limited (formerly VALLOUREC HEAT EXCHANGER TUBES LTD.,)*	*Patancheru, Hyderabad*	*DR*			
		I				*M/s. REMI*	*Tarapur*	*DR*			
		I				*M/s. Shinhan Metal*	*South Korea*	*DR*			
		I				M/s PLYMOUTH TUBE COMPANY,	USA	A			
55	STAINLESS STEEL TUBE (U TUBE) WELDED (UP TO 17 BWG)	I				M/s RATNAMANI METALS & TUBES LTD.,	AHMEDABAD/ KUTCH	A			
		I				M/s PLYMOUTH TUBE COMPANY,	USA	A			
		I				M/s VALLOUREC HEAT EXCHANGER TUBES LTD. (FORMERLY CST VALINOX)	HYDERABAD	A			
		I				REMI	TARAPUR	DR			
		I				SHINHAN	KOREA	DR			
56	SAFETY RELIEF VALVE (TUBE SIDE AND SHELL SIDE)	I				M/s TYCO	USA	A			
		I				M/s DRESSER	USA	A			
		I				*M/FAINGER LESSER*	*GERMANY*	*A*			
		I				*BHEL-HPBP-TRICHY*	*TRICHY*	*DR*			
		I				*PENTAIR VALVES & CONTROLS*	*VADODARA*	*DR*			
		I				*KSB MIL CONTROL LIMITED*	*CHENNAI*	*DR*			

Bharat Heavy Electricals Limited PS-MKTG Delhi

Jharkhand Vidyut Utpadan Nigam Limited * Patratu * Distt.-Ramgarh (Jharkhand) C & M Deptt. BHEL

एनटीपीसी NTPC

Project : PATRATU STPP(3X800MW)
Package : EPC
Contractor : BHEL, Hyderabad
Contract No.:

LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL

SUB SYSTEM: **BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator**

Ref No.: 9585-001-02
Revision No.: 00
Date: **05.04.2017**

SN	ITEM	QP/ INS-PN CAT *	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
		I				ASIAN INDUSTRIAL VALVES AND INSTRUMENTS	CHENNAI	DR			
57	LP HEATER	I				BHEL	HYDERBAD	A			
58	HP HEATER	I				BHEL	HYDERBAD	DR			SUB-QR ITEM
		I				SPX	USA	A			SUB-QR ITEM
		I				BHI	SOUTH KOREA	A			SUB-QR ITEM
		I				TEI	USA	A			SUB-QR ITEM
		I				SHANGHAI	CHINA	A			SUB-QR ITEM
59	DRAIN COOLER	I				HOLTEC	USA	A			SUB-QR ITEM
60	VALVES GATE, GLOBE, CHECK ½ TO 10" (UPTO 2500 CL)	II				BHEL	HYDERBAD	A			SUB-QR ITEM
		II				TOA VALVES	JAPAN	A			
		II				DEUTSCHE BABCOCK	GERMANY	A			
		I				DRESSER	USA	A			
		I				BHEL	TRICHY	A			
		I				FLOSTEER ENGINEERS PVT. LTD.,	AHMEDABAD	DR			
		I				JOSHIJAMPALA ENGINEERING PRIVATE LI	SATARA	DR			
		I				SKILT FABRICATORS PVT.LTD,	MUMBAI	DR			
		I				VALVE TECH INDUSTRIES	NAVI MUMBAI	DR			
		I				CHEMTECH INDUSTRIAL VALVES	THANE	DR			
61	VALVES (GATE, GLOBE, NRV) ½ TO 10" FOR LP	I				L&T	CHENNAI/COIMBATORE				

Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited C & M Deptt. Dist-Ramgarh(Jharkhand)

BHEL HYD

ENGINEERING DIV / QAI-NTPC,NOIDA | Page 16 of 20 | BHEL

एनटीपीसी NTPC

Project : PATRATU STPP(3X800MW)
Package : EPC
Contractor : BHEL, Hyderabad
Contract No.:

LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL

SUB SYSTEM: **BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator**

Ref No.: 9585-001-02
Revision No.: 00
Date: 05.04.2017

SN	ITEM	QP/ INS-PN CAT *	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
	APPLICATIONS	I				BHEL	TRICHY	A			
		I				FOURESS	AURANGABAD	A			Up to 2"x800# Upto 10x600#
		I				WEIR BDK	HUBLI	A			Up to 2"x800# Upto 10x600#
		I				FLOSTEER ENGINEERS PVT. LTD.,	AHMEDABAD	DR			
		I				JOSHIJAMPALA ENGINEERING PRIVATE LI	SATARA	DR			
		I				SKILT FABRICATORS PVT.LTD,	MUMBAI	DR			
		I				VALVE TECH INDUSTRIES	NAVI MUMBAI	DR			
		I				CHEMTECH INDUSTRIAL VALVES	THANE	DR			
62	CCS GLOBE VALVES UPTO 300 NB AND 150 CLASS	I				KBL	KONDAPURI	A			
		I				FOURESS ENGG	AURANGABAD	A			
		I				WEIR BDK	HUBLI	A			
		I				KSB	COIMBATORE	A			
		I				LEADER ENGG	JALLANDHAR	A			
		I				SKILT	MUMBAI	DR			
		I				BHEL	TRICHY	A			
		I				FLOSTEER ENGINEERS PVT. LTD.,	AHMEDABAD	DR			
		I				JOSHIJAMPALA ENGINEERING PRIVATE LI	SATARA	DR			
		I				VALVE TECH	NAVI MUMBAI	DR			

Bharat Heavy Electricals Limited ★ PS-MKTG Delhi

Damodar Valley Vidyut Utpadan Nigam Limited ★ Patratu ★ Distt. Ramgarh (Jharkhand) G & M Deptt.

एनटीपीसी NTPC

Project : PATRATU STPP(3X800MW)
Package : EPC
Contractor : BHEL, Hyderabad
Contract No.:

LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL

SUB SYSTEM: **BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator**

Ref No.: 9585-001-02
Revision No.: 00
Date: 05.04.2017

SN	ITEM	QP/ INS-PN CAT *	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
						INDUSTRIES					
		I				*CHEMTECH INDUSTRIAL VALVES*	*THANE*	DR			
63	DEARATOR	I				BHEL	HYDERABAD	A			
	# FABRICATOR BASED ON BHEL HYD DESIGN					#BHEL	VISHAKAPATNAM	DR			SUB-QR ITEM
						#VRK	HYDERABAD	DR			
						#Thandav Lakshmi Engineering works	VISHAKAPATNAM	DR			
						# Jay Engg	Trichy	DR			
						# Sai Sarag	Hyderabad	DR			
64	DEARATOR SPRAY VALVES	III				# Premier Engg	Hyderabad	DR			
						NEWTERA (COCHRANE ENVIRONMENTAL SYSTEM (CRANE))	USA	A			
		III				STERLING	USA	A			
		III				KCD	USA	DR			
		I				VALUE TREK ENGINEERS	HYDERABAD	DR			
		I				VIJAYA TOOLING ENGINEERS	HYDERABAD	DR			
65	DEARATOR TRAY ASSEMBLY	III				NEWTERA (COCHRANE ENVIRONMENTAL SYSTEM (CRANE))	USA	A			
		III				STERLING	USA	A			
		III				KCD	USA	DR			
		I				VRK INDUSTRIES	HYDERABAD	A			
		I				PREMIER ENGG	HYDERABAD	DR			

Bharat Heavy Electricals Limited * PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited * C & M Deptt. * Distt-Ramgarh (Jharkhand)

एनटीपीसी NTPC	Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator	Ref No.: 9585-001-02 Revision No.: 00 Date: 05.04.2017

SN	ITEM	QP/ INS-PN CAT *	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS
		I				VALUE TREK	HYDERABAD	DR			
		I				Pavan Engg	Hyderabad	DR			
		I				VIJAY TOOLING	HYDERABAD	DR			
66	LT MOTORS UPTO 200 KW(REFER NOTE-1)	I				BHARAT BIJLEE	MUMBAI	A			UPTO 160KW
		I				KEC	BANGALORE/ HUBLI*	A			* UPTO 90 KW
		I				MARATHON	KOLKATA	A			
		I				CGL	AHMEDNAGAR	A			
		I				ABB	FARIDABAD*/ BANGALORE	A			* UPTO 55 KW
						LAXMI HYDRAULICS	SOLAPUR	A			* UPTO 120 KW
67	SAFETY RELIEF VALVE	I				*SIEMENS INDIA*	*INDIA*	DR			
						BHEL,	*TIRICHY*	A			
						PENTAIR VALVES & CONTROLS	*VADODARA*	DR			
						KSB MIL CONTROL LIMITED	*CHENNAI*	DR			
						ASIAN INDUSTRIAL VALVES AND INSTRUMENTS	*CHENNAI*	DR			

A- Proposed vendor is acceptable to NTPC, N: BHEL/ MHI approved vendors indicated as "N" are accepted in NOTED category by NTPC for this project based on BHEL/MHI experience with the vendor for the items & DR – "Details required" for NTPC review.

2 QP/INSPECTION CATEGORY:

CAT – I : For those items the Quality Plans are approved by NTPC and final acceptance will be on physical inspection witness by NTPC.

CAT – II : For those items the Quality Plans are approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis of review of documents as per QP.

CAT-III : For those items main supplier approves Quality Plan. The final acceptance by NTPC shall on the basis of Certificate of Conformance by main supplier.

Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited C & M Deptt. Distt-Ramgarh(Jharkhand)

एनटीपीसी NTPC	Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator	Ref No.: 9585-001-02 Revision No.: 00 Date: 05.04.2017

SN	ITEM	QP/ INS-PN CAT *	QP No. xxxx-110	QP SUB-MISSION SCHEDULE	QP APPL SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB-SCHEDULE	SC APPL SCHEDULE	REMARKS

NOTE 1: a) Less than 30 KW

Acceptance of Motor less than 30 KW is based on COC of the manufacturer & the 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.

b) 30 KW and above

Acceptance of Motor rating between 30 KW & 50 KW is based on NTPC review of Routine Test inspection report as per IS 325 by main contractor along with COC of the manufacturer & the 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.

FOR HT MOTORS REFER SEPARATE VENDOR LIST FINALIZED FOR BHEL BHOPAL.

NOTE 2 : IF BOOSTER PUMPS SHAFT AND CEP SHAFT ARE MADE FROM ROLLED BARS THEN VENDORS SHALL BE AS PER BHEL APPROVED VENDOR LIST.

NOTE 3 : FOR VALVES OF SIZE ½ INCH AND BELOW SHALL BE PROCURED FROM BHEL APPROVED SOURCES.

Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited * Dist-Ramgarh(Jharkhand) * C & M Deptt. BHEL

NTPC	PROJECT:	: PATRATU EPC (3X			LIST OF ITEMS REQUIRING QUALITY PLAN		PACKAGE:	EPC
							SUB-PKG.:	
	CONTRACTOR:	BHEL-PEM					REV. NO.	00
	CONTRACT NO.:	9585-001-2					DATE:	12.04.2017
SI. NO.	ITEM	QP_ CAT	QP_NO	QP_SCH	PROPOSED SUB_SUPPLIER	PLACE	APPRL_STA TUS/ CAT	REMARK
1.00	LUBE OIL PUMP	I			MATZ ENGINEERS	AHEMDABAD	A	
		I			Delta PD Pumps Pvt.Ltd.	Vapi	DR	
		I			Del Pd Pumps & Gears	Surandenagar,Gujarat	DR	
		I			TUSHACO PUMPS	DAMAN	A	
2.00	SELF CLEANING STRAINER	I			MULTITEX	NOIDA	A	
		I			GEA BGR ENERGY SYSTEM	CHENNAI	A	
		I			FILTERATION ENGINEERS (I) PVT.	MUMBAI	DR	Approved upto 800 NB size
3.00	GM VALVES (UPTO 100 NB)	III			BHEL APPROVED SOURCES			VENDOR APPROVAL BY NTPC NOT ENVISAGED.
4.00	METELLIC BELLOWS	I			Qinhuangdao North Metal Hose Co. Ltd.,	CHINA	DR	
		I			FLEXICON BELLOWS & HOSES	BARODA	A*	A* AS PER APPROVAL CONDITIONS
		I			LONESTAR INDUS.	CHENNAI	A*	A* AS PER APPROVAL CONDITIONS
		I			MB METTALIC BELLOWS (I) P LTD	CHENNAI	A*	A* AS PER APPROVAL CONDITIONS
		I			METTALIC BELLOWS (I) P LTD	CHENNAI	A*	A* AS PER APPROVAL CONDITIONS
					FLEXATHERM EXPANLLOW PVT.	VADODARA	DR	
					BD ENGINEERING	AHMEDABAD	DR	
		I			TEDDINTON ENGINEERED	UK	DR	
5.00	THERMAL INSULATION (ROCKWOOL MATRESSES/ P-	I			Minsulate Manufacturing Co.	Jamshedpur	DR	
		I			GOENKA Rockwool	RAIPUR	A	
		I			LLOYD INSULATION (I) LTD	BHILAI,JAMSHEDPUR, AURANGABAD	A	
		I			ROCKWOOL INDIA	MEDAK , AP	A	
		I			THERMOCARE ROCKWOOL INDIA	RAJNANDGAON	DR	

Bharat Heavy Electricals Limited ★ PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited ★ Distt-Ram... C & M Deptt.

26/8/17 (NILESH KAMAL) BHEL-PEM

NTPC	PROJECT:	: PATRATU EPC (3X			LIST OF ITEMS REQUIRING QUALITY PLAN		PACKAGE:	EPC
	CONTRACTOR:	BHEL-PEM					SUB-PKG.:	
	CONTRACT NO.:	9585-001-2					REV. NO.	00
							DATE:	12.04.2017
SI. NO.	ITEM	QP_CAT	QP_NO	QP_SCH	PROPOSED SUB_SUPPLIER	PLACE	APPRL_STATUS/ CAT	REMARK
		I			SHREERAM EQUITECH PRIVATE	DURG	DR	
		I			Polybond Insulation Private Limited,	BHILAI	DR	
		I			Dhanbad Rockwool Insulation Pvt.Ltd.	Dhanbad	DR	
		I			Hitec Rockfibre Pvt.Ltd.	RAJNANDGAON	Dr	
6.00	BALL VALVES (NON FIRE SAFE TYPE)	I			MICROFINISH VALVES	HUBLI	A	UPTO 400NB, #300
		I			VAAS AUTOMATION	CHENNAI	DR	
		I			BELGAUM AQUA VALVES PVT. LTD.	BELGAUN	A	50 NB CLASS 800 200NB CLASS 150
		I			A.V. VALVES LTD	AGRA	DR	
		I			ATAM VALVES PVT. LTD.	JALANDHAR	DR	
		I			VALTECH INDUSTRIES	MUMBAI	DR	
		I			M/S GM ENGINEERING	RAJKOT	DR	
		I			INTERVALVE (INDIA) LTD.	PUNE	DR	
		I			DEMBLA VALVES LTD.	THANE	DR	
		I			UNIFLOW	CHENNAI	DR	
		I			WEIR BDK	HUBLI	A	UPTO 400 NBX150#
		I			LEADER	JALANDHAR	A	UPTO50MM-CLASS800, CCS-50TO100MM-CLASS 150
		I			NILON VALVES PRIVATE LTD	AHMEDABAD	DR	
		I			HAWA VALVES (IDIA) PVT. LTD.	NAVI MUMBAI	DR	
		I			HAWA ENGINEERS	AHMEDABAD	DR	
		I			CRESCENT VALVES	AHMEDABAD	DR	
		I			MICON VALVES	MUMBAI	DR	
		I			MEVADA ENGINEERING	MUMBAI	DR	

Bharat Heavy Electricals Limited ★ PS-MKTG Delhi

Nabinagar Power Utpadan Nigam Limited ★ Distt-Ramgarh (Jharkhand) ★ C & M Deptt.

NTPC	PROJECT:	: PATRATU EPC (3X			LIST OF ITEMS REQUIRING QUALITY PLAN		PACKAGE:	EPC
	CONTRACTOR:	BHEL-PEM					SUB-PKG.:	
	CONTRACT NO.:	9585-001-2					REV. NO.	00
							DATE:	12.04.2017
Sl. NO.	ITEM	QP_CAT	QP_NO	QP_SCH	PROPOSED SUB_SUPPLIER	PLACE	APPRL_STATUS/ CAT	REMARK
		I			DELVAL FLOW CONTROLS	SATARA	DR	
7.00	STEAM TRAPS	III			BHEL APPROVED SOURCES			VENDOR APPROVAL BY NTPC NOT ENVISAGED.
8.00	AIR TRAPS	III			BHEL APPROVED SOURCES			VENDOR APPROVAL BY NTPC NOT ENVISAGED.
9.00	BUTTERFLY VALVES (STEAM SERVICES)	I			FOURESS ENGG.	BANGALORE	A	UPTO 2600NB
		I			NENGFA WEIYE TIELING VALVE JOINT STOCK CO. LTD.	CHINA	DR	
		I			IL	PALGHAT	A	UPTO 2200NB
		I			SHENJIANG VALVES CO.	CHINA	DR	
10.00	AIR RELEASE VALVES	III			BHEL APPROVED SOURCES			BHEL APPROVED SOURCES
11.00	CHEMICAL DOSING (LP)	I			TECHNO CONSULTANT	MUMBAI	A	
		I			SWELLORE	AHEMDABAD	A	
		I			VK PUMPS	NASHIK	A	
		I			POWER PIPING COMPANY	Trichy	A	
		I			PSI	CHENNAI	A	

Bharat Heavy Electricals Limited ★ PS-MKTG Delhi ★

★Patratu Vidyut Utpadan Nigam Limited★ C & M Deptt. ★Distt-Ramgarh(Jharkhand)★

एनटीपीसी NTPC	PROJECT: PATRATU STPP (3X800MW)) PACKAGE : EPC PACKAGE SUPPLIER : BHEL CONT. NO.: CS-9585-001-2	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL	ANNEXURE- DOC. No. CS-9585-001-2 Revision No. : 00 DATE: 05/04/2017 PAGE : 1 OF 7

SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
1	LOW PRESSURE PIPING L1 LEVEL VENDOR (REFER NOTE 2)	I		RAUNAQ INTERNATIONAL	FARIDABAD	A	
		I		BRIDGE & ROOF CO	KOLKATA	A	
		I		TECHNOELECTRIC ENGG	KOLKATA	A	
		I		TECHNO FAB ENGG	NEW DELHI	A	
		I		UNITECH MACHINES LTD	GURGAON	A	
		I		THERMOSYSTEMS	HYDERAABAD	A	
		I		IOTL	MUMBAI	A	
		I		BHEL PIPING CENTRE	CHENNAI	A	
		I		GMW	BARODA	DR	
2	AIR CONDITIONING SYSTEM L1 LEVEL VENDOR (REFER NOTE 1& 2)	I		VOLTAS	MUMBAI	A	
		I		STERLING & WILSON	KOLKATA	A	
		I		ADVANCE VENTILATION	DELHI	A	
		I		~~ROOTS COOLING SYSTEM~~	~~NOIDA~~	~~A~~	
		I		GEMINI SHREEWAS (ENGRS) PVT LTD	CHENNAI	DR	
		I		INDUSTRIAL PROJECT & PRODUCTS LTD	BAWAL	DR	
3	VENTILATION SYSTEM L1 LEVEL VENDOR (REFER NOTE 1& 2)	I		VOLTAS	MUMBAI	A	
		I		STERLING & WILSON	KOLKATA	A	
		I		~~ROOTS COOLING SYSTEM~~	NOIDA	~~A~~	
		I		SK SYSTEMS PVT LTD	DELHI	A	
		I		C DOCTOR	KOLKATA	A	
		I		HYDERABAD POLLUTION	HYDERABAD	A	
		I		ADVANCE VENTILATION	DELHI	A	
		I		PACK PLAST ENGG	KOTA	DR	

Bharat Heavy Electricals Limited ★ PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited ★ Distt-Ramgarh (Jharkhand) ★ C & M Deptt.

FORMAT NO.: QS-01-QAI-P-01/F3-R0

ENGG. DIV./QA&I

एनटीपीसी NTPC

PROJECT: PATRATU STPP (3X800MW))

PACKAGE : EPC PACKAGE
SUPPLIER : BHEL
CONT. NO.: CS-9585-001-2

LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL

ANNEXURE-
DOC. No. CS-9585-001-2
Revision No. : 00
DATE: 05/04/2017
PAGE : 3 OF 7

SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
		I		ALPHA LAVAL	SATARA	A	ACCEPTABLE FOR INDIGENOUSLY PRESSED HT PLATES OF SIZE UPTO 2250MM LENGTH X 750MM WIDTH X 0.6MM THICKNESS.
		I		IDMC	ANAND	A	HT PLATES & GASKETS FROM SONDEX, DENMARK
		I		HISAKA	JAPAN	A	
		I		SONDEX INDIA	VADODARA	A	HT PLATES FROM SONDEX, DENMARK
6	HORIZONTAL CENTRIFUGAL PUMP (UP TO 1000 CUM/HR)	I		KIRLOSKAR BROS LTD.	KIRLOSKARWADI	A	
		I		MATHER & PLATT	PUNE	A	
		I		MATHER & PLATT	KOLHAPUR	A	
		I		SAM TURBO	COIMBATORE	A	
		I		FLOWMORE	GHAZIABAD	A	
		I		FLOWMORE	GHAZIABAD	A	
		I		BEST AND CROMPTON	CHENNAI	A	
		I		JYOTI	VADODARA	A	
		I		WPIL	GHAZIABAD	A	
		I		KISHORE PUMPS	PUNE	A	
7	FUEL OIL UNLOADING SYSTEM L1 LEVEL VENDOR (REFER NOTE 1 & 2)	I		KSB	PUNE	A	UPTO 500M3/HR
		I		RAUNAQ INTERNATIONAL LTD	FARIDABAD	A	
		I		GMW	VADODRA	A	
		I		UNITECH MACHINES LTD	GURGAON	A	
		I		TECHNO ELECTRIC	KOLKATA		

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FORMAT NO.: QS-01-QAI-P-01/F3-R0

1/1

एनटीपीसी NTPC

PROJECT: PATRATU STPP (3X800MW))

PACKAGE : EPC PACKAGE
SUPPLIER : BHEL
CONT. NO.: CS-9585-001-2

LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL

ANNEXURE-
DOC. No. CS-9585-001-2
Revision No. : 00
DATE: 05/04/2017
PAGE : 4 OF 7

SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
				ENGG			
		I		XICON INTERNATIONAL	THANE	DR	
		I		NEW FIRE ENGINEERS	NEW DELHI	DR	
		I		SHALCOT	NOIDA	A	
8	COOLING TOWER- IDCT L1 LEVEL VENDOR (REFER NOTE 1& 2)	I		THERMOSYSTEMS	HYDERABAD	A	
		I		L&T	CHENNAI	A	
		I		NBCC	NEW DELHI	A	
		I		GEA COOLING TOWER	CHENNAI	A	
		I		HAMMON SHRIRAM	UMBERGAON	A	
		I		PAHARPUR COOLING TOWERS	NEW DELHI	A	
		I		FANS AS	CZECK	A	
9	CW TREATMENT SYSTEM L1 LEVEL VENDOR (REFER NOTE 1 & 2	I		PAL TECH COOLING TOWER	GURGAON	A	
		I		DRIPLEX	NEW DELHI	A	
		I		THERMAX	PUNE	A	
		I		ION EXCHANGE	MUMBAI	A	
		I		TRIVENI ENGG	NOIDA	A	
		I		VASU CHEMICALS	MUMBAI	DR	
10	CONDENSATE POLISHING PLANT L1 LEVEL VENDOR (REFER NOTE 1 & 2)	I		CHEMBOND	MUMBAI	DR	
		I		DRIPLEX	HARIDWAR	A	
		I		ION EXCHANGE	MUMBAI	A	
		I		BGR ENERGY	CHENNAI	A	
11	(SUBMERSIBLE TYPE) 50 M3/HR, 20 MWC	I		THERMAX	PUNE	A	
		I		KISHORE PUMPS	PUNE	A	
		I		KSB	PUNE	A	
		I		KIRLOSKAR BROS LTD.	KIRLOSKARWADI	A	
		I		AQUA MACHINERY	AHMEDABAD	A	
		I		DARLING PUMPS	INDORE	A	

FORMAT NO.: QS-01-QAI-P-01/F3-R0

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ENGG. DIV./QA&I

Appendix B, Page 126 of 278

एनटीपीसी NTPC	PROJECT: PATRATU STPP (3X800MW)) PACKAGE : EPC PACKAGE SUPPLIER : BHEL CONT. NO.: CS-9585-001-2	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL	ANNEXURE- DOC. No. CS-9585-001-2 Revision No. : 00 DATE: 05/04/2017 PAGE : 5 OF 7

SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
		I		WPIL	GHAZIABAD	A	
		I		MBH	AHMEDABAD		
13	WATER PRE TREATMENT PLANT & LIQUID EFFLUENT TREATMENT PLANT L1 Level Vendor (Refer Note 1 & 2)	I		DRIPLEX	NEW DELHI	A	
		I		TRIVENI	NOIDA	A	
		I		BRIDGE & ROOF	KOLKATA	A	
		I		GEO MILLER	NEW DELHI	A	
		I		MCNALLY BHARAT	KOLKATA	A	
		I		VA TECH WABAG	PUNE	A	
		I		GANNON DUNKERLEY	NEW DELHI	A	
		I		UEM INDIA	NOIDA	A	
		I		ION EXCHANGE	MUMBAI	A	
		I		PARAMOUNT	VADODARA	DR	
		I		THERMAX	PUNE	DR	
		I		PBI ASSOCIATES	PUNE	DR	
		I		SHRI RAM EPC	CHENNAI	DR	
		I		CLEAR WATER	NEW DELHI	DR	
		I		AQUA DESIGN	CHENNAI	DR	
14	DM PLANT (CONVENTIONAL ION EXCHANGE BASED) L1 Level Vendor (Refer Note 1 & 2)	I		VEOLIA INDIA PVT LTD	CHENNAI	DR	
		I		THERMAX	PUNE	A	
		I		ION EXCHANGE	MUMBAI	A	
		I		DRIPLEX	NEW DELHI	A	
		I		PARAMOUNT	VADODARA	DR	
		I		AQUA DESIGN	CHENNAI	DR	
		I		V A TECH WABAG	PUNE	DR	
		I		AQUA TECH SYSTEMS	PUNE	DR	
		I		DOSHION	AHEMDABAD	DR	

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Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh(Jharkhand) * C & M Deptt.

एनटीपीसी NTPC	PROJECT: PATRATU STPP (3X800MW)) PACKAGE : EPC PACKAGE SUPPLIER : BHEL CONT. NO.: CS-9585-001-2	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL	ANNEXURE- DOC. No. CS-9585-001-2 Revision No. : 00 DATE: 05/04/2017 PAGE : 7 OF 7

SL.NO.	ITEM	QP/INSPN CAT	QP NO.	PROPOSED SUBVENDORS BY MAIN CONTRACTOR	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS

1. SYSTEM SUPPLIER / SUB-SUPPLIERSTATUS CATEGORY (SHALL BE FILLED BY NTPC).
A – For those items proposed vendor accepted to NTPC. To be indicated with letter "A" in the list along with condition of approval, if any.
DR - for those items " Details Required " for NTPC review.
Noted: For those items accepted by NTPC without specific sub-vendor approval from NTPC and indicated as "NOTED" in the list.
2. INSPECTION CATEGORY:
CAT I : For those items the quality plans are approved by NTPC and final acceptance will be on physical inspection witness by NTPC.

CAT II : For those items the quality plans are approved by NTPC. However no physical inspection will be done by NTPC. The final acceptance by NTPC shall be on the basis of review of documents as per QP.

CAT III: For those items Main Supplier approves quality plans. The final acceptance by NTPC shall be on the basis of certificate of conformance by Main Supplier.

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Patratu Vidyut Utpadan Nigam Limited ★ C & M Deptt. ★ Distt-Ramgarh(Jharkhand)

Main Contractor

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BHEL, PSM

FORMAT NO.: QS-01-QAI-P-01/F3-R0

1/1

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		I		Techno	Ahmedabad	DR	
		I		Tractel Tirfor India Pvt. Ltd	Palwal	A/DR	Approved Upto 15 Tons
		I		Rockwell Hoisto	Bahadurgarh	DR	
		I		Universal Hoisto Fabrik	Thane	A/DR	Approved Upto 20 Tons
		I		Global Technologies	Hyderabad	DR	
		I		Mangla Hoist	Greater Noida	A/DR	Approved Upto 10 Tons
		I		Safex	Ahmedabad	DR	
		I		Meeka Machinery	Ahmedabad	DR	
		I		Reva Industries	Faridabad	A/DR	Approved Upto 25 Tons
		I		Eddy Cranes	Pune	A/DR	Approved Upto 14 Tons
		I		Alpha Services	Bhiwadi	A/DR	Approved Upto 15 Tons
		I		Century Crane Engineers	Ballabhgarh	A/DR	Approved Upto 25 Tons
5	Chain Pulley Block	I		Grip Engineers	Hyderabad	A/DR	Approved Upto 40 Tons
		I		Techno	Ahmedabad	DR	
		I		Brady & Morris	Ahmedabad	DR	
		II		Century Crane Engineers	Ballabhgarh	A/DR	Approved Upto 15 Tons
		I		Universal Hoisto Fabrik	Thane	DR	
		II		Tractel Tirfor India Pvt. Ltd	Kalyani	A/DR	Approved Upto 20 Tons
		I		Tuobro Furguson India Pvt. Ltd	Kolkata	DR	
6	Fire Tender	I		Wadia Bodybuilders	Ahmedabad	A	
		I		Ambala Coach	Ambala	A	
		I		Brijbasi Hi Tech	Mathura	DR	
		I		Vijay Fire	Umbergaon	A	

Note 1 : Subject to Sub-QR clearance by Engg as per Technical Specification

Note 2 : Comprehensive L-2 list of sub-vendors shall be finalized alongwith the finally selected L-1 vendor but prior to order finalization on L-1 vendor by the Bidder.

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1. SYSTEM SUPPLIER / SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)

A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list alongwith the condition of approval, if any.

DR – For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list.

NOTED – For these items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with "NOTED."

2. QP/INSPN CATEGORY:

CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.

CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.

CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.

Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh (Jharkhand) * C & M Deptt. Page 2 of 2

Bharat Heavy Electricals Limited * PS-MKTG Delhi

This is a Part of Technical Specification No. PE-TS-475-673-A001

NTPC	PROJECT :PATRATU STPS (3X800 MW) PACAKGE : EPC Sub Package: MOTORS & VVF Drive Panels CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR ; CONTRACTOR-M/S BHEL	REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 20th April 2017

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9585-001-QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL. STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS
1)	L T (415 V) Motors	Refer Note 1				ABB	FARIDABAD	A		UPTO 55KW
						ABB	BANGALORE	A		55KW – 200KW
						BHARAT BIJLEE	MUMBAI	A		RQP, FOR FLAME PROOF ALSO
						CGL	AHMEDNAGAR	A		FOR FLAME PROOF ALSO
						JYOTI	BARODA	A		
						KEC	BANGALORE	A		FOR FLAMEVPROOF ALSO
						KEC	HUBLI	A		UPTO 90KW: FOR FLAME PROOF ALSO
						LHP	SOLAPUR	A		UPTO 200KW
						MARATHON	KOLKATA	A		FOR FLAME PROOF ALSO
						NGEF	BANGALORE	A		UPTO 15KW
						SIEMENS	MUMBAI	A		
2)	HT MOTOR	I				BHEL	BHOPAL	A		
3)	DC MOTOR	Refer Note 1				BHEL	HARIDWAR	A		
						CGL	AHMEDNAGAR	A		
						KEC	BANGLORE / HUBLI	DR		
4)	VARIABLE FREQUENCY DRIVES PANELS	I				L&T-YASHKAWA	INDIA	A		– DR for HT
						DANFOSS	CHENNAI	A		
						SCHNEIDER	NASHIK	A		
						ROCKWELL ALLEN BRADLEY	DELHI-SHAHIBABAD	A		
						ABB	BANGALORE	A		
						SIEMENS	NASHIK	A		
						GE		DR		

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For NTPC

169

LT SWITCHGEAR panels' sub-vendors are subject to sub-QR clearance from NTPC-Engg

एनटीपीसी NTPC	PROJECT : PATRATU STPP, PACAKGE : Sub Package: LT Switchgear & LT Busduct CONTRACTOR : M/S BHEL CONT. NO. CS- --- -001C-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : -----001-QOE-R-01 REVISION NO. 00 DATE -

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-001-QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS
						Schneider	Stone, UK	A@		PX30 & PX40 models only. A@- Subject to Sub-QR clearance form NTPC Engg
						ABB	Finland	A@		A@- Subject to Sub-QR clearance form NTPC Engg
						ABB	Baroda	A@		For 6XX Series A@- Subject to Sub-QR clearance form NTPC Engg
						Siemens	Goa	A@		7SR2X series only A@- Subject to Sub-QR clearance form NTPC Engg
						Siemens	Germany	A@		7SX Series only A@- Subject to Sub-QR clearance form NTPC Engg
8	Local Push Button Station	III				Main contractor approved sources for the box (with push button with CE/VDE/UL/CSA marked or BIS approved with valid CML no.)		Noted		
9	FQP for LT	I	G-01							

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83

This is a Part of Technical Specification No. PE-TS-475-673-A001

Page 188 of 278

एनटीपीसी NTPC	PROJECT :Patratu STPP (2X660 MW) PACAKGE :EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL	REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS
5.	Battery charger (110V/220V) @ subject to sub-QR clearance	I	4			M/s Amararaja	Tirupati	A@		
						M/s HBL- Power System	Hyderabad	A@		
						M/s Chhabi electrical	Jalgaon	A@		
						M/s. Chloride Power	Kolkatta	A@		
						M/s Statcon	Hapur	A@		Approved Up to 220, V 850 A subject to Sub-QR clearance, higher rating in DR
						M/s Dubas	Bangalore	A@		Approved upto 220 V, 850 A subject to Sub-QR clearance , higher rating in DR
						M/s Saft Nife Power Systems	Singapore	A@		
						Massteck	Jalgaon	A@		
						Emerson Network	Thane	DR@		
						Jema Energy	Spain	DR@		
6.	Battery (Ni-Cd)	I	5			M/S HBL-Power System	Hyderabad	A @		Up to 990 Ah with conditions(Pocket plate type)
						M/S Amcosaft	Bangalore	A @		8Ah to 990Ah- KPH type 10Ah to 1365 Ah- KPM type 11Ah to 1550Ah – KPL type (Pocket plate type)
						Hoppekke	Germany	A@		
						Exide	Kolkata	DR@		
7.	Battery Plante	I	6			M/s Exide	Kolkata	A@		
						Hoppekke	Germany	DR@		

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एनटीपीसी NTPC	PROJECT :Patratu STPP (2X660 MW) PACAKGE :EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL	REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
8.	Battery Health Monitoring System	I	7			Elteek	Gurgaon	DR		
						Emerson	Mumbai	DR		
						Hitachi Hirel	Gandhinagar	DR		
						HBL Power System	Hyderabad	A		
						Statcon	Hapur	DR		
						Hoppekke	Germany	DR		
9.	Fire Sealing System i) Type – A material supplier	III				M/s 3M India	Bangalore	A		
						M/s GE Silicon	USA	A		
						M/s Dow Corning	USA	A		
	ii) Type – B Material supplier	III				M/s Lloyds	Delhi	A		
						M/s Signum	Nagpur	A		
						M/s Vijay System Engineers Pvt. Ltd.	Mumbai	A		
						M/s Multikil Fire	Vadodara	DR		
						Murugapa Morgan	Ranipet	DR		
						Unifrax India	AHMEDABAD	DR		
	iii) Execution Agency for above					Same as 9 (ii) & 3 M India	Same as 9 (ii) & 3 M India	A		
10.	GI cable trays, fitting	I				Inar Profiles Ltd	Enkapalli	A		

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Patratu Vidyut Utpadan Nigam Limited C & M Deptt. Distt-Ramgarh(Jharkhand)

85

193

एनटीपीसी NTPC	PROJECT :Patratu STPP (2X660 MW) PACAKGE :EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL	REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SCAPPL SCHEDULE	REMARKS
	& accessories including bends					Vatco	Mumbai	A		Galvanization at Sigma Mumbai
						Indiana cable trays	Mumbai	A		Galvanization at Karamtara galvaniser
						Industrial Perforation	Kolkata	A		
						Ratan Engineering	Kolkata	A		Galvanization at B.P. Projects
						India Electric Syndicate	Kolkata	A		Galvanization at BMW Industries/B.P Projects
						Steelite engg.	Mumbai	A		
						Premier Power Products	Kolkata	A		Galvanising at Neha Galvaniser
						Indiana Gratings	Pune	A		Galvanization at Poona Galvanizer/ Anand Yeknow Aids Engg
						M.J. Engineering	Okhla/ Bhiwadi	A		
						Jamna Metal	Delhi/ Kundli	A		
						T.R.G	Chennai	A		Galvanization at TM Radhakrishna Chetty & Co
						Amtech	Pune	A		Galvanization at B.G. Shirke - Pune
						Kannade Anand Udyog	Mumbai	A		Fabrication at their units: Plot No. 42, Moriv District Thane & Plot No.: D-35 Anand Nagar MIDC, Addl. Ambernath , Dist.Thane Galvanization and offer the galvanized cable trays for inspection at D-34 Anand Nagar MIDC, Addl. Ambernath, Dist.Thane.
						Rukmani	Raipur	A		Ladder type cable trays only
						Passive Infra	Hasangarh (Rohtak)	A		
						Unitech Fabricators &	Howrah/	A		

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Patratu Vidyut Utpadan Nigam Ltd. C & M Deptt. Distt-Ramgarh(Jharkhand)

एनटीपीसी NTPC	PROJECT :Patratu STPP (2X660 MW) PACAKGE :EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL	REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017

Sl. No.	ITEM	QP / INSCAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL. STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
						Engineers	Hoogly (Kolkata)			
						Patny System	Hyderabad	A		Galvanisation at Gurpreet galvaniser - Hyderabad
						Rabi Engg	Kolkata	A		Galvanizing from NTPC approved sources
						Advance Power Products	Howrah	A		
						Maheswari Electricals	Noida	DR		
						Saral Industries	Raibareli	DR		
						Parmar Metal	Rajkot	DR		
						Pentax	Mumbai	DR		
						Eros metal	Nagpur	DR		
						Vinfab	Thane	DR		
						Namdhari	Ludhiana	DR		
						Indmark Formtech	PUNE	DR		
11.	Cable tray flexible support system (GI)	I	9			Vatco	Mumbai	A		Galvanising at Sigma Mumbai
						Inar profiles	Enkapalli	A		
						Industrial perforations	Kolkata	A		
						Premier power products	Kolkata	A		Galvanising at Neha Galvaniser
						Steelite engg.	Mumbai	A		
						Indiana gratings	Pune	A		Galvanising at Poona Galvaniser
						Amtech	Pune	A		Galvanising at B.G. Shirke
						Ratan Projects	Kolkata	A		Galvanization at NTPC approved sources
						Indmark Formtech	PUNE	DR		
12.	Lead coated steel flexible conduits	III				M/s PLICA	Ghaziabad	A		
						M/s Lapp	Germany	DR		
						M/s Bansal Labs	Bhopal	A		

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Patratu Vidyut Utpadan Nigam Limited * C & M Deptt. * Distt-Ramgarh(Jharkhand)

एनटीपीसी NTPC	PROJECT :Patratu STPP (2X660 MW) PACAKGE :EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL	REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL. STATUS AS PER NTPC	SCAPPL SCHEDULE	REMARKS
13.	Junction boxes / Link Boxes/ Test Link Box/ Adopter box, Switch Boxes, Pull Boxes (Hot Dip Galvanized)	III				Main contractor approved sources with galvanization from NTPC approved sources (Note-2)		Noted		
14.	FRP Junction boxes	II	10			Main Contractor approved sources		Noted		
15.	Cable termination kits & straight through jointing kit upto 33KV	I	11			M/s 3M Electro & Communication	Pune	A		up to 33 KV
						Raychem	Mumbai	A		Heat shrinkable type up to 33 KV
						Yamuna Cable Accessories	Yamunanagar	DR		
						Hari Consolidated Pvt Ltd	Delhi	A		Heat shrinkable type Upto 11 KV with conditions, above rating DR
16.	Cable glands	III				Main contractor approved sources		Noted		
17.	Cable lugs	III				M/s Dowell	Mumbai	A		
						M/s Billets Elektro Werke Ltd.	Umbergaon	A		

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88

96

एनटीपीसी NTPC	PROJECT :Patratu STPP (2X660 MW) PACAKGE :EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL	REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SCAPPL SCHEDULE	REMARKS
						(3 D)				
						M/s Chetna	Nasik	A		
						Additionally Any make's model with VDE or CE or UL or CSA marking or BIS approved with CML no. Refer Note-3		Noted		
18.	Lighting fixtures with accessories	I	12			M/s Crompton	Mumbai	A#		#- "A"- for filament type and " DR" for LED Type
						M/s Bajaj Electricals	Mumbai	A		
						M/s Philips	Noida	A#		
						M/s Wipro	Mumbai	A		
						M/s Surya Rosini	Kashipur	A		
						M/s Goldwyn	Noida	A		
19.	Lamps	III				M/s Crompton	Mumbai	A#		#- "A"- for filament type and " DR" for LED Type
						M/s Bajaj Electricals	Mumbai	A		
						M/s Philips	Noida	A#		
						M/ s Wipro	Mumbai	A		
						M/s Surya Rosini	Kashipur	A		
						Goldwyn	Noida	A		
20.	Lighting Panels	I				Please refer seriel no- 3 as identified in LT Switchgear & LT Busduct sub package list				

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एनटीपीसी NTPC	PROJECT :Patratu STPP (2X660 MW) PACAKGE :EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL	REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SCAPPL SCHEDULE	REMARKS
32.	FQP of Earthing	I	G-03							
33.	FQP of Station Lighting	I	G-04							

NB:
Under Sub Supplier approval status as per NTPC column:
A: mean that vendor for this item is acceptable to NTPC.
Under QP / INSPN CATEGORY column:

CAT-I : For these items the Quality Plans approved by NTPC & final acceptance will be on physical inspection & witness by NTPC

CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on basis of verification of documents as per approved QP
CAT-III : For these items Main supplier approves the Quality Plans. The final acceptance by NTPC shall be on basis of certificate of conformance by the main supplier.
@ : Vendors acceptance is subject to sub-QR clearance.
Note-1- Approval conditions attached to above identified vendors, as applicable shall be adhered to.
Note-2 – List of NTPC acceptable galvanizers

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This is a Part of Technical Specification No. PE-TS-475-673-A001

NTPC		PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP
		PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE
		CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY
		CONTRACT NO : CS-9585-001-2	REVISION NO : 00 DATE : 26.04.2017

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		II				Forbes Arca	Pune	A				Approvd up to 4" and 300 Class. "DR" for Higher rating and Size.
		*				Daume Regelamaturean GmbH	Germany	DR				M/s BHEL will forward only three proposals after details review of NTPC Technical specification requirements.
		*				Metso Singapore PTE ltd.	South Korea	DR				
		*				Severn Glocon	Chennai	DR				
		*				Spx Corporation	USA	DR				
		*				Ringo Valvulas SL	Spain	DR				
		*				Valvitalia SPA	Italy	DR				
		*				R K Controls	Thane	DR				
		*				Circor (Leslie)	Coimbatore	DR				
		*				Spx Flow Technologies	USA	DR				
		*				Circor (Leslie)	Coimbatore	DR				
		*				Schenjiang valve co. ltd.	China	DR				
		*				Spx Flow Technologies	Ahamadabad	DR				
		*				WEIR Valves and Controls	UK	DR				
		*				WALDEMAR PRUSS ARMATURENFABRIK GMBH	Germany	DR				
		*				BOMAFA Special valve solutions Pvt. Ltd.	Ahmedabad	DR				
		*				Suzhou delan enfery science and tehnology co. Ltd.	China	DR				
22	Temperature Transmitter	III				EMERSON	U.S.A/Pawane / Singapore	A			Sub QR	
	(Single and Duel Input)	III				Yokogawa	Japan	A				Final testing at M/S YIL,Bangalore is also acceptable
		III				Moore	USA	A				
		III				M System	JAPAN	A				
		III				ABB	GERMANY/ Bangalore	A				
		III				ENDRESS & HOUSER	Aurangabad	A				
		*				Khrone		DR				M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				Tokyo Keiso	Japan	DR				
		*				Honeywell	Pune	DR				
		*				INOR	Sweden	DR				
		*				P & F	Bangalore	DR				
		*				Siemens		DR				
		*				Yamatake	JAPAN	DR				
		*				Yamari	JAPAN	DR				
		*				Foxboro		DR				
23	Conduits/Pipe(GI)					Refer Electrical List						
24	Electronic transmitters (pressure, DP,Flow)	III				EMERSON (Rosemount)	USA/ Pawane	A			Sub QR	
		III				FUJI ELECTRIC	France	A				
		III				YOKOGAWA	JAPAN	A				Testing and Calibration at M/s YIL, Bangalore is also acceptable.

5 of 26

212

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9565-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9565-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		III				YOKOGAWA	Bangalore	A				EJA- E series 110,430,530
		III				ABB	Bangalore	A				Model - 2600 T
		III				ABB	GERMANY / Italy	A				Model - 2600 T
		III				Siemens	France / Kalwa	A				
		III				Honeywell	Pune	A				
		III				Laxson Automation	Daman	A				SMAR Make
		III				Baldota	Mumbai	A				SMAR Make
		*				ENDRESS & HOUSER	Aurangabad/ Germany	DR				
		*				CHINO	Ghaziabad	DR				
25	Thermocouples, RTD & Thermowell	III				HERAUS SENSOR	GERMANY	A			Sub QR	
		III				WISE Control	Korea	A				
		II				Tempsens	Udaipur	A				
		II				Pyroelectric	Goa	A				
		II				Detriv Instrumentation & Electronics Ltd	Mumbai	A				
		III				Minco	USA	A				
		III				OKAZAKI corporation	JAPAN	A				
		III				Yamari	JAPAN	A				
		III				Yamari	Singapore	A				For RTD Reference list and Performance feedback is to be submitted.
		III				ABB(SENSYCON)	Germany	A				
		III				EMERSON (Rosemount)	Germany	A				
		II				EMERSON (Rosemount)	Pawane	A				Imported from Emerson, Germany (make)
		II				Thermal Instruments(GIC)	Savantwadi	A				
		II				Techno Instruments	Ahamadabad	A				
		II				GOA Instrument Industries	GOA	A				For Thermowell only
		*				GOA Instrument Industries	GOA	DR				M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				WIKA	Pune	DR				
		*				Toshniwal Industries	Ajmer	DR				
		*				E & H	Aurangabad	DR				
		*				Nesstech	Vapi	DR				
		*				Instrustial Instruments	Kolkatta	DR				
		*				Exotherm	Thane	DR				
		*				Baumer Technologies	Vapi	DR				
		*				Eleind Engineering	Noida	DR				
		*				Siemens India	Gurgaon	DR				
		II				Jindal Electronics	Roorkee	A				
26	Ultrasonic type level Transmitter	III				E & H	Aurangabad/ Germany	A			Sub QR	For Gentralor,turbine & Motor
		III				EMERSON	Pawane	A				
		III				SIEMENS MILTRONICS	CANADA	A				
		III				Nivelco	Hungery	A				
		*				Vega	Germany	DR				

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Yadav,

92

214

This is a Part of Technical Specification No. PE-TS-475-673-A001

NTPC		PROJECT : Patratu STPS Phase-I (3 X800MW)					LIST OF ITEMS REQUIRING QP					
		PACKAGE : EPC PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00		
		CONTRACTOR :BHEL Ltd					VENDOR AS APPROVED BY			DATE : 28.04.2017		
		CONTRACT NO : CS-9585-001-2										
No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		*				Khrone	France / USA / Pune	DR				M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				Yokogawa	Bangalore	DR				
		*				P&F	Germany	DR				
		*				Magnetrol	Belgium	DR				
		*				ABB	Germany / India	DR				
		*				Fobes Marshell	Pune	DR			Sub QR	
27	Orifice plate assembly	III				Instrumentation Limited	Palghat	A				
		III				Microprecision	Palwal	A				
		III				Starmech	Pune	A				
		III				Flow Star	Faridabad	A				
		III				SEIKO	Austria	A				
		III				MINCO India Pvt. Ltd.	GOA	A				Up to 32"
		III				MINCO India Flow Elements Pvt. Ltd.	GOA	A				Up to 26"
		III				WISE Control	Korea	A				
		III				T M Technomatic	Italy	A				
		*				IEPL	Hyderabad	DR				
		*				Engg. Specialities	Kolkata	DR				
		*				BALIGA	CHENNAI	DR				
		*				Pyroelectric	Mumbai	DR				
		*				Hydropneumatics	Mapusa	DR				
		*				Tansa Equipment Pvt. LTd.	Thane	DR				
		*				Dynamic Fluid Vales Pvt. Ltd.	Belgaun	DR				
28	Pressure, DP Gauge	III				BUDENBERG	UK	A				
		III				ASHCROFT	USA/Germany/ India	A				
		III				Wika	GERMANY	A				
		III				WISE Control	Korea	A				
		III				Nagano KEIKI	Japan	A				
		III				H.Guru South India	Bangalore	A				Not for MS & FW application
		III				A.N. Instruments	Kolakatta	A				Not for MS & FW application
		III				Gauge Bourdon	Panvel	A				
		III				Goa Thermostatic	GOA	A				Not for MS & FW application
		III				Wika	Pune	A				DR for MS & FW application
		III				Baumer	Vapi	A				DR for MS & FW application
		III				Precision mass products Pvt. Ltd.	Gandhinagar	A				Not for MS & FW application
		III				H Guru	Rishra/Muzaffarpur	A				Not for MS & FW application
		*				US Gauge	USA	DR				
		*				Winters	USA	DR				
		III				Forbes Marshall	Hyderabad	A				
		*				Manometer	Mumbai	DR*				
		III				Walchandnagar Industries Ltd.	Dharwad	A				
		III				Nesstech	Vapi	A				
		*				Gauges Bourdon	UK	DR				DP Gauge for M/s Nesstech, Japan
		*				Fisher Mess	Germany	DR				

7 of 26

Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh(Jharkhand) C & M Deptt.

215

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		*				Protech Control	Kolkata	DR				
		*				New Scientific	Kolkata	DR				
		*				PTCI	Kolkata	DR				
29	Level gauge (Transperent & Reflex, Tubular type)	III				Main Contractor approved Sources		A				
30	Press, DP, Vaccum Switch	III				SOR	USA	A			Sub QR	
		III				DRESSOR (ASHCROFT)	USA/Germany	A				
		III				ITT BARTON	USA	A				
		III				HERION	GERMANY	A				
		III				BARKSDALE	GERMANY	A				
		*		*		Nagano KEIKI	Japan	DR				
		II				Switzer Process Instrument	Chennai	A				Up to 40kg/cm2 & not for Compound Switch and except 900 series
		II				Trafag	Gurgaon	A				Up to 40kg/cm2 & not for Compound Switch
		II				Switzer Process Instrument	Ghaziabad	A				Up to 40kg/cm2 & not for Compound Switch
		III				Delta control	UK	A				
		I				Gauges Bourdon (GIC)	Panvel	A				Up to 40kg/cm2 & not for Compound Switch
		I				ASHCROFT	Gandhinagar	A				
		*				Wika	Pune	DR				
		III				Gorgeion	France	A				
		III				United Electric	USA	A				
		*				SMC	Japan	DR				M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				Neodyne	USA	DR				
		*				IMI NORGEN	Noida	DR				
		*				WISE Control	Korea	DR				
		*				Baumer	Vapi	DR				
		*				Vasu Tech	New Delhi	DR				
		III				Boll & Krich	Germany	DR				
31	Temperature Switch	III				SOR	USA	A			Sub QR	
		III				DRESSOR (ASCHROFT)	USA/Germany	A				
		III				ITT BARTON	USA	A				
		III				DELTA CONTROLS	UK	A				
		I				Switzer Process Instrument	Chennai	A				
		I				Switzer Process Instrument	Ghaziabad	A				up to 200 Deg. C
		II				Trafag	Gurgaon	A				up to 200 Deg. C
		I				ASHCROFT	Gandhinagar	A				up to 200 Deg. C
		*				Wika	Pune	DR				
		III				Gorgeion	France	A				
		III				United Electric	USA	A				
		*				SMC	Japan	DR				
32	Flow switch	III				UNIVERSAL FLOW METER	USA	A			Sub QR	
		III				Switzer	Chennai	A				

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Patratu Vidyut Utpadan Nigam Limited ★ Distt-Ramgarh (Jharkhand) ★ C & M Deptt.

8 of 26

P.P./Delhi

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216

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		III				Levcon	Kiokatta	A				
		III				DK Instrument	Kolkatta	A				
		III				Khrone Marshal	Pune	A				
		III				Chemtrol	India	DR				
		III				V Automat	NewDelhi	DR				
		III				Gauges Bourdon	Panvel	A				
		III				Magnetrol	Belgium	A				
		III				Ashcroft	Germany	A				
		III				Auxitrol	UK	A				
		III				Mericoid	USA	A				
		III				Delta Control	UK	A				
		III				Merium	USA	A				
		*				Sumag Corporation		DR				
33	Condensing Pots	III				Main Contractor approved Sources		A				
34	Electric to Pneumatic converter	III				IMI NORGEN	India	A			Sub QR	Make : WATSON SMITH
		III				Fair child	USA	A				
		*				ABB	India	A				Subject to meeting the NTPC specification requirement
		*				SMC Pneumatics	Noida	DR				
		*				P & F	Bangalore	DR				
		*				Fairchild India Pvt. Ltd.	Noida	DR				
		*				FESTO	Bangalore	DR				
35	Conduits lead coated (Flexible)	III				Plica	Ghaziabad	A				Main contractor can propose additional vendor for this item
		III				Bansal labortories	BHOPAL	A				
36	Intelligent Battery charger 24V DC & DCDB /BHMS	II				Chabbi Electricals	Jalgaon	A			Sub QR	Modules from EMERSON
		II				Eltech	Gurgaon	A				Modules from ELTEK
		II				MasTech	Jalgaon	A				Modules from ELTEK
		II				Emerson	India	A				
		II				MasTech (Selek Modules)	Jalgaon	A				BHMS from M/s USV, Germany
		*				HBL Power Systems	India	DR				
		*				Dubas	India	DR				
		*				Chabbi Electricals (Chabbi Modules)	Jalgaon	DR				
		*				Hitachi Hi Rel	Gandhinagar	DR				
		*				Statcon Power Controls Pvt. Ltd.	Noida	DR				
		*				Chloride Power Systems (caldyne)	India	DR				
		*				Amararaja	Tirupati	DR				
		*				Keltron Power Electronics	Trivendram	DR				

M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.

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9 of 26

95

217

This is a Part of Technical Specification No. PE-TS-475-673-A001

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR : BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		-				Universal Instrument manufacturing co P Ltd	India	DR				
		-				Hind Rectifier Ltd	India	DR				
37	Battery Health Monitoring System	III				Emerson	Mumbai	A				
		III				Eltek SGS Pvt Ltd	Gurgaon	A				
		-				B Tech Inc	USA	DR				
		III				Hitachi Hi Rel	Gandhinagar	A				
		-				Hopeckea	Germany	DR				
		-				Hitachi Hi Rel	Gandhinagar	DR				
38	Battery(Ni-cd)	I				AMCO SAFT	Bangalore	A				
		II				SAFT	France/Sweeden	A				
		I				HBL POWER	Hyderabad	A				
		II				Hopeke	Germany	A				
39	Socket weld fittings	III				BHEL Approved Sources						Carbon steel only
40	Impulse pipe & tubes	II				Mahrashtra Seamless	Raigarh	A				
		II				Sumitomo/Kawasaki/Nippon	Japan	A				
		II				TPS TECHNITUBE	Germany	A				
		II				Velurio & mannesmann	Germany	A				
		II				BHEL	Trichy	A				
		II				Trouvay and Cauvin	France	A				Makes shall be as per approved list (Sr. No. 41)
		II				ISMT	Ahamadnagar	A				Carbon steel only.
		II				Sandvik		A				For SS only.
		-				TUBACES	Spain	DR				
		-				Salzgitter Mannesmann International	Germany	DR				
		-				Jindal saw	India	DR				
		II				Ratanamani Metal and Tubes	Ahamadabad	A				SS only
		II				Heavy metals and Tubes	Ahamadabad	A				SS and CS only.
		-				Shubhalaxmi Metal and Tubes	Mumbai	DR				
41	Compression fittings	III				Parker	USA	A				
		III				Precision	Mumbai	A				
		III				Astech	Mumbai	A				
		III				Fluid control Pvt. Ltd.	Pune	A				
		III				HP Valves and fittings	CHENNAI	A				Ferruleas are to be hardned at Exim Holand for pressure above 9000 psi.
		III				Excel hydro	Mumbai	A				Ferruleas are to be hardned at Exim Holand for pressure above 9000 psi.
		III				Swagelock	USA	A				
		III				Panam	Mumbai	A				
		III				Metgress	Kolkata	DR				
		-				AURA INC	New Delhi	DR				
		-				Prime Engineers		DR				
		-				Arya Craft		DR				

Bharat Heavy Electricals Limited * PS-MKTG Delhi

Dept.

218

This is a Part of Technical Specification No. PE-TS-475-673-A001

NTPC		PROJECT : Patratu STPS Phase-I (3 X800MW)					LIST OF ITEMS REQUIRING QP					
		PACKAGE : EPC PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00		
		CONTRACTOR :BHEL Ltd					VENDOR AS APPROVED BY			DATE : 26.04.2017		
		CONTRACT NO : CS-9585-001-2										
No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		*				PMT Engineers	Ahemdabad	DR				
		*				Flowtech	Kolkatta	DR				
		*				Parker Hannfin India Pvt Ltd		DR				
42	Instrument valves	III				BHEL	Trichy	A				
		II				Excel Hydro	Mumbai	A				
		II				Instrumentation Ltd.,	Palghat	A				
		III				Swagelok	USA	A				
		III				Parker	USA	A				
		II				HP Valves and fittings	CHENNAI	A				
		II				Fluid control Pvt. Ltd.	Pune	A				
		II				Baldota	Mumbai	A				
43	Valve manifolds	III				Excel hydro	Mumbai	A				
		III				SCHNEIDER	Germany	A				
		III				Anderson Greenwood	USA	A				
		III				Astech	Mumbai	A				
		III				HP Valves and fittings	CHENNAI	A				
		III				Fluid control Pvt. Ltd.	Pune	A				
		III				Microprecision	Faridabad	A				
		III				Parker	USA	A				
		III				Swagelock	USA	A				
		III				Baldota	Mumbai	A				
		*				Metpress Engg. works	Kolkata	DR				
		*				Flow tech	Kolkata	DR				
44	Local Instrument Enclosure/Rack	I				Pyrotech	Udaipur	A				
		I				Instrumentation Limited	Kota	A				
		I				Sajas electrical	Trichurapalli	A				
		I				Prammen	Puddukottai	A				
		I				Chemin	Pondicherry	A				
		*				Forbes Marshall	Pune	DR				
		*				Positronics	Vadodara	DR				
		*				Procon	Chennai	DR				
45	Instrument Cables	I				Paramount	Khuskhera	A				PVC,FRLS type,RQP
		I				Polycab	Daman	A				PVC,FRLS type,RQP
		I				Delton	Faridabad	A				PVC,FRLS type,RQP
		I				KEI	Bhiwadi	A				PVC,FRLS type
		I				Elkey Telelinks	Faridabad	A				PVC,FRLS type
		I				CORDS	Chopanki	A				PVC,FRLS type,RQP
		I				CORDS	Kaharani	A				PVC,FRLS type,RQP
		I				Nicco	Kolkata	A				PVC,FRLS type
		II				TEW & C	USA	A				
		II				Habia cables	Sweeden	A				
		II				Kerpen cables	Germany	A				
		II				Lapp cables	Germany	A				
		II				Thermo electra Bv	Netherland	A				
		I				Universal Cable	Satna	A				PVC,FRLS type
		I				Thermocables	Hyderabad	A				PVC,FRLS type

11 07 26

Bharat Heavy Electricals Limited PS-MKTG Delhi

C&M Deptt. Patratu ... Limited Distt-Ramgarh(Jharkhand)

219

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		I				Finolex Cable	Pune	DR *				
		I				Incab	Pune	DR *				
		I				Gupta Power Infrastructure Ltd.	Khurdha	A				
		*				Lapp cables	India	DR				
		*				Lioni cable	Pune	DR				
		*				RR Kabel	Silvasa	DR				
		*				Gemscab	Bhiwadi	DR				
		*				KEC International	Mysore	DR				
		*				Advance cable Technologies	Bangalore	DR				
		*				Suyog Electricals Ltd.	Vadodara	DR				
		*				Special Cable	India	DR				M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				CMI	Faridabad	DR				
		*				Govind Cables	Kolkata	DR				
		*				Associate Cables	Mumbai	DR				
		*				Radiant RSCC Speciality	Hyderabad	DR				
		*				APAR Industries	Banglore	DR				
		*				Tempsens Cable	Udaipur	DR				
		*				Mansfield cables co. Ltd.	Hyderabad	DR				
		*				Servel India Pvt. Ltd.	Neemrana	DR				
		*				TC Communication Pvt. Ltd.	Ghaziabad	DR				
46	Electrical actuator	III				Auma	Germany	A				
		III				Limitorge	USA	A				
		III				Rotorq	UK	A				
		II				Limitorque	Faridabad	A				
		II				Rotork	Chennai/ Bangalore	A				
		III				Nippon gear	Japan	A				
		II				Auma	Bangalore	A				
		III				Harold Beck	USA	A				
		III				Drehmo	Germany	A				
		I				Antrieb	Chennai	A				For Low torque application such as SH/RH vent, circulation isolation
		*				Lindco	USA	DR				
		*				Siemens	Germany	DR				
47	Electrical actuator for ID/FD/PA Blade pitch and Guide vane control	III				Harold Beck	USA	A				
		III				SIPOS Aktrorik GmbH	Germany	A				
		*				ABB	Germany	DR				
48	Flow nozzle / Venturi assembly	II				Microprecision	Faridabad	A			Sub QR	
		II				SEIKO	Austria	A				
		II				TECHNOMATIC	Italy	A				
		II				Instrumentation Limited	Palghat	A				
		I				Starmech	Pune	A				
		II				WISE Control	Korea	A				

Bharat Heavy Electricals Limited PS-MKTG Delhi

C&M Deptt. Patratu Vidyut Utpadan Nigam Limited Distt-Ramgarh(Jharkhand)

12

98

228

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		I				MINCO India Flow Elements Pvt. Ltd.	GOA	A				
		*				SAMIL	Korea	DR				
		*				MINCO	GOA	DR				
		*				Engg. Specialities	Kolkata	DR				
		*				Pyroelectric	Mumbai	DR				
		*				Hydropneumatics	Mapusa / GOA	DR				
		*				ASIAN INDUSTRIAL VALVES	Chennai	DR				
		*				Dynafluid valves Pvt. Ltd.	Belgium	DR				
49	HIGH Temp. cable (PTFE/FEP)	II				Habia cables	Swaden	A				
		II				Lapp cables	Germany	A				
		II				Kerpen cables	Germany	A				
		II				TEW & C	USA	A				
		II				Thermo-Electra Bv	Netherland	A				
		II				Habia cables	China	A				
		II				Thermocables	Hyderabad	A				
		II				Tempsens	Udaipur	A				
		*				Delton Cables	Faridabad	DR				
		*				RJ Cables	Roorkee	DR				
50	Fiber optic cable	II				HFCL	Goa	A				
		II				R&M	Switzerland	A				
		II				Aksh Fibre	Bhiwadi	A				
		II				Finolex	Pune/Goa	A				
		II				Birla Ericson	Rewa	A				
		II				Molex	UK	A				
		II				Corning	USA	A				
		II				Schneider	GOA	A				Previously known as D Link / Smartlink, Goa
		*				RPG Cables	India	DR				
		*				Uniflex Cables	India	DR				
		*				Terracom	India	DR				
51	Pneumatic Actuator (Power Cylinder e. g. FOR SADC)	II				Dong Woo Valve Control Co. LTD	Korea	A				
		II				Shin Hwa Engineering Co. LTD	Korea	A				
		I				Instrumentation Limited	Palghat	A				
		I				Kelton	Cochin(Alleppy)	A				
		I				SMC Pneumatics	Noida	A				Up to 12 Inch only
		I				Rotex	Mumbai	A				Conditional
		*				Emerson Process Management	Chennai	DR				
		*				MIL Controls	Alwaye	DR				
		*				Festo	Bangalore	DR				
		*				IMI Norgen	Noida	DR				
52	Level switch capacitance type	III				ENDRESS & HOUSER	Aurangabad	A			Sub QR	
		III				MAGNETROL	BELGIUM	A				
		III				SBEM	PUNE	A				
		III				PUNE TECHTROL	PUNE	A				

Bharat Heavy Electricals Limited * PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh(Jharkhand) * C&M Deptt.

66

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		III				LEVCON	KOLKATA	A				
		III				Nivo Controls	Indore	A				
		*				V AUTOMAT	New Delhi	DR				
		*				D K Instrument	Kolkata	DR				
		*				Siemens	Germany	DR				
		*				ABB	Korea	DR				
		*				Rosemount	Korea	DR				
53	Transducer	II				AE	Mumbai	A				
		II				Southern Transducer	Chennai	A				
		II				Elster	Mumbai	A				
		III				Camille Bauer	Germany	A				
		III				Metrawat	Germany	A				
		II				Rishab	Nasik	A				
		*				Pyrotech	Udaipur	DR				
		*				Masibus	Gandhinagar	DR				
		*				SIEMENS	Germany	DR				
54	Mini UPS up to 3.5 KVA	III				EMERSON	Mumbai	A				
		III				EMERSON	Pune	A				
		III				Hitachi Hi- Rel	Gandhinagar	A				
		III				APC	Bangalore	A				
		III				APLAB	Mumbai	A				
		III				Delta	Gurgaon	A				
		*				Powertronix	Bangalore	DR				
		*				DUBAS ENGG.PVT.LTD., BANGALORE		DR				
		*				Grid power conversion Pvt Ltd.		DR				
		*				Schneider	Bangalore	DR				
55	Level switch- cond type	III				EMERSON (Solartron mobrey)	UK	A			Sub QR	
		II				Hi Tech	Kolkata	A				Levelstate, UK System
		III				Yarway	USA	A				
		III				LEVELSTATE	UK	A				
		II				Raman Instruments	Delhi	A				Emerson (Mobrey) System
		*				BHEL	Trichy	DR				
		*				IGEMA	Germany	DR				
56	Level switch - Float/Displacer Type	III				ENDRESS & HOUSER	AURANGABAD	A			Sub QR	
		III				MAGNETROL	BELGIUM	A				
		III				LEVCON	KOLKATA	A				
		III				SBEM	PUNE	A				
		III				Chemtrols samil	Mubmai	A				
		III				NAKATIYA	JAPAN	A				
		III				Sigma Industries	Mubmai	A				
		III				D K Instrument	KOLKATA	A				
		III				PUNE TECHTROL	PUNE	A				
		III				V AUTOMAT	NEW DELHI	A				
		*				WAREE	WAPI	DR				
		III				LEVELSTATE	UK	A				

15 07 26

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* Patratu Vidyut Utpadan Nigam Limited * Distt-Ramgarh (Jharkhand)

C & M Deptt.

This is a Part of Technical Specification No. PE-TS-475-673-A001

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR:-BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		III				Gauges Bourdon (GIC)	Panvel	A				
		*				Nisan Scientific Process	Navi Mumbai	DR				
57	Air filter regulator	III				Fairchild	USA	A				
		III				Sharvo Norgen	Mumbai	A				
		III				SMC Pneumatics	NOIDA	A				
		III				Emerson (Asco)	Chennai	A				
		III				Festo	Bangalore	A				
		III				Placka	Chennai	A				
						Divya Control Elements	Gujarat	DR				
58	Copper tubing/Brass connectors	III				Main Contractor approved Sources		A				
59	Coupling / Interposing relays	III				PARAMOUNT	BANGALORE	A				
		III				OMRON		A				
		III				OEN		A				
		III				Jyoti	Baroda	A				
		*				ELSTA	SWITZERLAND	A				
		*				Schnaider	Germany	DR				
		*				Siemens	Germany	DR				
		*				Phoenix	Germany	DR				
60	Solenoid valve	III				Finder		DR				
		III				Rotex	Vadodara	A			Sub QR	
		III				Avcon	Mumabi	A				
		III				Herion	Germany	A				
		III				IMI NORGEN	GERMANY	A				
		III				Jafferson	Argentina	A				
		III				Asco	Chennai/USA	A				
		III				Festo	Bangalore	A				
		III				SMC	Noida	A				
		III				Parker	Brand Name	A				
		*				Schnaider	Germany	DR				
		*				Neucon Industries Pvt. Ltd.		DR				
61	Lube oil control valve - Self Regulating	III				NUOVO PIGNONE	ITALY	A				
		III				EMERSON	CHENNAI	A				
		III				SAMSON	GERMANY / PUNE	A				
62	Guided wave/Radar type level transmitter	III				Forbes marshall arca pvt. Ltd.	Pune	A				Approved up to 16", 900 Class.
		III				Magnetrol	Belgium	A			Sub QR	
		III				Endress & Houser	Germany/ Aurangabad	A				
		III				Emerson Process Management	Sweden/ PAVANE	A				
		III				ABB(K-Tech)	USA	A				
		II				Supreme Technology	Thane	A				Make M/s Siemens, Canada
		*				Yokogawa	Japan	DR				
		*				ABB	India	DR				
		*				P & F	Bangalore	DR				

Bharat Electricals Limited * PS-MKTG Delhi

C & M Deptt. Patratu Vidyut Utpadan Nigam Limited * (Jharkhand) * Dist-Ramgarh (Jharkhand)

15.07.16

223

NTPC		PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
		PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
		CONTRACTOR : BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
		CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		*				Khrone	France	DR				
		*				HONEYWELL	Pune	DR				
		*				Vega	Germany / India	DR				
		*				Siemens	India	DR				
		*				SBEM	Pune	DR				
63	Maintenance and Calibration Equipment					Main Contractor will propose the vendors during detail Engineering.						
64	Temperature Gauge	III				BUDENBERG	UK	A				
		III				DRESSOR (ASHCROFT)	USA/Germany	A				
		III				Wika	GERMANY/ Pune	A				
		III				WISE Control	Korea	A				
		III				Nagano KEIKI	Japan	A				
		III				H.Guru South India	Bangalore	A				
		III				A.N. Instruments	Kolakatta	A				
		III				NUOVA FIMA	ITALY	A				
		III				Goa Thermostatic	Goa	A				
		III				Goa Instrument Industries	Goa	A				
		III				Baumer	Vapi	A				
		III				Precision mass products Pvt. Ltd.	Gandhinagar	A				
		III				H Guru	Rishra/Muzaffarpur	A				
		III				Baumer	Vapi	A				
		III				Forbes Marshall	Hyderabad	A				
		III				Gauges Bourdon (GIC)	Panvel	A				
		*				Konics	Korea	DR				M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				Pyroelectric	GOA	DR				
		*				Winters Gauge	USA	DR				
		*				Walchandnagar Industries Ltd.	Dharwad	DR				
		III				Nesstech	Vapi	A				
		*				US Gauge	USA	DR				
65	Furniture for computer (Chair, Almirah, Lock etc.)	III				Main contractor approved sources		A				
66	Terminal Block (Cage and Clamp type)	III				Weidmuller	Germany	A				
		III				Phoenix	Germany / India	A				
		III				Wago	Germany / India	A				
		III				Elmex	Vadodara	A				
67	FRP Junction Box for C&I system	III				BHEL Approved Sources		A				CE Mark only
68	PLC System (if applicable)	I				GE Intellegent plateforms	Bangalore	A				
		I				ABB	Bangalore	A				
		I				Schneider	Nasik	A				
		I				Rockwell	Sahibabad	A				
		I				Siemens	Nasik	A				
		I				HONEYWELL	Pune	A				
69	SMART POSITIONER (Make)	#				ABB						# - To be covered in Control Valve QP.

Bharat Heavy Electricals Limited PS-MKTG Delhi

15 07 26

C & M Deptt.

224

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		#				Masoleniein						
		#				Siemens						
		#				Smar						
		#				Yokogawa						
		#				EMERSON (Fisher Rosemount)						
		#				METSO						
		#				Yamatake						
		#				Moore						
70	ROTAMETER	III				IEPL	HYDRABAD	A			Sub QR	
		III				TRAC	HYDRABAD	A				
		III				PLACKA	CHENNAI	A				
		III				EUREKA	PUNE	A				
		III				SCIENTIFIC DEVICES	MUMBAI	A				UP TO 300 NB
		III				FLOW STAR	FARIDABAD	A				
		*				TOKOYO KEISO	JAPAN	A				
		*				Flowtech Instrument Services	Vadodara	DR				
		*				Samil Chemtrol	MUMBAI	DR				
		*				Gauges Bourdon	Panvel	DR				
		*				Tansa Equipment Pvt. Ltd.	Thane	DR				
71	SINGLE AND MULTI POINT TEMPERATURE RECORDER (Micorprocessor based)	III				YOKOGAWA INDIA	BANGALORE	A				Make Yokogawa, Japan
		III				CHINO CORPORATION	JAPAN	A				
		III				EUROTHERM	UK	A				
		III				EUROTHERM	INDIA	DR				
		III				YOKOGAWA	JAPAN	A				
		III				ABB	UK / GERMANY	A				
		III				FUJI	JAPAN	A				
		III				HONEYWELL	USA / NETHERLAND	A				
72	Reverse Rotation Indicator (RRI)	III				GE BENTLY NEVEDA	USA	A			Sub QR	ALL TSI VENDORS ARE ALSO ACCEPTABLE
		III				SHINKAWA	JAPAN	A				
73	Instrument Tube Fittings (Air)	III				P & F	Bangalore	A				
74	pH/ Conductivity Analyser	III				Main contractor approved sources		A				
		III				HACH	Switzerland / USA	A			Sub QR	
		III				YOKOGAWA	Banglaore / Japan	A				Make Yokogawa- Japan
		III				ABB	UK / USA	A				
		III				EMERSON	Pawane	A				
		*				Thermo orion		DR				
75	PADO	*				Forbes Marshell	Pune	DR				
76	DEW Point Sensor / meter/ Moisture Measuring System	III				Main Contractor will propose the vendors during detail Engineering.						
		III				GE Sensing	USA / Ireland	A				Panametric brand
		III				Michell Instrument	UK	A				
		III				Shaw	UK	A				

17 of 26

Bharat Heavy Electricals Limited ★ PS-MKTG Delhi

C & I Deptt. Patratu Vidyut Utpadan Nigam Limited ★ Distt-Ramgarh(Jharkhand)

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
98	Printer (Dot Matrix)	III				BHEL Approved Sources						Make
99	Printer (Inkjet)	III				BHEL Approved Sources						Make
100	Printer (Laser)	III				BHEL Approved Sources						Make
101	Semaphore Indicators	III				Subklew	Germany	A				
		III				K & N	Austria	A				
		III				ABB	Germany	A				
		III				Siemens	Germany	A				
102	Synchronising Relay	III				Siemens	Mumbai	A			Sub QR	
		III				Areva	Chennai	A				
		III				ABB	Bangalore	A				
103	Synchroscope	III				BHEL Approved Sources		A			Sub QR	
104	Ultrasonic Type Flow Meter (for Stack)	III				Maihak	Germany	A			Sub QR	
		III				Durag	Germany	A				
		III				Teledyne	USA	A				
		*				GE Sensing	USA	DR				
105	UPS / ACDB	I				EMERSON (DB Power)	Pune	A			Sub QR	Approved up to 105 kVA, 1Φ
		I				Merlin & Gerin	France	A				
		I				Gutur	Switzerland	A				
		I				AEG (Saft)	Germany	A				
		I				Hitachi Hirel	Gandhinagar	A				Approved up to 150 kVA, 1Φ
		I				Emerson (Tata Liberl)	Ambamath	A				Approved up to 150 kVA, 1Φ
		I				Fuji Electric	Japan	A				
		*				Keltron	Kerala	DR				
		*				APC	India	DR				
		*				DUBAS ENGG.PVT.LTD., BANGALORE		DR				
		*				Grid power conversion Pvt Ltd.		DR				
106	Vibration Monitoring System for BOP	II / I				Shinkawa	Japan	A			Sub QR	
	Refer Note - 1	II / I				Bentley Nivada	USA	A				
		II / I				Vibrometer	Switzerland	A				
		II / I				Rockwell Automation	USA	A				
		II / I				SKF	USA	A				Refer Note - 1
		I				GE	Pune	A				GE Bently, USA make System
		I				Meggit	Bangalore	A				Vibromer, Switzelerland make System
		I				Forbes Marshall	Pune	A				Shinkawa, Japan make System
		I				Rockwell Automation	Sahibabad	A				
		*				Emerson	Mumbai	DR				
		*				Burel and Kajer		DR				
		*				IRD Mechanalysis	Mumbai	DR				
107	Voltmeter	III				Rishabh	Nasik	A			Sub QR	
		III				AE	Mumbai	A				
		III				Yokogawa	Japan	A				
		*				MECO		DR				
108	Watthour Meters	III				L&T	Bangalore	A				

Bharat Heavy Electricals Limited ★ PS-MKTG Delhi ★

Patratu Vidyut Utpadan Nigam Limited ★ Distt-Ramgarh(Jharkhand) ★ C&M Deptt.

104

225

NTPC		PROJECT : Patratu STPS Phase-I (3 X800MW)					LIST OF ITEMS REQUIRING QP					
		PACKAGE : EPC PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00		
		CONTRACTOR :BHEL Ltd					VENDOR AS APPROVED BY			DATE : 26.04.2017		
		CONTRACT NO : CS-9585-001-2										
No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		III				Elster	Mumbai	A				
		III				Secure Meters	Udaipur	A				
		III				Yokogawa	Japan	A				
		III				GEC	UK	A				
		III				Schnieder Electric	India	DR				
		III				Lendis + Gyr	Kolkata	DR				
109	Wireless Solution (Microwave Tower Communication)	III				D Link	Goa	A				
		III				Sheetal	Pune	A				
		III				Pyrotech	Udaipur	A				
		III				Arya Communications	New Delhi	A				
		*				Lotus Wireless	Vishakhapatnam	DR				
		*				Avirion	Israel	DR				
		*				Prudent Automation Pvt. Ltd.	Hyderabad	DR				
		*				AMG Systems Ltd.	UK	DR				
110	Large Video Screen (LED Based)	III				Delta	Gurgaon	A				
		III				Barco	Noida	A				
		III				Planer System	USA	A				
		*				Christie	USA	DR				
		*				Eyevis	Germany	DR				
111	CJC Box (If applicable)					Main Contractor will propose the vendors during detail Engineering.						
112	3 D level Scanner for Solid Application	III				APM	ISRAIL	A				
113	Dust Sensor	III				BHEL Approved Sources		A				
114	Pulse jet Controller	III				Switching Circuit	Kolkata	A				
		III				Advance Concept	Kolkata	A				
		III				Control Devices	Kolkata	A				
		*				Voltcraft	Kolkata	DR				
		*				Micro System	Kolkata	DR				
115	Solid Mass Flow Meter	III				Schenk	Ranchi	A				
		III				Thermofisher (Ramsay)	Nasik	A				
		III				Siemens Miltronics	Canada	A				
		III				Mutec	Germany	A				
		III				SWR	Germany	A				
116	Nucleonic Density meter	III				E & H	Aurangabad	A				
		III				Thermofisher Scientific	UK	A				
		*				Siemens	Germany	DR				
		*				EMERSON	USA	DR				
		*				GE Sensing	USA	DR				
		*				Berthhold	Germany	DR				
117	Humidistat / Thermostat / Gyserstat / Airstat	III				BHEL Approved Sources		A			Sub QR	
118	Level Switch (RF Type)	II				EIP Enviro	Noida	A			Sub QR	
		II				FLOW STAR	Faridabad	A				
		II				Nivo Controls	Indore	A				
		*				BHEL		DR				

22 oct 26

220

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		I				Cords Cable	Bhiwadi / Kaharani	A				

LEGENDS :

1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)

A - For those items proposed vendor is acceptable to NTPC, subject to meeting the NTPC Specificaiton requirement. To be indicated with letter "A" in the list alognwith the condition of approval, if any.

DR - For those items "Detailed Required" for NTPC review. To be identified with letter "DR" in the list.

NOTED : For these items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with "NOTED"

2.0 QP INSPECTION CATEGORY :
CAT - I : For those items the Quality Plans are approved by NTPC and final acceptance will be on physical inspection witness by NTPC
CAT - II : For those items the Quality Plans are approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis of review of documents.

CAT-III:

UNITS/WORKS : Place of manufacturing- Place of main supplier of multi units/works.

* - Inspection category will be decided during vendor evaluation.

NOTE - 1 : EMPTY CABINETS, COMPUTERS, SIGNAL ISOLATOR/ MULTIPLIER, MCB, TB, POWER SUPPLY ETC. SHALL ALSO BE ACCEPTABLE FROM INDEGENEOUS SOURCES AGREED BY NTPC IN QP. IF THE TOTAL INTEGRATED PANEL AND FAT IS CONDUCTED INDEGENEOUSLY ITEM TO BE TREATED AS CAT - I.

NOTE - 2 : Mandatory Sapre will be treated as CAT-III

NOTE - 3 : For the items not appearing in the preaward list, bidder and NTPC will mutually discussed in future.

NOTE - 4 : Intergration testing of DDCMIS shall be done with monitor connected to the LVS workstation. This wouled be tied up in the QAP/ATST. Dispatch of LVS can be allowed like a CAT-III item but only after successful testing of funcaality as indiacted in QP and completion of ATST of first unit.

NOTE - 5 : C&I items intergral for skid,Fan, Motor,Pump etc instrument shall be supplied as per OEM standred/ approved soureces.

NOTE - 6 : for instrumentation cable quantity less than 1 km of each type inspection category is III and for less then 2.5 km of each type inspection category is CAT-II
FORMAT NO. : QS-01-QAI-P-1/F3-R0

Engg. Div/QA&I

P.P. Patil

PRASHANT P. PATIL
Dy.m (QA-C&F)

26.07.26.

Bharat Heavy Electricals Limited
PS-MKTG
Delhi

Apadav
AMIT YADAV
Mgr. MKTG.
BHEL

Patratu Vidyut Utpadan Nigam Limited
C & M
Deptt.
Distt-Ramgarh(Jharkhand)

SUB-VENDOR LIST
(CONT.)

LIST OF MAKES OF SUB-VENDOR ITEMS

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
1.	PRESSURE VESSELS	GLOBAL STRUCTURES & COMPOSITE LTD	-	
		JASMINO POLYMERTECH	TALOJA	
		SYSCON ENGINEERS	AMBERNATH	
		S.V. FABRICATORS	NAVI MUMBAI	
		SPARK FABRICATORS / STEELCON	-	
		ANUP ENGINEERING	AHMEDABAD	
		MURTHAL TANKS & VESSELS	SONEPAT	
		TITAN ENGG.	DURGAPUR	
		RISHI INDUSTRIES	BAHALGARH	
		UNIVERSAL HEAT EXCHANGERS	-	
		ATS CHEM	SALEM/HOSUR	
		CHEM PROCESS SYSTEM	SANAND	
		PROGEN	CHENNAI	
		CRYSTAL ENGINEERING	HOSUR	
		ISHAN EQUIPMENTS	VADODARA	
2.	ATMOSPHERIC/ STORAGE TANKS	GLOBAL STRUCTURES & COMPOSITE LTD	-	
		JASMINO POLYMERTECH	TALOJA	
		SYSCON ENGINEERS	AMBERNATH	
		S.V. FABRICATORS	NAVI MUMBAI	
		SPARK FABRICATORS / STEELCON	-	
		ANUP ENGINEERING	AHMEDABAD	
		MURTHAL TANKS & VESSELS	SONEPAT	
		TITAN ENGG.	DURGAPUR	
		RISHI INDUSTRIES	BAHALGARH	
		UNIVERSAL HEAT EXCHANGERS	-	
		ATS CHEM	SALEM/HOSUR	
		CHEM PROCESS SYSTEM	SANAND	
		PROGEN	CHENNAI	
		CRYSTAL ENGINEERING	HOSUR	
		ISHAN EQUIPMENTS	VADODARA	
3.	RUBBER LINING (AT SHOP)	TEMSEC	KOLKATA	
		RISHI INDUSTRIES	SONEPAT	
		CORI ENGINEERS	CHENNAI	
		POLY RUBBER	MUMBAI	
		INDUSTRIAL LINING	VADODARA	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		ARUL RUBBERS	CHENNAI	
		JASMINO POLYMERTECH	TALOJA	
		WESTERN RUBBER	NAVI MUMBAI	
		ELASTOMER LINNING	AMBERNATH	
		EMKAY RUBBER	MUMBAI	
4.	AIR BLOWERS (TWIN LOBE TYPE)	SWAN PNEUMATIC	NOIDA	
		EVEREST TRANSMISSION	NEW DELHI	
		KAY INTERNATIONAL	NEW DELHI / SONEPAT	
		EVEREST BLOWER	BAHADURGARH	
		KULKARNI POWER TOOLS	KOLHAPUR/ PUNE	
5.	METERING PUMPS	VK PUMPS	NASIK	
		MILTON ROY INDIA	CHENNAI	
		SWELLORE	AHMEDABAD	
		POSITIVE METERING PUMPS	NASIK	
		METACHEM	MUMBAI	
6.	AGITATOR	REMI PEOCESS PLANT & M/C	MUMBAI	
		FIBRE & FIBRE	MUMBAI / SILVASA	
		CEECONS	CHENNAI	
		STANDARD ENGINEERS	MUMBAI	
7.	HORIZONTAL CENTRIFUGAL PUMPS	BEST AND CROMPTON ENGG LTD.	CHENNAI	
		BHARAT PUMPS & COMPRESSORS LTD	ALLAHABAD	
		FLOWMORE LTD.	GURGAON	
		FLOWSERVE INDIA CONTROLS PVT. LTD.	COIMBATORE	
		JYOTI LTD.	VADODARA	
		KIRLOSKAR BROTHERS LTD	PUNE	
		WILO MATHER & PLATT PUMPS PVT. LTD.	PUNE	
		V-FLO PUMPS & SYSTEMS CO. LTD.,	BEIJING-CHINA	
		WPIL LIMITED	KOLKATA	
		VARAT PUMP AND MACHINERY PVT. LTD.	HOWRAH	
		SINTECH PRECISION PRODUCT LTD.	GHAZIABAD	
		MAXFLOW PUMPS INDIA PVT. LTD.	GURUGRAM	
8.	VERTICAL CENTRIFUGAL PUMPS	BHARAT PUMPS & COMPRESSORS LTD	ALLAHABAD	
		FLOWMORE LTD.	GURGAON	
		FLOWSERVE INDIA CONTROLS PVT. LTD.	COIMBATORE	
		JYOTI LTD.	VADODARA	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		WILO MATHER & PLATT PUMPS PVT. LTD.	PUNE	
		SULZER PUMPS INDIA LTD.	THANE	
		WPIL LIMITED	KOLKATA	
9.	SCREW PUMP	UT PUMP		
		ROTO PUMPS		
		TUSHACO		
10.	HORIZONTAL CENTRIFUGAL PUMPS (RUBBER LINED)	KISHORE PUMPS	PUNE	
		SU MOTORS	MUMBAI	
11.	NON METALLIC (PP/FRP) HORIZONTAL CENTRIFUGAL PUMPS	ENGINEERS COMBINE	THANE	
		ANTICORROSIVE	VALSAD	
		LEAK PROOF PUMPS PVT. LTD. (RAJEDIA)	-	
12.	MISC. PUMP VERTICAL TURBINE TYPE	KBL	PUNE	
		M&P	PUNE	
		WPIL	GHAZIABAD	
		KISHORE PUMPS	PUNE	
		FLOWMORE	SAHIBABAD	
13.	BATTERY CHARGER FOR PLC	AMARA RAJA POWER SYSTEMS LIMITED	TRIPUTI	
		CHHABI ELECTRICALS PVT.LTD.	JALGAON	
		CHLORIDE POWER SYSTEMS & SOLUTIONS LIMITED	KOLKATA	
		DUBAS ENGG PVT LTD	BANGALORE	
		HBL POWER SYSTEMS LTD	HYDERABAD	
		JEMA ENERGY	SPAIN	FOR STATIC SCR TYPE FULL WAVE FULLY CONTROL TYPE
		MASS-TECH CONTROLS PVT.LTD.	MUMBAI	
		STATCON POWER CONTROLS LTD	NOIDA	
14.	UNDER BED NOZZLE	JONSONS SCREEN	AUSTRALIA/ IRELAND	
15.	COATING & WRAPPING MATERIAL TAPE	IWL LTD.	CHENNAI	
		MP TAR PRODUCT	BHILAI	
		PORWAL INDUSTRIES	RAIPUR	
		RUSTECH	KOLKATA	
		STP	JAMSHEDPUR	
16.	HEATER	ESCORTS	FARIDABAD	
		RACOLDS	FARIDABAD	
17.	CLARIFIER/ THICKENER MECHANISM	CLEAR WATER	DELHI	
		TRIVENI	NOIDA	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		PBJ ASSOCIATE	PUNE	
18.	**CENTRIFUGE**	HUMBOLT	-	
		HILLER	-	
19.	**CAST IRON GATE/GLV/NRV/SRV**	A.V. VALVES LTD	AGRA	
		ATAM VALVES PVT. LTD.	JALANDHAR	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	
		G.M. DALUI AND SONS PVT.LTD.	HOWRAH	
		H.SARKER AND COMPANY	HOWRAH	
		LEADER VALVES LTD.	JALANDHAR	
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	
20.	**BALL VALVE (MANUAL /PNEUMATIC/ ELECTRIC) CLASS 150**	A.V. VALVES LTD	AGRA	
		AKAY INDUSTRIES PVT.LTD.	DHARWAD	
		BELGAUM AQUA VALVES PVT. LTD.	BELGAUN	
		ASIAN INDUSTRIAL VALVES & INSTRUMENTS.	CHENNAI	
		ATAM VALVES PVT. LTD.	JALANDHAR	
		DEMBLA VALVES LTD.	THANE	
		M/S GM ENGINEERING	RAJKOT	
		HAWA VALVES (INDIA) PVT. LTD.	NAVI MUMBAI	
		INTERVALVE (INDIA) LTD.	PUNE	
		LEADER VALVES LTD.	JALANDHAR	
		MICROFINISH VALVES PVT LTD.	HUBLI	
		NILON VALVES PRIVATE LIMITED	AHMEDABAD	
		SURYA VALVES AND INSTRUMENTS MFG CO.	CHENNAI	
		UNIFLOW	CHENNAI	
		VALTECH INDUSTRIES	MUMBAI	
		VAAS AUTOMATION PVT. LTD.	NEW DELHI	
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI	
21.	**ELECTRIC MOTOR**	CROMPTON GREAVES	AHMEDNAGAR	
		LAXMI HYDRAULICS PVT. LTD	BANGALORE / HUBLI*	
		RAJINDRA ELECT INDUSTRIES	FARIDABAD* / BANGALORE	
		GE-POWER		
		BHARAT BIJLEE	MUMBAI	
		SIEMENS	MUMBAI	
		NGEF	BANGALORE	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		KIRLOSKAR ELECTRIC CO LTD.		
		ASEA BROWN BOVERI		
		MARATHON	KOLKATA	
22.	BUTTER-FLY VALVE	ADVANCE VALVES PVT. LTD.	NOIDA	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	
		INSTRUMENTATION LTD.	PALAKKAD	
		INTERVALVE (INDIA) LTD.	PUNE	
		R AND D MULTIPLES (METAL CAST) PVT LTD	MUMBAI	
		SURYA VALVES AND INSTRUMENTS MFG CO.	CHENNAI	
		PENTAIR VALVES AND CONTROLS INDIA PRIVATE LIMITED	NAVI MUMBAI	
		UPADHAYA VALVES MANUFACTURERS PRIVATE LIMITED,	KOLKATA	
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI	
23.	DIAPHRAGM VALVE (MANUAL / PNEUMATIC) CLASS 150	WEIR BDK	HUBLI	
		CRANE FLOW PROCESS	SATARA	
		PROCON	MUMBAI	
		MAJESTIC VALVES (LABLINE)	-	
		HAWA ENGINEERS	AHMEDABAD	
24.	DUAL PLATE CHECK VALVES	ADVANCE VALVES PVT. LTD.	NOIDA	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	1. DUAL PLATE CHECK VALVE CI - CLASS 150 & UP TO 600NB, 2. DUAL PLATE CHECK VALVE CCS - CLASS 150 & UP TO 500NB
		R AND D MULTIPLES (METAL CAST) PVT LTD	MUMBAI	
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	CI ,CCS & STAINLESS STEEL SPRING ASSISTED DUAL PLATE CHECK VALVES UPTO 700 NB AND 150 CLASS RATING.
25.	Y-TYPE STRAINER	OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		GRAND PRIX	NEW DELHI	
		JAYPEE	NEW DELHI	
		GREAVES COTTON	MUMBAI	
		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI / NOIDA	
		FILTERATION ENGINEERS (I) PVT. LTD	MUMBAI	
		FLUIDNYE	-	
		SUNGOV ENGINEERING PVT. LTD.	DELHI	
		GRAND PRIX	FARIDABAD	
		JAYPEE INDUSTRIES PVT. LTD.	DELHI	
		BHATIA ENGINEERING CO.	DELHI	
26.	**RUBBER FLAP TYPE CHECK VALVES**	ASHVIK VALVES	-	
		FLOW WAY VALVES	-	
		BDK	-	
		MAJESTIC VALVES (LABLINE INST)	-	
		ADVANCE VALVES	-	
27.	**SOLENOID VALVES**	ROTEX	-	
		AVCON	-	
28.	**PRESSURE GAUGE/ DIFFERENTIAL PRESSURE GAUGE**	A.N. INSTRUMENTS PVT. LTD.	KOLKATA	
		ASHCROFT INDIA PVT LTD.	GUJARAT	
		BOSE PANDA INSTRUMENTS PVT.LTD.	KOLKATA	
		FORBES MARSHALL (HYD) LTD.	HYDERABAD	
		GAUGE BOURDON INDIA PVT. LTD.	MUMBAI	
		H.GURU INDUSTRIES	KOLKATA	
		H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	BANGALORE	
		BAUMER TECHNOLOGIES INDIA PVT. LTD.	MUMBAI	
29.	**CHAIN PULLEY BLOCK**	ARMSEL MHE PVT. LTD	BANGALORE	
		CENTURY CRANE ENGINEERS PVT. LTD.	FARIDABAD	
		HERCULES HOISTS LTD.	RAIGAD	
		LIFTING EQUIPMENTS AND ACCESSORIES	DELHI	
		TUOBRO FURGUSON (INDIA) PVT LTD	KOLKATA	UPTO 10 TONNE.
		TRACTEL TIRFOR INDIA PVT. LTD.	FARIDABAD	
		TECHNO INDUSTRIES	AHMEDABAD	
		ARMSEL MHE PVT. LTD	BANGALORE	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		ALPHA SERVICES	BHIWADI	
		CONSOLIDATED HOISTS PVT LTD	PUNE	UPTO 20 TONNES
		CENTURY CRANE ENGINEERS PVT. LTD.	FARIDABAD	
		EDDY CRANES PVT. LTD.	MUMBAI	CAPACITY UPTO 10 TONS. BOIS BHEL APP.SUB-VENDORS.
		GRIP ENGINEERS PVT. LTD.,	FARIDABAD,	
		GLOBAL TECHNOLOGIES	HYDERABAD	
		HERCULES HOISTS LTD.	RAIGAD	
		LIFTING EQUIPMENTS AND ACCESSORIES	DELHI	
		MANGLA HOISTS PVT LTD	NEW DELHI	
		MEEKA MACHINERY PVT. LTD.	AHMEDABAD	
		REVA INDUSTRIES LTD.	FARIDABAD	UPTO 25.0 T CAPACITY.
		ROCKWELL HOISTO CRANES PVT. LTD.	BAHADURGARH	
		SAFEX ENERGY PVT. LTD.	AHMEDABAD	
		TUOBRO FURGUSON (INDIA) PVT LTD	KOLKATA	UPTO 15 TONNES.
		TECHNO INDUSTRIES	AHMEDABAD	
30.	**ELECTRIC HOIST**	ARMSEL MHE PVT. LTD	BANGALORE	
		ALPHA SERVICES	BHIWADI	
		CONSOLIDATED HOISTS PVT LTD	PUNE	UPTO 20 TONNES
		CENTURY CRANE ENGINEERS PVT. LTD.	FARIDABAD	
		EDDY CRANES PVT. LTD.	MUMBAI	CAPACITY UPTO 10 TONS. BOIS BHEL APP.SUB-VENDORS.
		GRIP ENGINEERS PVT. LTD.,	FARIDABAD,	
		GLOBAL TECHNOLOGIES	HYDERABAD	
		HERCULES HOISTS LTD.	RAIGAD	
		LIFTING EQUIPMENTS AND ACCESSORIES	DELHI	
		MANGLA HOISTS PVT LTD	NEW DELHI	
		MEEKA MACHINERY PVT. LTD.	AHMEDABAD	
		REVA INDUSTRIES LTD.	FARIDABAD	UPTO 25.0 T CAPACITY.
		ROCKWELL HOISTO CRANES PVT. LTD.	BAHADURGARH	
		SAFEX ENERGY PVT. LTD.	AHMEDABAD	
		TUOBRO FURGUSON (INDIA)	KOLKATA	UPTO 15

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		PVT LTD		TONNES.
		TECHNO INDUSTRIES	AHMEDABAD	
31.	CONTROL VALVE	SPX CORPORATION, USA	AHMEDABAD	
		CONTROL COMPONENT INC.	CALIFORNIA	
		DRESSER VALVE INDIA PVT. LTD	COIMBATORE	
		DAUME REGELARMATUREN GMBH,	GERMANY	
		EMERSON PROCESS MANAGEMENT CHENNAI LIMITED	CHENNAI	
		WEIR VALVES & CONTROLS UK LTD.	U.K	
		HOLTER REGELARMATUREN GMBH & CO.KG	GERMANY	
		INSTRUMENTATION LTD.	KERALA	
		KOSO INDIA PRIVATE LIMITED,	NASHIK	
		LESLIE CONTROLS, INC	USA	
		MIL CONTROLS LTD.	KERALA	
		METSO SINGAPORE PTE. LTD.,	SINGAPORE	
		PARCOL S.P.A	ITALY	
		R.K.CONTROL INSTRUMENTS PVT. LTD.	THANE	
		RINGO VALVULAS S.L,	SPAIN	
		SHENJIANG VALVE CO. LTD.	CHINA	
		VALVITALIA S.P.A. ,	ITALY	
		WALDEMAR PRUSS ARMATURENFABRIK GMBH	GERMANY	
32.	PRESSURE/DP/VACUUM SWITCH	INDFOSS	GHAZIABAD	
		SOR	USA	
		DRESSOR	USA	
		DELTA CONTROL	UK	
		TRAFAG	RANIPET	
		GIC(GAUGES BOURDON)	PANVEL	
		ASHCROFT INDIA PVT LTD.	USA/GERMANY	
		SWITZER	CHENNAI	
33.	TEMPERATURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	KOLKATA	
		ASHCROFT INDIA PVT LTD.	GUJARAT	
		BUDENBERG GUAGE CO.LTD.	UK	
		FORBES MARSHALL (HYD) LTD.	HYDERABAD	
		GOA INSTRUMENTS INDUSTRIES PVT.LTD.	GOA	
		GOA THERMOSTATIC INSTRUMENTS PVT.LTD.		
		GAUGE BOURDON INDIA PVT.	MUMBAI	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		LTD.		
		H.GURU INDUSTRIES	KOLKATA	
		H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	BANGALORE	
		BAUMER TECHNOLOGIES INDIA PVT. LTD.	MUMBAI	
34.	**LEVEL GAUGE (F&B, TUBULAR, REFLEX)**	SBEM		
		CHEMTROL		
		PUNE TECHTROL		
		SIGMA		
		V AUTOMAT		
		GENERAL INSTRUMENTS		
35.	**ROTAMETER**	EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.	PUNE	
		FLOW STAR ENGINEERING PVT. LTD.,	FARIDABAD	
		FLOWTECH INSTRUMENTS SERVICRS	VADODARA	
		INSTRUMENTATION ENGINEERS PVT LTD	TELANGANA	
		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	NAVI MUMBAI	
		TANSA EQUIPMENTS PVT.LTD	MUMBAI	
36.	**LEVEL SWITCH-CONDUCTIVITY TYPE**	BLISS ANAND PVT. LTD.	GURGAON	
		FLOWTECH INSTRUMENTS SERVICRS	VADODARA	
		HI-TECH SYSTEMS & SERVICES LTD.	KOLKATA-	VENDOR SHALL SOURCE IMPORT CONTENTS OF LEVEL SWITCH (CONDUCTIVITY TYPE) FROM LEVELSTATE SYSTEMS LTD., UNITED KINGDOM.
		LEVCON INSTRUMENTS PVT. LTD.	KOLKATA	
		RAMAN INSTRUMENTS PVT.LTD.	MUMBAI	VENDOR SHALL SOURCE IMPORT CONTENTS OF LEVEL SWITCH (CONDUCTIVITY TYPE) FROM MOBREY MEASUREMENT, AN OPERATING UNIT OF MORBEY LTD., SLOUGH,

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
				BERKSHIRE, UNITED KINGDOM.
		SIGMA INSTRUMENTS CO.	MUMBAI	
		SOR INC.	USA	
		SAPCON INSTRUMENT PVT LTD.	INDORE	
		V. AUTOMAT & INTRUMENTS (P) LTD.	NEW DELHI	
37.	LEVEL SWITCH (ALL TYPES)	LEVCON		
		CHEMTROLS SAMIL (INDIA) PVT LTD.		
		SWITZER		
		WAAREE (BAUMER INSTRUMENTS)		
		V AUTOMAT		
		PUNE TECHTROL		
38.	MAGNETIC FLOW METER	ABB	-	
		WAAREE (BAUMER INSTRUMENTS)	-	
		EUREKA	-	
		EMERSON	-	
		YOKOGAWA	-	
		HACH (POTENSE)	-	
		KROHNE MARSHALL	-	
39.	FLOW ELEMENT - NOZZLE	HYDROPNEUMATICS PVT. LTD.	GOA	
		INSTRUMENTATION LTD.	PALAKKAD	
		MICRO PRECISION PRODUCTS PVT. LTD.	FARIDABAD	
		MINCO (INDIA) FLOW ELEMENTS PVT. LTD.	GOA	
		STAR-MECH CONTROLS (I) PVT.LTD.	PUNE	
		SEIKO FLOW CONTROL GMBH	AUSTRIA	
40.	FLOW ELEMENT - ORIFICE	FLOW STAR ENGINEERING PVT. LTD.,	FARIDABAD	
		HYDROPNEUMATICS PVT. LTD.	GOA	
		INSTRUMENTATION LTD.	PALAKKAD	
		INSTRUMENTATION ENGINEERS PVT LTD	HYDERABAD	
		MICRO PRECISION PRODUCTS PVT. LTD.	FARIDABAD	
		MINCO (INDIA) PRIVATE LIMITED	GOA	
		STAR-MECH CONTROLS (I)	PUNE	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		PVT.LTD.		
		CHEMTROLS INDUSTRIES PVT.LTD	THANE	
		DYNAFLUID VALVES AND FLOW CONTROLS(P) LTD.	BELGAUM	
		ELECTRONET EQUIPMENTS PVT. LTD	PUNE	
		MINCO (INDIA) FLOW ELEMENTS PVT. LTD.	MAPUSA	
		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	NAVI MUMBAI	
		TANSA EQUIPMENTS PVT.LTD	MUMBAI	
41.	FLOW TRANSMITTERS (ALL TYPES)	E & H	-	
		KHRONE MARSHALL	-	
		EMERSON	-	
		ABB	-	
		HONEYWELL	-	
		YOKOGAWA	-	
42.	LEVEL TRANSMITTERS (ALL TYPES)	EMERSON	-	
		E & H	-	
		ABB	-	
		HONEYWELL	-	
		V AUTOMAT	-	
		YOKOGAWA	-	
		SIEMENS	-	
		KROHNE MARSHALL	-	
43.	PRESSURE TRANSMITTERS (ALL TYPES)	EMERSON	USA/PAWANE	
		LAXONS AUTOMATION	DAMAN	
		YIL	BANGALORE	
		SIEMENS	THANE	
		FUJI	CHINA	
		YOKOGAWA	JAPAN	
		HONEYWELL	USA/PUNE	
44.	TEMPERATURE TRANSMITTERS	EMERSON	-	
		E & H	-	
		ABB	-	
		HONEYWELL	-	
		V AUTOMAT	-	
		YOKOGAWA	-	
		SIEMENS	-	
		FORBES MARSHALL	-	
45.	PH TRANSMITTERS	EMERSON	-	
		YOKOGAWA	-	
		HONEYWELL	-	
		ABB	-	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		HACH	-	
		FORBES MARSHALL	-	
46.	ANALYSERS (ALL TYPES)	ABB	-	
		EMERSON	-	
		YOKOGAWA	-	
		HONEYWELL	-	
		HACH POLYMETRON	-	
		SIEMENS	-	
		FORBES MARSHALL	-	
47.	PROGRAMMABLE LOGIC CONTROLLER	GE INTELLIGENT PLATFORMS PRIVATE LIMITED	BANGALORE	
		HONEYWELL AUTOMATION INDIA LIMITED ,	PUNE	
		ROCKWELL AUTOMATION INDIA LTD	SAHIBABAD	
		SIEMENS LIMITED	MUMBAI	
		SCHNEIDER ELECTRIC INDIA PVT.LTD.	NEW DELHI	
48.	UPS	HITACHI-HIREL	GANDHINAGAR	
		APC	BANGALORE	
		DELTA	GURGAON	
		EMERSON	MUMBAI	
		DB POWER	PUNE	
		APLAB	MUMBAI	
49.	INSTRUMENT FITTINGS	AURA INCORPORATED	NEW DELHI	
		ASTEC VALVES & FITTINGS PVT. LTD.,	MUMBAI	
		ARYA CRAFTS & ENGINEERING PVT. LTD.	MUMBAI	
		COMFIT & VALVE PVT. LTD.	GUJARAT	
		FLUIDFIT ENGINEERS PVT. LTD.	MUMBAI	
		FLUID CONTROLS PVT. LTD.	MUMBAI	
		HP VALVES & FITTINGS INDIA PVT. LTD.	CHENNAI	
		PRECISION ENGINEERING INDUSTRIES	MUMBAI	
		PANAM ENGINEERS,	MUMBAI	
		PERFECT INSTRUMENTATION CONTROL (INDIA) PVT. LTD.	MUMBAI	
		VIKAS INDUSTRIAL PRODUCTS	NOIDA	
50.	JUNCTION BOX	AJMERA INDUSTRIAL & ENGINEERING WORKS	MUMBAI	
		FLEXPRO ELECTRICALS PVT. LTD.	GUJARAT	METAL TYPE JUNCTION BOX ONLY

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		K.S.INSTRUMENTS PVT.LTD.	BANGALORE	
		SUCHITRA INDUSTRIES	BANGALORE	
		SHRENIK & COMPANY,	AHMEDABAD	
51.	CABLE GLAND	COMET	-	
		DOWELL	-	
		CHETNA	-	
52.	CABLE LUGS	ELECTRO BILLETS	-	
		COMET	-	
		DOWELL	-	
		CHETNA	-	
53.	MS PLATES	SAIL		
		ESSAR STEEL		
		TISCO		
		RINL		
		JINDAL		
		LLOYD		
		ISPAT		
		INDIAN IRON & STEEL CO. LTD		
54.	CS PIPE (ASTM A 106 GR. B)	INDIAN SEAMLESS METAL TUBES	AHMEDABAD	UPTO 150 NB
		MAHARASHTRA SEAMLESS	RAIGAD	UPTO 350 NB
55.	MS PIPES	SAIL	ROURKELA	
		JINDAL	GHAZIBAD/HISSAR	
		SURYA ROSHNI	BAHADUR GARH	
		TATA TUBE	JAMSHEDPUR	
		PSL	CHENNAI/VIZAG/KUTCH/DAMAN	
		LALIT PROFILE	THANE	
		SAMSHI PIPES INDUSTRIES	VADODARA	
		MUKUT PIPES	RAJPURA	
		INDUS TUBES	G B NAGAR	
		MANN IND	INDORE	
		SURENDRA ENGG	RAJPURA	
		PRATIBHA PIPES & STRUCTURE PVT LTD	THANE	
		JCO GAS PIPE	CHINDWARA	
		NUKAT TANKS AND VESSELS	TARAPUR	
		DADU PIPES	SIKRANDRABAD	
		GOOD LUCK TUBES	SIKANDRABAD	
		ADVANCE STEEL TUBES	SAHIBABAD	
		BIHAR TUBES	SIKANDRABAD	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		HI TECH PIPES	SIKANDRABAD	
		RATNAMANI	KUTCH/AHMEDABAD/CHHATRAL	
		MAHARASHTRA SEAMLESS	RAIGAD	
		WELSPUN	ANJAR/BHARUCH	
56.	SS PIPES/ TUBES	APEX TUBES	BEHROR (ALWAR)	
		RATNAMANI	CHATTRAL	
		REMI	TARAPUR	
		PRAKASH STEELAGE	-	
57.	POWER/CONTROL/INSTRUMENT CABLE	CORDS CABLE	BHIWADI	
		RADIANT CABLES	HYDERABAD	
		POLYCAB	DAMAN	
		KEI	BHIWADI	
		NICCO	KOLKATA	
		RAVIN CABLES	PUNE	
		INCAB	PUNE	
		HVPL	FARIDABAD	
		TORRENT CABLE	NADIAD	
		HAVELLS	ALWAR	
		PARAMOUNT	KHUSHKHERA	
		SRI RAM CABLES	BHIWADI	
		THERMOCABLES	HYDERABAD	
		TORRENT CABLE	NADIAD	
		UNIVERSAL CABLES	SATNA	
		GEMSCAB	BHIWADI	
		DELTON	FARIDABAD	
58.	SAFETY SHOWER	UNICARE	-	
		MOHAN INDUSTRIES	-	
		SUPER SAFETY SERVICES	-	
59.	FRP TANKS & FITTINGS	GLOBAL COMPOSITE	-	
		EPP	-	
		DEEPA COMPOSITE	-	
		COROSEAL INDUSTRIES	-	
		CHEMICAL PROCESS & EQUIPMENT PVT LTD	-	
		J.R FIBRE INDUSTRIES PVT LTD	-	
		POLYPLAST	-	
60.	EJECTOR	ESSEM TECHNOLOGIES	-	
		RATNA PRASAD	-	
61.	LOCAL CONTROL	INDUSTRIAL SWITCHGEAR & CONTROL	-	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
	PANEL	POSITRONICS	-	
		DELTA CONTROL	-	
		L & T	-	
		GE POWER	-	
		PYROTECH	-	
		C& S	-	
62.	**TANK (FRP)**	INDUSTRIAL SERVICE	KOLKATA	
		SUNRISE	BARODA	
		GANDHI & ASSOCIATES	AHMEDABAD	
		MODERN EQUIPMENTS	CHENNAI	
		EAGLE PLAST	PUNE	
		OMEGA PLAST	MUMBAI	
63.	**STROKE CONTROLLER**	V K PUMPS	NASIK	
		METACHEM	MUMBAI	
		SWELORE	AHMEDABAD	
		MILTON ROY INDIA	CHENNAI	
64.	**SAFETY VALVES/RELIEF VALVES**	METACHEM	MUMBAI	
		KEYSTONE	BARODA	
		V K PUMPS	NASIK	
		MILTON ROY	CHENNAI	
65.	**DUPLEX STRAINER**	JAYPEE INDUSTRIES PVT. LTD.	NEW DELHI	
		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI	
		OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI	
		SUNGOV ENGINEERING PVT. LTD.	CHENNAI	
66.	**ORIFICE PLATE**	MICRO PRECISION	FARIDABAD	
		INSTRUMENTAION LTD	PALGHAT	
		CARLO DYNAMICS	HYDERABAD	
67.	**STEEL GATE/GLOBE/NR VALVES**	A.V. VALVES LTD	AGRA	
		ATAM VALVES PVT. LTD.	JALANDHAR	(1) CARBON STEEL GATE VALVES & NON RETURN VALVES: 15 NB TO 50 NB (#800) & 65 NB TO 300 NB (#150) (2) CARBON STEEL GLOBE VALVES: 15 NB TO 50 NB (#800) & 65 NB TO 200 NB (#150)
		FLUIDLINE VALVES COMPANY PVT.LTD.	KAUSHAMBI	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		M/S GM ENGINEERING	RAJKOT	
		INTERVALVE (INDIA) LTD.	PUNE	A) STEEL GATE VALVES: UPTO 50NB, #800 AND 65NB TO 150NB, #150 B) STEEL GLOBE VALVES: UPTO 50NB, #800 AND 65NB TO 100NB, #150 C)SUPPLIER NOT REGISTERED FOR NR VALVES
		LEADER VALVES LTD.	JALANDHAR	
		NITON VALVE INDUSTRIES PVT LTD	MUMBAI	
		NSSL LIMITED.	NAGPUR	
		STEEL STRONG VALVES (I) PVT.LTD.	NAVI MUMBAI	LIMITED TO RANGES & CLASSES AS AVAILABE IN VD FILE.
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	CC/CSS-GATE-BBT-UPTO600NB CL UPTO300,GATE-PSBT UPTO250NB CL 1500,GLV-BBT-UPTO300NB CL UPTO600,SCNRV-BBT-UPTO600NB CL UPTO150,SCNRV-BBT-UPTO300NB CL 300,SCNRV-PSBT-UPTO150NB CL UPTO900
		VALTECH INDUSTRIES	MUMBAI	CAST CARBON & ALLOY STEEL - VALVE/RATING/SIZE- GV/150/900,GV/300/400, GV/600/300 , GV/GLV/NRV/900/250 , GLV/300/300,GLV/150/350/ , SCNRV/150/700,

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
				SCNRV/300/350, SCNRV/600/250.
		V.K. VALVES PVT. LTD.,	JALANDHAR	
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI	
68.	SLUICE GATE	H SARKAR	KOLKATA	
		JASH ENGINEERING	-	
		YASHWANT INDUSTRIES	-	
69.	3 WAY VALVE	HI TECH	AHMEDABAD	
		ADVANCE VALVES PVT.LTD	NOIDA	
		BDK	HUBLI	
		FOURESS ENGG.INDIA LTD.	MUMBAI	
		FLUIDLINEVALVES COMPANY PRIVATE LTD.,	MUMBAI	
		INSTRUMENTATION LTD.	PALAKAD	
		KIRLOSKAR BROTHERS LTD.	PUNE	
		VENUS PUMP & ENGG. WORKS	KOLKATA	
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI	
		STAFFORD CONTROLS LIMITED	PUNE	
		MICON VALVES (INDIA) PVT.LTD	MUMBAI	
70.	PLUG VALVE(MANUAL)	BDK	HUBLI	
		HAWA ENGINEERS / MARCK & CARE	-	
		MICON VALVES	-	
		MICON VALVES (INDIA) PVT.LTD	MUMBAI	
71.	FITTINGS (CS/SS)	M.S. FITTINGS	KOLKATA	
		METAL LLOYDS	MUMBAI	
		TRUE FORGE	FARIDABAD	
		TUBE PRODUCTS	BARODA	
		NL HAZRA	KOLKATA	
		GUJRAT INFRA PIPES	BARODA	
		EDWARDS	USA	
		PIPEFIT ENGINEERS	BARODA	
		SIDDARTH & GAUTAM	FARIDABAD	
		EBY	MUMBAI	
72.	FLANGES (SS/CS)	PRADEEP METALS LTD	MUMBAI	
		TUBE PRODUCT INCOROPORATION	BARODA	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		MS FITTINGS	KOLKATA	
		HAWA ENGINEERING	-	
		ALIANCE PIPE & PLANGES	KOLKATA	
		JAI AMBE	MUMBAI	
73.	PIPE & FILLTING (PP,HDPE,PVC & CPVC)	GEROGE FISHCHER	DELHI	
		ASTROL PLYTECHINC LTD	AHMEDABAD	
		JAIN IRRIGATION	-	
		ORIPLAST	-	
74.	VALVES (GATE/GLOBE/NRV/BALL)- (PP,HDPE,PVC & CPVC)	GEROGE FISHCHER IPING SYSTEMS PVT LTD	DELHI	
		ASTROL PLYTECHINC LTD	AHMEDABAD	
		JAIN IRRIGATION	-	
		ORIPLAST	-	
75.	AIR FILTER REGULATOR	SHAVO NORGEN	-	
		PLACKA INSTRUMENTS	-	
76.	FILTER MEDIA	GLOBAL ABSORBENT	KOLKATA	
		BHARAT MINERALS		
77.	DC LEAD ACID / NI-CD BATTERIES	AMCO SAFT INDIA LTD	BANGALORE	NI-CD BATTERIES ONLY
		EXIDE INDUSTRIES LTD	NEW DELHI	LEAD ACID BATTERIES ONLY.
		HBL POWER SYSTEMS LTD	HYDERABAD	NI/CD AND TUBULAR TYPE FOR LEAD ACID
		HOPPECKE BATTERIEN GMBH & CO.KG,	GERMANY	
78.	DC LEAD ACID BATTERIES	EXIDE INDUSTRIES LTD	NEW DELHI	
		HBL POWER SYSTEMS LTD	HYDERABAD	TUBULAR TYPE
		HOPPECKE BATTERIEN GMBH & CO.KG,	GERMANY	
79.	DC NI CD BATTERIES	AMCO SAFT INDIA LTD	BANGALORE	
		HBL POWER SYSTEMS LTD	HYDERABAD	
		HOPPECKE BATTERIEN GMBH & CO.KG,	GERMANY	
80.	SIGHT FLOW INDICATORS	B.K.EQUIPMENTS PVT.LTD.	CHENNAI	
		BLISS ANAND PVT. LTD.	GURGAON	
		FLOWTECH INSTRUMENTS SERVICRS	VADODARA	
		INSTRUMENTATION ENGINEERS PVT LTD	TELANGANA	
		SIGMA INSTRUMENTS CO.	MUMBAI	
		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	NAVI MUMBAI	

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		TELACE EQUIPMENT PVT.LTD.	CHENNAI	
81.	PAINT	ASIAN PAINTS (I) LTD.		
		BERGER PAINTS INDIA LTD		
		GOODLASS NEROLAC		
		JENSON & NICHOLSON (I) LTD		
		CDC CARBOLINE (I) LTD.		
		SHALIMAR PAINTS LTD.		
		ADDISON PAINTS LTD		
		GRAND POLYCOAT		
		BOMBAY PAINTS		
		HEMPLE PAINTS (SINGAPORE)		
		JOTUN PAINTS		
82.	PNEUMATIC ACTUATOR	PROCON ENGINEERS	-	
		TYCO	-	
		CRANE PROCESS	-	
		BDK	-	
		INTERVALVE	-	
		BRAY CONTROL	-	
83.	MOTORISED ACTUATOR	ROTARK	-	
		AUMA	-	
		LIMITORK	-	
84.	UF MEMBRANE	DOW	-	
		HYFLUX	-	
		GE	-	
		MEMBRANE HITECH	-	
85.	RO MEMBRANE	DOW CHEMICALS – FILMYECH	USA	
		HYDRANAUTICS	USA	
		KOCH MEMBRANE- FLUID SYSTEM	USA	
		TOREY	JAPAN	
86.	RO PRESSURE TUBES (FRP)	PENTAIR WATER	GOA	
87.	MBR MEMBRANE	KOCH		
		GE		
		TOREY		

NOTE:

1. The sub vendor list above is indicative only and is subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.

   Bidder to propose sub vendor list with following back up documents within 4 weeks of placement of LOI. Thereafter no request for additional sub-vendor shall be entertained. The sub vendor list shall

subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.

a) Documentation to show that the equipment /system has been supplied for a plant of similar or higher capacity.

b) End user performance certificate that the equipment/system has been operating satisfactorily for minimum two years as on the scheduled date of bid opening.
Bidder to assess the capability of their proposed sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them.

2. The inspection category will be intimated after award of contract by BHEL/customer. However, the same will be adhered by the bidder without any commercial and delivery implication to BHEL/ customer.

The list of approved make of the LT Motors are as mentioned below:

S. NO.	LIST OF MOTORS	
1	NON FLAME PROOF	ABB
2		BHARAT BIJLEE LTD.
3		CROMPTON GREAVES
4		GE-POWER
5		KIRLOSKAR ELECTRIC CO LTD.
6		LAXMI HYDRAULICS PVT. LTD
7		MARATHON
8		NGEF
9		RAJINDRA ELECT INDUSTRIES
10		SIEMENS
11	FLAME PROOF	RAJINDRA ELECT INDUSTRIES

However, the final list of makes for the LT Motors is subjected to BHEL/Customer approval, during contract stage, without any commercial implications.

SUB VENDOR LIST

PACKAGE WISE REGISTERED SUPPLIER LIST (PERMANENT CATEGORY) AS ON 7/12/2022 12:06:36 PM

Sl No	Package Name	PEM Supplier Code	Supplier Name	Reg Status	Supplier Communication Address	Supplier Works Address	Department	Tech Limit	Fin Limit	DT Regular	MSE status	Validity of MSE Certificate	Remarks
1	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	A010	A.N. INSTRUMENTS PVT. LTD.	REGULAR	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA Phone- 24757784,22472509 Pincode : 700020 Email : anidel@bol.net.in	Works-1->Mr. Gautam Mukherjee Kusumba,Sonarpur Station Road,P.O. -Narendrapur, -Kolkata-WEST BENGAL INDIA Phone- 9836878855 FAX : 033-24342748 Pincode : 700103 Email :	C&I				Micro	30-Sep-15	, , ,
2	TEMPERATURE GAUGE	A010	A.N. INSTRUMENTS PVT. LTD.	REGULAR	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA Phone- 24757784,22472509 Pincode : 700020 Email : anidel@bol.net.in	Works-1->Mr. Gautam Mukherjee Kusumba,Sonarpur Station Road,P.O. -Narendrapur, -Kolkata-WEST BENGAL INDIA Phone- 9836878855 FAX : 033-24342748 Pincode : 700103 Email :	C&I				Micro	30-Sep-15	, , ,
3	TRANSMITTERS	B049	ABB INDIA LIMITED	REGULAR	MR. RAJIV GOVIL 14, MATHURA ROAD, FARIDABAD Phone- 09971085678 Pincode : 121003 Email : vipin.swami@in.abb.com		C&I	PRESSURE TRANSMITTER, DP TRANSMITTER and TEMP TRANSMITTER					(1) A GROUP COMPANY OF ABB, NOW. (2) NAME OF VENDOR CHANGED FROM BIRLA-KENT TAYLOR LIMITED TO ABB LIMITED W.E.F. 27.06.2011 , Technical limit reviewed and changed on 05.06.2014; Technical limit further reviewed on 12.10.2015; , Name changed from ABB Limited to ABB India Limited on 23.08.2018 as per 16th MISCC-Electrical and C& ,
4	ELECTROMAGNETIC FLOW METER	A216	Adept Fluidyne Pvt. Ltd.	REGULAR	Vinayak Gadre Plot No 4,S.No.17/1-B Kothrud Industrial Estate Pune Phone- 020 25464551 Pincode : 411038 Email : info@adeptfluidyne.com	Works-1-> Plot No 4,S.No.17/1-B Kothrud Industrial Estate -Pune-MAHARASHTRA india Phone- 020 25464551 FAX : Pincode : 411038 Email :	C&I			12-Sep-16	Small	31-Mar-22	, , ,
5	ULTRASONIC FLOW METERS	A216	Adept Fluidyne Pvt. Ltd.	REGULAR	Vinayak Gadre Plot No 4,S.No.17/1-B Kothrud Industrial Estate Pune Phone- 020 25464551 Pincode : 411038 Email : info@adeptfluidyne.com	Works-1-> Plot No 4,S.No.17/1-B Kothrud Industrial Estate -Pune-MAHARASHTRA india Phone- 020 25464551 FAX : Pincode : 411038 Email :	C&I			07-Nov-17	Small	31-Mar-22	, , ,
6	JUNCTION BOX	A101	AJMERA INDUSTRIAL & ENGINEERING WORKS	REGULAR	JIGNESH MAHENDRA AJMERA DENA BANK BLDG.,SHREE NAGESH INDL. ESTATE,STATION ROAD, MUMBAI Phone- 022 67973578 Pincode : 400 088 Email : ajmera@ajmera.net, jmajmera@yahoo.com	Works-1->JIGNESH MAHENDRA AJMERA DENA BANK BLDG., SHREE NAGESHINDL. ESTATE,STATION ROAD, -MUMBAI-MAHARASHTRA INDIA Phone- 022 67973578 FAX : Pincode : 400 088 Email : ajmera@ajmera.net	C&I			26-Nov-10			Reviewed in MISCC dt. 21.07.2015 for non-response in 4 consecutive tender enquiry; , APPROVED FOR GALVANIZED AND FRP JUNCTION BOXES; Technical limit reviewed on 30.04.2014 , ,
7	INSTRUMENT FITTINGS	A121	Arya Crafts & Engineering Pvt. Ltd.	REGULAR	Mr.Sanjay Brahman/Mr.Shyam Vazirani 102, Vora Industrial Estate No.4 Navghar, Vasai Road (E) Dist.Thane, Mumbai Phone- +91-250-2392246 Pincode : 401210 Email :		C&I			16-Jun-12	Small	29-Jun-18	, , ,
8	INSTRUMENT FITTINGS	A079	AURA INCORPORATED	REGULAR	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com		C&I			27-Jan-09			, , ,
9	INSTRUMENTS PIPE FITTINGS	A079	AURA INCORPORATED	REGULAR	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com		C&I			27-Jan-09			, , ,
10	INSTRUMENTS TUBE FITTINGS	A079	AURA INCORPORATED	REGULAR	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com		C&I			27-Jan-09			, , ,
11	SIGHT FLOW INDICATORS	B068	B.K.EQUIPMENTS PVT.LTD.	REGULAR	T. BALAKRISHNAN/S.VENKATESH 217 , ARCOT ROAD PORUR , CHENNAI Phone- 9444057761 Pincode : 600116 Email : bkequip@gmail.com	Works-1->V.KARUNANIDHI/P.BABU 217 , ARCOT ROAD,PORUR , -CHENNAI-TAMIL NADU INDIA Phone- 9444131187 FAX : 044-24766852 Pincode : 600116 Email :	C&I			30-Jul-10			, , ,
12	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	B085	Barksdale GmbH, Germany	REGULAR	Michael Weileder Dorn Assenheimer, Strasse 27 Reichelsheim Phone- +91-9999107840 Pincode : D-61203 Email : msingh@barksdale.de		C&I			01-Sep-10			, , ,
13	LEVEL SWITCH-CAPACITANCE TYPE	W017	Baumer Technologies India Pvt. Ltd.	REGULAR	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 À GIDC À Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com	C&I						, NAME HAS BEEN CHANGED FROM M/S WAAREE INSTRUMENTS LTD. TO M/S BAUMER TECHNOLOGIES INDIA PVT. LTD. W.E.F. 13.06.2012 , ,
14	LEVEL SWITCH-FLOAT TYPE	W017	Baumer Technologies India Pvt. Ltd.	REGULAR	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 À GIDC À Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com	C&I						, NAME HAS BEEN CHANGED FROM M/S WAAREE INSTRUMENTS LTD. TO M/S BAUMER TECHNOLOGIES INDIA PVT. LTD. W.E.F. 13.06.2012 , ,

15	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	W017	Baumer Technologies India Pvt. Ltd.	REGULAR	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 À GIDC À Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com	C&I						, NAME HAS BEEN CHANGED FROM M/S WAAREE INSTRUMENTS LTD. TO M/S BAUMER TECHNOLOGIES INDIA PVT. LTD. W.E.F. 13.06.2012 , ,
16	TEMP. ELEMENT	W017	Baumer Technologies India Pvt. Ltd.	REGULAR	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 À GIDC À Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com	C&I						, NAME HAS BEEN CHANGED FROM M/S WAAREE INSTRUMENTS LTD. TO M/S BAUMER TECHNOLOGIES INDIA PVT. LTD. W.E.F. 13.06.2012 , ,
17	TEMPERATURE GAUGE	W017	Baumer Technologies India Pvt. Ltd.	REGULAR	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com	Works-1->Mr. Shyam Warilani/Mr. V Suresh Babu Plot No 34 À GIDC À Phase 1, -VAPI-GUJARAT INDIA Phone- +91 11 4161 7111 FAX : 022 2687 3613 Pincode : 396 195 Email : pbajaj@baumer.com	C&I						, NAME HAS BEEN CHANGED FROM M/S WAAREE INSTRUMENTS LTD. TO M/S BAUMER TECHNOLOGIES INDIA PVT. LTD. W.E.F. 13.06.2012 , ,
18	LEVEL GAUGE	B077	BLISS ANAND PVT. LTD.	REGULAR	Mr. Vikas Anand/ Mr.RGRajan 92B & 93 B , IMT MANESAR Gurgaon Phone- 0124-4366000 TO 9 Pincode : 122001 Email : sales@blissanand.com	Works-1->Mr. Bharat Kumar/ Mr. Sasi Kumar Plot No. 92B & 93B,Sec-V, IMTManesar -GURGAON-HARYANA INDIA Phone- 0124-4366000 TO 9 FAX : 0124-2290884 Pincode : 122002 Email : bharat@blissanand.com	C&I				Small	31-Mar-22	, , ,
19	LEVEL SWITCH-CONDUTIVITY TYPE	B077	BLISS ANAND PVT. LTD.	REGULAR	Mr. Vikas Anand/ Mr.RGRajan 92B & 93 B , IMT MANESAR Gurgaon Phone- 0124-4366000 TO 9 Pincode : 122001 Email : sales@blissanand.com	Works-1->Mr. Bharat Kumar/ Mr. Sasi Kumar Plot No. 92B & 93B,Sec-V, IMTManesar -GURGAON-HARYANA INDIA Phone- 0124-4366000 TO 9 FAX : 0124-2290884 Pincode : 122002 Email : bharat@blissanand.com	C&I				Small	31-Mar-22	, , ,
20	SIGHT FLOW INDICATORS	B077	BLISS ANAND PVT. LTD.	REGULAR	Mr. Vikas Anand/ Mr.RGRajan 92B & 93 B , IMT MANESAR Gurgaon Phone- 0124-4366000 TO 9 Pincode : 122001 Email : sales@blissanand.com	Works-1->Mr. Bharat Kumar/ Mr. Sasi Kumar Plot No. 240, Sector-3, HSIIDC, Bawal -Rewari-HARYANA INDIA Phone- 0124-4366000 TO 9 FAX : 0124-2290884 Pincode : 123501 Email : bharat@blissanand.com	C&I				Small	31-Mar-22	Reassessed on 07.04.2016; , , ,
21	CONTROL VALVE	B207	BOMAFA SPECIAL VALVE SOLUTIONS PVT LTD	REGULAR	Mr. K.M. Anklesaria/ R. M. Anklesaria Plot No: 285/2, Panchratna Estate, Near Ramol Bridge, Vatva Ahmedabad Phone- 079-40083825 Pincode : 382445 Email : info@bomafa-india.com	Works-1->Mr. K.M. Anklesaria/ Mr. R.M. Anklesaria Dir Plot No: 285/2, Panchratna Estate, Near Ramol Bridge, Vatva, -Ahmedabad-GUJARAT INDIA Phone- 079-40083825 FAX : Pincode : 382445 Email : info@bomafa-india.com	C&I			17-Dec-16	Small	31-Mar-22	, , ,
22	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	B083	BOSE PANDA INSTRUMENTS PVT.LTD.	REGULAR	Mr. Partha Bose 44, Saheed Hemanta Kumar Bose, Sarani, Kolkata Phone- +91 33 2548 7220 Pincode : 700074 Email : parthabosebpi@gmail.com; bosepanda@vsnl.net	Works-1->Mr. Partha Bose 44, Saheed Hemanta Kumar Bose,Sarani, -Kolkata-WEST BENGAL India Phone- +91 33 2548 7220 FAX : +91 33 2548 0429, Pincode : 700074 Email : parthabosebpi@gmail.com bosepanda@vsnl.net	C&I			20-Aug-14	Micro	31-Mar-23	Trial to Hold as per SEARP amd-3,w.e.f. 15-09-12 , Supplier registered in trial category on 30.10.2010 and was thereafter put in susp-hold category as per SEARP Amd-03 on 15.09.2012. Further, on evaluation put in permanent category on 20.08.2014; , ,
23	FLOW ELEMENT - ORIFICE	C203	CHEMTROLS INDUSTRIES PVT. LTD.	REGULAR	Mr. K. NANDAKUMAR AMAR HILL, SAKI VIHAR ROAD, POWAI, MUMBAI Phone- 022-67151261 Pincode : 400072 Email : manikandan@chemtrols.com	Works-2->+Works -II :M/s Chemtrols Samil (I) Pvt. Ltd.,Plot No.F-43,44 Others Additional Ambernath Industrial ,M.I.D.C., Ambernath -Thane-MAHARASHTRA INDIA Phone- 22-67151261,9821014902 FAX : 91-22-28571913 Pincode : 421503 Email : manikandan@chemtrols.com	C&I			08-Aug-17	Small	19-Jun-18	, , ,
24	CONTROL VALVE	C228	CIRCOR FLOW TECHNOLOGIES INDIA PVT. LTD.	REGULAR	Mr. Vinodh Gopinath, Senior Director SF No. 337/2, No.15 Naranapuram Village,Ponnandampalayam Coimbatore Phone- 9500928448 Pincode : 641659 Email : santhosh.ponnusamy@circor.com	Works-1->Mr. Santhosh Ponnusamy Others SF No. 337/2, No.15, Naranapuram Village,Ponnandampalayam -Coimbatore-TAMILNADU INDIA Phone- 9500928448 FAX : 04212321600 Pincode : Coimbatore Email :	C&I			23-Aug-20			Registered on 23.08.2020 as per 15th MISCC , , ,
25	INSTRUMENT FITTINGS	C067	Comfit & Valve Pvt. Ltd.	REGULAR	Mr. Jeetu Jain/Mr. Vinay Sosa Survey No. 23/1, Part 2, Ahmedabad-Mehsana Highway Laxmipura, Nandasan Phone- 02764-267036/37 Pincode : 382705 Email : marketing@com-fit.com	Works-1->Miss Sonal Pithadia/Miss Pavan Chavda Survey No. 23/1, Part 2, Ahmedabad-Mehsana Highway, Laxmipura -Nandasan-GUJARAT INDIA Phone- 8460848087 FAX : 2764-267036/37 Pincode : 382705 Email : domestic@com-fit.com	C&I			29-Feb-12			, , ,
26	Cold Junction Compensation Box (CJCB)	C048	CREATIVE INSTRUMENTS & CONTROLS	REGULAR	NO-17/1 , 1ST FLOOR , 11TH CROSS 1ST K BLOCK , RAJAJINAGAR, BANGALORE-560010 Phone- Pincode : Email : crinstruments@gmail.com		C&I						, , ,
27	LEVEL SWITCH-FLOAT TYPE	D046	D.K. INSTRUMENTS PVT.LTD.	REGULAR	N.SIKDAR/ SUMIT SIKDAR 76/2,SELIMPUR RD DHAKURIA Kolkata Phone- 033-2415-1310. Pincode : 700031 Email : dkinst@vsnl.net		C&I			30-Jul-10			, , ,

28	TEMP. ELEMENT	I022	DETRIVE INSTRUMENTATION & ELECTRONICS LTD.	REGULAR	320, TV INDUSTIAL ESTATE, OFF.DR.A.BESANT ROAD, BEHIND GLAXO, WORLI, MUMBAI Phone- 24934125,24938403 Pincode : 400025 Email : trivtech@vsnl.com	Works-1->Mr. A.D.Solomon J-14, MIDC, TARAPORE, BOISER STN., -THANE-MAHARASHTRA India Phone- FAX : Pincode : Email : trivtech@vsnl.com	C&I						, , ,
29	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	D021	DRESSER INDUSTRIES INC.	REGULAR	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 02764-233682 Pincode : 382729 Email : Nishit.patel@ashcroftindia.com		C&I						, , ,
30	TEMPERATURE SWITCH	D021	DRESSER INDUSTRIES INC.	REGULAR	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 02764-233682 Pincode : 382729 Email : Nishit.patel@ashcroftindia.com		C&I						, , ,
31	ANUBAR (DELTA TUBE)	D212	DYNAFLUID VALVES AND FLOW CONTROLS (P) LTD.	REGULAR	Mr. Yogish M. Kulkarni Plot # 23, Udyambag, Belgaum Phone- 0831-4210386 Pincode : 590008 Email : yogish@dyna-fluid.com	Works-1->Mr. Yogish M. Kulkarni Dir Plot # 23, Udyambag, -Belgaum-KARNATAKA INDIA Phone- 0831-4210386 FAX : 0831-4210386 Pincode : 590008 Email : yogish@dyna-fluid.com	C&I			05-Aug-16	Micro	31-Mar-23	, , ,
32	FLOW ELEMENT - NOZZLE	D212	DYNAFLUID VALVES AND FLOW CONTROLS (P) LTD.	REGULAR	Mr. Yogish M. Kulkarni Plot # 23, Udyambag, Belgaum Phone- 0831-4210386 Pincode : 590008 Email : yogish@dyna-fluid.com	Works-1->Mr. Yogish M. Kulkarni Dir Plot # 23, Udyambag, -Belgaum-KARNATAKA INDIA Phone- 0831-4210386 FAX : 0831-4210386 Pincode : 590008 Email : yogish@dyna-fluid.com	C&I			05-Aug-16	Micro	31-Mar-23	, Technical limit reviewed on 30.10.2017. , ,
33	FLOW ELEMENT - ORIFICE	D212	DYNAFLUID VALVES AND FLOW CONTROLS (P) LTD.	REGULAR	Mr. Yogish M. Kulkarni Plot # 23, Udyambag, Belgaum Phone- 0831-4210386 Pincode : 590008 Email : yogish@dyna-fluid.com	Works-1->Mr. Yogish M. Kulkarni Dir Plot # 23, Udyambag, -Belgaum-KARNATAKA INDIA Phone- 0831-4210386 FAX : 0831-4210386 Pincode : 590008 Email : yogish@dyna-fluid.com	C&I			05-Aug-16	Micro	31-Mar-23	, , ,
34	ELECTROMAGNETIC FLOW METER	E211	Electronet Equipments Pvt Ltd.	REGULAR	Mr. Rajendra Nagaonkar/MD, Plot No. 84, 85 & 86, Tiny Industrial Estate Kondhwa Budruk, Pune Phone- 9822015256 Pincode : 411048 Email : ho@eeplindia.com	Works-1-> Others Plot No. 84, 85 & 86, Tiny Industrial Estate, Kondhwa Budruk -Pune-MAHARASHTRA INDIA Phone- 20-26932039 FAX : 20-26934122 Pincode : 411048 Email : ho@eeplindia.com	C&I			12-Sep-16	Small	31-Mar-22	, , ,
35	FLOW ELEMENT - ORIFICE	E211	Electronet Equipments Pvt Ltd.	REGULAR	Mr. Rajendra Nagaonkar/MD, Plot No. 84, 85 & 86, Tiny Industrial Estate Kondhwa Budruk, Pune Phone- 9822015256 Pincode : 411048 Email : ho@eeplindia.com	Works-1-> Others Plot No. 84, 85 & 86, Tiny Industrial Estate, Kondhwa Budruk -Pune-MAHARASHTRA INDIA Phone- 20-26932039 FAX : 20-26934122 Pincode : 411048 Email : ho@eeplindia.com	C&I			13-Jun-19	Small	31-Mar-22	, , ,
36	ULTRASONIC FLOW METERS	E211	Electronet Equipments Pvt Ltd.	REGULAR	Mr. Rajendra Nagaonkar/MD, Plot No. 84, 85 & 86, Tiny Industrial Estate Kondhwa Budruk, Pune Phone- 9822015256 Pincode : 411048 Email : ho@eeplindia.com	Works-1-> Others Plot No. 84, 85 & 86, Tiny Industrial Estate, Kondhwa Budruk -Pune-MAHARASHTRA INDIA Phone- 20-26932039 FAX : 20-26934122 Pincode : 411048 Email : ho@eeplindia.com	C&I			07-Nov-17	Small	31-Mar-22	, , ,
37	TRANSMITTERS	R002	EMERSON PROCESS MANAGEMENT (INDIA) PVT.LTD.	REGULAR	Mr. Amit Paithankar/Vikram Raj Singh 206-210,BALARAMA BUILDING 2ND FLR. BANDRA EAST MUMBAI Phone- 9619121500 Pincode : 400051 Email : vikramraj.singh@emerson.com	Works-1->Kalpesh Chandan/Hrishikesh Aghor Plot No. A 145/4 TTC IND AREA,MIDC, PAWANE, -NAVI MUMBAI-MAHARASHTRA INDIA Phone- 9619688001 FAX : 022-66736000 Pincode : 400 705 Email : Kalpesh.chandan@emerson.com	C&I						, , ,
38	CONTROL VALVE	F015	EMERSON PROCESS MANAGEMENT CHENNAI LIMITED	REGULAR	147, KARAPAKKAM VILLAGE, CHENNAI Phone- 23722184, 23716242 Pincode : 600096 Email : jatinder.singh@emerson.com	Works-1->Mr. Rangarajan (Head - Lean and Manufact 147,Karapakkam Village, -Chennai-TAMIL NADU India Phone- 0444903 4395 FAX : Pincode : 600097 Email : Rangarajan.M@emerson.com	C&I						Vendor's name changed from "Fisher Sanmar Limited" to "Emersion Process Management Chennai Limited" w.e.f. 22.09.2011 , , ,
39	TRANSMITTERS	E057	Endress + Hauser (India) Pvt. Ltd.,	REGULAR	Mr. Prakash Vaghela 215-216, DLF Tower 'A', Jasola District Centre, New Delhi, Phone- 9717593001, Pincode : 110025, Email : prakash.vaghela@in.endress.com,	Works-1-> M-171 to 173, MIDC, Waluj, -Aurangabad-MAHARASHTRA India Phone- 9881000474, FAX : 0240-2555179, Pincode : 431136, Email : Narendra.Kulkarni@wetzer.endress.com	C&I	"Except Displacement Type Level Transmitters"		24-Oct-13			, Technical Limit reviewed and changed from "For temperature transmitter only" to "Except Displacement Type Level Transmitters" w.e.f. from 21.03.2018 , ,
40	ELECTROMAGNETIC FLOW METER	E047	EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.	REGULAR	Mr V. K. Pandit/Mr Ashish Shaha 17-20, Royal chambers, Paud Road Pune Phone- 9370469466 Pincode : 411038 Email : sales@eurekaflow.com	Works-1->Mr Ashish Shaha, J-501, M.I.D.C. Pimpri, -PUNE-MAHARASHTRA INDIA Phone- 9370469464 FAX : Pincode : 411018 Email : northsales@eurekaflow.com	C&I			23-Apr-22	Small	31-Mar-23	Temporary code allotted on 17.07.2021 for 2X660 MW BIFPCL MAITREE KHULNA STPP , Supplier registered as per 2nd MISCC FY 2022-23 dated 23.04.2022 , ,
41	FLOW ELEMENT - ORIFICE	E047	EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.	REGULAR	Mr V. K. Pandit/Mr Ashish Shaha 17-20, Royal chambers, Paud Road Pune Phone- 9370469466 Pincode : 411038 Email : sales@eurekaflow.com	Works-1->Mr Ashish Shaha, J-501, M.I.D.C. Pimpri, -PUNE-MAHARASHTRA INDIA Phone- 9370469464 FAX : Pincode : 411018 Email : northsales@eurekaflow.com	C&I			23-Apr-22	Small	31-Mar-23	, Supplier registered as per 2nd MISCC FY 2022-23 dated 23.04.2022 , ,
42	ROTAMETER	E047	EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.	REGULAR	Mr V. K. Pandit/Mr Ashish Shaha 17-20, Royal chambers, Paud Road Pune Phone- 9370469466 Pincode : 411038 Email : sales@eurekaflow.com	Works-1->Mr S. M. Alawani/Mr V. V. Deshpande J-501, M.I.D.C. Pimpri, -PUNE-MAHARASHTRA INDIA Phone- 9325751732 FAX : 020-30681731 Pincode : 411018 Email : works@eurekaflow.com	C&I			30-Jul-10	Small	31-Mar-23	, , ,

43	ULTRASONIC FLOW METERS	F206	FLASH FORGE PVT LTD	REGULAR	Mr. Gautam Makker, 503, 'A'-wing, Delphi, Orchard Avenue Road, Powai Mumbai Phone- 022-42784300 Pincode : 400076 Email : hemendrapatil@f-f.co.in	Works-1-> Others M/s Endress & Hauser, Aurangabad, Maharastra - Aurangabad-MAHARASHTRA INDIA Phone- FAX : Pincode : Email : Works-2->+ Others M/s Endress & Hauser, Bhiwandi,Thane -Thane-MAHARASHTRA INDIA Phone- FAX : Pincode : Email :	C&I			04-Nov-16			Exclusive partner for bidding of BHEL tender for M/s Endress & Hauser make Ultrasonic Flowmeters and MOU agreement valid upto 30.06.2018 , Manufacturing works at M/s Endress & Hauser, Aurangabad, Maharashtra and M/s Endress & Hauser, Bhiwandi, Thane, Maharashtra , ,
44	ULTRASONIC FLOW METERS	F211	FLEXIM Flexible Industriemesstechnik GmbH	REGULAR	Boxberger Str., 4, Berlin Berlin Phone- 0049 30 93 66 76 60 Pincode : 12681 Email : info@flexim.de	Works-1-> Others Boxberger Str. 4, -Berlin- GERMANY Phone- 0049 30 93 66 76 60 FAX : Pincode : 12681 Email : info@flexim.de	C&I			14-Nov-17			, , ,
45	JUNCTION BOX	F201	FLEXPRO ELECTRICALS PVT. LTD.	REGULAR	Mr. Dineshbhai Zaveri C-1/ 27&37, GIDC, Kabilpore, Navsari Phone- 02637-265140,265003 Pincode : 396424 Email : flexpro@flexproltd.com	Works-1->Mr. Dineshbhai Zaveri CEO C-1/ 27&37, GIDC, Kabilpore, -Navsari-GUJARAT INDIA Phone- 02637-265140,265003 FAX : 02637-265308 Pincode : 396424 Email : flexpro@flexproltd.com	C&I	Metal type junction box only		02-Feb-15			Technical limit reviewed on 12.10.2015; , , ,
46	INSTRUMENT FITTINGS	H024	Fluid Controls Pvt. Ltd.	REGULAR	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com	Works-1->Mr. Tansen Choudhari/Mr. Mahesh Darekar Shed No.8, Lonavla Indl.Co-op.Estate Ltd,Nagargaon, -Lonavla-MAHARASHTRA INDIA Phone- 9823951347 FAX : (02114) 271132 Pincode : 410 401 Email : factory@hyd-air.com	C&I			14-Feb-12			Name changed from M/s Hyd-Air Valves Pvt. Ltd. to M/s Fluid Controls Pvt. Ltd. as per 25th MISCC-Electrical and C&I dtd. 20.02.2014 , , ,
47	INSTRUMENTS PIPE FITTINGS	H024	Fluid Controls Pvt. Ltd.	REGULAR	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com	Works-1->Mr. Tansen Choudhari/Mr. Mahesh Darekar Shed No.8, Lonavla Indl.Co-op.Estate Ltd,Nagargaon, -Lonavla-MAHARASHTRA INDIA Phone- 9823951347 FAX : (02114) 271132 Pincode : 410 401 Email : factory@hyd-air.com	C&I			30-Mar-10			, , ,
48	INSTRUMENTS TUBE FITTINGS	H024	Fluid Controls Pvt. Ltd.	REGULAR	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com	Works-1->Mr. Tansen Choudhari/Mr. Mahesh Darekar Shed No.8, Lonavla Indl.Co-op.Estate Ltd,Nagargaon, -Lonavla-MAHARASHTRA INDIA Phone- 9823951347 FAX : (02114) 271132 Pincode : 410 401 Email : factory@hyd-air.com	C&I			17-Sep-09			, , ,
49	INSTRUMENT FITTINGS	F040	FLUIDFIT ENGINEERS PVT. LTD.	REGULAR	Mr. Abbas Bhola Potia Building No. 2, Office No. 3,292, Bellasis Road,Mumbai Central (East) Mumbai Phone- 9920044113 Pincode : 400008 Email : ab@fluidfitengg.com	Works-1->Mr. Abbas Bhola Unit No. 16, Supreme Industrial Estate,Kaman Bhiwandi Road,Devdal, -Vasai East-MAHARASHTRA India Phone- 9920044113 FAX : 07303178243 Pincode : 401208 Email : ab@fluidfitengg.com	C&I			15-Jan-14	Small	23-Feb-17	Registered as per 22nd Electrical and C&I MISCC Meeting dtd. 15.01.2014 , , ,
50	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	F016	FORBES MARSHALL (HYD) LTD.	REGULAR	MR SAILESH PATALAY/MR. M K SRINIVASAN PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD Phone- 9849913704 Pincode : 500 076 Email : mksrinivasan@forbesmarshall.com	Works-1->MR G.SRINIVASAN/MR ANUJ MALPANI PLOT NO:A-19/2 & T-4/2,I.DA. NACHARAM , -HYDERABAD-TELANGANA INDIA Phone- 09866550762 FAX : 040 27152193 Pincode : 560076 Email : gshrinivasan@forbesmarshall.com	C&I						, , ,
51	TEMPERATURE GAUGE	F016	FORBES MARSHALL (HYD) LTD.	REGULAR	MR SAILESH PATALAY/MR. M K SRINIVASAN PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD Phone- 9849913704 Pincode : 500 076 Email : mksrinivasan@forbesmarshall.com	Works-1->MR G.SRINIVASAN/MR ANUJ MALPANI PLOT NO:A-19/2 & T-4/2,I.DA. NACHARAM , -HYDERABAD-TELANGANA INDIA Phone- 09866550762 FAX : 040 27152193 Pincode : 560076 Email : gshrinivasan@forbesmarshall.com	C&I						, , ,
52	CONTROL VALVE	F030	FORBES MARSHALL ARCA PVT.LTD.	REGULAR	A-34/35 , MIDC ESTATE, H-BLOCK, PIMPRI, PUNE, Phone- 020-27442020, Pincode : 411018 Email : mnadgaundi@forbesmarshall.com	Works-1->Mr. Sanjeev Shinde A-34/35 MIDC Estate,H Block, Pimpri, -Pune-MAHARASHTRA India Phone- 9323176406 FAX : 020-27442040 Pincode : 411018 Email : sshinde@forbesmarshall.com	C&I	No technical limit exists except for feed control valve. For feed control valves, approved up to sub-critical power plants of 600 MW rating.		16-Dec-10			, Technical limit reviewed on 30.04.2014 and further revised on 29.12.2015; , Reviewed in MISCC dt. 21.07.2015 for non-response in 4 consecutive tender enquiry; ,
53	VIBRATION MONITORING SYSTEM	F034	FORBES MARSHALL PVT. LTD	REGULAR	Mr. Kekoo Vacha P No. B 85, Phase II, Chakan Industrial Area, VIL.-Savardari Chakan, Tal:Khed PUNE Phone- 9823092007 Pincode : 410501 Email : kvacha@forbesmarshall.com		C&I			24-Aug-12			IN ASSOCIATION WITH SHINKAWA ELECTRIC CO. LTD.,JAPAN (V.CODE S155) AS PER AGREED SCOPE MATRIX.ENTIRE RESPONSIBILITY OF ALL CONTRACTUAL OBLIGATIONS SHALL BE OF INDIAN VENDOR
54	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	G071	GAUGE BOURDON INDIA PVT. LTD.	REGULAR	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com,	Works-1->Gauge Bourdon India Pvt. Ltd., Plot No-4, 5, 6,Jawahar Co-operative Industrial Estate, -Kalamboli Taluka Panvel-MAHARASHTRA India Phone- 022-27421095, FAX : 022-27421901, Pincode : 410209, Email : info@general-gauges.com	C&I			06-Mar-14	Small	11-Jun-18	Registered as per 26th MISCC-Electrical and C&I dtd. 06.03.2014. , , ,

55	TEMP. ELEMENT	G071	GAUGE BOURDON INDIA PVT. LTD.	REGULAR	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com,	Works-1->Gauge Bourdon India Pvt. Ltd., Plot No-4, 5, 6,Jawahar Co-operative Industrial Estate, -Kalamboli Taluka Panvel-MAHARASHTRA India Phone- 022-27421095, FAX : 022-27421901, Pincode : 410209, Email : info@general-gauges.com,	C&I			29-Dec-15	Small	11-Jun-18	, , ,
56	TEMPERATURE GAUGE	G071	GAUGE BOURDON INDIA PVT. LTD.	REGULAR	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com,	Works-1->Gauge Bourdon India Pvt. Ltd., Plot No-4, 5, 6,Jawahar Co-operative Industrial Estate, -Kalamboli Taluka Panvel-MAHARASHTRA India Phone- 022-27421095, FAX : 022-27421901, Pincode : 410209, Email : info@general-gauges.com,	C&I			28-Mar-13	Small	11-Jun-18	, , ,
57	VIBRATION MONITORING SYSTEM	G068	GE INDIA INDUSTRIAL PVT. LTD.	REGULAR	Mr. Pramod Kaushik/Vijay Pal BUILDING NO-7A, 4TH FLOOR GURGAON Phone- 0124-4808515 Pincode : 122002 Email : vijay.pal@ge.com		C&I			24-Aug-12			PARENT COMPANY: BENTLY NEVADA INC, USA. ENTIRE RESPONSIBILITY OF ALL CONTRACTUAL OBLIGATIONS SHALL BE OF INDIAN VENDOR AS DECIDED BY 4TH MISCC (ELECT AND C&I) HELD ON 24.08.2012. , , ,
58	PROGRAMMABLE LOGIC CONTROLLER	G035	GE Intelligent Platforms Private Limited	REGULAR	90/B, ELECTRONICS CITY, HOSUR ROAD, BANGLORE Phone- 28528328 Pincode : 561229 Email : shivesh.k.jha@ge.com		C&I						, , ,
59	LEVEL SWITCH-FLOAT TYPE	G060	GENERAL INSTRUMENTS CONSORTIUM	REGULAR	Mr. Amarendra Kulkarni 194/195, Gopi Tank Road, Off. Pandurang Naik Marg, Mahim Mumbai Phone- 9323195251 Pincode : 400016 Email : amarendra@general-gauges.com		C&I			30-Sep-10			Workas at- GAUGES BOURDON INDIA PVT. LTD. (A MFG. UNIT OF GENERAL INSTRUMENTS CONSORTIUM , PLOT NO-4, 5 & 6, JAWAHAR Co-op. INDUSTRIAL ESTATE, KAMOTHE, PANVEL- 410 209 , , ,
60	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	G060	GENERAL INSTRUMENTS CONSORTIUM	REGULAR	Mr. Amarendra Kulkarni 194/195, Gopi Tank Road, Off. Pandurang Naik Marg, Mahim Mumbai Phone- 9323195251 Pincode : 400016 Email : amarendra@general-gauges.com		C&I			30-Sep-10			Workas at- GAUGES BOURDON INDIA PVT. LTD. (A MFG. UNIT OF GENERAL INSTRUMENTS CONSORTIUM , PLOT NO-4, 5 & 6, JAWAHAR Co-op. INDUSTRIAL ESTATE, KAMOTHE, PANVEL- 410 209 , , ,
61	TEMP. ELEMENT	G032	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	REGULAR	D2/5, Mapusa Industrial Estate, Mapusa, Goa, Phone- 09326054551, Pincode : 403507, Email : sumukh@goainstruments.com,	Works-1->Mr. S.G. Dixit D2/5, Mapusa Industrial Estate, -Mapusa-GOA INDIA Phone- 09326054551 FAX : 0832-2262331 Pincode : 403 507 Email : sumukh@goainstruments.com	C&I			09-May-13	Micro	31-Mar-23	GCC Rev.5 has been accepted in toto. , , ,
62	TEMPERATURE GAUGE	G032	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	REGULAR	D2/5, Mapusa Industrial Estate, Mapusa, Goa, Phone- 09326054551, Pincode : 403507, Email : sumukh@goainstruments.com,	Works-1->Mr. S.G. Dixit D2/5, Mapusa Industrial Estate, -Mapusa-GOA INDIA Phone- 09326054551 FAX : 0832-2262331 Pincode : 403 507 Email : sumukh@goainstruments.com	C&I				Micro	31-Mar-23	GCC Rev.5 has been accepted in toto. , , ,
63	TEMPERATURE GAUGE	G047	GOA THERMOSTATIC INSTRUMENTS PVT.LTD.	REGULAR	FLAT -B , GF, HILL CROWN APTS., COLLEGE ROAD, MAPUSA Phone- Pincode : 403525 Email : gtilworks@pyro-electric.in	Works-1->Mrs Saanvi Naik BICHOLIM, -BICHOLIM-GOA INDIA Phone- 9595855152 FAX : Pincode : 403 529 Email : saanvi.naik@thermostatic.in	C&I			30-Jul-10			, , ,
64	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H023	H.GURU INDUSTRIES	REGULAR	Mr. G. D. Hazra/Mr. P. K. Mitra 10 B, HO-CHI-MINH SARANI, KOLKATA Phone- 033 2282 2463 / 1637 Pincode : 700071 Email : mguru@vsnl.net	Works-1->NA NA -- Phone- FAX : Pincode : Email :	C&I		OVERALL PENDING ORDER VALUE (EXCLUDING VALUE OF ORDERS ALREADY EXECUTED) FOR ALL PACKAGES FOR WHICH VENDOR IS REGISTERED SHALL NOT EXCEED RS. 1.0 CRORE				, Financial limit reviewed on 05.06.2014; , ,
65	TEMPERATURE GAUGE	H023	H.GURU INDUSTRIES	REGULAR	Mr. G. D. Hazra/Mr. P. K. Mitra 10 B, HO-CHI-MINH SARANI, KOLKATA Phone- 033 2282 2463 / 1637 Pincode : 700071 Email : mguru@vsnl.net	Works-1->NA NA -- Phone- FAX : Pincode : Email :	C&I		OVERALL PENDING ORDER VALUE (EXCLUDING VALUE OF ORDERS ALREADY EXECUTED) FOR ALL PACKAGES FOR WHICH VENDOR IS REGISTERED SHALL NOT EXCEED RS. 1.0 CRORE				, Financial limit reviewed on 05.06.2014; , ,
66	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H040	H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	REGULAR	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE Phone- 080-23370300, Pincode : 560022 Email : info@hgurusouth.com	Works-1->Shikha Hazra/ Shyamal Hazra 32, Industrial Suburb,Yeshwanthpur -BANGALORE-KARNATAKA INDIA Phone- 080-23370300 FAX : 080-23379890 Pincode : 560022 Email : shikhahazra@hgurusouth.com	C&I			30-Jul-10	Micro	31-Mar-23	, , ,

67	TEMPERATURE GAUGE	H040	H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	REGULAR	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE Phone- 080-23370300, Pincode : 560022 Email : info@hgurusouth.com	Works-1->Shikha Hazra/ Shyamal Hazra 32, Industrial Suburb,Yeshwanthpur -BANGALORE-KARNATAKA INDIA Phone- 080-23370300 FAX : 080-23379890 Pincode : 560022 Email : shikhahazra@hgurusouth.com	C&I			30-Jul-10	Micro	31-Mar-23	, , ,
68	LEVEL SWITCH-CONDUTIVITY TYPE	H047	HI-TECH SYSTEMS & SERVICES LTD.	REGULAR	Mr. Vikash Agrawal/Mr. Tarun Debnath 119, PARK STREET , KOLKATA Phone- 033-22290045 Pincode : 700016 Email : sandeep@hitech.in	Works-1->Mr. Jitendra Kumar/Mr. Debasis Dey 82/1, Sarsuna Main Road, -KOLKATA-WEST BENGAL INDIA Phone- 9883994030 FAX : Pincode : 700061 Email : jitendra@hitech.in	C&I	Vendor shall source import contents of Level Switch (Conductivity Type) from Levelstate Systems Ltd., United		01-Jun-09			Technical limit reviewed on 12.10.2015; , Technical limit reviewed on 30.04.2014; , ,
69	TRANSMITTERS	T031	Honeywell Automation India Limited	REGULAR	Mr. Ritwij Kulkarni 917, INTERNATIONAL TRADE TOWER, NEHRU PLACE, NEW DELHI Phone- 9890200584 Pincode : 110019 Email : rajesh.chaudhary@honeywell.com	Works-1->Mr.Kedar Tillu 53, 54, 56 & 57,Hadapsar Industrial Estate -PUNE-MAHARASHTRA INDIA Phone- 9665034625 FAX : 020 66039905 Pincode : 411013 Email : kedar.tillu@honeywell.com	C&I						, , ,
70	PROGRAMMABLE LOGIC CONTROLLER	H063	Honeywell Automation India Limited ,	REGULAR	56 & 57, Hadapsar Industrial Estate, Pune, Phone- 9689940949, Pincode : Email : amit.aglave@honeywell.com,	Works-1-> 56 & 57, Hadapsar Industrial Estate, -Pune-MAHARASHTRA India Phone- 9689940949, FAX : 020-66039800, Pincode : Email : amit.aglave@honeywell.com	C&I			28-Mar-13			, , ,
71	INSTRUMENT FITTINGS	H61	HP VALVES & FITTINGS INDIA PVT. LTD.	REGULAR	S. Harichandran/P.S. Pandi B-11, Mugappair Industrial Estate, CHENNAI Phone- 044 26252537 Pincode : 600037 Email : sales@hpvalvesindia.com	Works-1->S. Harichandran/ P.S. Pandi B-11, Mugappair Industrial Estate, -CHENNAI-TAMIL NADU INDIA Phone- 044-25252537 FAX : 044-26252538 Pincode : 600037 Email : sales@hpvalvesindia.com	C&I			30-May-12	Small	31-Mar-23	, , ,
72	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	D003	INDFOS (INDIA) LIMITED	REGULAR	MR.L.C.VENKATRANGAN/MR.B.KANNAN New No.17, II Floor, Adwave Towers, Dr.Sevalia Shivaji Salai, T.Nagar Chennai Phone- +91 44 24353407 Pincode : 600017 Email : delhi@indfos.com		C&I						, , ,
73	TEMPERATURE SWITCH	D003	INDFOS (INDIA) LIMITED	REGULAR	MR.L.C.VENKATRANGAN/MR.B.KANNAN New No.17, II Floor, Adwave Towers, Dr.Sevalia Shivaji Salai, T.Nagar Chennai Phone- +91 44 24353407 Pincode : 600017 Email : delhi@indfos.com		C&I						, , ,
74	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	I041	INDFOS INDUSTRIES LIMITED	REGULAR	B-20-21, INDUSTRIAL AREA, MEERUT ROAD, GHAZIABAD Phone- 0120-2712016 Pincode : Email : mktg@indfos.com		C&I						, , ,
75	FLOW ELEMENT - ORIFICE	I030	INSTRUMENTATION ENGINEERS PVT LTD	REGULAR	SH.N.V.RAM GOPAL/MS. N.NIHARIKA PLOTS 1,2,3, PHASE-III, IDA, JEEDIMETLA HYDERABAD Phone- 9848407365 Pincode : 500055 Email : iedelhi@ieflowmeters.com	Works-1->MR. A.V.MURTHY/MR. K.T. RAVISANKER PLOTS 1,2,3, PHASE-III,IDA, JEEDIMETLA - HYDERABAD-TELANGANA INDIA Phone- 9885107312 FAX : 040-23096401 Pincode : 500055 Email : sales@ieflowmeters.com	C&I			11-Apr-13	Micro	31-Mar-22	, , ,
76	ROTAMETER	I030	INSTRUMENTATION ENGINEERS PVT LTD	REGULAR	SH.N.V.RAM GOPAL/MS. N.NIHARIKA PLOTS 1,2,3, PHASE-III, IDA, JEEDIMETLA HYDERABAD Phone- 9848407365 Pincode : 500055 Email : iedelhi@ieflowmeters.com	Works-1->MR. A.V.MURTHY/MR. K.T. RAVISANKER PLOTS 1,2,3, PHASE-III,IDA, JEEDIMETLA - HYDERABAD-TELANGANA INDIA Phone- 9885107312 FAX : 040-23096401 Pincode : 500055 Email : sales@ieflowmeters.com	C&I				Micro	31-Mar-22	, , ,
77	SIGHT FLOW INDICATORS	I030	INSTRUMENTATION ENGINEERS PVT LTD	REGULAR	SH.N.V.RAM GOPAL/MS. N.NIHARIKA PLOTS 1,2,3, PHASE-III, IDA, JEEDIMETLA HYDERABAD Phone- 9848407365 Pincode : 500055 Email : iedelhi@ieflowmeters.com	Works-1->MR. A.V.MURTHY/MR. K.T. RAVISANKER PLOTS 1,2,3, PHASE-III,IDA, JEEDIMETLA - HYDERABAD-TELANGANA INDIA Phone- 9885107312 FAX : 040-23096401 Pincode : 500055 Email : sales@ieflowmeters.com	C&I				Micro	31-Mar-22	, , ,
78	CONTROL VALVE	I006	INSTRUMENTATION LTD.	REGULAR	KANJIKODE WEST, PALALKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvldil@gmail.com;fa2@ilpgt.com	Works-1->D.SASIDHARAN, AGM(Works&PPC) KANJIKODE WEST, -PALAKKAD-KERALA INDIA Phone- 0491-2566536 FAX : 0491-2566135 Pincode : 678623 Email : sasidharan@ilpgt.com;mraj@ilpgt.com;gireesh@ilpgt.com, commercial@ilpgt.com;fa2@ilpgt.com;nazeera@ilpgt.com;pkv@ilpgt.com	C&I						SICK PSU. BIFR CASE. , , ,
79	FLOW ELEMENT	I006	INSTRUMENTATION LTD.	REGULAR	KANJIKODE WEST, PALALKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvldil@gmail.com;fa2@ilpgt.com		C&I						SICK PSU. BIFR CASE. , , ,

80	FLOW ELEMENT - NOZZLE	I006	INSTRUMENTATION LTD.	REGULAR	KANJIKODE WEST, PALALKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvldil@gmail.com;fa2@ilpgt.com	Works-1->D.SASIDHARAN, AGM(Works&PPC) KANJIKODE WEST, -PALAKKAD-KERALA INDIA Phone- 0491-2566536 FAX : 0491-2566135 Pincode : 678623 Email : sasidharan@ilpgt.com;mraj@ilpgt.com;gireesh@ilpgt.com, commercial@ilpgt.com;fa2@ilpgt.com;nazeera@ilpgt.com;pkv@ilpgt.com	C&I						SICK PSU. BIFR CASE. , , ,
81	FLOW ELEMENT - ORIFICE	I006	INSTRUMENTATION LTD.	REGULAR	KANJIKODE WEST, PALALKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvldil@gmail.com;fa2@ilpgt.com	Works-1->D.SASIDHARAN, AGM(Works&PPC) KANJIKODE WEST, -PALAKKAD-KERALA INDIA Phone- 0491-2566536 FAX : 0491-2566135 Pincode : 678623 Email : sasidharan@ilpgt.com;mraj@ilpgt.com;gireesh@ilpgt.com, commercial@ilpgt.com;fa2@ilpgt.com;nazeera@ilpgt.com;pkv@ilpgt.com	C&I						SICK PSU. BIFR CASE. , , ,
82	JUNCTION BOX	K043	K.S.INSTRUMENTS PVT.LTD.	REGULAR	S Raghavan No. 72, 3rd Main, 1st Stage Industrial Suburb, Yeshwanthpur Bangalore Phone-9880385770 Pincode : 560022 Email : sales1@ksinstruments.net		C&I			30-Jul-10			, , ,
83	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	K054	Kaustubha Udyog,	REGULAR	S.No. 36/1/1, Sinhgad Road, Vadgaon Khurd, Near Lokmat Press, Pune, Phone- 020-24393577, Pincode : Email : pressure@vsnl.com		C&I			28-Mar-13	Small	30-Mar-20	, , ,
84	CONTROL VALVE	K048	Koso India Private Limited,	REGULAR	H 33 & 34, MIDC, Ambad, Nashik, Phone- 09650233433 Pincode : 422010, Email : enquiry@koso.co.in;jetmal.gour@koso.co.in	Works-1->P.J.ASHOK KUMAR/SEEMA ANAND Control Valve Division, H-33&34, MIDC, Ambad, -Nashik-MAHARASHTRA India Phone- 91 944 744 3198 FAX : 0491 - 5269914 Pincode : 422010 Email : pja@koso.co.in;enquiry@koso.co.in Works-2->+P.J.ASHOK KUMAR/SEEMA ANAND J-1,MIDC,Ambad -Nashik-MAHARASHTRA India Phone- 91 944 744 3198 FAX : 0491 - 5269914 Pincode : 422010 Email : pja@koso.co.in;enquiry@koso.co.in	C&I			30-Sep-09	Medium	31-Mar-23	, The name has been changed from M/s KOSO FLUID CONTROLS (PVT) LTD to M/s Koso India Private Limited as per 11th MISCC Elect and C&I dated 30.07.2013. , Approved works at Control Valve Division, H-33&34, Ambad, Nashik w.e.f. 12.10.2015; Additional works at "J-1,MIDC,Ambad, nashik-422010" approved w.e.f. 17.06.2016; ,
85	CONTROL VALVE	M005	KSB MIL CONTROLS LTD.	REGULAR	Mr.Jacob Cherian/Mr.Geo Jolly Meladoor, Annamanada P.O. MALA, Thrissur Phone- 0480-2695700 Pincode : 680741 Email : biju.simon@ksb.com	Works-1->Mr.Biju Simon/Mr.Jose Paul Meladoor, Annamanada, -Thrissur-KERALA INDIA Phone-9447555500 FAX : 91 480 2890952 Pincode : 680741 Email : jose.paul@ksb.com	C&I						, Name changed from MIL Controls limited to KSB MIL Control limited based on MISCC dated 06.04.2017 , ,
86	LEVEL SWITCH-CAPACITANCE TYPE	L005	LEVCON INSTRUMENTS PVT. LTD.	REGULAR	Mr Shayak Gupta/Badal Jana Rajkamal', 7th floor, 13, Camac Street KOLKATA Phone- 0 33 2283 2766 Pincode : 700017 Email : b_jana@levcongroup.com		C&I						, , ,
87	LEVEL SWITCH-CONDUTIVITY TYPE	L005	LEVCON INSTRUMENTS PVT. LTD.	REGULAR	Mr Shayak Gupta/Badal Jana Rajkamal', 7th floor, 13, Camac Street KOLKATA Phone- 0 33 2283 2766 Pincode : 700017 Email : b_jana@levcongroup.com	Works-1-> 38G, PICNIC GARDEN ROAD, -KOLKATA-WEST BENGAL INDIA Phone- FAX : Pincode : Email :	C&I			01-Jun-09			, , ,
88	LEVEL SWITCH-FLOAT TYPE	L005	LEVCON INSTRUMENTS PVT. LTD.	REGULAR	Mr Shayak Gupta/Badal Jana Rajkamal', 7th floor, 13, Camac Street KOLKATA Phone- 0 33 2283 2766 Pincode : 700017 Email : b_jana@levcongroup.com		C&I			01-Jun-09			, , ,
89	CONTROL VALVE	M224	Mascot Valves Pvt. Ltd.	REGULAR	166-167 GIDC Naroda Ahmedabad Phone- 0792282 1619 Pincode : 382330 Email : dom.sales@mascotvalves.com	Works-1->Varun Patel Dir 166-167 ,GIDC Naroda -Ahmedabad-GUJARAT India Phone- 0792282 1619 / 3369 FAX : Pincode : 382330 Email : dom.sales@mascotvalves.com	C&I			29-Aug-17	Small	31-Mar-23	, , ,
90	VIBRATION MONITORING SYSTEM	M097	MEGGITT INDIA PVT. LTD.	REGULAR	LJ Swaminathan/Gaurav Anand Unit-04A, Level-02, Bagmane Laurel Bagmane Tech Park, CV Raman Nagar Bangalore Phone- +91-9731577119 Pincode : 560093 Email : gaurav.anand@meggitt.com		C&I			24-Aug-12			PARENT COMPANY: MEGGITT SA, SWITZERLAND. ENTIRE RESPONSIBILITY OF ALL CONTRACTUAL OBLIGATIONS SHALL BE OF INDIAN VENDOR AS DECIDED BY 4TH MISCC (ELECT AND C&I) HELD ON 24.08.2012. , , ,
91	ANUBAR (DELTA TUBE)	M009	MICRO PRECISION PRODUCTS PVT. LTD.	REGULAR	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola,Tehsil & Distt. Palwal FARIDABAD Phone-9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com	Works-1->Mr. SANJEEV CHAUHAN ,H.B. No.-40 Others Revenue Estate, Village-Dudhola, Tehsil & Distt.-Palwal -Faridabad-Haryana India Phone- 9560742713 FAX : Pincode : 121002 Email : anil.bhati@wika.com	C&I			26-Nov-15	Medium	31-Mar-23	, New Works "H.B. No.-40, Revenue Estate, Village-Dudhola, Faridabad-121102 , Haryana " approved w.e.f. 07.05.2018 due to shifting. , ,

92	FLOW ELEMENT	M009	MICRO PRECISION PRODUCTS PVT. LTD.	REGULAR	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola,Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com		C&I				Medium	31-Mar-23	REGISTERED AS MSED VENDOR W.E.F.15.11.2011 FOR FY 2011-12. , , ,
93	FLOW ELEMENT - NOZZLE	M009	MICRO PRECISION PRODUCTS PVT. LTD.	REGULAR	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola,Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com	Works-1->Mr. SANJEEV CHAUHAN ,H.B. No.-40 Others Revenue Estate, Village-Dudhola, Tehsil & Distt.-Palwal -Faridabad-Haryana India Phone- 9560742713 FAX : Pincode : 121002 Email : anil.bhati@wika.com	C&I			15-Nov-11	Medium	31-Mar-23	REGISTERED AS MSED VENDOR W.E.F.15.11.2011 FOR FY 2011-12. , New Works "H.B. No.-40, Revenue Estate, Village-Dudhola, Faridabad-121102 , Haryana " approved w.e.f. 07.05.2018 due to shifting. , ,
94	FLOW ELEMENT - ORIFICE	M009	MICRO PRECISION PRODUCTS PVT. LTD.	REGULAR	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola,Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com	Works-1->Mr. SANJEEV CHAUHAN ,H.B. No.-40 Others Revenue Estate, Village-Dudhola, Tehsil & Distt.-Palwal -Faridabad-Haryana India Phone- 9560742713 FAX : Pincode : 121002 Email : anil.bhati@wika.com	C&I			15-Nov-11	Medium	31-Mar-23	REGISTERED AS MSED VENDOR W.E.F.15.11.2011 FOR FY 2011-12. , New Works "H.B. No.-40, Revenue Estate, Village-Dudhola, Faridabad-121102 , Haryana " approved w.e.f. 07.05.2018 due to shifting. , ,
95	VENTURI METER	M009	MICRO PRECISION PRODUCTS PVT. LTD.	REGULAR	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola,Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com		C&I			22-Oct-11	Medium	31-Mar-23	, , ,
96	FLOW ELEMENT - NOZZLE	M201	MINCO (INDIA) FLOW ELEMENTS PVT. LTD.	REGULAR	Mr. Raghavendra M. Kulkarni D2-49/50, Tivim Industrial Estate, Karaswada Mapusa Phone- 0832-2257059 Pincode : 403526 Email : gicflowelement@giconindia.com	Works-1->Mr. Raghavendra M. Kulkarni Dir D2-49/50, Tivim Industrial Estate,Karaswada - Mapusa-GOA INDIA Phone- 0832-2257059 FAX : 022-24455026 Pincode : Email : ramk@giconindia.com	C&I			02-Feb-15	Small	31-Mar-23	, Supplier Re-assessed on 27.05.2021 (2nd MISCC FY 2021-22) , ,
97	FLOW ELEMENT - ORIFICE	M201	MINCO (INDIA) FLOW ELEMENTS PVT. LTD.	REGULAR	Mr. Raghavendra M. Kulkarni D2-49/50, Tivim Industrial Estate, Karaswada Mapusa Phone- 0832-2257059 Pincode : 403526 Email : gicflowelement@giconindia.com	Works-1->Mr. Raghavendra M. Kulkarni Dir D2-49/50, Tivim Industrial Estate,Karaswada - Mapusa-GOA INDIA Phone- 0832-2257059 FAX : 022-24455026 Pincode : 403526 Email : gicflowelement@giconindia.com	C&I			28-Apr-17	Small	31-Mar-23	, Supplier Re-assessed on 27.05.2021 (2nd MISCC FY 2021-22) , ,
98	ANUBAR (DELTA TUBE)	M075	MINCO (INDIA) PRIVATE LIMITED	REGULAR	Mr. Rajeev Vasudeva, D/35, TIVIM INDUSTRIAL ESTATE, KARASWADA, MAPUSA, Goa, Phone- 9313637073 Pincode : 403526, Email : gicdelhi@general-gauges.com	Works-1-> D/35,TIVIM INDUSTRIAL ESTATE, KARASWADA,MAPUSA, -Goa-Goa India Phone- 9320197825, FAX : 0832-2257262, Pincode : 403526, Email : santoshkumar@general-gauges.com	C&I				Small	31-Mar-23	One time code accorded for 2x660 MW Suratgarh STPS, Stage-V. Hold uplifted w.e.f. 27.12.2017. , , Suspension Delisting w.e.f. 11.08.2015 due to non participation in RA for Banharpalli Project for Flow Orifice. Hold uplifted w.e.f. 27.12.2017. ,
99	FLOW ELEMENT - NOZZLE	M075	MINCO (INDIA) PRIVATE LIMITED	REGULAR	Mr. Rajeev Vasudeva, D/35, TIVIM INDUSTRIAL ESTATE, KARASWADA, MAPUSA, Goa, Phone- 9313637073 Pincode : 403526, Email : gicdelhi@general-gauges.com	Works-1-> D/35,TIVIM INDUSTRIAL ESTATE, KARASWADA,MAPUSA, -Goa-Goa India Phone- 9320197825, FAX : 0832-2257262, Pincode : 403526, Email : santoshkumar@general-gauges.com	C&I				Small	31-Mar-23	NO FURTHER TENDER/P.O. TILL FINAL REVIEW AFTER 3rd ORDER EXECUTION.Hold uplifted w.e.f. 27.12.2017. , , Suspension Delisting w.e.f. 11.08.2015 due to non participation in RA for Banharpalli Project for Flow Orifice. Hold uplifted w.e.f. 27.12.2017. ,
100	FLOW ELEMENT - ORIFICE	M075	MINCO (INDIA) PRIVATE LIMITED	REGULAR	Mr. Rajeev Vasudeva, D/35, TIVIM INDUSTRIAL ESTATE, KARASWADA, MAPUSA, Goa, Phone- 9313637073 Pincode : 403526, Email : gicdelhi@general-gauges.com	Works-1-> D/35,TIVIM INDUSTRIAL ESTATE, KARASWADA,MAPUSA, -Goa-Goa India Phone- 9320197825, FAX : 0832-2257262, Pincode : 403526, Email : santoshkumar@general-gauges.com	C&I			03-May-13	Small	31-Mar-23	Hold uplifted w.e.f. 27.12.2017. , , Suspension Delisting w.e.f. 11.08.2015 due to non participation in RA for Banharpalli Project for Flow Orifice. Hold uplifted w.e.f. 27.12.2017. ,
101	PROGRAMMABLE LOGIC CONTROLLER	M205	MITSUBISHI ELECTRIC INDIA PVT. LTD.	REGULAR	Mr. Mehul Dholakia Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune Phone- 020-27102000 Pincode : 411026 Email : mehul.dholakia@asia.meap.com	Works-1->Mr. Mehul Dholakia Others Emerald House, EL-3, J Block, M.I.D.C., Bhosari, -Pune-MAHARASHTRA INDIA Phone- 020-27102000 FAX : 020-27102100 Pincode : 411026 Email : mehul.dholakia@asia.meap.com	C&I			15-Sep-15			, , ,
102	TRANSMITTERS	M091	Moore Industries International Inc.	REGULAR	Leonard.W. Moore/ Matt Moren 16650 Schoenborn St. North Hills Phone- +1 818 830 5548 Pincode : 91343 Email : mmoren@miinet.com	Works-1->Matt Moren/Gina Cruz 16650 Schoenborn St., North Hills - CALIFORNIA- USA Phone- +1 818 894 7111, ext FAX : +1 818 830 5588 Pincode : 91343 Email : gcruz@miinet.com	C&I			24-Aug-11			INDIAN REPRESENTATIVE: CHEMTROL INDUSTRIES LTD, , , ,
103	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	N214	Nesstech Instruments Private Limited	REGULAR	26/2, G Type, Global Industrial Park Near Nahuli Railway Crossing, Valvada Vapi Phone- 9920576002 Pincode : 396105 Email : sales@nesstech.co.in	Works-1-> Others 26/2, G Type, Global Ind. Park Near Nahuli Railway Crossing, -Vapi-GUJARAT INDIA Phone- 9920576002 FAX : Pincode : 396105 Email : sales@nesstech.co.in, bkapadia@nesstech.co.in	C&I			11-May-17			, , ,
104	TEMP. ELEMENT	N214	Nesstech Instruments Private Limited	REGULAR	26/2, G Type, Global Industrial Park Near Nahuli Railway Crossing, Valvada Vapi Phone- 9920576002 Pincode : 396105 Email : sales@nesstech.co.in	Works-1-> Others 26/2, G Type, Global Ind. Park Near Nahuli Railway Crossing, -Vapi-GUJARAT INDIA Phone- 9920576002 FAX : Pincode : 396105 Email : sales@nesstech.co.in, bkapadia@nesstech.co.in	C&I			11-May-17			, , ,

105	ELECTROMAGNETIC FLOW METER	N040	NIVO CONTROLS PVT. LTD.	REGULAR	Mr. Praveen Toshniwal 104-115, Electronic Complex, Indore Phone- 0731-4081305 Pincode : 452010 Email : sales@nivocontrols.com	Works-1->Mr. S L Sadani Others 104 - 115,Electronic Complex - Indore-MADHYA PRADESH INDIA Phone- 0731-4081307 FAX : Pincode : 452010 Email : sales@nivocontrols.com;sadanis@nivocontrols.com	C&I			18-Jan-20	Small	31-Mar-23	Supplier registered as per 15th MISCC-Electrical and C&I dated 18.01.2020 , , ,
106	TRANSMITTERS	N040	NIVO CONTROLS PVT. LTD.	REGULAR	Mr. Praveen Toshniwal 104-115, Electronic Complex, Indore Phone- 0731-4081305 Pincode : 452010 Email : sales@nivocontrols.com	Works-1->Mr. S L Sadani Others 104 - 115,Electronic Complex - Indore-MADHYA PRADESH INDIA Phone- 0731-4081307 FAX : Pincode : 452010 Email : sales@nivocontrols.com;sadanis@nivocontrols.com	C&I	For Capacitance type only		20-Sep-14	Small	31-Mar-23	Registered in permanent category as per 11th MISCC-Electrical and C&I (FY 2014-15) dt. 20.09.2014. , Technical limit reviewed on 12.10.2015; , ,
107	ULTRASONIC FLOW METERS	N209	NIVUS GMBH	REGULAR	Mr. Marcus Fischer Im Taele 2, D - 75031 Eppingen Phone- 00491712233770 Pincode : Email : carolin.schuster@nivus.com	Works-1->Mr. Marcus Fischer CEO Im Taele 2, Eppingen, -Baden Wuerttemberg,-Foreign Country GERMANY Phone- 0049-726291910 FAX : Pincode : 75031 Email : carolin.schuster@nivus.com	C&I			05-Jul-16			M/s Automation and Maintenance Systems approved as authorised distributor of M/s Nivus GmbH w.e.f. 01.11.2016 , , ,
108	INSTRUMENT FITTINGS	P082	PANAM ENGINEERS	REGULAR	Mr. Santosh Shukla 203, Jaisingh Business,Parsiwada, Sahar road,Andheri(East), Mumbai, Phone- 9892179529, Pincode : 400099, Email : santosh@panamengineers.com,	Works-1->Mr. Santosh Shukla Others R-628,TTC Industrial Area, MIDC Rabale, -Navi Mumbai-MAHARASHTRA India Phone- 9821350761, FAX : 022-27695559, Pincode : 400701, Email : sales@panamengineers.com	C&I			07-Feb-13			, , ,
109	TRANSMITTERS	P082	PANAM ENGINEERS	REGULAR	Mr. Santosh Shukla 203, Jaisingh Business,Parsiwada, Sahar road,Andheri(East), Mumbai, Phone- 9892179529, Pincode : 400099, Email : santosh@panamengineers.com,	Works-1->Mr. Santosh Shukla Others R-628,TTC Industrial Area, MIDC Rabale, -Navi Mumbai-MAHARASHTRA India Phone- 9821350761, FAX : 022-27695559, Pincode : 400701, Email : sales@panamengineers.com	C&I	For Pressure and Diff. Pressure transmitter		20-Aug-15			, , ,
110	INSTRUMENT FITTINGS	P81	Perfect Instrumentation Control (India) Pvt. Ltd.	REGULAR	MD Hussain Shaikh/Shahanawaz Khan Gala No. 168, Loheki Chwal,216/ 218, Maulana Azad Rd. Nagpada Junction Mumbai Phone- 91-9324383121 Pincode : 400008 Email : shahanawaz.khan@perfectinstrumentation.com	Works-1->Shahanawaz Khan Vishweshwar Ind. Premises Co-op Soc. Ltd,F-18/19, Pradhikaran,Bhosadi MIDC -PUNE-MAHARASHTRA INDIA Phone- 020-30694134 FAX : 022-23013010 Pincode : 411026 Email : shahanawaz.khan@perfectinstrumentation.com	C&I			23-Mar-12			, , ,
111	INSTRUMENT FITTINGS	P046	PRECISION ENGINEERING INDUSTRIES	REGULAR	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com	Works-1->ALEX BAPTIST/ K. SRINIVAS 7. SIDHAPURA INDUSTRIAL ESTATE,SV ROAD, GOREGAON(WEST) -MUMBAI-MAHARASHTRA INDIA Phone- 022-42631700 FAX : 022-40035259 Pincode : 400 062 Email : srinivas@precision-engg.com	C&I			14-Feb-12			, , ,
112	INSTRUMENTS PIPE FITTINGS	P046	PRECISION ENGINEERING INDUSTRIES	REGULAR	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com	Works-1->ALEX BAPTIST/ K. SRINIVAS 7. SIDHAPURA INDUSTRIAL ESTATE,SV ROAD, GOREGAON(WEST) -MUMBAI-MAHARASHTRA INDIA Phone- 022-42631700 FAX : 022-40035259 Pincode : 400 062 Email : srinivas@precision-engg.com	C&I						, , ,
113	INSTRUMENTS TUBE FITTINGS	P046	PRECISION ENGINEERING INDUSTRIES	REGULAR	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com	Works-1->ALEX BAPTIST/ K. SRINIVAS 7. SIDHAPURA INDUSTRIAL ESTATE,SV ROAD, GOREGAON(WEST) -MUMBAI-MAHARASHTRA INDIA Phone- 022-42631700 FAX : 022-40035259 Pincode : 400 062 Email : srinivas@precision-engg.com	C&I						, , ,
114	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	A126	PRECISION MASS PRODUCTS PVT. LTD.	REGULAR	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com	Works-1->Mr. Hitesh Parmar/Mr. Hitesh Parmar Plot No.2306, Phase II, GIDC Chhatral, -Kalol-GUJARAT INDIA Phone- 9327359227 FAX : 02764-233440 Pincode : 382729 Email : hitesh.parmar@ashcroftindia.com	C&I			23-Nov-12			Registration of "M/s Ashcroft India Pvt. Ltd." substituted to "M/s Precision Mass Products Pvt. Ltd." as per MISCC dt. 15.02.2016 based on "Termination and business transfer agreement" submitted by supplier. , , ,
115	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	A126	PRECISION MASS PRODUCTS PVT. LTD.	REGULAR	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com	Works-1->Mr. Hitesh Parmar/Mr. Hitesh Parmar Plot No.2306, Phase II, GIDC Chhatral, -Kalol-GUJARAT INDIA Phone- 9327359227 FAX : 02764-233440 Pincode : 382729 Email : hitesh.parmar@ashcroftindia.com	C&I			23-Nov-12			Registration of "M/s Ashcroft India Pvt. Ltd." substituted to "M/s Precision Mass Products Pvt. Ltd." as per MISCC dt. 15.02.2016 based on "Termination and business transfer agreement" submitted by supplier. , , ,
116	TEMPERATURE GAUGE	A126	PRECISION MASS PRODUCTS PVT. LTD.	REGULAR	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com	Works-1->Mr. Hitesh Parmar/Mr. Hitesh Parmar Plot No.2306, Phase II, GIDC Chhatral, -Kalol-GUJARAT INDIA Phone- 9327359227 FAX : 02764-233440 Pincode : 382729 Email : hitesh.parmar@ashcroftindia.com	C&I			23-Nov-12			Registration of "M/s Ashcroft India Pvt. Ltd." substituted to "M/s Precision Mass Products Pvt. Ltd." as per MISCC dt. 15.02.2016 based on "Termination and business transfer agreement" submitted by supplier. , , ,
117	LEVEL SWITCH-CAPACITANCE TYPE	P068	Pune Techtrol Pvt. Ltd.	REGULAR	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : bo@punetechtrol.com		C&I			23-Mar-12			, , ,

118	LEVEL SWITCH-FLOAT TYPE	P068	Pune Techtrol Pvt. Ltd.	REGULAR	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com		C&I			23-Mar-12			, , ,
119	TRANSMITTERS	P068	Pune Techtrol Pvt. Ltd.	REGULAR	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com		C&I	Only for capacitance Type Level Transmitter		07-Oct-14			Technical limit reviewed on 12.10.2015; , Manufacturing works: J-52/7, MIDC, Bhosari, Pune , ,
120	TEMP. ELEMENT	P061	PYRO ELECTRIC INSTRUMENTS GOA PVT.LTD.	REGULAR	M. D. BICHU/R. M. BICHU G.B, HILL CROWN APARTMENTS, COLLEGE ROAD, MAPUSA Phone- 9326114601 Pincode : 403507 Email : priyanka.marketing@pyro-electric.in	Works-1->A A KULKARNI/ VINOD C G PLOT NO. 71,BICHOLIM INDUSTRIAL ESTATE -BICHOLIM-GOA INDIA Phone- 9326114409 FAX : 91 832 2363381 Pincode : 403529 Email : pyroworks@pyro-electric.in	C&I			28-Jan-09			, , ,
121	LEVEL SWITCH-CONDUTIVITY TYPE	R047	RAMAN INSTRUMENTS PVT.LTD.	REGULAR	Mr. N R Shenoy/Mr G B Vijh 8, First Floor.Plot : 160A Bait-Ush-Sharaf, 29th Road,Bandra(W) MUMBAI Phone- 09892331381 Pincode : 400050 Email : ramanbpl@vsnl.com	Works-1->NA -- Phone- FAX : Pincode : Email :	C&I	Vendor shall source import contents of Level Switch (Conductivity Type) from Mobrey Measurement, an operating unit of Morbey Ltd., Slough, Berkshire, United		01-Jun-09			Technical limit reviewed on 12.10.2015; , Technical limit reviewed on 30.04.2014; , ,
122	PROGRAMMABLE LOGIC CONTROLLER	R021	ROCKWELL AUTOMATION INDIA LTD	REGULAR	(ALLENBRADLEY),C-11, SITE-4, INDUSTRIAL AREA SHHIBABAD, GHAZIABAD Phone- 2895247-52 Pincode : 201010 Email : pmehrotra@rockwell.com	Works-1->Anup Sharma C-11 Site-4 Industrial Area,Sahibabad -Ghaziabad-UTTAR PRADESH India Phone- 0120-4017926 FAX : 0120-2895224 Pincode : 201010 Email : raindia@ra.rockwell.com	C&I			30-Jul-10			, , ,
123	VIBRATION MONITORING SYSTEM	R056	ROCKWELL AUTOMATION INDIA PVT LTD	REGULAR	A-66, SEC- 64, NOIDA, Phone- 0120-4671236 Pincode : 201301 Email : raindia@ra.rockwell.com; asharma@ra.rockwell.com		C&I			24-Aug-12			PARENT COMPANY: ROCKWELL AUTOMATION INC,USA. ENTIRE RESPONSIBILITY OF ALL CONTRACTUAL OBLIGATIONS SHALL BE OF INDIAN VENDOR AS DECIDED BY 4TH MISCC (ELECT AND C&I) HELD ON 24.08.2012. , , ,
124	ELECTROMAGNETIC FLOW METER	R057	Rockwin Flowmeter India Pvt. Ltd.	REGULAR	B-24, Site-IV, Sahibabad Industrial Area Ghaziabad, Phone- 9810129687 Pincode : 201010, Email : amiya@rockwin.com	Works-1-> B-24, Site-IV, Sahibabad Industrial Area, -Ghaziabad-UTTAR PRADESH India Phone- 9810129687 FAX : 01202895450 Pincode : 201010 Email :	C&I			27-May-21	Small	31-Mar-23	Supplier registered on 27.05.2021 as per 2nd MISCC FY 2021-22 , , ,
125	ULTRASONIC FLOW METERS	R057	Rockwin Flowmeter India Pvt. Ltd.	REGULAR	B-24, Site-IV, Sahibabad Industrial Area Ghaziabad, Phone- 9810129687 Pincode : 201010, Email : amiya@rockwin.com	Works-1->MR Rajiv PRAKASH B-24, Site-IV, Sahibabad Industrial Area, -Ghaziabad-UTTAR PRADESH India Phone- 9810129687 FAX : 01202895450 Pincode : 201010, Email : rajiv@rockwin.com	C&I			14-Mar-17	Small	31-Mar-23	, , ,
126	CONTROL VALVE	S280	SAMSON CONTROLS PVT. LTD.	REGULAR	Mr. Atul raje-MD D 281, MIDC Ranjangaon Ta Shirur Pune Phone- 02067246600 Pincode : 412220 Email : sales@samsoncontrols.net	Works-1-> Others D 281, MIDC Ranjangaon -Pune-MAHARASHTRA India Phone- 02067246600,8554997963 FAX : Pincode : 412220 Email : sales@samsoncontrols.net	C&I			15-Jun-18	Medium	31-Mar-22	"Hydro test bench for 6" to 12", 2500# ANSI rating is available at unit II, D-100 MIDC Ranjangaon, Tal. Shirur, Dist. Pune." , , ,
127	LEVEL SWITCH-CONDUTIVITY TYPE	S123	Sapcon Instrument Pvt Ltd.	REGULAR	131, PALSHIKAR COLONY Contact Person- Mr. Ashwin (9826080207) INDORE Phone- +91-731-4085751, Pincode : 452004 Email : sales@sapconinstruments.com	Works-1->Mr. Ashwin R Palshikar/Mr. Navin Bodse 131 PALSHIKAR COLONY, -INDORE-MADHYA PRADESH INDIA Phone- 9754261005 FAX : 0731-2475475 Pincode : 452004 Email : sales@sapcon.in	C&I			22-Oct-11			, , ,
128	LEVEL SWITCH-FLOAT TYPE	S106	SBEM PVT. LTD.	REGULAR	MR.N.K. BEDARKAR/MR. VISHWANATH KARANDIK 39, ELECTRONIC CO.OP. ESTATE, PUNE SATARA ROAD PUNE, Phone- 912041030100 Pincode : 411009 Email : newdelhi@sbem.co.in	Works-1->MR. MOHAN PADWAL 691/A/2,BIBWEWADI INDL ESTATE -PUNE-MAHARASHTRA INDIA Phone- 918600042374 FAX : 912024215670 Pincode : 411037 Email : wm@sbem.co.in	C&I			30-Jul-10			, , ,
129	TRANSMITTERS	S106	SBEM PVT. LTD.	REGULAR	MR.N.K. BEDARKAR/MR. VISHWANATH KARANDIK 39, ELECTRONIC CO.OP. ESTATE, PUNE SATARA ROAD PUNE, Phone- 912041030100 Pincode : 411009 Email : newdelhi@sbem.co.in	Works-1->MR. MOHAN PADWAL 691/A/2,BIBWEWADI INDL ESTATE -PUNE-MAHARASHTRA INDIA Phone- 918600042374 FAX : 912024215670 Pincode : 411037 Email : wm@sbem.co.in	C&I	FOR CAPACITANCE TYPE.		31-May-11			Reviewed in MISCC dt. 21.07.2015 for non-response in 4 consecutive tender enquiry; , Technical limit reviewed on 30.04.2014 & 12.10.2015; , ,
130	PROGRAMMABLE LOGIC CONTROLLER	S083	SCHNEIDER ELECTRIC INDIA PVT.LTD.	REGULAR	A-4 , MOHAN CO-OP INDL AREA MATHURA ROAD NEW DELHI Phone- Pincode : 110044 Email : aditya.bawa@schneider-electric.com		C&I						, , ,
131	ELECTROMAGNETIC FLOW METER	S158	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	REGULAR	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane - Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com	C&I			31-May-17	Small	22-Feb-21	, , ,

132	FLOW ELEMENT - ORIFICE	S158	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	REGULAR	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane - Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com	C&I			31-May-17	Small	22-Feb-21	, , ,
133	LEVEL SWITCH-CAPACITANCE TYPE	S158	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	REGULAR	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane - Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com	C&I			31-May-17	Small	22-Feb-21	, , ,
134	LEVEL SWITCH-FLOAT TYPE	S158	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	REGULAR	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane - Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com	C&I			31-May-17	Small	22-Feb-21	, , ,
135	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	S158	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	REGULAR	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane - Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com	C&I			31-May-17	Small	22-Feb-21	, , ,
136	ROTAMETER	S158	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	REGULAR	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Centre, S.No. 65, Hissa No. 7,By-Pass Juction, Kausa, -Mumbai-MAHARASHTRA INDIA Phone- 9892230623, FAX : 022-25491408/9 Pincode : 400 612, Email : sales@scientificdevices.com	C&I			05-Dec-12	Small	22-Feb-21	, , ,
137	SIGHT FLOW INDICATORS	S158	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	REGULAR	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com		C&I			05-Dec-12	Small	22-Feb-21	, , ,
138	TEMP. ELEMENT	S158	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	REGULAR	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com	Works-1->Scientific Center, Others By-Pass Junction,Near Kalsekar College kausa, mumbra,Thane - Mumbai-MAHARASHTRA INDIA Phone- 022-25491409,9892230623 FAX : Pincode : 400612 Email : sdbpl@vsnl.com	C&I			31-May-17	Small	22-Feb-21	, , ,
139	CONTROL VALVE	S163	Severn Glocon India Pvt. Ltd.	REGULAR	F96 & F97, Sipcot Industrial Park, Irungattukottai, Chennai, Phone- 044-47104200, Pincode : 602117, Email : info@severnglocon.co.in,	Works-1->Mr. K.Kaushik, F96 & F97, Sipcot Industrial Park,Irungattukottai, -Chennai-TAMIL NADU India Phone- 044-47104200, FAX : 044-47100073, Pincode : 602117, Email : info@severnglocon.co.in	C&I			29-May-18	Small	31-Mar-23	, Technical limit reviewed on 30.04.2014 and 12.10.2015; , Deleted due to non-response in 4 consecutive tenders w.e.f. 27.07.2016;.Registered again w.e.f. 29.05.2018 ,
140	JUNCTION BOX	S114	Shrenik & Company,	REGULAR	Mr. Mitesh Shah/Mr. Pulin Shah 39 A/3 ,Panchratna Industrial Estate, Sarkhej-Bavla Road Ahmedabad Phone- 9825024921 Pincode : 382213 Email : sales@pustron.com, pulin@sumip.com	Works-1->Mr.Pulin Shah/ Mr. Kaloesh Parmar 39 A/3 ,Panchratna Industrial Est,Sarkhej-Bavla Road, Changodhar -Ahmedabad-GUJARAT INDIA Phone- 98250 80339 1 FAX : 079-26932424 Pincode : 382213 Email : sales@sumip.com	C&I			24-Mar-10			Registered for FRP JBs AND METAL JBs. , Technical limit reviewed on 30.04.2014; , ,
141	PROGRAMMABLE LOGIC CONTROLLER	S001	SIEMENS LIMITED	REGULAR	Dr. Armin Bruck/Sandeep Mathur 130, Pandurang Budhkar Marg Worli Mumbai Phone- 0124 383 7377 Pincode : 400018 Email : ankit.varshney@siemens.com	Works-1->Ankit Varshney Kalwa Works, Thane-Belapur Road, Thane, -MUMBAI-MAHARASHTRA INDIA Phone- FAX : Pincode : 400708 Email :	C&I						, , ,
142	TRANSMITTERS	S001	SIEMENS LIMITED	REGULAR	Dr. Armin Bruck/Sandeep Mathur 130, Pandurang Budhkar Marg Worli Mumbai Phone- 0124 383 7377 Pincode : 400018 Email : ankit.varshney@siemens.com	Works-1->Ankit Varshney Kalwa Works, Thane-Belapur Road, Thane, -MUMBAI-MAHARASHTRA INDIA Phone- FAX : Pincode : 400708 Email :	C&I						Comm Add: Attn Mr K.K.Bedi/ Mr Sanjay Satpute, Siemens Ltd. EFIE, Plot no 6A, Sec-18, Maruti Industrial Area, Gurgaon - 122015, Ph 0124-3836250 , , ,
143	LEVEL GAUGE	S008	SIGMA INSTRUMENTS CO.	REGULAR	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in	C&I						, , ,
144	LEVEL SWITCH-CAPACITANCE TYPE	S008	SIGMA INSTRUMENTS CO.	REGULAR	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in	C&I						, , ,

145	LEVEL SWITCH-CONDUTIVITY TYPE	S008	SIGMA INSTRUMENTS CO.	REGULAR	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in	C&I						, , ,
146	LEVEL SWITCH-FLOAT TYPE	S008	SIGMA INSTRUMENTS CO.	REGULAR	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in	C&I			01-Jun-09			Vendor shall source import contents of Level Switch (Conductivity Type) from Mobrey Measurement, an operating unit of Morbey Ltd., Slough, Berkshire, United Kingdom. , , ,
147	SIGHT FLOW INDICATORS	S008	SIGMA INSTRUMENTS CO.	REGULAR	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in	Works-1->R Gopinath 27 Nahur Udyog Industrial Premises,M.M.Malviya Road, Mulund(-MUMBAI-MAHARASHTRA INDIA Phone- +912225918567 FAX : +912225918566 Pincode : 400080 Email : sales@sigmainstruments.co.in	C&I						Reassessed on 27.04.2016; , , ,
148	VIBRATION MONITORING SYSTEM	S156	SKF INDIA LIMITED	REGULAR	Mr. Shishir Joshipura SERVICE BUSINESS UNIT, CHINCHWAD, PUNE Phone- +91 982 3161755 Pincode : 411033 Email : sandeep.gadre@skf.com		C&I			24-Aug-12			PARENT COMPANY: SKF CONDITION MONITORING INC, USA. ENTIRE RESPONSIBILITY OF ALL CONTRACTUAL OBLIGATIONS SHALL BE OF INDIAN VENDOR AS DECIDED BY 4TH MISCC (ELECT AND C&I) HELD ON 24.08.2012. , , ,
149	TRANSMITTERS	S039	SMART INSTRUMENTS LTD, BRAZIL	REGULAR	Agents: Digital Electronic Ltd. 74/11 'C' Cross Road MIDC Andheri (East) MUMBAI Phone- 28208477 Pincode : 400093 Email : corp@delbby.rpgms.ems.vsnl.net.in		C&I	LD-301 & T-301 TRANSMITTER FROM M/S SMART EQUIPMENTS BRAZIL					Technical limit reviewed on 12.10.2015; , Technical limit reviewed on 30.04.2014 , ,
150	DIFFERENTIAL PRESSURE SWITCH	S010	SOR INC.	REGULAR	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdhesh@sherman-india.com		C&I						, Reassessed on 21.03.2018. , ,
151	LEVEL SWITCH-CONDUTIVITY TYPE	S010	SOR INC.	REGULAR	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdhesh@sherman-india.com	Works-1->LARRY DEGARMO/ ROY STUMBOUGH 14685 W. 105TH STREET, LENEXA -KANSAS- USA Phone- 913-888-0767 FAX : 913-888-0767 Pincode : 66215 Email : rstumbough@sorinc.com	C&I						, , ,
152	LEVEL SWITCH-FLOAT TYPE	S010	SOR INC.	REGULAR	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdhesh@sherman-india.com	Works-1->LARRY DEGARMO/ ROY STUMBOUGH 14685 W. 105TH STREET, LENEXA -KANSAS- USA Phone- 913-888-0767 FAX : 913-888-0767 Pincode : 66215 Email : rstumbough@sorinc.com	C&I						, Reassessed on 21.03.2018. , ,
153	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	S010	SOR INC.	REGULAR	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdhesh@sherman-india.com	Works-1->LARRY DEGARMO/ ROY STUMBOUGH 14685 W. 105TH STREET, LENEXA -KANSAS- USA Phone- 913-888-0767 FAX : 913-888-0767 Pincode : 66215 Email : rstumbough@sorinc.com	C&I						, , ,
154	TEMPERATURE SWITCH	S010	SOR INC.	REGULAR	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com, avdhesh@sherman-india.com	Works-1->LARRY DEGARMO/ ROY STUMBOUGH 14685 W. 105TH STREET, LENEXA -KANSAS- USA Phone- 913-888-0767 FAX : 913-888-0767 Pincode : 66215 Email : rstumbough@sorinc.com	C&I						, , ,
155	ANUBAR (DELTA TUBE)	S044	STAR-MECH CONTROLS (I) PVT.LTD.	REGULAR	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net	Works-1->VIVEK GOTE/ MAHúNDRA BANSODE Sr no.54, Plot No.ll0,Swami ViVekanand Industrial Est.HADAPS -PUNE-MAHARASHTRA INDIA Phone- 02026970450 FAX : 02026970470 Pincode : 411028 Email : marketing@starmech.net	C&I				Small	31-Mar-23	, , ,
156	FLOW ELEMENT	S044	STAR-MECH CONTROLS (I) PVT.LTD.	REGULAR	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net	Works-1->VIVEK GOTE/ MAHúNDRA BANSODE Sr no.54, Plot No.ll0,Swami ViVekanand Industrial Est.HADAPS -PUNE-MAHARASHTRA INDIA Phone- 02026970450 FAX : 02026970470 Pincode : 411028 Email : marketing@starmech.net	C&I				Small	31-Mar-23	, , ,
157	FLOW ELEMENT - NOZZLE	S044	STAR-MECH CONTROLS (I) PVT.LTD.	REGULAR	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net	Works-1->VIVEK GOTE/ MAHúNDRA BANSODE Sr no.54, Plot No.ll0,Swami ViVekanand Industrial Est.HADAPS -PUNE-MAHARASHTRA INDIA Phone- 02026970450 FAX : 02026970470 Pincode : 411028 Email : marketing@starmech.net	C&I				Small	31-Mar-23	, , ,

158	FLOW ELEMENT - ORIFICE	S044	STAR-MECH CONTROLS (I) PVT.LTD.	REGULAR	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net	Works-1->VIVEK GOTE/ MAHúNDRA BANSODE Sr no.54, Plot No.ll0,Swami ViVekanand Industrial Est.HADAPS -PUNE-MAHARASHTRA INDIA Phone- 02026970450 FAX : 02026970470 Pincode : 411028 Email :	C&I				Small	31-Mar-23	, , ,
159	VENTURI METER	S044	STAR-MECH CONTROLS (I) PVT.LTD.	REGULAR	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net	Works-1->VIVEK GOTE/ MAHúNDRA BANSODE Sr no.54, Plot No.ll0,Swami ViVekanand Industrial Est.HADAPS -PUNE-MAHARASHTRA INDIA Phone- 02026970450 FAX : 02026970470 Pincode : 411028 Email :	C&I			22-Oct-11	Small	31-Mar-23	, , ,
160	JUNCTION BOX	S095	SUCHITRA INDUSTRIES	REGULAR	NO-2,OPP-27 AECS LAYOUT 2ND STG REJAMAHALVILAS EXTN 2ND STG BANGALORE Phone- Pincode : Email : suchitra.industriesblr@gmail.com	Works-1->B. Srinivas Suchitra Industries, Opp No 53, Muneshwara Black Devinagar, Lottagal hal - BANGALORE-KARNATAKA INDIA Phone- 080-23511247 FAX : Pincode : 560094 Email : suchitra_industries@yahoo.com	C&I						, , ,
161	ANUBAR (DELTA TUBE)	S009	SWITZER PROCESS INSTRUMENTS PVT. LTD.	REGULAR	Mr. V S Jayaprakash, 128, SIDCO North Phase, Ambattur Estates CHENNAI Phone- 044-26252017/2018 Pincode : 600050 Email : sales@switzerprocess.co.in	Works-1->C S Shankar 127, Sidco North Phase, Ambattur Estates, - CHENNAI-TAMIL NADU INDIA Phone- 8754491904 FAX : 044-26248849 Pincode : 600050 Email : cservice@switzerinstrument.com	C&I			30-Jul-10	Small	20-May-19	Name changed from "M/s Switzer Instrument Ltd." to "M/s Switzer Process Instruments Pvt. Ltd." w.e.f. 27.07.2016; , , ,
162	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	S009	SWITZER PROCESS INSTRUMENTS PVT. LTD.	REGULAR	Mr. V S Jayaprakash, 128, SIDCO North Phase, Ambattur Estates CHENNAI Phone- 044-26252017/2018 Pincode : 600050 Email : sales@switzerprocess.co.in	Works-1->C S Shankar 127, Sidco North Phase, Ambattur Estates, - CHENNAI-TAMIL NADU INDIA Phone- 8754491904 FAX : 044-26248849 Pincode : 600050 Email : cservice@switzerinstrument.com	C&I				Small	20-May-19	Name changed from "M/s Switzer Instrument Ltd." to "M/s Switzer Process Instruments Pvt. Ltd." w.e.f. 27.07.2016; , , ,
163	TEMPERATURE SWITCH	S009	SWITZER PROCESS INSTRUMENTS PVT. LTD.	REGULAR	Mr. V S Jayaprakash, 128, SIDCO North Phase, Ambattur Estates CHENNAI Phone- 044-26252017/2018 Pincode : 600050 Email : sales@switzerprocess.co.in	Works-1->C S Shankar 127, Sidco North Phase, Ambattur Estates, - CHENNAI-TAMIL NADU INDIA Phone- 8754491904 FAX : 044-26248849 Pincode : 600050 Email : cservice@switzerinstrument.com	C&I				Small	20-May-19	Name changed from "M/s Switzer Instrument Ltd." to "M/s Switzer Process Instruments Pvt. Ltd." w.e.f. 27.07.2016; , , ,
164	FLOW ELEMENT - ORIFICE	T211	TANSA EQUIPMENTS PVT. LTD.	REGULAR	Mr. Vardhan Tamhankar, Unit No35/36/41,Om Anand Industrial Est. Mohanjee Sundarjee Road,Raghunath Nagar, Thane Phone- 022-25832323 Pincode : 400604 Email : tansaindia@gmail.com	Works-1-> Others Mohanjee Sundarjee Road, Raghunath Nagar, Thane -Mumbai-MAHARASHTRA INDIA Phone- FAX : Pincode : 400604 Email :	C&I			29-Nov-16			, , ,
165	ROTAMETER	T211	TANSA EQUIPMENTS PVT. LTD.	REGULAR	Mr. Vardhan Tamhankar, Unit No35/36/41,Om Anand Industrial Est. Mohanjee Sundarjee Road,Raghunath Nagar, Thane Phone- 022-25832323 Pincode : 400604 Email : tansaindia@gmail.com	Works-1-> Others Mohanjee Sundarjee Road, Raghunath Nagar, Thane -Mumbai-MAHARASHTRA INDIA Phone- FAX : Pincode : 400604 Email :	C&I			29-Nov-16			, , ,
166	TEMP. ELEMENT	T107	Tempsens Instrument (I) Pvt Ltd	REGULAR	MR. V.P.RATHI/MR. HEMANT RATHI B-188A ROAD NO.5 , M.I.A UDAIPUR Phone- 09352420069 Pincode : 313003 Email : info@tempsens.com	Works-1->Mr. S.D Deval B-188A ROAD NO.5 ,M.I.A -UDAIPUR-RAJASTHAN INDIA Phone- 9352501530 FAX : 0294-3057750 Pincode : 313003 Email : deval@tempsens.com	C&I			30-Nov-11	Medium	31-Mar-22	, , ,
167	TEMP. ELEMENT	T115	Thermal Instrument India Pvt. Ltd.	REGULAR	Mr. Raghavendra M. Kulkarni 194/195, Gopi Tank Road Behind Citylight Cinema,Mahim Mumbai Phone- 09322664709 Pincode : 400016 Email : ramk@giconindia.com	Works-1->Mr. Raghavendra M. Kulkarni Survey No. 250A/B, Post-Mangaon,Tal.- Kudal, Dist.-Sindhudurg, --MAHARASHTRA India Phone- 09322664709 FAX : 022-24455026 Pincode : 416519 Email : ramk@giconindia.com	C&I			20-Sep-14			Registered as per 11th MISCC-Electrical and C&I (FY 2014-15) dt. 20.09.2014. , , ,
168	FLOW ELEMENT	T108	TM TECNOMATIC SPA	REGULAR	MR. ANTONIO NOVIELLO/Mrs. Enrica Bazzocc VIA DELLE INDUSTRIE, 36 CREMONA Phone- 39037221574 Pincode : 26100 Email : info@tmtecnomatic.com	Works-1->Mrs. Enrica Bazzocchi VIA DELLE INDUSTRIE, 36, - CREMONA- Italy Phone- 39037221574 FAX : 39037228318 Pincode : 26100 Email : sales@tmtecnomatic.com	C&I			22-Dec-11			, , ,
169	VENTURI METER	T108	TM TECNOMATIC SPA	REGULAR	MR. ANTONIO NOVIELLO/Mrs. Enrica Bazzocc VIA DELLE INDUSTRIE, 36 CREMONA Phone- 39037221574 Pincode : 26100 Email : info@tmtecnomatic.com	Works-1->Mrs. Enrica Bazzocchi VIA DELLE INDUSTRIE, 36, - CREMONA- Italy Phone- 39037221574 FAX : 39037228318 Pincode : 26100 Email : sales@tmtecnomatic.com	C&I			19-Oct-12			AS PER DECISION OF MISCC-ELECT AND C&I HELD ON 19.10.2012 , , ,
170	LEVEL GAUGE	T001	TOSHNIWAL BROTHERS PVT.LTD.	REGULAR	WORKS:TOSHNIWAL IND.PVT.LTD, INDUSTRIAL ESTATE MAKHUPURA, AJMER Phone- 441171 Pincode : 305002 Email : toshniwalprocess@gmail.com		C&I	MAKE:NIVO CONTROLS					, , ,
171	TEMPERATURE SWITCH	T001	TOSHNIWAL BROTHERS PVT.LTD.	REGULAR	WORKS:TOSHNIWAL IND.PVT.LTD, INDUSTRIAL ESTATE MAKHUPURA, AJMER Phone- 441171 Pincode : 305002 Email : toshniwalprocess@gmail.com		C&I						, , ,

172	TEMP. ELEMENT	T111	TOSHNIWAL INDUSTRIES PVT. LTD.,	REGULAR	Industrial Estate, Makhupura, Ajmer, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com,	Works-1-> Khasra No.: 218-230& 235, Industrial Estate,Makhupura, -Ajmer-RAJASTHAN India Phone- 9887865856, FAX : 0145-2695174, Pincode : 305002, Email : rajeev.gupta@tipl.com	C&I			28-May-13	Small	31-Mar-23	GCC Rev.5 has been accepted in toto. , , ,
173	TRANSMITTERS	T111	TOSHNIWAL INDUSTRIES PVT. LTD.,	REGULAR	Industrial Estate, Makhupura, Ajmer, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com,	Works-1-> Khasra No.: 218-230& 235, Industrial Estate,Makhupura, -Ajmer-RAJASTHAN India Phone- 9887865856, FAX : 0145-2695174, Pincode : 305002, Email : rajeev.gupta@tipl.com	C&I			28-May-13	Small	31-Mar-23	GCC Rev.5 has been accepted in toto. , , ,
174	ULTRASONIC FLOW METERS	T111	TOSHNIWAL INDUSTRIES PVT. LTD.,	REGULAR	Industrial Estate, Makhupura, Ajmer, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com,	Works-1->RAJEEV TOSHNIWAL, MD Others INDUSTRIAL ESTATE, MAKHUPURA -AJMER-RAJASTHAN INDIA Phone- FAX : 1456601111 Pincode : 305002 Email : info@tipl.com	C&I			06-Aug-20	Small	31-Mar-23	Registered on 06.08.2020 as per 12th MISCC , , ,
175	LEVEL SWITCH-CAPACITANCE TYPE	V040	V. AUTOMAT & INTRUMENTS (P) LTD.	REGULAR	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-61, OKHLA INDL.AREA,PHASE-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com	C&I			28-Jan-09	Small	31-Mar-23	, , ,
176	LEVEL SWITCH-CONDUTIVITY TYPE	V040	V. AUTOMAT & INTRUMENTS (P) LTD.	REGULAR	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-61, OKHLA INDL.AREA,PHASE-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com	C&I				Small	31-Mar-23	, , ,
177	LEVEL SWITCH-FLOAT TYPE	V040	V. AUTOMAT & INTRUMENTS (P) LTD.	REGULAR	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-61, OKHLA INDL.AREA,PHASE-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com	C&I				Small	31-Mar-23	, , ,
178	SIGHT FLOW INDICATORS	V040	V. AUTOMAT & INTRUMENTS (P) LTD.	REGULAR	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-34, OKHLA INDL.AREA,PHASE-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com	C&I			21-Jan-17	Small	31-Mar-23	, , ,
179	TRANSMITTERS	V040	V. AUTOMAT & INTRUMENTS (P) LTD.	REGULAR	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com	Works-1->Mr. BHAGWAN SINGH/ Mr. NANDAN SINGH F-61, OKHLA INDL.AREA,PHASE-I -NEW DELHI-DELHI INDIA Phone- 011-47627200 Extn. 3 FAX : 011- 26819440 Pincode : 110 020 Email : production@vautomat.com	C&I	a)DISPLACEMENT TYPE TRANSMITTERS . b)PRESSURE AND DP TRANSMITTERS		28-Jan-09	Small	31-Mar-23	Technical limit reviewed on 12.10.2015; , Technical limit reviewed on 30.04.2014 , ,
180	ELECTROMAGNETIC FLOW METER	V212	V.A Valves	REGULAR	Mr.Vishal Jain, Udyog Nagar, Gadaipur, Jalandhar Phone- 9872626376 Pincode : 144004 Email : support@fedrelflowmeters.com	Works-1->Mr.Vishal Jain Dir Udyog Nagar, Gadaipur, -Jalandhar-PUNJAB INDIA Phone- 01812601741,9872626376 FAX : Pincode : 144004 Email : support@fedrelflowmeters.com	C&I			14-Sep-18	Small	31-Mar-23	, , ,
181	INSTRUMENT FITTINGS	V039	VIKAS INDUSTRIAL PRODUCTS	REGULAR	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com	Works-1->S.R.SINGH/ NAVEEN SINGH B - 2, SECTOR - 6, -NOIDA-UTTAR PRADESH INDIA Phone- 0120-4352940 FAX : 0120-4352940 Pincode : 201301 Email : naveensingh@vsnl.com	C&I		Over all financial limit for ordering as Rs.30 lacs (Rs.Thirty Lacs).	14-Feb-12			, Financial limit reviewed on 05.06.2014 , ,
182	INSTRUMENTS PIPE FITTINGS	V039	VIKAS INDUSTRIAL PRODUCTS	REGULAR	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com	Works-1->S.R.SINGH/ NAVEEN SINGH B - 2, SECTOR - 6, -NOIDA-UTTAR PRADESH INDIA Phone- 0120-4352940 FAX : 0120-4352940 Pincode : 201301 Email : naveensingh@vsnl.com	C&I		Over all financial limit for ordering as Rs.30 lacs (Rs.Thirty Lacs).	22-Dec-11			, , ,
183	INSTRUMENTS TUBE FITTINGS	V039	VIKAS INDUSTRIAL PRODUCTS	REGULAR	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com	Works-1->S.R.SINGH/ NAVEEN SINGH B - 2, SECTOR - 6, -NOIDA-UTTAR PRADESH INDIA Phone- 0120-4352940 FAX : 0120-4352940 Pincode : 201301 Email : naveensingh@vsnl.com	C&I		Over all financial limit for ordering as Rs.30 lacs (Rs.Thirty Lacs). The registration category & the financial limit may be reviewed after survey in March 2009 and approval thereof. Registered w.e.f. 22.01.2009.	30-Jul-10			, , ,
184	TRANSMITTERS	Y10	YOKOGAWA INDIA LIMITED,	REGULAR	PLOT NO.96, ELECTRONICS CITY COMPLEX, HOSUR ROAD, BANGALORE, Phone- 080-41586000, Pincode : Email : uday.shankar@in.yokogawa.com,	Works-1-> PLOT NO.96, ELECTRONICS CITY COMPLEX, HOSUR ROAD, -BANGALORE-KARNATAKA INDIA Phone- 080-41586000, FAX : 080-28521442, Pincode : Email : uday.shankar@in.yokogawa.com	C&I			14-Jun-13			Subject to submission of renewed ISO certificate & compliance to GCC; Relevant documents (ISO 9001:2008 and GCC Rev-05) furnished on 18.06.2013. , , ,

ANNEXURE-III

FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES

1.0 PERFORMANCE GUARANTEES

1.1 GENERAL REQUIREMENTS

a) The bidder shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in these specifications.
b) The guaranteed performance parameters furnished by the Bidder in his offer, shall be without any tolerance values and all margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures
c) The Contractor shall conduct performance test and demonstrate all the guarantees covered herein during functional guarantee / acceptance test. The various tests which are to be carried out during performance guarantee/acceptance test are listed in this Sub-section. The guarantee tests shall be conducted by the Contractor at site in presence of Employer on each unit individually.
d) All costs associated with the tests including cost associated with the 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. The performance tests will be performed using only the normal number of Employer supplied operating staff. Contractor, vendor or other subcontractor personnel shall only be used for instructional purposes or data collection. At all times during the Performance Tests the effluents if any as per scope from the Plant shall not exceed the Guaranteed Effluent Limits.
f) The Contractor shall make their system ready for the performance guarantee tests before start of initial operation.
g) All instruments required for performance testing shall be of the type and accuracy required by the ASME PTC code. Prior to the start of the initial operation, the contractor shall get these instruments calibrated in an independent test Institute approved by the Employer. All calibration procedures and standards shall be subjected to the approval of the Employer. 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.
h) 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.

2.0 FUNCTIONAL GUARANTEE

2.1 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 as specified in elsewhere in tender specification. Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 651 or BS 5969 or is 9779. Sound pressure shall be measured all around the equipment at a distance of 1.0m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5m above the floor level in elevation.

3.0 TECHNICAL GUARANTEE:

3.1 SEWAGE TREATMENT OUTLET QUALITY:

Minimum Guarantees to be demonstrated by bidder have been included below. However, in case the guaranteed parameters as per the latest MOEF, State pollution control board norms and Local authority requirement, are more stringent than the specified parameters given below, then more stringent outlet parameters must be followed and guaranteed by bidder.

OUTLET QUALITY (MINIMUM)		
S. No	**Description**	**Value**
a.	BOD_5	Less than 10 mg/l
b.	COD	Less than 50 mg/l
c.	TSS	Less than 10 mg/l
d.	pH	7-8
e.	Coliform count	100 counts/ 100 ml
f.	NH4-N	Less than 5 mg/l
g.	N Total	Less than 10 mg/l
h.	Residual chlorine	Not exceeding 0.5 mg/l
i.	Temperature	Ambient

NOTES: -

The treated sewage quality standards shall be achieved at average sewage flow rates as well as peak sewage flow rates.

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 days by bidder.

Bidder further confirmed that drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. 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 for across the table discussions/ finalizations/ submissions of drawings.

- 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 STP Plant.
  - Equipment Cable tray layout of STP Plant.
  - Civil assignment drawings.
  - Piping lay out drawing of STP 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.
  Hence in line with above, bidder shall provide necessary support with respect to detailed piping drawing, isometric drawing, etc. as and when required during detail engineering.

- 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.

After award of LOI/LOA, following minimum drawing/documents shall be submitted by the bidder for BHEL/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.

For the Drawings/Documents Submission Procedure, please refer following Annexure-A. 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. The number of drawing/documents to be submitted by the bidder shall be as per enclosed Annexure-IV.

Every revised submission incorporating comments shall be resubmitted within 7 days.

BHEL shall provide observation / approval within 15 days from the date of document submission by bidder.

Bidder to note that drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. Engineering meeting shall be held fort nightly, for which the bidder shall depute his concerned engineers along with project manager to PEM office or at customer office without fail.
Bidder to note that drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account.

S. No.	DOCUMENT / DRAWING NO.	DRAWING / DOCUMENT TITLE FOR SEWAGE TREATMENT PLANT	SCHEDULE OF SUBMISSION FROM LOI (IN WEEKS)	SIZE
	MECHANICAL			
1.	PE-V0-475-673-A001	P&ID FOR SEWAGE TREATMENT PLANT*	4	A0
2.	PE-V0-475-673-A002	LAYOUT OF SEWAGE TREATMENT PLANT *	4	A0
3.	PE-V0-475-673-A003	PROCESS DESIGN & SIZING CALCULATIONS, PRESSURE DROP CALCULATIONS FOR STP*	4	A4
4.	PE-V0-475-673-A004	HYDRAULIC FLOW DIAGRAM & CALCULATION*	4	A1 & A4
5.	PE-V0-475-673-A005	THICKNESS CALCULATION OF VESSELS AND TANKS*	4	A4
6.	PE-V0-475-673-A006	SUB VENDOR LIST AND INSPECTION CRITERIA*	6	A4
7.	PE-V0-475-673-A007	CONTROL WRITE UP*	6	A4
8.	PE-V0-475-673-A008	TECHNICAL DATA SHEET AND GA DRG OF HORIZONTAL CENTRIFUGAL PUMPS	8	A4
9.	PE-V0-475-673-A009	TECHNICAL DATA SHEET AND GA DRG OF SUBMERSIBLE PUMPS	8	A4
10.	PE-V0-475-673-A010	TECHNICAL DATA SHEET AND GA DRG OF BLOWERS	8	A4
11.	PE-V0-475-673-A011	CIVIL INPUT DRAWING OF FOUNDATION OF EQUIPMENT INSIDE AND OUTSIDE OF STP AREA	12	A1
12.	PE-V0-475-673-A012	MECHANICAL GA DRG OF RCC SUMPS INSIDE STP AREA	12	A1
13.	PE-V0-475-673-A013	MECHANICAL GA DRG OF RCC SUMPS OUTSIDE STP AREA	12	A1

14.	PE-V0-475-673-A014	PIPING LAYOUT INSIDE STP AREA ALONG WITH DETAILS OF SUPPORTS	16	A1
15.	PE-V0-475-673-A015	YARD PIPING LAYOUT ALONG WITH DETAILS OF SUPPORTS	16	A0
16.	PE-V0-475-673-A016	PG TEST PROCEDURE STP	20	A4
17.	PE-V0-475-673-A017	GA DRAWING OF ATMOSPHERIC TANKS	10	A3
18.	PE-V0-475-673-A018	DATASHEET AND GA DRG OF BALL VALVE	10	A4
19.	PE-V0-415-673-A019	DATASHEET AND GA DRG OF PRV, SRV & NEDDLE VALVE	10	A4
20.	PE-V0-475-673-A020	DATASHEET AND GA DRG OF GATE VALVE	10	A4
21.	PE-V0-475-673-A021	DATASHEET AND GA DRG OF BUTTERFLY VALVE	10	A4
22.	PE-V0-475-673-A022	DATASHEET AND GA DRG OF MULTIPORT VALVE	10	A4
23.	PE-V0-475-673-A023	DATASHEET AND GA DRG OF NRV	10	A4
24.	PE-V0-475-673-A024	VALVE SCHEDULE	10	A4
25.	PE-V0-475-673-A025	PIPING SCHEDULE	10	A4
	ELECTRICAL			
26.	PE-V0-475-673-A101	ELECTRICAL LOAD LIST	8	A4
27.	PE-V0-475-673-A102	DATASHEET OF MOTORS	10	A4
28.	PE-V0-475-673-A103	CABLE TRAY/TRENCH & CONDUIT ROUTING DIAGRAM INCLUDING JB LOCATION OF INSIDE AND OUTSIDE STP	12	A0
29.	PE-V0-475-673-A104	EARTHING LAYOUT OF INSIDE AND OUTSIDE STP	12	A0
	CONTROL & INSTRUMENTATION			
30.	PE-V0-475-673-A201	LIST OF DRIVES, JB GROUPING AND I/O LIST	10	A4
31.	PE-V0-475-673-A202	INSTRUMENT SCHEDULE	10	A4
32.	PE-V0-475-673-A203	DATASHEET OF LOCAL INSTRUMENTS	10	A4
33.	PE-V0-475-673-A204	DATASHEET OF SOLENOID VALVE	10	A4
34.	PE-V0-475-673-A205	DATA SHEET AND GA FOR JUNCTION BOXES	10	A4
35.	PE-V0-475-673-A206	CABLE SCHEDULE AND INTERCONNECTION DIAGRAM	12	A4
36.	PE-V0-475-673-A207	INSTRUMENT INSTALLATION DRAWINGS/ HOOK UP DIAGRAM FOR INSTRUMENTS	12	A4
37.	PE-V0-475-673-A208	DATASHEET & GA DRAWING OF MICROPROCESSOR BASED CONTROL SYSTEM	12	A4
38.	PE-V0-475-673-A209	DATASHEET & GA DRAWING OF LOCAL CONTROL PANEL	12	A4
39.	PE-V0-475-673-A210	ALARM AND ANNUNCIATION LIST	10	A4
	QAP			
40.	PE-V0-475-673-A301	QAP FOR HORIZONTAL CENTRIFUGAL PUMP	9	A4
41.	PE-V0-475-673-A302	QAP FOR BLOWER	9	A4

42.	PE-V0-475-673-A303	QAP FOR ATMOSPHERIC TANK	9	A4
43.	PE-V0-475-673-A304	QAP FOR PRV, SRV & NEDDLE VALVE	9	A4
44.	PE-V0-475-673-A305	QAP FOR GATE VALVE	9	A4
45.	PE-V0-475-673-A306	QAP FOR NRV	9	A4
46.	PE-V0-475-673-A307	QAP FOR MS/ CS PIPES	9	A4
47.	PE-V0-475-673-A308	QAP FOR HDPE PIPE	9	A4
48.	PE-V0-475-673-A309	QAP/ ICL OF STP (FOR BALANCE OF ITEMS)	9	A4
49.	PE-V0-475-673-A310	QAP FOR CPVC PIPES	9	A4
50.	PE-V0-475-673-A311	QAP FOR MOTOR	9	A4
51.	PE-V0-475-673-A312	QAP FOR SUBMERSIBLE PUMP	9	A4
52.	PE-V0-475-673-A313	QAP FOR TREATMENT SKID	9	A4
53.	PE-V0-475-673-A314	QAP FOR BUTTERFLY VALVE	9	A4
54.	PE-V0-475-673-A315	QAP FOR BALL VALVE	9	A4
55.	PE-V0-475-673-A315	QAP FOR MULTIPORT VALVE	9	A4

MANUAL HOIST (CHAIN PULLEY BLOCK):

S. No.	DOCUMENT / DRAWING NO.	DRAWING / DOCUMENT TITLE FOR CHAIN PULLEY BLOCK	SCHEDULE OF SUBMISSION FROM LOI (IN WEEKS)	SIZE
1.	PE-V0-475-673-A400	MANUFACTURING QUALITY PLAN	8	A4
2.	PE-V0-475-673-A401	GA DRAWING FOR CPB WITH DETAIL BOM WITH PAINTING DETAILS	10	A4
3.	PE-V0-475-673-A402	O&M MANUAL INCLUDING ERECTION PROCEDURE	10	A4

'*' Basic engineering documents.

Notes:-

1. The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. While some of the drawings indicated above may not be applicable, some additional drawings may also be required based on scope of work.
2. Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.
3. Only manual calculation with authentic supporting literature (e.g. extracts of hand Book/ standard/codes) shall be acceptable. All design calculations and drawings shall be in SI system only.
4. All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.: -
   a) All drawings and documents shall indicate the list of all reference drawings including general arrangement.
   b) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view; all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.
   c) Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.

d) All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

e) Drawings/ documents to be submitted for purchasers review/ approval shall be under Revision A, B, C… etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0, 1, 2, 3.etc.

f) Drawings and documents not covered above but required to check safety of machines/ system, shall be submitted during detailed engineering stage without any commercial implication.

g) All drawings shall include "B.O.M" and indicate quantity, material of construction, make along with IS/BS No., Technical parameters, dimensions, hardness, machining symbol and tolerance, requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity.

h) All drawings shall be prepared as per BHEL's title block and shall bear BHEL's drawing No.

i) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

j) Bidder to follow the following the drawing submission schedule:

k) 1st submission of drawings from date of LOI as per the submission schedule.

l) Every revised submission incorporating comments – within 7 days.

m) Bidder to submit revised drawings complete in all respects incorporating all comments. 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 for across the table discussions/ finalizations/ submissions of drawings.

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 sewage treatment plant
    - Equipment Cable tray layout for sewage treatment plant
    - Equipment earthing layout sewage treatment plant
    - Civil scope drawings.
    - Piping lay out drawing for sewage treatment plant and yard piping layout.
    - Valve schedule.
    - Instrument schedule.
    - Any Other Dwg/Docs as required.

ANNEXURE-V

FORMAT FOR OPERATION AND MAINTENANCE MANUAL

Bidder to submit operation and Maintenance manual with minimum information as listed in below check list during contract stage.

1. **CHECK LIST FOR OPERATION & MAINTENANCE MANUAL**

2. Project name :
3. Project number :
4. Package Name :
5. PO reference :
6. Document number :
7. Revision number :
8.

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
9.	Cover page				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant/System				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				

4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5. 1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5. 2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5. 3	Do's & Don't of the equipments.				
5. 4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5. 5	Parameters to be monitored with normal values and limiting values				
5. 6	Trouble shooting with causes and remedial measures				
5. 7	Routine operational checks, recommended logs & records				
5. 8	Changeover schedule if more than one auxiliary for the same purpose is given				
5. 9	Painting requirement and schedule				
5. 10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				

6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centers ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	**Statutory and other specific requirements considerations.**				
8.0	**List of reference documents**				
9.0	**Binding as per requirement**				

ANNEXURE-VI

PRE-COMMISSIONING AND COMMISSIONING

PRE-COMMISSIONING ACTIVITIES, COMMISSIONING OF FACILITIES AND INITIAL OPERATIONS

1.00.00 GENERAL

1.01.00 The pre-commissioning and commissioning activities including Guarantee tests, checks and initial operations of the equipment furnished and installed by the Contractor shall be the responsibility of the Contractor as detailed in relevant clauses in Technical Specification. The Contractor shall provide, in addition, test instruments, calibrating devices, etc. and labour required for successful performance of these operations. If it is anticipated that the above test may prolong for a long time, the Contractor's workmen required for the above test shall always be present at Site during such operations.

1.02.00 It shall be the responsibility of the Contractor to provide all necessary temporary instrumentation and other measuring devices required during start-up and initial operation of the equipment systems which are installed by him. The Contractor shall also be responsible for flushing & initial filling of all oils & lubricants required for the equipment furnished and installed by him so as to make such equipment ready for operation. The Contractor shall be responsible for supplying such flushing oil and other lubricants unless otherwise specified elsewhere in these specifications & documents.

1.03.00 The Contractor upon completion of installation of equipments and systems, shall conduct precommissioning and commissioning activities, to make the facilities ready for sustained safe, reliable and efficient operation. All precommissioning/ commissioning activities considered essential for such readiness of the facilities including those mutually agreed and included in the Contractors quality assurance programme as well as those indicated in clauses elsewhere in the technical specifications shall be performed by the Contractor.

2.00.00 TESTING / COMMISSIONING SCHEDULE

The Contractor shall submit to the Employer, his testing/ commissioning schedules for various equipments/ systems covered under the contract, for approval, at least 18 months before the actual commissioning of the equipment/ systems.

The testing/ commissioning schedule is required to be of a standard format in order to maintain consistency of presentation, content and reporting. The list of documents and commissioning checks to be submitted and their content details shall be agreed upon during preaward discussions.

The list of model commissioning documents viz. standard checklists, testing/ commissioning schedules, commissioning tests and checks and the details regarding contents of testing/ commissioning schedule are indicated in this chapter. These schedules are indicative only.

(i) Testing Schedules & Commissioning Schedules.

(ii) Standard Checklist of Items.

(iii) Commissioning Test and checks

(iv) Brief write-up on Contents of Testing Schedule.

(v) Demonstration/Acceptance test procedures during Commissioning/Initial operation

Procedures/ Schedule shall be approved by the Employer.

3.00.00 PRECOMMISSIONING & COMMISSIONING ACTIVITIES

3.01.00 **General**

The pre-commissioning activities including some of the important checks & tests for certain major equipment/ systems (as a minimum) are described below, although it is the Contractor's responsibility to draw up a detailed sequential & systematic list of checks / tests and various activities / procedures connected with pre-commissioning of the complete facilities with all systems, sub-systems and equipment supplied and installed by him and get the same approved by the Employer.

3.02.00 **DEMONSTRATION DURING COMMISSIONING**

The following test shall be demonstrated during commissioning for which the bidder has to furnish the procedure and get the approval of employer.

3.02.01 **Start-up, Loading, Unloading and Shutdown Capabilities (For Turbine Generator)**

(i) **Unit Start Up**

Start-up time (upto full load), and loading capabilities for the Turbine Generator together for cold start conditions (greater than 36 hours shutdown), warm start conditions (between 8 and 36 hours shutdown) and hot start conditions (less than 8 hours shutdown) as indicated by the Contractor in the offer and accepted by the EMPLOYER shall be demonstrated, ensuring that the various turbine operational parameters like vibration, absolute and differential expansion, eccentricity and steam-metal temperature mismatch etc. are within design limits.

(ii) Sudden Total Loss of External Load

On occasions, the steam turbine generator unit may experience sudden total loss of all external load. Under these conditions, the steam turbine generator unit shall not trip but shall continue to be in operation under the control of its speed governor to supply power for the plant auxiliary load with HP-LP bypass in operation while staying within the agreed limits of steam to metal temperature mismatch, exhaust hood temperature, absolute and differential expansion, vibration and eccentricity. The same shall be

demonstrated. Further, the provisions of Part-B, Section-VI, shall also be complied with.

(iii) **Steam Metal Temperature Mismatch Limitation**

The steam-metal temperature differential for cold, warm and hot start up , loading / unloading and shutdown conditions shall be within the permissible limits indicated by the Bidder in the offer and accepted by the Employer.

3.02.02 **Turbine Generator Set Capability**

The steam turbine generator unit shall be capable of delivering at generator terminals the output as indicated by the BIDDER in the heat balances submitted alongwith his bid, under the following conditions.

(a) Maximum continuous output at generator terminals corresponding to both strings of HP heaters out of operation, under rated steam conditions, at a condenser pressure of 89 mm of Hg (Abs) and 3% make up& Aux. Steam requirement tapped from CRH, generating not less than the rated output OR output corresponding to design BMCR heat duty, whichever is less without overstressing turbine components.

(b) Demonstration of minimum ramp rate of 5% per minute above the control load (i.e. 50% MCR).

NOTE: While conducting the tests of (a) above the condenser pressure measurement shall be done at 300mm above the top row of condenser tubes.

3.02.03 **Turbine Auxiliaries**

(i) **H.P./L.P. Bypass Capabilities**

The HP & LP Bypass system should satisfy the following functional requirements under automatic interlock action. It should come into operation automatically under the following conditions :

(a) Generator circuit breaker opening.

(b) HP - IP stop valves closing due to turbine tripping.

(c) Sudden reduction in demand to house load.

Under all these conditions, while passing the required steam flows as per the relevant heat balances, the condenser should be able to swallow the entire steam without increasing the exhaust hood temperature and condenser pressure beyond the maximum permissible value indicated by the BIDDER in his offer and accepted by the EMPLOYER. The same shall be demonstrated.

(ii) **Steam Condensing Plant for main turbine**

(a) Temperature of condensate, at outlet of condenser, shall not be less than saturation temperature corresponding to the condenser pressure at all loads.

(b) Oxygen content in condensate, at hotwell outlet, shall not exceed 0.015 CC per litre over the entire load range and shall be determined according to calorimetric Indigo - Carmine method.

(c) Air leakage in the condenser under full load condition shall not exceed more than 50% of design value taken for sizing the condenser air evacuation system.

(d) When one half of the condenser is isolated, condenser shall be capable of taking at least 60% T.G. load under EMCR conditions.

(e) The capacity of each vacuum pump in free dry air under standard conditions at a condenser pressure of 25.4 mm Hg (abs) and sub cooled to 4.17 deg.C below the temperature corresponding to absolute suction pressure shall not be less than 20 SCFM. Correction curves for establishing the capacity at site conditions shall also be furnished.

(f) The air and vapour mixture from air cooling zone of condenser shall be 4.17 deg.C below the saturation temperature corresponding to 25.4 mm Hg (abs) suction pressure. Correction curves for establishing the same at site conditions shall also be furnished.

(g) Condenser on load tube cleaning system life of sponge rubber balls & Number of balls lost during 1000 hrs of plant operation shall be as indicated by bidder in the offer & accepted by the Employer.

(iii) **Steam Condensing Plant for drive turbine condenser (if envisaged)**

(a) Temperature of condensate, at outlet of condenser, shall not be less than saturation temperature corresponding to the condenser pressure at all loads.

(b) Air leakage in the condenser under full load condition shall not exceed more than 50% of design value taken for sizing the condenser air evacuation system.

(c) The capacity of each vacuum pump in free dry air under standard conditions at a condenser pressure of 25.4 mm Hg (abs) and sub cooled to 4.17 deg.C below the temperature corresponding to absolute suction pressure shall be demonstrated. Correction curves for establishing the capacity at site conditions shall also be furnished.

(d) The air and vapour mixture from air cooling zone of condenser shall be 4.17 deg.C below the saturation temperature corresponding to 25.4 mm Hg (abs) suction pressure. Correction curves for establishing the same at site conditions shall also be furnished.

(iv) **Feed water heaters & Deaerator**

(a) TTD's and DCA's of feed water heaters in line with 660 MW TMCR heat balance shall be demonstrated.

(b) Difference between saturation temperature of steam entering the deaerator and temperature of feed water leaving deaerator.

(c) Dissolved O2 content in Deaerator effluent at deaerator outlet without chemical dosing at all loads, not to exceed 0.005 CC/litre determined as per ASTM-D--5543-09 or Indigo Carmine method.

(vi) **Condensate Extraction Pumps**

(a) Each CEP set shall be capable of delivering flow & total dynamic head corresponding to runout point as specified.

(b) The vibration, noise level and parallel operation of any two of the three pumps shall be demonstrated.

(vii) **Drip Pumps (if envisaged)**

(a) Each drip pump shall be capable of delivering flow & total dynamic head corresponding to design point as specified.

(b) The vibration and noise level shall be demonstrated.

(viii) **Boiler feed pumps**

(a) Each boiler feed pump set shall be capable to deliver flow and total dynamic head corresponding to runout point as specified elsewhere.

(b) The vibration, noise level and parallel operation of any two of the three pumps shall be demonstrated as per specification requirements.

(c) Cold start up / hot start up of the unit using TDBFP with motive steam from auxiliary steam header.

3.02.04 **Balance Pumps, Blowers, Fans, Compressors and rotating equipment.**

a) The vibration, noise level and parallel operation, wherever applicable, of the pumps, blowers, fans, compressors and rotating equipment shall be demonstrated.

b) Pumps, blowers, fans, compressors and rotating equipment shall be capable of delivering flow and head corresponding to design point as specified.

3.02.05 **Pre-commissioning & Commissioning activities requiring approval of the employer:**

(a) Hydraulic Test for STG integral piping, heat exchangers, condenser tubes & condenser, equipment cooling water system pipes and associated equipment etc. shall be done. The hydraulic test of other piping system as per statutory requirement and specified elsewhere shall also be carried out. All equipment needed for the tests shall be furnished by the Contractor.

(b) Oil flushing of lube oil system, control & jacking oil system, etc. for turbines shall be done. Entire flushing oil requirement & refilling with fresh oil and other consumables along with flushing equipment shall be met by the Contractor.

(c) High Pressure/Low Pressure (HP/LP) bypass tests, vacuum tightness test as per approved procedures shall be done by the Contractor after arranging & lining up of all the necessary equipment by him.

(d) Steam blowing & chemical cleaning, as applicable of integral piping of the turbo-generator, Low pressure piping, Power cycle piping & other piping in the scope of the Contractor shall be done by the Contractor.

(e) Steam blowing & chemical cleaning, as applicable of integral piping of CEP sets & other piping in the scope of the Contractor shall be done by the Contractor.

(f) All tests and activities pertaining to the CEP and its drive as per manufacturer's recommendations and as given in the chapter and covered in the specification.

(g) Steam blowing & chemical cleaning, as applicable of integral piping of Drip Pump sets & other piping (if applicable) in the scope of the Contractor shall be done by the Contractor.

(h) All tests and activities pertaining to the Drip Pump and its drive (if applicable) as per manufacturer's recommendations and as given in the chapter and covered in the specification.

(i) Steam blowing & chemical cleaning, as applicable of integral piping of the Heaters & other components in the scope of the Contractor shall be done by the Contractor.

(j) All tests and activities pertaining to the Heater as per manufacturer's recommendations and as given in the chapter and covered in the specification.

(k) Oil flushing of lube oil system, control & jacking oil system, for BFP sets shall be done. Entire flushing oil requirement & refilling with fresh oil and other consumables alongwith flushing equipment shall be met by the Contractor.

(l) Steam blowing & chemical cleaning, as applicable of integral piping of BFP sets & other piping in the scope of the Contractor shall be done by the Contractor.

(m) All tests and activities pertaining to the BFP and its drive as per manufacturer's recommendations and as given in the chapter and covered in the specification.

(n) Hydraulic Test for all low and high pressure piping, equipment cooling water system pipes and associated equipment etc. shall be done as per statutory requirement and specified elsewhere shall be carried out. All equipment needed for the tests shall be furnished by the Contractor.

(o) All tests and activities pertaining to the Generator and Excitation as per manufacturer's recommendations and covered in the specification.

(p) All tests and activities pertaining to the Generator Auxiliaries viz Primary water system, Seal oil system, Gas system etc., as per manufacturer's recommendations and covered in the specification.

(q) Any other pre-commissioning checks/ tests and activities as described below and also those mutually agreed between the Contractor & the Employer shall be undertaken .

CONTROL & INSTRUMENTATION SYSTEM REQUIREMENTS

3.02.07 For STG integral controls the following requirement shall be demonstrated through native HMI of the respective DDCMIS..

3.02.08 The offered control system shall meet the requirement of initial pressure at turbine inlet as per the requirement of IEC-45-1 or equivalent as defined under mechanical sections of the specification. In order to realize the stipulated process requirement of TG systems that will be realized by interaction with employer procured control system Bidder will provide all required data and necessary interfaces so that Integrated Plant operation and control can be seamlessly realized by the employer.

3.02.09 The offered control system shall meet the process requirements specified under Sub Section OPERATING CAPABILITY OF THE PLANT, Part-B of Technical Specifications

3.02.10 Further the Contractor DDCMIS and Employer's SG C&I part of DDCMIS shall be properly integrated to achieve total plant operation. All required interfacing requirements shall be provided by the Contractor for enabling this integration of the total plant C&I and achieving the performance requirements. Tests in this regard shall be carried out at site by the Employer to verify the integrated performance of the total plant C&I. In case during these tests or otherwise it is observed that the behaviour/response of Contractor's system (drives actuators/valves etc.) is not satisfactory/acts as a limitation/restriction in achieving the permissible limits, the

	Contractor shall carry out all required modifications, rectification etc. in his systems without any price repercussions whatsoever so that the permissible limits can be achieved. Contractor shall depute his experts for associating in the above tests and also for carrying out the necessary modifications, rectification etc. in Contractor's equipment and Control systems.
3.02.11	In case the Contractor feels that some specific requirements are to be met by the SG C&I contractors, then the same has to be clearly brought out in the offer. (For example the loop reaction time is specified as 500 millisec. in SG C&I specification).
3.02.12	Contractor shall meet system performance and parametric requirement follows -
3.02.13	On the bidder's supplied DDCMIS system ,the following parametric tests shall also be conducted under worst case loading conditions (details of worst case loading shall be as agreed during detailed engineering.) (i) For control system - CPU loading, Cycle time/controller reaction time (ii) For MMIPIS - CPU loading, spare duty cycle, Memory Spare Capacity (if applicable as per standard practice of bidder) (iii) Spare duty cycle for system bus (if applicable as per standard practice of bidder) (iv) Various display response time (v) System accuracy (vi) Display update time
3.02.14	For the parametric test, the following requirements shall be met (i) **Processor Spare Duty Cycle (Free Time)** - Under worst case loading of MMIPIS and system bus each MMIPIS processor shall have 40% free time when measured over any two second period and 50% free time when measured over any one minute period. (if applicable as per standard practice of bidder) - Under worst case loading conditions of control system, control system processor shall have 20% free time when measured over any one minute period.

- The Bidder shall furnish all necessary data to fully satisfy the Employer that the processor spare duty cycle figures quoted by the Bidder are realistic and based on configuration and computation capability of the offered system and these shall be actually achieved in the fully implemented system as commissioned at project site.

(ii) **System Bus Spare Duty Cycle (Free Time)**

The system bus shall have min. 50% free time during the worst case loading conditions of control system, MMIPIS and the system Bus, measured over any 2 seconds interval. (if applicable as per standard practice of bidder)

(iii) **Response Time**

(a) Display:

The time from mouse click or last button pressed to the commencement of the requested display under the worst case loading conditions shall not be worse than the following:

All control related displays	2 sec
Point Details Display(single point)	1-2 secs
Bar chart display (20 points, current data)	2-3 secs.
Operator guide/plant start-up guide message display (full screen of alphanumeric information and a maximum of ten numbers of dynamic data items)	1-2 secs.
Plant mimic display of fair complexity with a minimum of 120 numbers of dynamic data items e.g., values, macros, line segment, etc.	2-3 secs.
Group review display (current values of twenty points)	2-3 secs.
X-Y plot display (2 X-Y- plots and a single display requiring both historical as well as current data)	3-4 secs.
X-T plot display (Trend of 6 analog points and a single display requiring both historical as well as current data)	3-4 secs.
Plant Summary display (e.g., bad point summary, limit check removed point summary. Assume the whole data base search is required and the summary display contains ten points only).	3-4 secs.

(b) Command:

The response time for screen update, after the execution of the control command, from the time the command is issued (for example command to start a motor to the time the screen is updated) shall be within two seconds (excluding the drive actuation time).

(iv) **System Accuracy Requirements**

The overall system accuracy from signal input terminals to output presentation on display and printers shall meet process requirement as agreed during detailed engineering.

(v) **Display Updated Rates**

All displays shall be updated at least every two seconds.

3.03.00 LIST OF TEST / ACTIVITIES TO BE PERFORMED ON TG & AUXILIARY (BUT NOT LIMITED TO THE FOLLOWING)

A) **TESTING SCHEDULES**

1. TURBINE ON BARRING GEAR
2. BEARING AND JACKING OIL INITIAL CIRCULATION
3. HP BYPASS SYSTEM
4. LP BYPASS SYSTEM
5. GOVERNOR OIL CONTROL SYSTEM
6. VACUUM RAISING PLANT
7. CONDENSER & COLTCS SYSTEM
8. CENTRAL OIL PURIFICATION PLANT
9. HYDRAULIC TEST PROCEUDRE FOR
   - A) LUB OIL SYSTEM
   - B) CONTROL OIL & JACKING OIL SYSTEM
   - C) GENERATOR SEAL OIL SYSTEM
   - D) GENERATOR STATOR WATER SYSTEM

E) GENERATOR GAS SYSTEM (Alternatively, pneumatic test with suitable leak detection method shall also be acceptable subject to owner's approval)

F) HEATERS

10. OIL FLUSHING OF LUB OIL SYSTEM

11. OIL FLUSHING OF CONTROL & JACKING OIL SYSTEM

12. OIL FLUSHING OF GENERATOR SEAL OIL SYSTEM

13. ALKALI FLUSHING FOR CONDENSATE SYSTEM

14. HP/ LP BYPASS SYSTEM

15. CONDENSER FLOOD TEST

16. CONDENSER VACUUM TIGHTNESS TEST

17. STEAM BLOWING OF GLAND SEAL PIPE LINES, AUX. STEAM PIPELINE

18. CEP

19. Drip Pump (if applicable)

20. HEATER

21. DEAERATOR

22. BFP

23. BEARING AND JACKING OIL INITIAL CIRCULATION

24. GOVERNOR OIL CONTROL SYSTEM

25. HYDRAULIC TEST PROCEDURE FOR

A) LUB OIL SYSTEM

B) CONTROL OIL & JACKING OIL SYSTEM

C) WATER SYSTEM

D) HEAT EXCHANGERS

26. OIL FLUSHING OF LUB OIL SYSTEM

27. OIL FLUSHING OF CONTROL & JACKING OIL SYSTEM

28. STEAM BLOWING OF GLAND SEAL PIPE LINES, AUX. STEAM PIPELINE

29 HT MOTORS

B) COMMISSIONING SCHEDULE

1. Turbine Gland sealing system for Main Turbine
2. HP-LP Bypass system
3. Turbine Initial Run up for Main Turbine
4. Lube Oil / Governing Oil System for Main Turbine
5. LP HEATERS
6. HP HEATERS
7. DEAERATOR STEAM OPERATION
8. Turbine Gland sealing system for BFP turbine
9. Turbine Initial Run up for BFP turbine
10. Lube Oil / Governing Oil System for BFP turbine
11. Generator and excitation system
12. Generator seal oil system
13. Generator stator water system
14. Generator gas system

C) COMMISSIONING TESTS/CHECKS

1. Test running of all pumps
2. Condenser vacuum test, feed water heater operational tests for establishing correct cascaded flow, heater water levels etc. & checking of all parameters as per approved heat balance diagrams.
3. Test for HP/LP bypass valves operation & their control system.
4. Test for operation of governing control system for turbines.
5. Standard commissioning tests and procedures as per Contractor's practice for steam turbine generator and other equipment / auxiliaries within the Contractor's scope of work.

6. Checks on operation of all individual control loops in the turbine generator control system.

7. Checks on correct functioning of the Turbine Protection System (TPS), Turbine Supervisory Control System (TSCS) for main turbine, Automatic Turbine Run-up System (ATRS), Automatic Testing of Turbine (ATT).

8. Standard commissioning tests and procedures as per Contractor's practice for CEP and other equipment / auxiliaries within the Contractor's scope of work.

9. Checks on operation of all individual control loops in the CEP control system.

10. Standard commissioning tests and procedures as per Contractor's practice for Drip Pump (if applicable) and other equipment / auxiliaries within the Contractor's scope of work.

11. Checks on operation of all individual control loops in the Drip Pump control (if applicable) system.

12. Feed Water Heater operational test for establishing correct cascaded flow, heater water levels and checking of all parameters as per approved heat balance diagram

13. Standard commissioning tests and procedures as per Contractor's practice for heaters and deaerator and other equipment / auxiliaries within the Contractor's scope of work.

14. Checks on operation of all individual control loops in the heater and deaerator control system.

15. Test for operation of governing control system for BFP turbines.

16. Standard commissioning tests and procedures as per Contractor's practice for BFP and other equipment / auxiliaries within the Contractor's scope of work.

17. Checks on operation of all individual control loops in the BFP control system.

18. Checks on correct functioning of the BFP Turbine for Turbine Protection System (TPS), Turbine Supervisory Control System (TSCS) for main turbine, Automatic Turbine Run-up System (ATRS), Automatic Testing of Turbine (ATT).

19. Calibration tests of orifice, flow nozzles, instruments and control equipment to the extent included in these specifications.

20. Checks on operation of all rotating equipments to ascertain level of noise and vibration

21. Checks on operation of all static equipments to ascertain level of noise and vibration

22. Standard commissioning tests and procedures as per manufacturer's practice for Generator, Excitation and its auxiliaries within the Contractor's scope of work.

3.04.00 Chemical Cleaning of Pressure Parts

Complete chemical cleaning procedure, the scheme and layout including parameters of the pumps, size of tanks, materials of construction, the rate of consumption and total requirements of steam and water for such cleaning process shall meet the approval of the Employer.

The Contractor shall furnish all labour, materials such as the required chemicals and other consumables, all equipment such as acid transfer and acid circulating pumps complete with drive motors, acid storage and acid mixing tanks, all temporary piping, valves and specialities and local instruments for pressure, temperature and flow measurements and any other items needed to carry out the process. All equipment required for chemical cleaning shall be supplied by the contractor.

The Employer will arrange to supply Raw water and Demineralised water required for the cleaning operations at the Terminal Point's as indicated elsewhere, in the specification.

The Contractor shall take care to dispose off the used chemicals and the effluents from the cleaning operations, after neutralisation, meeting all the statutory regulations and in a manner acceptable to the Project Manager and which would comply with the norms of the State Pollution Control Board. This include construction of suitable neutralization pit, channels, disposal equipments etc.

The Contractor shall specifically make all necessary arrangements for prevention of any fire accidents, explosions etc. during the performance of the chemical cleaning operations.

The Contractor shall ensure that during the cleaning process the procedure adopted shall be such as to consume minimum demineralized water.

All equipment needed for such preservation including the nitrogen cylinders, interconnecting piping and any regulating equipment for N2 cap and other preservatives shall be provided by the Contractor and the same shall also become the property of the Employer after completion of the chemical cleaning.

The Contractor shall provide adequate safety and protective equipment for all his employees and ensure that they are worn at all times of danger. Specialised treatment equipment (such as required for first aid when using hydrofluoric acid) must be provided at the place of handling acid. An acid cleaning report and log of each cleaning must be provided by the Contractor to the Employer, immediately after the cleaning operation.

3.05.00

Steam Blowing

Steam blowing of various pipelines shall be carried out by the Contractor as per requirements/scope of work of this specification. In addition if any other piping, not specifically mentioned in the scope of the Contractor and is also required to be steam blown, the Contractor shall also to perform steam blowing of these additional piping during steam blowing operation.

The Contractor shall give recommended procedures, method of blowing and scheme for steam blowing indicating clearly additional system, if any, to be cleaned by steam blowing and furnish data/ write-up/ layouts/ drawings to that effect to the Employer for the Employer's approval.

The Contractor shall furnish his recommendations regarding use of various test equipments and instruments and termination/acceptance criteria for steam blowing, which in any case shall meet the steam turbine-generator requirements.

The systems which should be ready and operational before steam blowing and are in the scope of the Contractor shall be made ready/operational by the Contractor by the scheduled date for starting of steam blowing.

For equipments/components installed on high pressure boiler external piping, such as various thermowells, flow meter, control valves, HP/LP Bypass valves etc., the Contractor shall comply with guidelines to be followed during steam blowing, with respect to removal / blanking / replacement of such items their internals etc. by spool pieces as given by the respective manufacturer/sub-contractor.

Supply of all such spools (as above) and/or blanks, temporary piping and supports etc. as required, cutting / welding / edge preparation and rewelding required for blanking, temporary piping connection and/or for replacements by spool pieces shall be the responsibility of the Contractor. After steam blowing removal of spool pieces & temporary piping and reinstallation of various components, shall also be the responsibility of the Contractor.

The Contractor shall ensure successful and timely completion of steam blowing of all systems and will render all help/services as required including:

(i) Services of test/operating personnel/supervisors.

(ii) Extending all cooperation during erection, pre-commissioning of plant and equipment to be made ready and operational before starting steam blowing.

(iii) Extending all cooperation for interface engineering of equipments/components of temporary system required for steam blowing operation.

(iv) Contractor's engineers shall be available for all coordination meetings arranged by the Employer for finalising the details of temporary system for steam blowing.

3.06.00	**Balance of Plant equipment & systems** All pre-commissioning tests & activities as indicated above and elsewhere in the technical specification shall be performed by the Contractor.
3.07.00	**Commissioning of Facilities**
3.07.01	**General** Upon completion of precommissioning activities/test the Contractor shall initiate commissioning of facilities. During commissioning the Contractor shall carryout system checking and reliability trials on various parts of the facilities. Contractor shall carry out these checks/tests at site to prove to the Employer that each equipment of the supply complies with requirements stipulated and is installed in accordance with requirements specified. Before the plant is put into initial operation the Contractor shall be required to conduct test to demonstrate to the Employer that each item of the plant is capable of correctly performing the functions for which it was specified and its performance, parameters etc. are as per the specified/approved values. These tests may be conducted concurrently with those required under commissioning sequence. The Contractor shall finalise the protocol of check lists, after erection of the system and equipment, as per International Codes/Standard with the Employer. The Contractor shall furnish requisite no. of copies of procedures and list of start up, precommissioning, commissioning and initial operation tests for Employer's approval. The Contractor shall also demonstrate the performance of all C&I equipment, the tests on main equipment or prior to that as the case may be. Other tests shall be conducted, if required by the Employer, to establish that the plant equipments are in accordance with requirements of the specifications.
4.00.00	**Initial Operation** Upon completion of system checking/tests and as a part of commissioning of facilities, complete plant/facilities shall be put on initial operation for a period of thirty (30) days or 720 hours as stipulated in General Technical Requirements.
5.00.00	The Contractor shall conduct all the commissioning tests and undertake commissioning activities pertaining to all other auxiliaries and equipments including all Electrical & C&I equipment/systems not specifically brought out above but are within the scope of work and facilities being supplied & installed by the Contractor and follow the guidelines indicated above or elsewhere in these technical specifications (Section-VI).

6.00.00	**COMMISSIONING SPARES**
6.01.00	It will be the responsibility of the Contractor to provide all commissioning spares including consumable spares required for initial operation till the Completion of Facilities. The Contractor shall furnish a list of all commission-ing spares within 60 days from the date of Notification of Award and such list shall be reviewed by the Employer and mutually agreed to. However. such review and agreement will not absolve the Contractor of his responsibilities to supply all commissioning spares so that initial operation do not suffer for want of commissioning spares. All commissioning spares shall be deemed to be included in the scope of the Contract at no extra cost to the Employer.
6.02.00	These spare will be received and stored by the Contractor atleast 3 months prior to the schedule date of commencement of initial operation of the respective equipment and utilised as and when required. The unutilised spares and replaced parts, if any, at the end of successful completion of guarantee tests shall be the property of the Contractor and he will be allowed to take these parts back at his own cost with the permission of Employer.

ANNEXURE-VII

SURFACE PREPARATION & PAINTING

SUB–SECTION – A-7

SURFACE PREPARATION & PAINTING

1.00.00	**Specification of surface preparation & painting**
1.01.00	Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.
1.02.00	All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labeled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.
1.03.00	Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.
1.04.00	All pipelines shall be Colour coded for identification as per the NTPC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.
1.05.0	**SURFACE PREPARATION**
1.05.01	All surfaces to be painted shall be thoroughly cleaned of oil, grease and other foreign matter. Surfaces shall be free of moisture and contamination from chemicals and solvents.
1.05.02	The following surface schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer.

SP1	Solvent cleaning
SP2	Application of rust converter (Ruskil or equivalent grade)
SP3	Power tool cleaning
SP4	Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)
SP4*	Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns
SP5	Phospating
SP6	Emery sheet cleaning/Manual wire brush cleaning.

1.06.00	**APPLICATION OF PRIMER/PAINT**
1.06.01	The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.
1.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.
1.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.
1.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.

1.06.05 Following are the Primer/painting schemes envisaged herein:

PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104.

PS3* - Zinc Chrome primer (Alkyd base) by dip coat.

PS4 - Synthetic Enamel (long oil alkyd) to IS2932.

PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744

PS9 - Aluminium paint to IS 2339.

PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC)

PS13 - Rust preventive fluid by spray, dip or brush.

PS14 - Weldable primer-Deoxaluminate or equivalent.

PS16 - High Build Epoxy CDC mastic `15'.

PS17 - Aliphatic Acrylic Polyurethane CDE134 ,%V=40.0(min.)

PS18 - Epoxy based TiO2 pigmented coat

PS19 - Epoxy based Zinc phosphate primer (92% zinc in dry film (min.), %VS=35.0(min.).

PS-20 - Epoxy based finish paint

1.06.06 All weld edge preparation for site welding shall be applied with one coat of wieldable primer.

1.06.07 For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.

1.06.08 Primer/Painting Schedule

Sl. No	Description		Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
				Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping														As per NTPC Colour shade/ coding scheme
1.	All insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.		SP3/SP4	PS 9*	1	20	-	-	-	PS9*	1	20	40	
2.	All un -insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.	Design temperature < or equal to 60^{0}C	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3 $	35 $	155 $	
		Design temperature above 60 ^{0}C-200^{0}C	SP3/SP4	PS 9*	1	20	-	-	-	PS9*	1	20	40	
		Design temperature > 200^{0}C	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH), Variable Load Hanger (VLH).		SP4*	PS19	1	40	-	-	-	PS17	1	30	70	
4.	Piping hangers/ supports (other than (3) above. (un-insulated)		SP3/SP5	PS 5	2	25	-	-	-	PS4	2	25	100	
5.	Valves													

	Cast/Forged	Design temperature < or equal to 60 degC #	SP3/SP5	PS 5	2	35	-	-	-	PS4	2	25	120	
		Design temperature above 60 degC	SP3/SP5	PS 9*	1	20	-	-	-	PS9*	1	20	40	
6.	All auxiliary Structural Steel components for pipe supports	Outside TG building and in SG envelope	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a))Epoxy coat b)Final coat of paint PS17	2 1	35 30	250	
		Within TG building	SP4*	-do-	1	35	PS18	1	35	a))Epoxy coat b)Final coat of paint PS17	2 1	25 30	150	
7.	Weld Edges		SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25	

1. $ The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3rd finish coat (min.DFT 35 Microns) shall be applied at site. 2. For valves below 65NB and temperature upto and including 540 Deg.C, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint. 3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable. 4. For spring cages, 2 coats of 30 µm(min) zinc-rich epoxy resin primer with zinc content> 80 weight% in dry film followed by 2 coats of 30 µm(min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme. 5. For corrosion protection for all inner parts of the hangers shall be atleast in full compliance to Corrosion category C3 as per EN ISO12944. 6. # - For Cast/forged valves upto & including design temperature 60Deg.C, Aluminium painting as per IS-13183 Gr-3 or better with total DFT 40Micron is also acceptable.												
B) LOW PRESSURE PIPING													
		Surface Preparation	**Type of Primer**	**No. of Coats**	**Min. DFT / coat (Microns)**	**Type of coating**	**No. Coats**	**Min. DFT/ Coat (Microns)**	**Type of coating**	**No. Coats**	**Min. DFT/ Coat (Microns)**	**Min. Total DFT (Microns)**	
1	All Piping, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/ PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Colour shade/ coding scheme
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											

ANNEXURE-VIII

SITE STORAGE & PRESERVATIONS

SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHNANICAL BOPs

(Doc No: PE-DC-SSG-A001 REV.00)

PROJECT ENGINEERING MANAGEMENT, POWER SECTOR

BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. ‘No smoking’ signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.

11. Following preservatives/preservation methods can be used depending upon type of equipment

    a. Rust preventive fluid (RPF)

    b. Rust protective paints

    c. Tarpaulin covers, in case of outdoor storage

    d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –

    - Ingress of moisture and corrosion damages.
    - Damage to protective coating.
    - Open ends in pipes, vessels and equipment -
        - In case any open ends are noticed, same shall be capped.

2. Any damages to equipment / materials.

    - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
    - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere**. (C)

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.

ii **Semi-closed storage**. (S)

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.

iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.

The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H_2SO_4)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self-life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self-life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	**Description of the equipment**	**Type of Storage**	**Check for**	**Remarks**
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

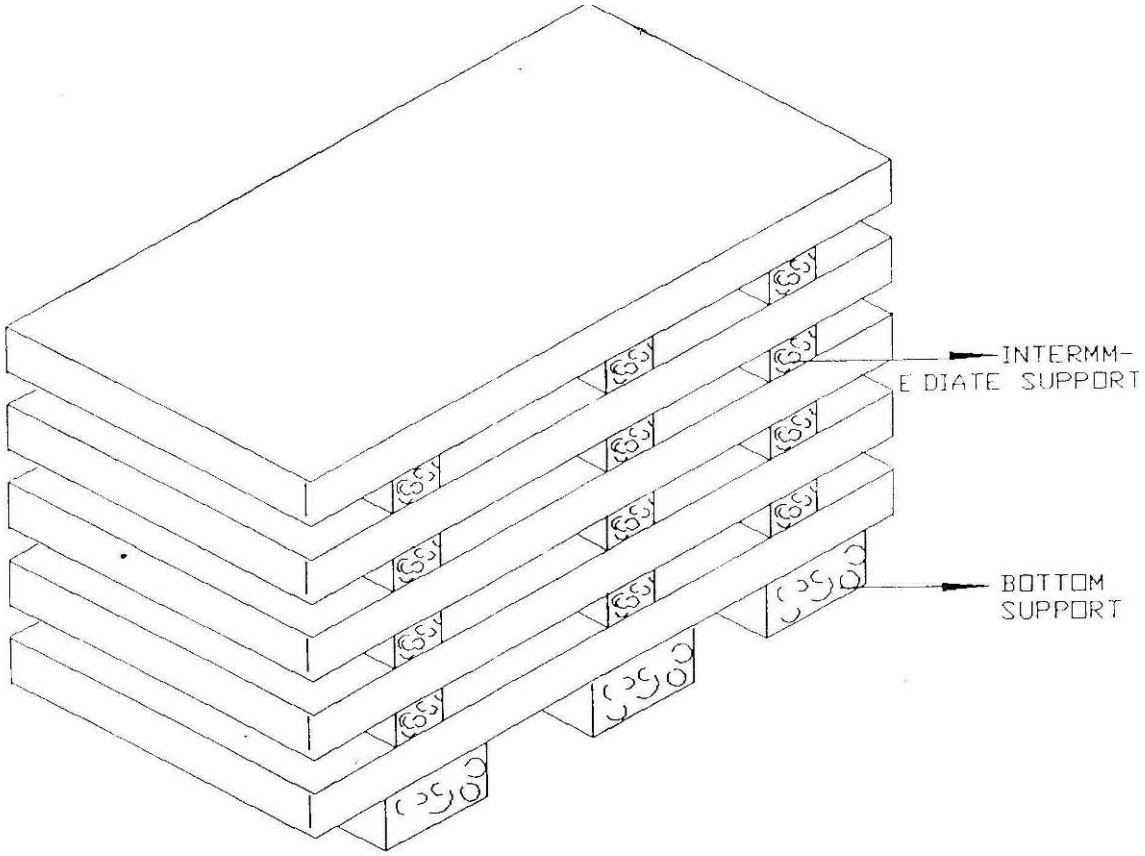

Figure – 1 – PLATE STACKING ARRANGEMENT

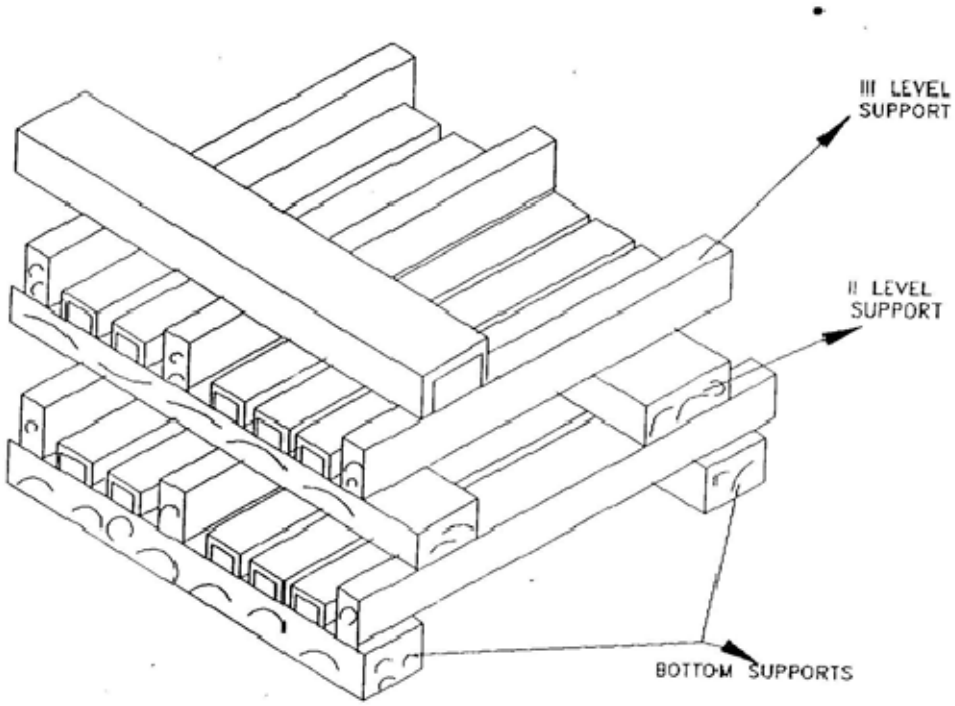

Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT

ANNEXURE-IX

SEWAGE WATER ANALYSIS

INLET SEWAGE WATER ANALYSIS

INFLUENT QUALITY (MINIMUM)			
S. No	**Description**	**Unit**	**Value**
a.	BOD_5	mg/ l	300
b.	COD	mg/ l	600
c.	TSS	mg/ l	200
d.	pH		6.5 – 8
e.	Temperature		Ambient
f.	Oil & Grease	mg/l	20

Bidder to note that above influent sewage parameters are bare minimum. In addition to the above, bidder should consider additional influent parameters while designing of complete sewage treatment plant as per proven practice and guidelines issued by MOEF/ State pollution control board/ local authorities etc.

ANNEXURE-X

GENERAL TECHNICAL REQUIREMENT

PART – C

GENERAL TECHNICAL REQUIREMENT (GTR)

PART - C

CONTENTS

GENERAL TECHNICAL REQUIREMENTS

1.00.00 **INTRODUCTION**

This part covers technical requirements which will form an integral part of the Contract. The following provisions shall supplement all the detailed technical requirements brought out in Section-VI, the Technical Specification and the Technical Data Sheets.

2.00.00 **BRAND NAME**

Whenever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific item mentioned shall be understood to be indicative of the function and quality desired, and not restrictive, other manufacturer's products may be considered provided sufficient information is furnished to enable the Employer to determine that the products proposed are equivalent to those named.

3.00.00 **BASE OFFER & ALTERNATE PROPOSALS**

The Bidder's proposal shall be based upon the use of equipment and material complying fully with the requirements specified herein. It is recognized that the Contractor may have standardized on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered, provided the base offer is in line with technical specifications and such proposals meet the specified design standards and performance requirement and are acceptable to the Employer. Sufficient amount of information for justifying such proposals shall be furnished to Employer along with the bid to enable the Employer to determine the acceptability of these proposals.

4.00.00 **COMPLETENESS OF FACILITIES**

4.01.00 Bidders may note that this is a contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure that a completely engineered plant is provided.

4.02.00 All equipments furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation of the equipment and for the safety of the operating personnel, as required by applicable

codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions.

All same standard components/ parts of same equipment provided, shall be interchangeable with one another.

4.03.00 For the C&I systems, the Contractor shall be required to provide regular information about future upgrades and migration paths to the Employer.

5.00.00 **CODES & STANDARDS**

5.01.00 In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India, as well as of the locality where they will be installed, including the following:

(a.) Indian electricity act

(b.) Indian electricity rules

(c.) Indian Explosives Act

(d.) Indian Factories Act and State Factories Act

(e) Indian Boiler Regulations (IBR)

(f.) Regulations of the Central Pollution Control Board, India

(g.) Regulations of the Ministry of Environment & Forest (MoEF), Government of India

(h) Pollution Control Regulations of Department of Environment, Government of India

(i.) State Pollution Control Board.

(j.) Rules for Electrical installation by Tariff Advisory Committee (TAC).

(k.) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996

	(l.) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998
	(m.) Explosive Rules, 1983
	(n.) Petroleum Act, 1984
	(o.) Petroleum Rules, 1976,
	(p.) Gas Cylinder Rules, 1981
	(q.) Static and Mobile Pressure Vessels (Unified) Rules, 1981
	(r.) Workmen's Compensation Act, 1923
	(s.) Workmen's Compensation Rules, 1924
	(t.) NTPC Safety Rules for Construction and Erection
	(u.) NTPC Safety Policy
	(v.) Any other statutory codes / standards / regulations, as may be applicable.
5.02.00	Unless covered otherwise in the specifications, the latest editions (as applicable as on date of bid opening), of the codes and standards given below shall also apply:
	(a) Bureau of Indian Standards (BIS)
	(b.) Japanese Industrial Standards (JIS)
	(c.) American National Standards Institute (ANSI)
	(d.) American Society of Testing and Materials (ASTM)
	(e.) American Society of Mechanical Engineers (ASME)
	(f.) American Petroleum Institute (API) (g.) Standards of the Hydraulic Institute, U.S.A.
	(h.) International Organisation for Standardization (ISO)
	(i.) Tubular Exchanger Manufacturer's Association (TEMA)

	(j.) American Welding Society (AWS) (k.) National Electrical Manufacturers Association (NEMA) (l.) National Fire Protection Association (NFPA) (m.) International Electro-Technical Commission (IEC)/European Norm (EN) (n.) Expansion Joint Manufacturers Association (EJMA) (o.) Heat Exchange Institute (HEI) p) IEEE standard q) JEC standard
5.03.00	Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned else where in the specification together with the complete word to word translation of the standard that is normally not published in English.
5.04.00	As regards highly standardized equipments such as Steam Turbine and Generator, National /International standards such as JIS, DIN, VDI, ISO, SEL, SEW, VDE, IEC & VGB shall also be considered as far as applicable for Design, Manufacturing and Testing of the respective equipment. However, for those of the above equipment not covered by these National / International standards, established and proven standards of manufacturers shall also be considered.
5.05.00	In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, the requirement of Technical Specification shall govern.
5.06.00	Two (2) English language copies of all-national and international codes and/or standards used in the design of the plant, equipment, and structural works shall be provided by the Contractor to the Employer within two calendar months from the date of the Notification of Award.
5.07.00	In case of any change in codes, standards & regulations between the date of bid opening and the date when vendors proceed with fabrication, the Employer shall

have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect.

6.00.00 **EQUIPMENT FUNCTIONAL GUARANTEE**

6.01.00 The functional guarantees of the equipment under the scope of the Contract is given in Section-VI Part - A & B of technical specification .These guarantees shall supplement the general functional guarantee provisions covered under General Conditions of Contract.

6.02.00 Liquidated damages for shortfall in meeting functional guarantee(s) during the performance and guarantee tests shall be assessed and recovered from the Contractor as specified elsewhere in this specification.

7.00.00 **DESIGN OF FACILITIES/ MAINTENANCE & AVAILABILITY CONSIDERATIONS**

7.01.00 **Design of Facilities**

All the design procedures, systems and components proposed shall have already been adequately developed and shall have demonstrated good reliability under similar conditions elsewhere.

The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best co-ordinated performance of the entire system. The basic requirements are detailed out in various clauses of the Technical Specifications. The design of various components, assemblies and subassemblies shall be done so that it facilitates easy field assembly and dismantling. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical or close to the operating range of the unit.

7.02.00 **Maintenance and Availability Considerations**

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

Bidder shall state in his offer the various maintenance intervals, spare parts and man-hour requirement during such operation. The intervals for each type of maintenance namely inspection of the turbine and equipments, inspection of the

steam path and the minor and major overhauls shall be specified in terms of running hours, clearly defining the spare parts and manhour requirement for each stage.

Lifting devices i.e. hoists and chain pulley jacks, etc. shall be provided by the contractor for handling of any equipment or any of its part having weight in excess of 500 Kgs during erection and maintenance activities.

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

8.00.00 **DOCUMENTS, DATA AND DRAWINGS TO BE FURNISHED BY CONTRACTOR**

8.01.00 Bidders may note that this is a contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant and equipment shall be fully integrated, engineered and designed to perform in accordance with the technical specification. All engineering and technical services required to ensure a completely engineered plant shall be provided in respect of mechanical, electrical, control & instrumentation, civil & structural works as per the scope.

Each main and auxiliary equipment/item of the plant including instruments shall be assigned a unique tag number. The assignment of tag numbers shall be in accordance with KKS system. In all drawings/documents/data sheet etc. KKS tag number of the equipment/item/instrument etc. shall be indicated.

The Contractor shall furnish engineering data/drawings. in accordance with the schedule of information as specified in Technical Specification and Technical data sheet.

8.02.00 The number of copies/prints/CD-ROMs/manuals to be furnished for various types of documents is given in Annexure-I to this Part-C, Section-VI of the Technical Specification.

8.03.00 The documentation that shall be provided by the Contractor is indicated in thvarious sections of specification. This documentation shall include but not be limited to the following :

8.03.01

(a.) **BASIC ENGINEERING DOCUMENTATION**

Prior to commencement of the detailed engineering work, the Contractor shall furnish a Plant Definition Manual within 12 weeks from the date of the Notification of Award. This manual shall contain the following as a minimum:

i. System description of all the mechanical, electrical, control & instrumentation & civil systems.

ii. Technology scan for each system / sub-system & equipment.

iii. Selection of appropriate technology / schemes for various systems/ subsystems including techno-economic studies between various options.

iv. Optimization studies including thermal cycle optimization.

v. Sizing criteria of all the systems, sub-systems including various piping systems/ equipments/ structures/ equipment foundations alongwith all calculations justifying and identifying the sizing and the design margins.

vi. Schemes and Process & Instrumentation diagrams for the various systems/ sub-system with functional write-ups.

vii. Operation Philosophy and the control philosophy of the equipments / system covered under the scope.

viii. General Layout plan of the power station incorporating all facilities in Contractor's as well as those in the Employer's scope. This drawing shall also be furnished in the form of CD-ROMs to the Employer for engineering of areas not included in bidder's scope.

ix. Basic layouts and cross sections of the TG building (various floor elevations), and other areas included in the scope of thebidder.

x. Documentation in respect of Quality Assurance System as listed out elsewhere in this specification.

The successful bidder shall furnish within three (3) weeks from the date of Notification of Award, a list of contents of the Plant Definition Manual (PDMs) including techno-economic studies, which shall then be mutually discussed & finalised with the Employer.

(b) **DETAILED ENGINEERING DOCUMENTS**

i. General layout plan.

ii. Layouts, general arrangements, elevations and cross-sections drawings for all the equipment and facilities of the plant.

iii. Flow diagrams, Process & Instrumentation Diagrams alongwith write-up and system description.

iv. Start-up curves for turbine, for various start-ups, viz. cold, warm and hot start-up.

v. Piping isometric, composite layout and fabrication drawings.

vi. Piping engineering diagrams, pipe and fittings schedules, valve schedules, hanger and support schedules, insulation schedules.

vii. Technical data sheets for all bought out and manufactured items. Contractor shall use the NTPC specifications as a base for placement of orders on their sub-vendors.

viii. Detailed design calculations for components, system/sub-system, piping etc., wherever applicable including sizing calculations for all auxiliaries like BFPs, CEPs, Heaters/ Deaerators, Condensers, vacuum pumps etc.

ix. Transient, hydraulic and thermal stress analysis of piping and system wherever applicable & input and output data alongwith stress analysis isometrics showing nodes.

x. Thermal cycle information (heat balance diagrams, condenser and heat exchanger thermal calculations etc.).

xi. Characteristic Curves/ Performance Correction Curves. Hydraulic & Mechanical design calculations for condensers & heaters.

xii. Comprehensive list of all terminal points which interface with Employer's facilities giving details of location, terminal pressure, temperature, fluid handled & end connection details, forces, moments etc.

xiii. Power supply single line diagram, block logics, control schematics, electrical schematics, etc.

xiv. Protection system diagrams and relay settings.

xv. Interconnection diagrams.

xvi. Cable routing plan.

xvii. Instrument schedule, measuring point list, I/O list, Interconnection & wiring diagram, functional write-ups, installation drawings for field mounted instruments, logic diagrams, control schematics, wiring and tubing diagrams of panels and enclosures etc. Drawings for open loop and close loop controls (both hardware and software). Motor list and valve schedule including type of actuator etc.

xviii. Alarm and annunciation list / Sequence of Event (SOE) list and alarms & trip set points.

xix. Sequence and protection interlock schemes.

xx. Type test reports and power system stability study report.

xxi. Control system configuration diagrams.

xxii. Detailed DDCMIS system manuals

xxiii. Detailed flow chart for digital control system.

xxiv. Mimic diagram layout, Assignment for other application engg.

xxv. Civil & Structural works drawings and documents for all structures, facilities, foundations, underground and overground works and super-structural works as included in the scope of the Bidder.

xxvi. Model study reports wherever applicable.

xxvii. Functional & guarantee test procedures and test reports.

xxviii. Documentation in respect of Quality Assurance System as listed out elsewhere in this specification.

xxix. Documentation in respect of commissioning as listed out elsewhere in this specification.

The Contractor while submitting the above documents / drawings for approval / reference as the case may be, shall mark on each copy of submission the reference letter alongwith the date vide which the submissions are made.

8.03.02 **INSTRUCTION MANUALS**

The Contractor shall submit to the Employer, draft instruction manuals for all the equipments covered under the Contract by the end of one year from the date of his acceptance of the Letter of Award.The Instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically compiled for this project. After finalization and approval of the Employer the Instruction Manuals shall be submitted as indicated in Annexure-I. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals have been supplied to the Employer. The Instruction Manuals shall comprise of the following.

(a.) **Erection Manuals**

The erection manuals shall be submitted atleast three (3) months prior to the commencement of erection activities of particular equipment/system. The erection manual should contain the following as a minimum.

a) Erection strategy.

b) Sequence of erection.

c) Erection instructions.

d) Critical checks and permissible deviation/tolerances.

e) List of tool, tackles, heavy equipments like cranes, dozers, etc.

f) Bill of Materials

g) Procedure for erection .

h) General safety procedures to followed during erection/installation.

i) Procedure for initial checking after erection.

j) Procedure for testing and acceptance norms.

k) Procedure / Check list for pre-commissioning activities.

l) Procedure / Check list for commissioning of the system.

m) Safety precautions to be followed in electrical supply distribution during erection

(b.) **Operation & Maintenance Manuals**

a) The manual shall be a two rim PVC bound stiff sided binder able to withstand constant usage or where a thicker type is required it shall have locking steel pins, the size of the manual shall not be larger than international size A3. The cover shall be printed with the Project Name, Services covered and Volume / Book number Each section of the manual shall be divided by a stiff divider of the same size as the holder. The dividers shall clearly state the section number and title. All written instructions within the manual not provided by the manufacturers shall be typewritten with a margin on the left hand side.

b) The arrangement and contents of O & M manuals shall be as follows :

1) Chapter 1 - Plant Description : To contain the following sections specific to the equipment/system supplied

(a) Description of operating principle of equipment / system with schematic drawing / layouts.

(b) Functional description of associated accessories / controls. Control interlock protection write up.

(c) Integrated operation of the equipment alongwith the intended system. (The is to be given by the supplier of the Main equipment by taking into account the operating instruction given by the associated suppliers).

(d) Exploded view of the main equipment, associated accessories and auxiliaries with description. Schematic drawing of the equipment alongwith its accessories and auxiliaries.

(e) Design data against which the plant performance will be compared.

(f) Master list of equipments, Technical specification of the equipment/ system and approved data sheets.

(g) Identification system adopted for the various components, (it will be of a simple process linked tagging system).

(h) Master list of drawings (as built drawing - Drawings to be enclosed in a separate volume).

2) Chapter 2.0 - Plant Operation: To contain the following sections specific to the equipment supplied

(a) Protection logics provided for the equipment alongwith brief philosophy behind the logic, Drawings etc.

(b) Limiting values of all protection settings.

(c) Various settings of annunciation/interlocks provided.

(d) Startup and shut down procedure for equipment alongwith the associated systems in step mode.

(e) Do's and Don'ts related to operation of the equipment.

(f) Safety precautions to be take during normal operation. Emergency instruction on total power failure condition/lubrication failure/any other conditions.

(g) Parameters to be monitored with normal value and limiting values.

(h) Equipment isolating procedures.

(i) Trouble shooting with causes and remedial measures.

(j) Routine testing procedure to ascertain healthiness of the safety devices alongwith schedule of testing.

(k) Routine Operational Checks, Recommended Logs and Records

(l) Change over schedule if more than one auxiliary for the same purpose is given.

(m) Preservation procedure on long shut down.

(n) System/plant commissioning procedure.

3) Chapter 3.0 - Plant Maintenance- To contain the following sections specific to the equipment supplied.

(a) Exploded view of each of the equipments. Drawings alongwith bill of materials including name, code no. & population.

(b) Exploded view of the spare parts and critical components with dimensional drawings (In case of Electronic cards, the circuit diagram to be given) and spare parts catalogue for each equipment.

(c) List of Special T/ P required for Overhauling /Trouble shooting including special testing equipment required for calibration etc.

(d) Stepwise dismantling and assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained etc. Clearance to be maintained etc.

(e) Preventive Maintenance schedules linked with running hours/calendar period alongwith checks to be carried out.

(f) Overhauling schedules linked with running hours/calendar period alongwith checks to be done.

(g) Long term maintenance schedules

(h) Consumables list alongwith the estimated quantity required during normal running and during maintenance like Preventive Maintenance and Overhauling.

(i) List of lubricants with their Indian equivalent, Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation and quantity required for complete replacement..

(j) Tolerance for fitment of various components.

(k) Details of sub vendors with their part no. in case of bought out items.

(l) List of spare parts with their Part No, total population, life expediency & their interchangeability with already supplied spares to NTPC.

(m) List of mandatory and recommended spare list along with manufacturing drawings, material specification & quality plan for fast moving consumable spares.

(n) Lead time required for ordering of spares from the equipment supplier, instructions for storage and preservation of spares.

(o) General information on the equipment such as modification carried out in the equipment from its inception, equipment population in the country / foreign country and list of utilities where similar equipments have been supplied.

8.03.03 After finalization and approval of the Employer, the O & M Manuals shall be submitted as indicated in Annexure-VI. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals (both erection and O & M manuals have been supplied to the Employer.

If after the commissioning and initial operation of the plant, the instruction manuals (Erection and /or O &M manuals) require modifications/additions/ changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by the Contractor to the Employer for records and number of copies shall be as mentioned in Annexure-VI.

8.03.03 **PLANT HANDBOOK AND PROJECT COMPLETION REPORT**

(a.) PLANT HANDBOOK

The Contractor shall submit to the Employer a preliminary plant hand book preferably in A-4 size sheets which shall contain the design and performance data of various plants, equipments and systems covering the complete project including

1. Design and performance data.

2. Process & Instrumentation diagrams.

3. Single line diagrams.

4. Sequence & Protection Interlock Schemes.

5. Alarm and trip values.

6. Performance Curves.

7. General layout plan and layout of main plant building and auxiliary buildings

8. Important Do's & Don't's

The plant handbook shall be submitted within twelve (12) months from the date of award of contract. After the incorporation of Employer's comments, the final plant handbook complete in all respects shall be submitted three (3) months before start-up and commissioning activities.

(b.) **Project Completion Report**

The Contractor shall submit a Project Completion Report at the time of handing over the plant.

8.03.04 **DRAWINGS**

(a.) All documents submitted by the Contractor for Employer's review shall be in electronic form (soft copies) along with the desired number of hard copies as per Annexure-I of Part-C. The soft copies shall be uploaded by the vendors in c-folder, a web based system of NTPC ERP, for which a username and password will be alloted to the new vendor by NTPC.

Similarly, the vendor can download the drawings / documents, approved / commented by NTPC , through above site.
The soft copies of identified drawings / documents shall be in pdf format, whereas the attachements / reply to the submitted document(s) can be in .doc, .xls, .pdf, .dwg or .std formats.

(b.) Final copies of the approved drawings alongwith requisite number of hard copies shall be submitted as per Annexure-I of Part-C.

(c.) Contractor shall prepare the model of all the facilities located in TG building (including all facilities), and any other facility located in TG building area in an integrated & intelligent 3D software solution using rule-based, data centric 3D Design software with equipment drawings, data sheets, intelligent P&ID correlated with intelligent 3D Model, BOQ, schematics and logic diagrams

etc. attached to the respective equipment / systems in the aforesaid 3D model.

All piping layouts, equipment layouts, floor plans, ducting layout (A/C, Ventilation etc.), General Arrangement drawings of major buildings, structural arrangement drawings and RCC layout drawings shall necessarily be extracted from the aforesaid 3D model and submitted for employer's review along with the 3D review model to enable NTPC to review and approve these drawings.

Contractor shall prepare and provide 3D design review model (network ready, which shall include visual interference check, walk-through animation, video simulation for major equipment placement and removal, visual effect, photo realism etc.), which is extracted from intelligent 3D model and shall make a presentation of the same every 3 months from LOA to enable NTPC to review the progress of engineering or as and when required by employer.. After the completion of engineering of facilities covered under this package, the corresponding complete 3D review model shall be handed over to the employer for its reference.

(d.) All documents/text information shall be in latest version of MS Office/ MS Excel/ PDF Format as applicable.

(e.) All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail indicating the type, size, arrangement, weight of each component for packing and shipment, the external connection, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearance and spaces required between various portions of equipment and any other information specifically requested in the drawing schedules.

(f.) Each drawing submitted by the Contractor (including those of subvendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, notings, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

(g.) The drawings submitted by the Contractor (or their subvendors) shall bear Employer's drawing number in addition to contractor's (their sub-vendor's) own drawing number. Employer's drawing numbering system shall be made available to the successful bidder so as to enable him to assign Employer's drawing numbers to the drawings to be submitted by him during the course of execution of the Contract.

Similarly, all the drawings/ documents submitted by the Contractor during detailed engineering stage shall be marked "FOR APPROVAL" or "FOR INFORMATION" prior to submission.

Further, space shall be identified on each drawing for approval stamp and electronic signature.

(j.) The furnishing of detailed engineering data and drawings by the Contractor shall be in accordance with the time schedule for the project. The review of these documents/ data/ drawings by the Employer will cover only general conformance of the data/ drawings/ documents to the specifications and contract, interfaces with the equipments provided by others and external connections & dimensions which might affect plant layout. The review by the Employer should not be construed to be a thorough review of all dimensions, quantities and details of the equipments, materials, any devices or items indicated or the accuracy of the information submitted. The review and/ or approval by the Employer / Project Manager shall not relieve the Contractor of any of his responsibilities and liabilities under this contract.

(k.) After the approval of the drawings, further work by the Contractor shall be in strict accordance with these approved drawings and no deviation shall be permitted without the written approval of the Employer.

(l.) All manufacturing, fabrication and execution of work in connection with the equipment / system, prior to the approval of the drawings, shall be at the Contractor's risk. The Contractor is expected not to make any changes in the design of the equipment /system, once they are approved by the Employer. However, if some changes are necessitated in the design of the equipment/system at a later date, the Contractor may do so, but such changes shall promptly be brought to the notice of the Employer indicating the reasons for the change and get the revised drawing approved again in strict conformance to the provisions of the Technical Specification.

(m.) Drawings shall include all installations and detailed piping layout drawings. Layout drawings for all piping of 65 mm and larger diameter shall be submitted for review/ approval of Employer prior to erection. Small diameter pipes shall however be routed as per site conditions in consultation with site authority / representative of Employer based on requirements of such piping indicated in approved / finalized Flow Scheme / Process & Instrumentation Diagrams and/or the requirements cropping up for draining & venting of larger diameter piping or otherwise after their erection as per actual physical condition for the entire scope of work of this package.

(n.) Assessing & anticipating the requirement and supply of all piping and equipment shall be done by the contractor well in advance so as not to hinder the progress of piping & equipment erection, subsequent system charging and its effective draining & venting arrangement as per site suitability.

(o.) As Built Drawings

After final acceptance of individual equipment / system by the Employer, the Contractor will update all original drawings and documents for the equipment / system to "as built" conditions and submit number of coppies as per **Annexure-I**.

(p.) Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to Engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission. The contractor shall make a visit to site to see the existing facilities and understand the layout completely and collect all necessary data / drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same.

(q.) The Contractor shall submit adequate prints of drawing / data / document for Employer's review and approval. The Employer shall review the drawings and return soft copy to the Contractor authorizing either to proceed with manufacture or fabrication, or marked to show changes desired. When changes are required, drawings shall be re-submitted promptly, with revisions clearly marked, for final review. Any delays arising out of the failure of the Contractor to submit/rectify and resubmit in time shall not be accepted as a reason for delay in the contract schedule.

(r.) All engineering data submitted by the Contractor after final process including review and approval by the Project Manager/ Employer shall form part of the contract documents and the entire works covered under these specification shall be performed in strict conformity with technical specifications unless otherwise expressly requested by the Project Manager in writing.

8.03.05 **e-Learning Package:**

e-learning packages shall be supplied for the equipment / system for the following Steam Turbine Generator & auxiliaries along with associated electrical and C&I system.

8.03.05.01 **Steam Turbine Generator & Auxiliaries**

Steam Turbine including stop valves, control valves, overload valves and cross over piping. Steam Turbine Auxiliary Systems including Quick Closing and Ordinary NRVs, Turbine gland sealing system, Lubricating oil system and its purification system, Centralised oil storage and its purification system, Control fluid and its purification system, governing and protection system, exhaust hood spray cooling system, drainage and vent system, turbine preservation system, HP/LP Bypass system.

Generator and Auxiliary System including Generator, complete hydrogen cooling, carbon dioxide and nitrogen gas systems as applicable, complete seal oil system, complete water cooling system where applicable and complete excitation system.

Condensing Plant including Condenser, Condenser air evacuation system and Condenser on load tube cleaning system as applicable.

Drip Pump along with all accessories as applicable, Condensate Extraction Pumps along with all accessories, Deaerator level Control Station, Feed Water Heating Plant including Drain Cooler, low pressure heaters, deaerator and feed storage tank, high pressure heaters and associated accessories, Boiler Feed Pumps along with all accessories, Drive Turbine for Boiler Feed Pump along with all accessories, Feed regulating station, Make up system to Condenser, Gland Steam Condenser Recirculation System, Turbine Hall EOT Cranes and EOT Crane for Boiler Feed Pump as applicable.

8.03.05.02 These packages shall be installed on the Learning Management Server (LMS) of Power Management Institute (PMI) , NTPC located at Noida . The Engineer- In-Charge (EIC) for the e-learning modules shall be from PMI.

1. The objective of the e-Learning package consisting of courses for erection, commissioning, operation and maintenance of equipment / system as specified above is to facilitate the employees to have first hand information /requirement with respect to above activities for the supplied equipment /system.

2. The bidder shall submit e-learning courses each for erection, commissioning, operation and maintenance of each of the equipment / system supplied as above.
   a. The erection course(s) should include instructions on pre-checks, prerequisites, erection strategy, erection procedure etc.
   b. The commissioning course(s) should include instructions on recommissioning,commissioning, initial operation etc.
   c. The operation course(s) should include instructions on the permissive, interlocks, physical check ups, start up , shutdown and protections etc.
   d. The maintenance course(s) should include instructions on predictive, preventive, breakdown and overhauling.

   Depth of coverage of above courses shall be as specified for “Instruction Manuals” in above clauses. A literature on caution / safety while handling equipment / system for the above modules shall follow the description of the said equipment /system.

3. The e-Learning packages on equipment / system shall be installed by the vendor and shall be successfully test run in the presence of EIC or representative before acceptance by NTPC. The vendor will also give the master copy in form of Flash Drive/CD/DVD. The respective module for erection & commissioning shall be delivered and successfully test run at least three months before the scheduled start of the corresponding activity at site.

The respective module for operation & maintenance shall be delivered and successfully test run at least three months before scheduled first synchronization of first unit.

4. **e-Learning course broad requirements:**

a. The courses shall be web based and mobile based Application type.

It shall run on all possible versions of web browser like Internet Explorer, Google Chrome, Firefox etc. on Laptop/Desktop and shall be Smartphone/Tablet/Mobile responsive. The Mobile responsive courses shall run on Android, Windows Mobile, Blackberry, iOS etc.

b. The courses shall support liquid/fluid page layout so that the entire screen gets adjusted to PC, Laptop, Smartphone/Mobile, Tablet and any other display devices.

c. Course content text shall be in English language and be associated with a voiceover in English language with Indian accent.

d. Courses shall be SCORM (Sharable Content Object Reference Model) compliant, version 1.2 which is compatible with LMS at PMI.

e. Each course shall have every physical and functional detail of the equipment / system supplied.

f. Each of the e-Learning course shall be based on multiple web pages and mobile pages with multiple modules.

g. There shall be option for self-assessment test after every course. In case the user doesn't opt for self assessment test the user shall be able to go to the next course. There shall be no restriction in no. of times for repeating the assessments. All correct answers along with the answers marked by the users shall be displayed at the end of test/quiz.

h. If Java and Flash, as applicable are not available in the system to run the package, then there shall be a prompt message for updation of the same.

i. Each course shall have a self-running interactive content with navigation buttons containing forward, backward, pause, bookmark and menu options in the course window.

j. The course shall contain chapter titled 'Introduction/overview' that explains the purpose of the course.

k. The course content shall contain descriptive text shall be factual, specific, terse, clearly worded, and simply illustrative, so that the user can understand it.

l. The system shall provide the user with the ability to select the information with a Cursor.

m. The course menu should contain table of content linked to concerned pages. The user shall be given the capability to access all of the functions available on the system through a menu system. This shall consist of active buttons, which shall control a hierarchy of pull down/pop up menus. Menu shall appear quickly and exist only while a selection is being made. The user shall be given the capability to position the cursor or pointer on the menu item and use pointer device such as mouse to activate the function.

n. Every course shall contain the 3D design/drawing/exploded view/360_0 turn around view of the equipment/system, textual description of the equipment/system and its functionality with video (as applicable), animation and audio.

o. The users shall be able to control audio sound level associated with the courses.

p. Drawings / text in the courses shall be scalable (Zoom In/ Out).'

q. The user shall have the capability to record a **bookmark** to mark displayed information for later recall, whenever he accesses the same course next time.

Notes:

1. e-learning Package of an equipment / system shall include e-learning courses for each of erection, commissioning, operation and maintenance of that equipment / system.

2. e-learning courses on erection, commissioning, operation and maintenance of an equipment / system shall include e-learning lessons/chapters/modules (as required) for erection, commissioning, operation and maintenance respectively of that equipment / system.

3. The vendor shall get the approval of one sample course from EIC before proceeding for further courses.

8.04.00 Engineering Co-ordination Procedure

8.04.01 The following principal coordinators will be identified by respective organizations at time of award of contract:

NTPC Engineering Coordinator (NTPC EC) :

Name :

Designation :

Address :

a) Postal :

b) Telegraphic / e-Mail :

c) FAX : TELEPHONE :

Contractor's/ Vendor's Engineering Coordinator (VENDOR EC):

Name :

Designation :

Address :

a) Postal :

b) Telegraphic / e-Mail :

c) FAX : TELEPHONE :

8.04.02 All engineering correspondence shall be in the name of above coordinators on behalf of the respective organizations.

8.04.03 Contractor's/Vendor's Drawing Submission and Approval Procedure:

a) All data/information furnished by Vendor in the form of drawings/ documents/catalogues or in any other form for NTPC's information/ interface and or review and approval are referred by the general term "drawings".

b) Not used

c) All drawings (including those of subvendor's) shall bear at the right hand bottom corner the 'title plate' with all relevant information duly filled in. The Contractor shall furnish this format to his subvendor along with his purchase order for subvendor's compliance.

d) Not used

e) The contractor shall make a visit to site to see the existing facilities and understand the layout completely and collect all necessary data / drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same.

f) **Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper endorsement for checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission.**

g) The Contractor shall submit adequate prints of drawing / data / document for Employer's review and approval. The drawings submitted by the Contractor/vendor shall be reviewed by NTPC and their comments shall be forwarded within three (3) weeks of receipt of drawings. Upon review of each drawing, depending on the correctness and completeness of the drawing, the same will be categorized and approval accorded in one of the following categories :

CATEGORY- I:	Approved
CATEGORY- II	Approved, subject to incorporation of comments/ modification as noted. Resubmit revised drawing incorporating the comments.
CATEGORY –III	Not approved. Resubmit revised drawings for approval after incorporating comments/ modification as noted.
CATEGORY -IV	For information and records.

h) Contractor shall resubmit the drawings approved under Category II, III & IVR within three (3) weeks of receipt of comments on the drawings, incorporating all comments. Every revision of the drawing shall bear a revision index wherein such revisions shall be highlighted in the form of description or marked up in the drawing identifying the same with relevant revision Number enclosed in a triangle (eg. 1, 2, 3 etc). Contractor shall not make any changes in the portions of the drawing other than those commented. If changes are required to be made in the portions already approved, the Contractor shall resubmit the drawing identifying the changes for Employer's review and approval. **Drawings resubmitted shall show clearly the portions where the same are revised marking the relevant revision numbers and Employer shall review only such revised portion of documents.**

i) In case, the Contractor/ Vendor does not agree with any specific comment, he shall furnish the explanation for the same to NTPC for consideration. In all such cases the Contractor shall necessarily enclose explanations along with the revised drawing (taking care of balance comments) to avoid any delay and/or duplication in review work.

j) It is responsibility of the Contractor/ Vendor to get all the drawings approved in the Category I & IV (as the case may be) and complete engineering activities within the agreed schedule. Any delay arising out of submission and modification of drawings shall not alter the contract completion schedule.

k) If Contractor/ Vendor fails to resubmit the drawings as per the schedule, construction work at site will not be held up and work will be carried out on the basis of comments furnished on previous issues of the drawing.

l) These comments will be taken care by the contractor while submitting the revised drawing.

The contractor shall use a single transmittal for drawings. Submission. This shall include transmittal numbers and date, number of copies being sent, names of the agencies to whom copies being sent, drawing number and titles, remarks or special notes if any etc.

8.05.00 **ENGINEERING PROGRESS AND EXCEPTION REPORT**

8.05.01 The Contractor shall submit every month an Engineering progress and Exception Report giving the status of each engineering information including

(a.) A list of drawings/engineering information which remains unapproved for more than four (4) weeks after the date of first submission.
(b.) Drawings which were not submitted as per agreed schedule.

8.05.02 The draft format for this report shall be furnished to the Employer within four (4) weeks of the award of the contract, which shall then be discussed and finalised with the Employer.

8.06.00 **TECHNICAL CO-ORDINATION MEETING**

8.06.01 The Contractor shall be called upon to organise and attend monthly Design/ Technical Co-ordination Meetings (TCMs) with the Employer/Employer's representatives and other Contractors of the Employer during the period of contract. The Contractor shall attend such meetings at his own cost at NEW DELHI / NOIDA or at mutually agreed venue as and when required and fully co-operate with such persons and agencies involved during the discussions.

8.06.02 The Contractor should note that Time is the essence of the contract. In order to expedite the early completion of engineering activities, the Contractor shall submit all drawings as per the agreed Engineering Information Submission Schedule.The drawings submitted by the Contractor will be reviewed by the Employer as far as practicable within three (3) weeks from the date of receipt of the drawing .The comments of the Employer shall then be discussed across the table during the above Technical Co-ordination Meeting (s) wherein best efforts shall be made by both sides to ensure the approval of the drawing.

8.06.03 The Contractor shall ensure availability of the concerned experts / consultants/ personnel who are empowered to take necessary decisions during these meetings. The Contractor shall be equipped with necessary tools and facilities so that the drawings/documents can be resubmitted after incorporating necessary changes and approved during the meeting itself.

8.06.04 Should any drawing remain unapproved for more than six (6) weeks after it's first submission, this shall be brought out in the monthly Engineering Progress and Exception Report with reasons thereof.

8.06.05 Any delays arising out of failure by the Contractor to incorporate Employer's comments and resubmit the same during the TCM shall be considered as a default and in no case shall entitle the Contractor to alter the Contract completion date.

8.07.00 **DESIGN IMPROVEMENTS**

The Employer or the Contractor may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes the specification shall be modified accordingly.

If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any changing the price and/or schedule of completion before the Contractor proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.

8.07.01 **Testing of major design features:**

The major design features of the system shall be conducted by the Contractor at the Contractor's works or any other place mutually agreed within six months from the date of LOA. These are the system function tests, which have a major impact on the detailed system design & finalization of important engineering documents like configuration, functional grouping, BOM etc., but do not require a fully engineered system for conductance. Bidder shall identify these features & include detailed test procedures in the bid, which shall be finalized during discussions with the bidder before award. The developments and any augmentation of standard features undertaken by the Bidder to fulfill the various specification requirements, shall be also be tested during these major design tests. This shall include but not be limited to the following.

a) System accuracy tests of DDCMIS for the various type of inputs identified in Part-B.

b) Loop reaction time for sample loops/ logics.

c) N/A.

d) Server changeover.

e) Various response times, having serious implication on operation & maintenance philosophy.

f) Duty cycle of controller/ HMIPIS with simulated load, representative of the final engineered load.

g) Unified HMI for DDCMIS as indicated in IIC-01, Scope of supply & services chapter of Part-A, Section-VI.

The results of the above tests, after its acceptance by the Employer, shall be properly documented and submitted to Employer. If any of the envisaged tests have

been carried out by Bidder in a previous NTPC project, then the same need not be specifically conducted by the Bidder for this project, provided it is clearly established by the Bidder & accepted by the Employer that there is no difference between the system offered for this project & the previous NTPC project w.r.t. the test. However, even in such a case, test report of the previous project shall be submitted by the Bidder as a part of MDFT (Major Design Feature Test) report.

8.07.02 **Demonstration of Application Engineering**

A) The Contractor shall prepare and submit typical implemented scheme in their system (Control system & HMI) on sample basis. The typical cases to be covered shall include but not be limited to the following.

(i) Logics/Loops:

a) Drive logics implementation for each type of binary drive along with its display in HMI.

b) Sequence implementation along with its display in HMI.

c) Single non-cascade controller implementation.

d) Cascade loop implementation.

e) Master slave implementation with different slave combination.

f) Temperature & pressure compensation for flow signals & pressure compensation for level signals as applicable.

(ii) HMI Functions:

a) LVS Annunciation.

b) Graphics.

c) HSR

d) Logs/Reports.

e) N/A.

B) The above typical cases shall be finalized with the Employer through Technical Co-ordination meetings.

After review and finalization of the typical cases, the implementation of each logic & control loop shall be carried out by the Contractor. After implementation of these

logics & loops, the Contractor shall test each logic/loop and record the observations in a format to be provided by the Employer and demonstrate to Employer at Employer premises during engineering finalization. Any modifications as a result of the demonstration shall be done and documented as part of the test report along with the final scheme. Similarly, HMI functions shall also be demonstrated by the Contractor at Employer premises & the results shall be documented as part of test report.

C) During the integrated testing at the Contractor's works, only sample checks shall be done by the Employer for the items covered in above application engineering demonstration.

8.08.00 **EQUIPMENT BASES**

A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete base, unless otherwise specifically agreed to by the Employer. Each base plate which support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have threaded drain connections.

8.09.00 **PROTECTIVE GUARDS**

Suitable guards shall be provided for protection of personnel on all exposed rotating and/or moving machine parts. All such guards shall be designed for easy installation and removal for maintenance purpose.

8.10.00 **LUBRICANTS, SERVO FLUIDS AND CHEMICALS**

8.10.01 All the first fill and one year's topping requirements of consumables such asgreases, oil, lubricants, servo fluids / control fluids, gases (excluding H2, CO2 and N2 for Generator) and essential chemicals 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 supplied by the Contractor. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum.

Bidder scope shall also include supply of H2 , CO 2 and N2 as applicable for the Generator till successful commisioning of the Generator.

Bidder shall also supply a quantity not less than 10% of the full charge of each variety of lubricants, servo fluids, gases, chemicals etc (as detailed above) which is expected to be utilised during the first year of operation. This additional quantity shall be supplied in separate Containers.

8.10.02	As far as possible lubricants marketed by the Indian Oil Corporation shall be used. The variety of lubricants shall be kept to a minimum possible. Detailed specifications for the lubricating oil, grease, gases, servo fluids, control fluids, chemicals etc. required for the complete plant covered herein shall be furnished. On completion of erection, a complete list of bearings/ equipment giving their location and identification marks shall be furnished to the Employer alongwith lubrication requirements.
8.11.00	**Lubrication**
8.11.01	Equipment shall be lubricated by systems designed for continuous operation. Lubricant level indicators shall be furnished and marked to indicate proper levels under both standstill and operating conditions.
8.12.00	**Material of Construction**
8.12.01	All materials used for the construction of the equipment shall be new and shall be in accordance with the requirements of this specification. Materials utilised for various components shall be those which have established themselves for use in such applications.
8.13.00	**RATING PLATES, NAME PLATES & LABELS**
8.13.01	Each main and auxiliary item of plant including instruments shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturer's name, equipment, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.
8.13.02	Each item of plant shall be provided with nameplate or label designating the service of the particular equipment. The inscriptions shall be approved by the Employer or as detailed in appropriate section of the technical specifications.
8.13.03	Such nameplates or labels shall be of white nonhygroscopic material with engraved black lettering or alternately, in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back. The name plates shall be suitably fixed on both front and rear sides.
8.13.04	Items of plant such as valves, which are subject to handling, shall be provided with an engraved chromium plated nameplate or label with engraving filled with enamel.

The name plates for valves shall be marked in accordance with MSS standard SP-25 and ANSI B 16.34 as a minimum.

8.13.05 Hanger/ support numbers shall be marked on all pipe supports, anchors, hangers, snubbers and restraint assemblies. Each constant and variable spring support shall also have stamped upon it the designed hot and cold load which it is intended to support. Suitable scale shall also be provided to indicate load on support/hanger.

8.13.06 Valves, steam traps and strainers shall be identified by Employer's tag number of a metal tap permanently attached to non pressure parts such as the yoke by a stainless steel wire. The direction of flow shall also be marked on the body.

8.13.07 Safety and relief valves shall be provided with the following :

(a.) Manufacturer's identification.

(b.) Nominal inlet and outlet sizes in mm.

(c.) Set pressure in Kg/cm² (abs).

(d.) Blowdown and accumulation as percentage of set pressure.

(e.) Certified capacity in Kg of saturated steam per hour or in case of liquid certified capacity in litres of water per minute.

8.13.08 All such plates, instruction plates, etc. shall be bilingual with Hindi inscription first, followed by English. Alternatively, two separate plates one with Hindi and the other with English inscriptions may be provided.

8.13.09 All segregated phases of conductors or bus ducts, indoor or outdoor, shall be provided with coloured phase plates to clearly identify the phase of the system

8.14.00 **TOOLS AND TACKLES**

The Contractor shall supply with the equipment one complete set of all special tools and tackles and other instruments required for the erection, assembly, disassembly and proper maintenance of the plant and equipment and systems (including software). These special tools will also include special material handling equipment, jigs and fixtures for maintenance and calibration / readjustment, checking and measurement aids etc. A list of such tools and tackles shall be submitted by the Bidder alongwith the offer.

The price of each tool / tackle shall be deemed to have been included in the total bid price. These tools and tackles shall be separately packed and sent to site. The Contractor shall also ensure that these tools and tackles are not used by him during erection, commissioning and initial operation. For this period the Contractor should bring his own tools and tackles. All the tools and tackles shall be of reputed make acceptable to the Employer.

8.15.00 **WELDING**

8.15.01 If the manufacturer has special requirements relating to the welding procedures for welds at the terminals of the equipments to be performed by others the requirements shall be submitted to the Employer in advance of commencement of erection work.

8.16.00 **COLOUR CODE FOR ALL EQUIPMENTS/ PIPINGS/ PIPE SERVICES**

8.16.01 All equipment/ piping/ pipe services are to be painted by the Contractor in accordance with Employer's standard colour coding scheme, which will be furnished to the Contractor during detailed engineering stage.

8.17.00 **PROTECTION AND PRESERVATIVE SHOP COATING**

8.18.00 **PROTECTION**

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either metallic or a nonmetallic protection device. All ends of all valves and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather, should also be properly treated and protected in a suitable manner. All primers/paints/coatings shall take into account the hot humid, corrosive & alkaline, subsoil or overground environment as the case may be. The requirements for painting specification shall be complied with as detailed out in Part-A & B of the Technical Specification.

8.19.00 **PRESERVATIVE SHOP COATING**

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scales, oxides and other coatings and prepared in the shop. The surfaces that are to be finish-painted

after installation or require corrosion protection until installation, shall be shop painted as per the requirement covered in the relevant part of the Technical Specification.

Transformers and other electrical equipments if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colors shall be as per manufacturer's standards, to be selected and specified by the Employer at a later date.

8.19.01 Shop primer for all steel surfaces which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor after obtaining specific approval of the Employer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperature higher than 95 degrees Celsius and such primer shall also be subject to the approval of the Employer.

8.19.02 All other steel surfaces which are not to be painted shall be coated with suitable rust preventive compound subject to the approval of the Employer.

8.19.03 All piping shall be cleaned after shop assembly by shot blasting or other means approved by the Employer. Lube oil piping or carbon steel shall be pickled.

8.19.04 Painting for Civil structures shall be done as specified under technical requirements on civil works in relevant part of this specifications.

9.00.00 **QUALITY ASSURANCE PROGRAMME**

9.01.00 The Contractor shall adopt suitable quality assurance programme to ensure that the equipment and services under the scope of contract whether manufactured or performed within the Contractor's works or at his sub-contractor's premises or at the Employer's site or at any other place of work are in accordance with the specifications. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Employer/authorised representative after discussions before the award of the contract. The QA programme shall be generally in line with ISO-9001.A quality assurance programme of the contractor shall generally cover the following:

(a.) His organisation structure for the management and implementation of the proposed quality assurance programme

(b.) Quality System Manual

(c.) Design Control System

(d.) Documentation and Data Control System

(e.) Qualification data for bidder's key personnel.

(f.) The procedure for purchase of materials, parts, components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.

(g.) System for shop manufacturing and site erection controls including process, fabrication and assembly.

(h.) Control of non-conforming items and system for corrective actions and resolution of deviations.

(i.) Inspection and test procedure both for manufacture and field activities.

(j.) Control of calibration and testing of measuring testing equipment.

(k.) System for Quality Audits.

(l.) System for identification and appraisal of inspection status.

(m.) System for authorising release of manufactured product to the Employer.

(n.) System for handling, storage and delivery.

(o.) System for maintenance of records, and

(p.) Quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component.

9.02.00 **GENERAL REQUIREMENTS - QUALITY ASSURANCE**

9.02.01 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the contractor for some of the major items is given in the respective technical specification which shall be finalised giving due consideration to the manufacturer's standard and proven practices being followed. This is, however, not intended to form a comprehensive programme as it is the contractor's responsibility to draw up and implement such programme duly approved by the Employer. The detailed Quality Plans for manufacturing and field activities

	shall be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalisation of such quality plans will be finalised before award. Monthly progress reports on MQP/FQP submission/approval shall be furnished on enclosed format No. QS-01-QAI-P-02/F1.
9.02.02	Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's/ Sub-contractor's/ sub-supplier's Quality Control Organisation, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing. The Quality Plan shall be submitted on electronic media through c-folders, a web based system of NTPC ERP in addition to hard copy, for review and approval. After approval the same shall be submitted in compiled form on CD-ROM.
9.02.03	Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's "Site Quality Control Organisation", during various stages of site activities starting from receipt of materials/equipment at site.
9.02.04	The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality Plans and reference documents/standards etc. will be subject to Employer's approval without which manufacturer shall not proceed. These approved documents shall form a part of the contract. In these approved Quality Plans, Employer shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Employer's Project Manager or his authorised representative and beyond which the work will not proceed without consent of Employer in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Employer along with technical justification for approval and dispositioning.
9.02.05	No material shall be despatched from the manufacturer's works before the same is accepted, subsequent to predespatch final inspection including verification of records of all previous tests/inspections by Employer's Project Manager/Authorised representative and duly authorised for despatch by issuance of Material Despatch Clearance Certificate (MDCC).
9.02.06	All material used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties; chemical analysis and details of

	heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details.
9.02.07	The contractor shall submit to the Employer Field Welding Schedule for field welding activities in the enclosed format No.: QS-01-QAI-P-02/F2. The field welding schedule shall be submitted to the Employer along with all supporting documents, like welding procedures, heat treatment procedures, NDT procedures etc. at least ninety days before schedule start of erection work at site.
9.02.08	All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the Employer. All welding/brazing procedures shall be submitted to the Employer or its authorised representative for approval prior to carrying out the welding/brazing.
9.02.09	All brazers, welders and welding operators employed on any part of the contract either in Contractor's/sub-contractor's works or at site or elsewhere shall be qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer.
9.02.10	Welding procedure qualification & Welder qualification test results shall be furnished to the Employer for approval. However, where required by the Employer, tests shall be conducted in presence of Employer/authorised representative.
9.02.11	For all IBR pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. However, for other piping system ASME B31.1 or other relevant code as applicable shall be followed. Similarly, any other statutory requirements for the equipment/systems shall also be complied with. On all back-gauged welds MPI/LPI shall be carried before seal welding.
9.02.12	Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only.
9.02.13	No welding shall be carried out on cast iron components for repair.
9.02.14	All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.
9.02.15	All non-destructive examination shall be performed in accordance with written procedures as per International Standards, The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination) / EN /

	Equivalent. NDT shall be recorded in a report, which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job. All plates of thickness above 40mm & all bar stock/Forging above 40mm dia shall be ultrasonically tested. For pressure parts, plate of thickness equal to or above 25mm shall be ultrasonically tested.
9.02.16	The Contractor shall list out all major items/ equipment/ components to be manufactured in house as well as procured from sub-contractors (BOI). All the sub-contractor proposed by the Contractor for procurement of major bought out items including castings, forging, semi-finished and finished components/equipment etc., list of which shall be drawn up by the Contractor and finalised with the Employer, shall be subject to Employer's approval. The contractor's proposal shall include vendor's facilities established at the respective works, the process capability, process stabilization, QC systems followed, experience list, etc. along with his own technical evaluation for identified sub-contractors enclosed and shall be submitted to the Employer for approval within the period agreed at the time of pre-awards discussion and identified in "DR" category prior to any procurement. Monthly progress reports on sub-contractor detail submission / approval shall be furnished on enclosed on format no. QS-01-QAI-P-02/F1. Such vendor approval shall not relieve the contractor from any obligation, duty or responsibility under the contract.
9.02.17	For components/equipment procured by the contractors for the purpose of the contract, after obtaining the written approval of the Employer, the contractor's purchase specifications and inquiries shall call for quality plans to be submitted by the suppliers. The quality plans called for from the sub-contractor shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc. Such quality plans of the successful vendors shall be finalised with the Employer and such approved Quality Plans shall form a part of the purchase order/contract between the Contractor and sub-contractor. With in three weeks of the release of the purchase orders /contracts for such bought out items /components, a copy of the same without price details but together with the detailed purchase specifications, quality plans and delivery conditions shall be furnished to the Employer on the monthly basis by the Contractor along with a report of the Purchase Order placed so far for the contract.
9.02.18	Employer reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub-contractor's quality management and control activities. The contractor shall provide all necessary assistance to enable the Employer carry out such audit and surveillance.

9.02.19	The contractor shall carry out an inspection and testing programme during manufacture in his work and that of his sub-contractor's and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. Contractor shall carry out all tests/inspection required to establish that the items/equipment conform to requirements of the specification and the relevant codes/standards specified in the specification, in addition to carrying out tests as per the approved quality plan.
9.02.20	Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Employer to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings, etc.
9.02.21	For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.
9.02.22	Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorised representative.
9.02.23	Environmental Stress Screening All solid state electronic system / equipment / sub assembly shall be free from infant mortile components. For establishing the compliance to this requirement, the contractor / sub - contractor should meet the following. 1) The Contractor / Sub - contractor shall furnish the established procedure being followed for eliminating infant mortile components. The procedure followed by the Contractor / Sub - contractor should be substantiated along with the statistical figures to validate the procedure being followed. The necessary details as required under this clause shall be furnished at the stage of QP finalization. OR In case the Contractor / Sub - contractor do not have any established procedure to eliminate infant mortile components then two or 10% which ever is less, most densely populated Panels shall be tested for Elevated Temperature Cycle Test as per the following procedure.

Elevated Temperature Test Cycle

During the elevated temperature test which shall be for 48 hours, the ambient temperature shall be maintained at 50° C. The equipment shall be interconnected with devices and kept under energized conditions so as to repeatedly perform all operations it is expected to perform in actual service with load on various components being equal to those which will be experienced in actual service.

During the elevated temperature test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature at 50° C.

In case of any failure during the test cycle, the further course of action should be mutually discussed for demonstrating the intent of the above requirement.

2) Burn in Test Cycle

The test shall be conducted on all the panels fully assembled and wired including the panels having undergone the above mentioned elevated temperature test.

The period of Burn in Test Cycle shall be 120 hrs and process shall be similar to the elevated temperature test as above except that the temperature shall be reduced to the ambient temperature prevalent at that time.

During the above tests, the process I/O and other load on the system shall be simulated by simulated inputs and in the case of control systems; the process which is to be controlled shall also be simulated. Testing of individual components or modules shall not be acceptable.

During the Burn in Test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature.

The Contractor / Sub-contractor shall carry out routine test on 100% item at contractor / sub-contractor's works. The quantum of check / test for routine & acceptance test by employer shall be generally as per criteria / sampling plan defined in referred standards. Wherever standards have not been mentioned

quantum of check / test for routine / acceptance test shall be as agreed during detailed engineering stage.

9.03.00 **QA DOCUMENTATION PACKAGE**

The Contractor shall be required to submit the QA Documentation in two hard copies and two CD ROMs, as identified in respective quality plan with tick (✓) mark.

9.03.01 Each QA Documentation shall have a project specific Cover Sheet bearing name & identification number of equipment and including an index of its contents with page control on each document.

The QA Documentation file shall be progressively completed by the Supplier's sub-supplier to allow regular reviews by all parties during the manufacturing.

The final quality document will be compiled and issued at the final assembly place of equipment before despatch. However CD-Rom may be issued not later than three weeks.

9.03.02 Typical contents of QA Documentation is as below:-

(a.) Quality Plan

(b.) Material mill test reports on components as specified by the specification and approved Quality Plans.

(c.) Manufacturer / works test reports/results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans.

(d.) Non-destructive examination results /reports including radiography interpretation reports. Sketches/drawings used for indicating the method of traceability of the radiographs to the location on the equipment.

(e.) Heat Treatment Certificate/Record (Time- temperature Chart)

(f.) All the accepted Non-conformance Reports (Major/Minor) / deviation, including complete technical details / repair procedure).

(g.) CHP / Inspection reports duly signed by the Inspector of the Employer and Contractor for the agreed Customer Hold Points.

(h.) Certificate of Conformance (COC) wherever applicable.

(i.) MDCC

9.03.03 NOT USED.

9.03.04 NOT USED.

9.03.05 Similarly, the contractor shall be required to submit two sets (two hard copies and two CD ROMs), containing QA Documentation pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.

9.03.06 Before despatch / commissioning of any equipment, the Supplier shall make sure that the corresponding quality document or in the case of protracted phased deliveries, the applicable section of the quality document file is completed. The supplier will then notify the Inspector regarding the readiness of the quality document (or applicable section) for review.

(a.) If the result of the review carried out by the Inspector is satisfactory, the Inspector shall stamp the quality document (or applicable section) for release.

(b.) If the quality document is unsatisfactory, the Supplier shall endeavor to correct the incompleteness, thus allowing to finalize the quality document (or applicable section) by time compatible with the requirements as per contract documents. When it is done, the quality document (or applicable section) is stamped by the Inspector.

(c.) If a decision is made for despatch, whereas all outstanding actions cannot be readily cleared for the release of the quality document by that time, the supplier shall immediately, upon shipment of the equipment, send a copy of the quality document Review Status signed by the Supplier Representative to the Inspector and notify of the committed date for the completion of all outstanding actions & submission. The Inspector shall stamp the quality document for applicable section when it is effectively completed. The submission of QA documentation package shall not be later than 3 weeks after the despatch of equipment.

9.03.07 **TRANSMISSION OF QA DOCUMENTATION**

On release of QA Documentation by Inspector, one set of quality document shall be forwarded to Corporate Quality Assurance Department and other set to respective Project Site of Employer.

For the particular case of phased/part derivatives of equipment, the complete quality document of that particular equipment to the Employer shall be issued not later than 3 weeks after the date of the last delivery of equipment.

9.04.00 **Project Manager's Supervision**

9.04.01 To eliminate delays and avoid disputes and litigation, it is agreed between the parties to the Contract that all matters and questions shall be referred to the Project Manager and without prejudice to the provisions of 'Arbitration' clause in Section GCC of Vol.I, the Contractor shall proceed to comply with the Project Manager's decision.

9.04.02 The work shall be performed under the supervision of the Project Manager. The scope of the duties of the Project Manager pursuant to the Contract, will include but not be limited to the following:

(a.) Interpretation of all the terms and conditions of these documents and specifications:

(b.) Review and interpretation of all the Contractor's drawing, engineering data, etc:

(c.) Witness or his authorised representative to witness tests and trials either at the manufacturer's works or at site, or at any place where work is performed under the contract :

(d.) Inspect, accept or reject any equipment, material and work under the contract:

(e.) Issue certificate of acceptance and/or progressive payment and final payment certificates

(f.) Review and suggest modifications and improvement in completion schedules from time to time, and

(g.) Supervise Quality Assurance Programme implementation at all stages of the works.

9.05.00 **INSPECTION, TESTING AND INSPECTION CERTIFICATES**

9.05.01 The word 'Inspector' shall mean the Project Manager and/or his authorised representative and/or an outside inspection agency acting on behalf of the Employer

	to inspect and examine the materials and workmanship of the works during its manufacture or erection.
9.05.02	The Project Manager or his duly authorised representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.
9.05.03	The Contractor shall give the Project Manager/Inspector ten (10) working days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/Inspector, unless the witnessing of the tests is virtually waived and confirmed in writing, will attend such tests within ten (10) working days of the date on which the equipment is noticed as being ready for test/inspection failing which the contractor may proceed with test which shall be deemed to have been made in the inspector's presence and he shall forthwith forward to the inspector duly certified copies of test reports in two (2) copies.
9.05.04	The Project Manager or Inspector shall within ten (10) working days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.
9.05.05	When the factory tests have been completed at the Contractor's or sub-contractor's works, the Project Manager /Inspector shall issue a certificate to this effect ten (10) working days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within ten (10) working days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Project Manager /Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.
9.05.06	In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, material, electricity, fuel,

	water, stores, apparatus and instruments as may be reasonably demanded by the Project Manager /Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Project Manager/Inspector or to his authorised representative to accomplish testing.
9.05.07	The inspection by Project Manager / Inspector and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the contract.
9.05.08	To facilitate advance planning of inspection in addition to giving inspection notice as specified at clause no 9.05.03- of this chapter, the Contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at Customer Hold Point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.
9.05.09	All inspection, measuring and test equipment used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by NTPC. Wherever asked specifically, the contractor shall re-calibrate the measuring/test equipment in the presence of Project Manager / Inspector.
9.06.00	**ASSOCIATED DOCUMENT FOR QUALITY ASSURANCE PROGRAMME:**
9.06.01	List of items requiring Quality Plan & Sub-supplier approval. Format No. QS-01-QAI-P-01/F3-R0
9.06.02	Status of Quality Plan and Sub-supplier approval Format No. QS-01-QAI-P-02/F1-R0
9.06.03	Field Welding Schedule Format No.: QS-01-QAI-P-02/F2-R0
9.06.04	Manufacturing Quality Plan Format No.: QS-01-QAI-P-09/F1-R0
9.06.05	Field Quality Plan Format No.: QS-01-QAI-P-09/F2-R0 The above formats are enclosed as Annexure-III to VII
10.00.00	**PRE-COMMISSIONING AND COMMISSIONING FACILITIES**
	(a.) As soon as the facilities or part thereof has been completed operationally and structurally and before start-up, each item of the equipment and systems

forming part of facilities shall be thoroughly cleaned and then inspected jointly by the Employer and the Contractor for correctness of and completeness of facility or part thereof and acceptability for initial pre-commissioning tests, commissioning and start-up at Site. The list of pre-commissioning tests to be performed shall be as mutually agreed and included in the Contractor's quality assurance programme as well as those included in Part-D, Section-VI and elsewhere in the Technical Specifications.

(b.) The Contractor's pre-commissioning/ commissioning/start-up engineers, specially identified as far as possible, shall be responsible for carrying out all the pre-commissioning tests at Site. On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the commissioning of the complete facilities shall be commenced during which period the complete facilities, equipments shall be operated integral with sub-systems and supporting equipment as a complete plant.

(c.) All piping system shall be flushed, steam blown, air blown as required and cleanliness demonstrated using acceptable industry standards. Procedures to accomplish this work shall be submitted for approval to the Employer six months prior to the respective implementations. The Employer will approve final verification of cleanliness.

(d.) The time consumed in the inspection and checking of the units shall be considered as a part of the erection and installation period.

(e.) The check outs during the pre - commissioning period should be programmed to follow the construction completion schedule. Each equipment/system, as it is completed in construction and turned over to Employer's commissioning (start-up) Engineer(s), should be checked out and cleaned. The checking and inspection of individual systems should then follow a prescribed schedule to be agreed by the Employer.

(f.) The Contractor during initial operation and performance testing shall conduct vibration testing to determine the 'base line' of performance of all plant rotating equipment. These tests shall be conducted when the equipment is running at the base load, peak load as well as lowest sustained operating condition as far as practicable.

(g.) Contractor shall furnish the commissioning organization chart for review & acceptance of employer at least eighteen months prior to the schedule date of synchronization of 1st unit. The chart should contain:

(1.) Biodata including experience of the Commissioning Engineers.

(2.) Role and responsibilities of the Commissioning Organisation members.

(3.) Expected duration of posting of the above Commissioning Engineers at site.

10.02.00 **Initial Operation**

a) On completion of all pre-commissioning activities / tests and as a part of commissioning the complete facilities shall be put on 'Initial Operation' during which period all necessary adjustments shall be made while operating over the full load range enabling the facilities to be made ready for the Guarantee Tests.

b) The 'Initial Operation' of the complete facility as an integral unit shall be conducted for 720 continuous hours. During the period of initial operation of 720 hours, the unit shall operate continuously at full rated load for a period not less than 72 hours.

The Initial Operation shall be considered successful, provided that each item/ part of the facility can operate continuously at the specified operating characteristics, for the period of Initial Operation with all operating parameters within the specified limits and at or near the predicted performance of the equipment/ facility.

The Contractor shall intimate the Employer about the commencement of initial operation and shall furnish adequate notice to the Employer in this respect.

c) Any loss of generation due to constraints attributable to the Employer shall be construed as Deemed Generation.

In the event of test interruptions as a result of Force Majeure or Employer-Caused-Delay during Initial Operation test, where.

(i) The total cumulative interrupted time during the test is more than twenty-four (24) hours.

(ii) The total number of interruptions during the test is more than four (4).

The test shall not be deemed a successful Initial Operation Test.

The interrupted test resulting from Force Majeure or Employer-Caused-Delay shall be extended by an amount of time equal to the cumulative length of the interruptions, including time to return to steady-state operation; the test data for the period of interruptions shall be excluded from analysis; and the test data that were collected both before and after the interruptions shall be included in the analysis.

d) An Initial Operation report comprising of observations and recordings of various parameters to be measured in respect of the above Initial Operation shall be prepared by the Contractor. This report, besides recording the details of the various observations during initial operation shall also include the dates of start and finish of the Initial Operation and shall be signed by the representatives of both the parties. The report shall have sheets, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the Initial Operation. Based on the observations, necessary modifications/repairs to the plant shall be carried out by the Contractor to the full satisfaction of the Employer to enable the latter to accord permission to carry out the Guarantee tests on the facilities. However, minor defects which do not endanger the safe operation of the equipment, shall not be considered as reasons for with holding the aforesaid permission.

(g) **Grid Restriction**

Any loss in generation in terms of power (KW) or energy (KWH) during Initial operation Test due to grid restrictions shall be treated as deemed generation. however, the total cumulative deemed generation shall not exceed 5% of the total generation during the test period failing which the test shall be extended to limit the deemed generation to 5% of the total generation.

11.00.00 **GUARANTEE TESTS**

a) The final test as to prove the Functional Guarantees shall be conducted at Site by the Contractor in presence of the Employer. The contractor's Commissioning, Start-up Engineer shall make the unit ready to conduct such test before start of initial operation. Such test shall be conducted along with Initial Operations.

b) These tests shall be binding on both the parties of the Contract to determine compliance of the equipment with the functional guarantee.

c) For performance/ demonstration tests instrumentations, accuracy class shall be as per specified test codes. The numbers and location of the instruments shall be as per the specified test codes. In addition the values of parameters

shall be logged from the information system provided under Employer's Distributed Digital Control Monitoring and Information system. Test will be conducted at specified load points.

d) Any special equipment, tools and tackles required for the successful completion of the Guarantee Tests shall be provided by the Contractor, free of cost.

e) The Guarantee tests and specific tests to be conducted on equipments have been brought out in detail elsewhere in the specification.

12.00.00 **TAKING OVER**

Upon successful completion of Initial Operations and all the tests conducted to the Employer's satisfaction, the Employer shall issue to the Contractor a Taking over Certificate as a proof of the final acceptance of the equipment. Such certificate shall not unreasonably be with held nor will the Employer delay the issuance thereof, on account of minor omissions or defects which do not affect the commercial operation and/or cause any serious risk to the equipment. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of the Contract after issuance of such certificate.

13.00.00 **TRAINING OF EMPLOYER'S PERSONNEL**

13.01.00 The scope of service under training of Employer's engineers shall include a training module in the areas of Operation & Maintenance.

Such training should cover the following areas as a minimum in order to enable these personnel to individually take the responsibility of operating and maintaining the power station in a manner acceptable to the Employer:

(a.) Training for TG and related equipments.

(b.) TG related C&I system like turbine supervisory system (TSS) etc.

(c.) DDCMIS as detailed in Part-B

(d.) Training for Electric Power Supply systems

(e.) Training for power cycle piping / critical piping

13.02.00 The scope of services under training shall also necessarily include training of Employer's Engineering personnel covering entire scope for the package This shall

cover all disciplines viz, Mechanical, Electrical, C&I, & QA etcand shall include all the related areas like Design familiarization, training on product design features and product design softwares of major equipment and systems, engineering, manufacturing, erection, commissioning, training on operating features of equipment, quality assurance and testing, plant visits and visits to manufacturer's works, exposure to various kinds of problems which may be encountered in fabrication, manufacturing, erection, welding etc.

13.03.00 Contractor shall also arrange for training of Employer's personnel in respect of fire detection and protection systems and other Balance of Plant equipments.

13.04.00 Exact details, extent of training and the training schedule shall be finalised based on the Bidder's proposal within two (2) months from placement of award.

13.05.00 In all the above cases, the lodging and boarding of the Employer's personnel shall be at the cost of Bidder. The Bidder shall make all necessary arrangements towards the same.

13.06.00 Take off prices (product wise) should be indicated by the Bidder in the Bid Proposal Sheets. Employer reserves the right to include or exclude these item(s) during placement of Award.

Note:

1. For training purposes, one (1) man month implies 30 working days (excluding all intervening holidays) per person.
2. The total man months in each area shall be divided into suitable number of modules which shall be discussed and finalized during post award stage.
3. Duration of each module shall not be less than 10 (ten) working days out of which 20 % shall be for plant/manufacturers' works visits and 80% shall be class room training.
4. A) Location of class room training for engineering shall be at Design/Engineering office.

   B) Class room training for erection/O&M shall be at location of Manufacturers' works.

TRAINING REQUIRED IN MAN MONTH

Area	Engineering (Man months)	Erection (Man months)	O&M (Man months)

Steam Turbine Generator and its Auxiliaries including electricals	6.5	9.0	23
Station C&I (Control and Instrumentation)	3.5	5.5	10
Total			

Area	Topics	MANDAYS
Condensate Polishing Plant (CPU)	**System/Product Design** - Basic design features including Pre-filters - Theory & principle of operation - Latest technological trends in CPU & Pre-filters and design aspects & Selection criteria. **Plant Visit** - Operational feedback - O&M history / problems related to CPU plant **Visit to Manufacturer's Work** -Manufacturing process of pre-filters and major equipment -Testing facilities **Operation & Maintenance of Plant** -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	**3**

14.00.00 **SAFETY ASPECTS DURING CONSTRUCTION AND ERECTION**

In addition to the requirements given in Erection Conditions of Contract (ECC) the following shall also cover:

(a.) Working platforms should be fenced and shall have means of access.

(b.) Ladders in accordance with Employer's safety rules for construction and erection shall be used. Rungs shall not be welded on columns. All the stairs shall be provided with handrails immediately after its erection.

15.00.00 **NOISE LEVEL**

The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment / machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA except for

(a.) Safety valves and associated vent pipes for which it shall not exceed 105 dBA-115 dBA.

(b.) Regulating drain valves in which case it shall be limited to 90 dBA-115dBA.

(c.) TG unit in which case it shall not exceed 90 dBA.

(d.) For HP-LP bypass valves and other intermittantly operating control valves, the noise level shall be within the limit of 90 dBA.

(e) For BFP motor, the noise level shall be within the limit of 90 dBA

16.00.00 **PACKAGING AND TRANSPORTATION**

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. The Contractor shall ascertain the availability of Railway wagon sizes from the Indian Railways or any other agency concerned in India well before effecting despatch of equipment. Before despatch it shall be ensured that complete processing and manufacturing of the components is carried out at shop, only restricted by transport limitation, in order to ensure that site works like grinding, welding, cutting & preassembly to bare minimum. The Employer's Inspector shall have right to insist for completion of works in shops before despatch of materials for transportation.

17.00.00 **ELECTRICAL ENCLOSURE**

All electrical equipments and devices, including insulation, heating and ventilation devices shall be designed for ambient temperature and a maximum relative humidity as specified elsewhere in the specification,

18.00.00 **INSTRUMENTATION AND CONTROL**

All instrumentation and control systems/ equipment/ devices/ components, furnished under this contract shall be in accordance with the requirements stated herein, unless otherwise specified in the detailed specifications.

18.01.00 All instrument scales and charts shall be calibrated and printed in metric units and shall have linear graduation. The ranges shall be selected to have the normal reading at 75% of full scale.

All scales and charts shall be calibrated and printed in Metric Units as follows:

a) Temperature - Degree centigrade (deg C)

b) Pressure - Kilograms per square centimetre (Kg/cm2). Pressure instrument shall have the unit suffixed with 'a' to indicate absolute pressure. If nothing is there, that will mean that the indicated pressure is gauge pressure.

c) Draught - Millimetres of water column (mm wc).

d) Vacuum - Millimeters of mercury column (mm Hg) or water column (mm Wcl).

e) Flow (Gas) - Tonnes/ hour

f) Flow (Steam) - Tonnes/ hour

g) Flow (Liquid) - Tonnes / hour

h) Flow base - 760 mm Hg. 15 deg.C

i) Density - Grams per cubic centimetre.

18.02.00 All instruments and control devices provided on panels shall be of miniaturized design, suitable for modular flush mounting on panels with front draw out facility and flexible plug-in connection at rear.

18.03.00 **NOT USED**.

19.00.00 **ELECTRICAL NOISE CONTROL**

The equipment furnished by the Contractor shall incorporate necessary techniques to eliminate measurement and control problems caused by electrical noise. Areas in Contractor's equipment which are vulnerable to electrical noise shall be hardened to eliminate possible problems. Any additional equipment, services required for effectively eliminating the noise problems shall be included in the proposal.

20.00.00 **INSTRUMENT AIR SYSTEM**

The instrument air supply system as supplied by the Contractor for various pneumatic control & instrumentation devices like pneumatic actuators, power cylinders, E/P converters, piping / tubing etc. shall be as per the details furnished elsewhere.

Each pneumatic instrument shall have an individual air shut - off valve. The pressure regulating valve shall be equipped with an internal filter, a 50 mm pressure gauge and a built-in filter housing blow down valve.

21.00.00 **TAPPING POINTS FOR MEASUREMENTS**

Tapping points shall include probes, wherever applicable, for analytical measurements and sampling.

For direct temperature measurement of all working media, one stub with internal threading of approved pattern shall be provided along with suitable plug and washer. The Contractor will be intimated about thread standard to be adopted.

The following shall be provided on equipment by the Contractor. The standard which is to be adopted, will be intimated to the Contractor.

(a.) Temperature test pockets with stub and thermowell

(b.) Pressure test pockets

22.00.00 SYSTEM DOCUMENTATION

The Bidder shall provide drawings, system overview & description, hardware/ software details, technical literature, functional & hardware schemes, bill of material, parts list, interconnection diagrams, data sheets, erection/ installation/

commissioning procedures, instruction/ operating manuals, etc. for each of the C& I system / sub-systems/ equipment supplied under this package. The documentation shall include complete details of the C&I systems/ sub-systems/ equipment to enable review by Employer during detailed engineering stage and to provide information to plant personnel for operation & Maintenance (including quick diagnostics & trouble shooting) of these C&I systems/ sub-systems/ equipment at site. The minimum documentation requirements for C&I systems shall be as stipulated under C&I "Techncial Data Sheets" Part of specifications. In addition to this, system documentation for DDCMIS shall include as a minimum to that specified elsewhere in the Technical Specification.

The exact format, submission schedule and contents of various documents shall be as finalised during detailed engineering stage.

22.01.00 Bill of material (instrument list) for all C&I equipment/ devices shall be furnished by the bidder in standard formats as approved by the Employer.

23.00.00 **MAINTENANCE MANUALS OF ELECTRONIC MODULES**

The Contractor shall have to furnish two (2) sets of all maintenance manual of each and every electronic card/module as employed on the various systems and equipment including peripherals etc., offered by him. The Contractor will also have to furnish the data regarding the expected failure rate of various modules and other system components. Further, the contractor shall furnish a set of operating manuals which should include block diagrams, make, model/type, details wiring and external connection drawings etc as required to do the testing and maintenance of the electronic modules.

ANNEXURE-I

S.NO.	DESCRIPTION OF DOCUMENTS	NO OF PRINTS	NO. OF CD-ROMs
1.	PLANT DEFINITION MANUAL-	2 sets	4 CD-ROMs
2.	Drawings "FOR APPROVAL"		
	i) Layout drawings / P&IDs	6	2 CD - ROMs
	ii) Other drawings	2	2 CD - ROMs
3.	Drawings "FOR INFORMATION"	2	2 CD - ROMs
4.	Drawings "FINAL DRAWING"	15	4 CD-ROMs
5.	Drawings "AS BUILT "	15	4 CD-ROMs
6	DATASHEETS, DESIGN CALCULATIONS, PURCHASE SPECIFICATIONS, etc. and Other type of documents		
	i) For Approval	2	2 CD - ROMs
	ii) FINAL	15	4 CD-ROMs -
	iii) Analysis reports of equip-ments/ piping/ structures components/ systems employing software packages as detailed in the specifications	2	2 CD - ROMs
7.	Erection manual "1st Submission"	4 Sets	2 CD - ROMs
8	Erection manual "FINAL"	4 Sets	4 CD ROMs
9	Operation & Maintenance manual "1st submission"	4	2 CD - ROMs

S.NO.	DESCRIPTION OF DOCUMENTS	NO OF PRINTS	NO. OF CD-ROMs
10	Operation & Maintenance manual "FINAL"	4 Sets	4 CD-ROMs
11	Plant Hand Book "1st Submission"	4 Sets	2 CD ROMs
12	Plant Hand Book "FINAL"	4 Sets	4 CD ROMs
13	Commissioning and Performance Procedure manual "1st Submission"	4 Sets	2 CD-ROMs
14	Commissioning and Performance Procedure manual "FINAL"	4 Sets	4 CD ROMs
15	Performance and Functional GURANTEES TEST REPORT	4 Sets	4 CD ROMs
16	Project completion report	15	4 CD ROMs
17	QA programme including Organi-sation for implement-ation and QA systemmanual (with revision-servicing)	1	1 CD ROM
18	Vendor details in respect of pro-posed vendors including contractor's evaluation report.	1	1 CD ROM
19	Manufacturing QPs, Field QPs, Field welding schedules and their reference documents like test procedures, WPS, PQR etc.		
	(i) For review/comment	2	2 CD-ROMs
	(ii) For final approval	2	2 CD ROMs

S.NO.	DESCRIPTION OF DOCUMENTS	NO OF PRINTS	NO. OF CD-ROMs
20	Welding Manual, HeatTreatment Manuals, Storage & preservation manuals		
	1st Submission	4 Sets	2 CD ROMs sets
	Final	4 sets	4 CD ROMs
21	QA Documentation Packagefor items / equipmentmanufactured and and despatched to site	2 sets	4 CD ROMs
22	QA Documentation Package for field activities on equipment / systems at site	2 sets	4 CD ROMS

ANNEXURE-II

LIST OF CODES AND STANDARDS

Indian Standards	Title	International and Internationally recognised standards
IS:277	Galvanised steel sheets (plain or corrugated)	
IS:655	Specification for metal air duct	
IS:800	Code of practice for use of structural steel in general building construction	BS 449:1969 BS 5950 ASA A57, 1-1952
IS:807	Code of practice for design, manufacture, erection and testing (Structural portion) of cranes and hoists 6588 (Issued by Standards Associa-tion of Australia). DIN 120:1936 (Sheet 1) DIN 120:1936 (Sheet 2) 327 part-I, 1951 BS 466 part-II, 1960 BS 644:1960 BS 1757:1951 BS 2573:part-I:1960	Draft Revision of A.S. NO. CS.2 SAA Crane and Hoist code Doc:No. BU/4 Rev
IS:875	Code of practice for design loads (other than earthquake) for buildings and structures Leading standards (issued by Canadian Standard) DIN-1055-1955 (Issued by ASA)	National Building code of Canada (1953)-Part-IV Design section 4.1

IS:1239 Part-I	Mild steel tubes	(ISO/R 65-1957) (ISO/R-64-1958) (ISO/R-65-1958) (BS 1387 : 1957)
IS:1239 Part-II	Mild steel tubulars and other wrought steel pipe fittings	BS 1387 : 1967 BS 1387 :1967 BS 1740 :1965
IS:2825	Code for unfired vessels	
IS:1520	Horizontal centrifugal pumps for clear cold and fresh water	
IS:1600	Code for practice for performance of constant speed IC Engines for general purpose	
IS:1601	Specification for perform-ance of constant speed IC Engines for general Purpose	
IS:1893	Criteria for earthquake resistant design of structures	
IS1978-1971	Line Pipe April 1969.	API Standards 5L
IS:2254-1970	Dimensions of vertical shaft motor for pumps	IEC Pub 72-1 part I NEMA Pub MG 1 1954
IS:2266	Steel wire ropes for general engineering purposes	BS :302 : 1968
IS:2312	Propellant type Ventilation fans	

IS:2365	Steel wire suspension ropes for lifts and hoists	BS : 1957
IS:3346	Method for the determination of thermal conductivity of thermal insulation materials (two slab guarded hot plate method)	DIN 52612 (Deutscher Normenausschuss) ASTM C 163-1964 (American Society of Testing and materials) ASTM C 167-1974 ASTM C 177-1963
IS:3354	Outline dimensions for electric lifts.	
IS:3401	Silica gel	
IS:3588	Specification for electrical axial flow fans	
IS:3589	Electrically welded steel pipes for water, gas and sewage (200mm to 2000 mm Nominal Diametre)	
IS:3677	Unbonded rock and slag wool for thermal insulation	
IS:3815	Point hook with shank for general engineering purposes	BS 482 - 1968 Doc.:67/3 1284 (Revision of BS 2903) (Issued BS)
IS:3895	Specification for monocrystallines semiconductor rectifier cells and stacks	
IS:3963	Roof extractor unit	
IS:3975	Mild steel wires, strips and tapes for armouring cables	

IS:4503	Shell and tube type heat Exchanger	
IS:4540	Specification for monory-stallines rectifire assembly equipment	
IS:4671	Expanded polystyrene for thermal insulation purpose	
IS:4736	Hot dip zinc coating on steel tubes	
IS:4894	Centrifugal fans	
IS:5456	Code of practice for testing of positive displacement type air compressors and exhauster (For Test Tolerance Only)	
IS:5749	Forged ramshorn hooks	Entwurf DIN 15402 Blett 1 Entwurf DIN 15402 BS 3017-1958
IS:6392	Steel pipe flanges	BS 4504 : 1969
IS:6524 Part-I	Code of practice for design of tower cranes Static and rail mounted	BS 2799 : 1956
IS:7098	Cross linked Polyethylene insulated PVC sheathed cables	Standard No. 1 to IPCEA (USA) Pub. No. 5-66-524
IS:7373	Specification for wrought aluminium and aluminium sheet and strips	
IS:7938	Air receivers for compressed air installation	

ISO:1217	Displacement compressor-Acceplance test
ASHRAE-33	Methods of testing for rating of forced circulation air cooling and air heating coils.
ASHRAE-52-76	Air cleaning device used in general ventilation for removing particle matter.
ASHRAE-22-72	Method of testing for rating of water cooled refrigerant condensers.
ASHRAE 23-67	Methods of testing for rating of positive displacement refrigerant compressors.
ARI-450-6	Standard for water cooled refrigerant condensers.
ARI-550	Standard for centrifugal water chilling packages.
ARI-410	Standard for forced circulation air cooling and air heating coils
ARI-430/435	Central station AHU/Application of Central Station AHU
BS:848 (Part-1,2)	Fans
BS:400	Low carbon steel cylinders for the storage & transport of permanent gases.
BS:401	Low carbon steel cylinders for the storage & transport of liquified gases.
CTI Code ACT-105	Acceptance test code for Water Cooling Tower.
ANSI-31.5	Refrigerant piping
ASME-PTC-23-1958	Atmospheric Water Cooling Equipment
AMCA A-21C	Test Code for air moving devices
API:618	Reciprocating Compressor for general refinary services.

HYDRAULIC INSTITUTE STANDARDS.

HYDRANT SYSTEM MANUALS OF TAC.

TAC MANUALS OF SPRAY SYSTEM

NFPA USA/ NSC UK/ UL USA/ FM USA STANDARDS.

INDIAN EXPLOSIVES ACT.

INDIAN FACTORIES ACT.

STANDARD OF TUBULAR EXCHANGER MANUFACTURER'S ASSOCIATION.

CODE AND STANDARD FOR CIVIL WORKS

Some of the applicable Standards, Codes and references are as follows:

Excavation & Filling

IS: 2720 (Part-II, IV TO VIII, XIV, XXI, XXIII, XXIV, XXVII TO XXIX, XL) Methods of test for soils-determination for water content etc.

IS: 4701 Code of practice for earth work on canals.

IS: 9758 Guide lines for Dewatering during construction.

IS: 10379 Code of practice for field control of moisture and compaction of soils for embankment and sub-grade.

Properties, Storage and Handling of Common Building Materials

IS: 269 Specification for ordinary Portland cement, 33 grade.

IS: 383 Specification for coarse and fine aggregates from natural sources for concrete.

IS: 432 Specification for mild steel and (Parts 1&2) medium tensile steel bars and hard-drawn steel wires for concrete reinforcement.

IS: 455 Specification for Portland slag cement.

IS: 702 Specification for Industrial bitumen.

IS: 712 Specification for building limes.

IS: 808	Rolled steel Beam channel and angle sections.
IS: 1077	Specification for common burnt clay building bricks.
IS: 1161	Specification of steel tubes for structural purposes.
IS: 1363	Hexagon head Bolts, Screws and nuts of production grade C.
IS: 1364	Hexagon head Bolts, Screws and Nuts of Production grade A & B.
IS: 1367	Technical supply conditions for Threaded fasteners.
IS: 1489	Specification for Portland-pozzolana cement:
(Part-I)	Fly ash based.
(Part-II)	Calcined clay based.
IS: 1542	Specification for sand for plaster.
IS: 1566	Specification for hard-drawn steel wire fabric for concrete reinforcement.
IS: 1786	Specification for high strength deformed bars for concrete reinforcement.
IS: 2062	Specification for steel for general structural purposes.
IS: 2116	Specification for sand for masonry mortars.
IS: 2386 (Parts-I to VIII)	Testing of aggregates for concrete.
IS: 3150	Hexagonal wire netting for general purpose.
IS: 3495 (Parts-I to IV)	Methods of tests of burnt clay building bricks.
IS: 3812	Specification for fly ash, for use as pozzolana and admixture.
IS: 4031	Methods of physical tests for hydraulic cement.
IS: 4032	Methods of chemical analysis of hydraulic cement.

IS: 4082	Recommendations on stacking and storage of construction materials at site.
IS: 8112	Specification for 43 grade ordinary portland cement.
IS: 8500	Medium and high strength structural steel.
IS: 12269	53 grade ordinary portland cement.
IS: 12894	Specification for Fly ash lime bricks.

Cast-In-Situ Concrete and Allied Works

IS: 280	Specification for mild steel wire for general engineering purposes.
IS: 456	Code of practice for plain and reinforced concrete.
IS: 457	Code of practice for general construction of plain & reinforced concrete for dams & other massive structures.
IS: 516	Method of test for strength of concrete.
IS: 650	Specification for standard sand for testing of cement.
IS: 1199	Methods of sampling and analysis of concrete.
IS: 1791	General requirements for batch type concrete mixers.
IS: 1838 (Part-I)	Specification for preformed fillers for expansion joints in concrete pavements and structures (non-extruding and resilient type).
IS: 2204	Code of practice for construction of reinforced concrete shell roof.
IS: 2210	Criteria for the design of reinforced concrete shell structures and folded plates.
IS: 2438	Specification for roller pan mixer.
IS: 2502	Code of practice for bending and fixing of bars for concrete reinforcement.
IS: 2505	General requirements for concrete vibrators, immersion type.

IS: 2506	General requirements for concrete vibrators, screed board type.
IS: 2514	Specification for concrete vibrating tables.
IS: 2645	Specification for Integral cement water proofing compounds.
IS: 2722	Specification for portable swing weigh batches for concrete. (single and double bucket type)
IS: 2750	Specification for Steel scaffolding.
IS: 2751	Code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction.
IS: 3025	Methods of sampling and test waste water.
IS: 3366	Specification for Pan vibrators.
IS: 3370 (Part I to IV)	Code of practice for concrete structures for the storage of liquids.
IS: 3414	Code of practice for design and installation of joints in buildings.
IS: 3550	Methods of test for routine control for water used in industry.
IS: 3558	Code of practice for use of immersion vibrators for consolidating concrete.
IS: 4014 (Parts I & II)	Code of practice for steel tubular scaffolding.
IS: 4326	Code of practice for earthquake resistant design and construction of buildings.
IS: 4461	Code of practice for joints in surface hydro-electric power stations.
IS: 4656	Specification for form vibrators for concrete.
IS: 4925	Specification for batching and mixing plant.
IS: 4990	Specification for plywood for concrete shuttering work.

IS: 4995 (Parts I & II)	Criteria for design of reinforced concrete bins for the storage of granular and powdery materials.
IS: 5256	Code or practice for sealing joints in concrete lining on canals.
IS: 5525	Recommendations for detailing of reinforcement in reinforced concrete work.
IS: 5624	Specification for foundation bolts.
IS: 6461	Glossary of terms relating to cement concrete.
IS: 6494	Code of practice for water proofing of underground water reservoirs and swimming pools.
IS: 6509	Code of practice for installation of joints in concrete pavements.
IS: 7861	Code of practice for extreme weather concreting. (Parts I & II)
IS: 9012	Recommended practice for shot concreting.
IS: 9103	Specification for admixtures for concrete.
IS: 9417	Recommendations for welding cold worked steel bars for reinforced concrete construction.
IS: 10262	Recommended guidelines for concrete mix design.
IS: 11384	Code of practice for composite construction in structural steel and concrete.
IS: 11504	Criteria for structural design of reinforced concrete natural draught cooling towers.
IS: 12118	Specification for two-parts poly sulphide.
IS: 12200	Code of practice for provision of water stops at transverse contraction joints in masonry and concrete dams.
IS: 13311	Method of non-destructive testing of concrete.
Part-1	Ultrasonic pulse velocity.

Part-2	Rebound hammer.
SP:23	Handbook of concrete mixes
SP: 24	Explanatory Handbook on IS: 456-1978
SP: 34	Handbook on concrete reinforcement and detailing.

Precast Concrete Works

SP: 7(PartVI/	National Building Code- Structural design of prefabrication and Sec.7) systems building.
IS: 10297	Code of practice for design and construction of floors and roofs using precast reinforced/prestressed concrete ribbed or cored slab units.
IS: 10505	Code of practice for construction of floors and roofs using pre-cast reinforced concrete units.

Masonary and Allied Works

IS: 1905	Code of Practice for Structural Safety of Buildings-Masonry walls.
IS: 2212	Code of Practice for Brickwork.
IS: 2250	Code of Practice for Preparation and use of Masonry Mortar.
SP: 20	Explanatory hand book on masonry code.

Sheeting Works

IS:277	Galvanised steel sheets (plain or corrugated).
IS: 459	Unreinforced corrugated and semi-corrugated asbestos cement sheets.
IS: 513	Cold-rolled carbon steel sheets.
IS: 730	Specification for fixing accessories for corrugated sheet roofing.

IS: 1626	Specification for Asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing fittings.
IS: 2527	Code of practice for fixing rain water gutters and down pipe for roof drainage.
IS: 3007	Code of practice for laying of asbestos cement sheets.
IS: 5913	Methods of test for asbestos cement products.
IS: 7178	Technical supply conditions for tapping screw.
IS: 8183	Bonded mineral wool.
IS: 8869	Washers for corrugated sheet roofing.
IS: 12093	Code of practice for laying and fixing of sloped roof covering using plain and corrugated galvanised steel sheets.
IS: 12866	Plastic translucent sheets made from thermosetting polyster resin (glass fibre reinforced).
IS: 14246	Specification for continuously pre-painted galvanised steel sheets and coils.

Fabrication and Erection of Structural Steel Work

IS: 2016	Specification for plain washers.
IS: 814	Specification for covered Electrodes for Metal Arc Welding for weld steel.
IS: 1852	Specification for Rolling and Cutting Tolerances for Hot rolled steel products.
IS: 3502	Specifications for chequered plate.
IS: 6911	Specification for stainless steel plate, sheet and strip.
IS: 3757	Specification for high strength structural bolts
IS: 6623	Specification for high strength structural nuts.

IS: 6649	High Tensile friction grip washers.
IS: 800	Code of practice for use of structural steel in general building construction.
IS: 816	Code of practice for use of Metal Arc Welding for General Construction.
IS: 4000	Code of practice for assembly of structural joints using high tensile friction grip fasteners.
IS: 9595	Code of procedure of Manual Metal Arc Welding of Mild Steel.
IS: 817	Code of practice for Training and Testing of Metal Arc Welders.
IS: 1811	Qualifying tests for Metal Arc Welders (engaged in welding structures other than pipes).
IS: 9178	Criteria for Design of steel bins for storage of Bulk Materials.
IS: 9006	Recommended Practice for Welding of Clad Steel.
IS: 7215	Tolerances for fabrication steel structures.
IS: 12843	Tolerance for erection of structural steel.
IS: 4353	Recommendations for submerged arc welding of mild steel and low alloy steels.
SP: 6 (Part 1 to 7)	ISI Hand book for structural Engineers.
IS: 1608	Method of Tensile Testing of Steel products other than sheets, strip, wire and tube.
IS: 1599	Method of Bend Tests for Steel products other than sheet, strip, wire and tube
IS : 228	Methods of chemical Analysis of pig iron, cast iron and plain carbon and low alloy steel.
IS : 2595	Code of Practice for Radio graphic testing.

IS : 1182	Recommended practice for Radiographic Examination of fusion welded butt joints in steel plates.
IS : 3664	Code of practice for Ultra sonic Testing by pulse echo method.
IS : 3613	Acceptance tests for wire flux combination for submerged Arc Welding.
IS : 3658	Code of practice for Liquid penetrant Flaw Detection.
IS : 5334	Code of practice for Magnetic Particle Flaw Detection of Welds.

Plastering and Allied Works

IS : 1635	Code of practice for field slaking of Building lime and preparation of putty.
IS : 1661	Application of cement and cement lime plaster finishes.
IS : 2333	Plaster-of-paris.
IS : 2402	Code of practice for external rendered finishes.
IS : 2547	Gypsum building plaster.
IS : 3150	Hexagonal wire netting for general purpose.

Acid and Alkali Resistant Lining

IS : 158	Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali & heat resisting.
IS : 412	Specification for expanded metal steel sheets for general purpose.
IS : 4441	Code of practice for use of silicate type chemical resistant mortars.
IS : 4443	Code of practice for use of resin type chemical resistant mortars.
IS : 4456	Method of test for chemical resistant tiles. (Part I & II)

IS : 4457	Specification for ceramic unglazed vitreous acid resistant tiles.
IS : 4832	Specification for chemical resistant mortars.
	Part I Silicate type
	Part II Resin type
	Part III Sulphur type
IS : 4860	Specification for acid resistant bricks.
IS : 9510	Specification for bitumasitc, Acid resisting grade.

Water Supply, Drainage and Sanitation

IS : 458	Specification for concrete pipes.
IS : 554	Dimensions for pipe threads, where pressure tight joints are made on thread.
IS : 651	Specification for salt glazed stoneware pipes.
IS : 774	Flushing cisterns for water closets and urinals.
IS : 775	Cast iron brackets and supports for wash basins and sinks.
IS : 778	Copper alloy gate, globe and check valves for water works purposes.
IS : 781	Cast copper alloy screw down bib taps and stop valves for water services.
IS : 782	Caulking lead.
IS : 783	Code of practice for laying of concrete pipes.
IS : 1172	Basic requirements for water supply, drainage and sanitation.
IS : 1230	Cast iron rain water pipes and fittings.
IS : 1239	Mild steel tubes, tubulars and other wrought steel fittings.

IS : 1536	Centrifugally cast (Spun) iron pressure pipes for water, gas and sewage.
IS : 1537	Vertically cast iron pressure pipes for water, gas and sewage.
IS : 1538	Cast iron fittings for pressure pipe for water, gas and sewage.
IS : 1703	Ball valves (horizontal plunger type) including float for water supply purposes.
IS : 1726	Cast iron manhole covers and frames.
IS : 1729	Sand cast iron spigot and socket, soil, water and ventilating pipes, fittings and accessories.
IS : 1742	Code of practice for building drainage.
IS : 1795	Pillar taps for water supply purposes.
IS : 1879	Malleable cast iron pipe fittings.
IS : 2064	Code of practice for selection, installation and maintenance of sanitary appliances.
IS : 2065	Code of practice for water supply in building.
IS : 2326	Automatic flushing cisterns for urinals.
IS : 2470 (Part-I & II)	Code of practice for installation of septic tanks.
IS : 2501	Copper tubes for general engineering purposes.
IS : 2548	Plastic seat and cover for water-closets.
IS : 2556 (Part 1 to 15)	Vitreous sanitary appliances (vitreous china).
IS : 2963	Non-ferrous waste fittings for wash basins and sinks.
IS : 3114	Code of practice for laying of cast iron pipes.

IS : 3311	Waste plug and its accessories for sinks and wash basins.
IS : 3438	Silvered glass mirrors for general purposes.
IS : 3486	Cast iron spigot and socket drain pipes.
IS : 3589	Electrically welded steel pipes for water, gas and sewage (200mm to 2000mm nominal diameter).
IS : 3989	Centrifugally cast (Spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
IS : 4111 (Part I to IV)	Code of practice for ancillary structure in sewerage system.
IS : 4127	Code of practice for laying of glazed stone-ware pipes.
IS : 4764	Tolerance limits for sewage effluents discharged into inland-surface waters.
IS : 4827	Electro plated coating of nickel and chromium on copper and copper alloys.
IS : 5329	Code of practice for sanitary pipe work above ground for buildings.
IS : 5382	Rubber sealing rings for gas mains, water mains and sewers.
IS : 5822	Code of practice for laying of welded steel pipes for water supply.
IS : 5961	Cast iron grating for drainage purpose.
IS : 7740	Code of practice for road gullies.
IS : 8931	Cast copper alloy fancy bib taps and stop valves for water services.
IS : 8934	Cast copper alloy fancy pillar taps for water services.
IS : 9762	Polyethylene floats for ball valves.

IS : 10446	Glossary of terms for water supply and sanitation.
IS : 10592	Industrial emergency showers, eye and face fountains and combination units.
IS : 12592	Specification for precast concrete manhole covers and frames.
IS : 12701	Rotational moulded polyethylene water storage tanks.
SP: 35	Hand book on water supply and drainage.
-	Manual on Sewerage and sewage treatment (Published by CPH & EEO) As updated.

Doors, Windows and Allied Works

IS : 204	Tower Bolts
Part-I	Ferrous metals.
Part-II	Nonferrous metals.
IS : 208	Door Handles.
IS : 281	Mild steel sliding door bolts for use with padlocks.
IS : 362	Parliament Hinges.
IS : 420	Specification for putty, for use on metal frames.
IS : 1003 Part-I door	Specification for timber panelled and glazed shutters- (Part-I) shutters.
IS : 1038	Steel doors, windows and ventilators.
IS : 1081	Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators.
IS : 1341	Steel butt hinges.
IS : 1361	Steel windows for industrial buildings.
IS : 1823	Floor door stoppers.

IS : 1868	Anodic coatings on Aluminium and its alloys.
IS : 2202 (Part-II)	Specification for wooden flush door shutters (solid core type); particle board face panels and hard board face panels
IS:2209	Mortice locks (vertical type).
IS:2553	Safety glass
IS:2835	Flat transparent sheet glass.
IS:3548	Code of practice for glazing in buildings.
IS:3564	Door closers (Hydraulically regulated).
IS : 3614	Fire check doors; plate, metal covered and rolling type.
IS:4351	Steel door frames.
IS:5187	Flush bolts.
IS:5437	Wired and figured glass
IS:6248	Metal rolling shutters and rolling grills.
IS:6315	Floor springs (hydraulically regulated) for heavy doors.
IS:7196	Hold fasts.
IS:7452	Hot rolled steel sections for doors, windows and ventilators.
IS:10019	Mild steel stays and fasteners.
IS:10451	Steel sliding shutters (top hung type).
IS:10521	Collapsible gates.

Roof Water Proofing and AlliedWorks

IS:1203	Methods of testing tar and bitumen.

IS:1322	Specification for bitumen felts for water proofing and damp proofing.
IS:1346	Code of practice for water proofing of roofs with bitumen felts.
IS:1580	Specification for bituminous compound for water proofing and caulking purposes.
IS:3067	Code of practice for general design details and preparatory work for damp proofing and water proofing of buildings.
IS:3384	Specification for bitumen primer for use in water proofing and damp proofing.

Floor Finishes and Allied Works

IS:1237	Specification for cement concrete flooring tiles.
IS:1443	Code of practice for laying and finishing of cement concrete flooring tiles.
IS:2114	Code of practice for laying in-situ terrazzo floor finish.
IS:2571	Code of practice for laying in-situ cement concrete flooring.
IS:3462	Specification for unbacked flexible PVC flooring.
IS:4971	Recommendations for selection of industrial floor finishes.
IS:5318	Code of practice for laying of flexible PVC sheet and tile flooring.
IS:8042	Specification for white portland cement.
IS:13801	Specification for chequered cement concrete flooring tiles.

Painting and Allied Works

IS:162	Specification for fire resisting silicate type, brushing, for use on wood, colour as required.
IS:1477	Code of practice for painting of ferrous metals in buildings.
Part-I	Pretreatment.

Part-II	Painting.
IS:1650	Specification for colours for building and decorative finishes.
IS:2074	Specification for red oxide-zinc chrome, priming, ready mixed paint air drying.
IS:2338	Code of practice for finishing of wood and wood based materials.
Part-I	Operations and workmanship
Part-II	Schedules
IS:2395	Code of practice for painting concrete, masonry and plaster surfaces.
Part-I	Operations and workmanship.
Part-II	Schedule.
IS:2524	Code of practice for painting of nonferrous metals in buildings.
Part-I	Pretreatment.
Part-II	Painting.
IS:2932	Specification of synthetic enamel paint, exterior, under-coating and finishing.
IS:2933	Specification enamel paint, under coating and finishing.
IS:4759	Code of practice for hot dip zinc coating on structural steel and other allied products.
IS:5410	Specification for cement paint
IS:5411 (Part-I)	Specification for plastic emulsion paint-for exterior use
IS:6278	Code of practices for white washing and colour washing.
IS:10403	Glossary of terms relating to building finishes.

Piling and Foundation

IS:1080	Code of practice for design and construction of simple spread foundations.

IS:1904	Code of practice for design and construction of foundations in Soils; General Requirements.
IS:2911	Code of practice for designs and construction of Pile foundations (Relevant Parts).
IS:2950 (Part-I)	Code of practice for designs and construction of Raft foundation.
IS:2974 (Part-I TO V)	Code of practice for design and construction of machine foundations.
IS:6403	Code of practice for determination of Allowable Bearing pressure on Shallow foundation.
IS:8009	Code of practice for calculation of settlement of foundation subjected to symmetrical vertical loads.
Part-I	Shallow foundations.
Part-II	Deep foundations.
IS:12070	Code of practice for design and construction of shallow foundations on rocks.
DIN:4024	Flexible supporting structures for machines with rotating machines.
VDI:2056	Criteria for assessing mechanical vibrations of machines.
VDI:2060	Criteria for assessing rotating imbalances in machines.

Stop Log and Trash Rack

IS:4622	Recommendations for fixed - wheel gates structural design.
IS:5620	Recommendations for structural design criteria for low head slide gates.
IS:11388	Recommendations for design of trash rack for intakes.
IS:11855	General requirements for rubber seals for hydraulic gates.

Roads

IRC:5	Standard specifications and Code of practice for road bridges, section-I general Features of Design.
IRC:14	Recommended practice of 2cm thick bitumen and tar carpets.
IRC:16	Specification for priming of base course with bituminous primers.

IRC:19	Standard specifications and code of practice for water bound macadam.
IRC:21	Standard specifications and Code of practice for road bridges, section-III - Cement concrete (plain and reinforced).
IRC:34	Recommendations for road construction in waterlogged areas.
IRC:36	Recommended practice for the construction of earth embankments for road works.
IRC:37	Guidelines for the Design of flexible pavements.
IRC:56	Recommended practice for treatment of embankment slopes for erosion control.
IRC:73	Geometric design standards for rural (non-urban) highways.
IRC:86	Geometric Design standards for urban roads in plains.
IRC:SP:13	Guidelines for the design of small bridges & culverts.
IRC - Public-	Ministry of Surface Transport (Roads Wing), Specifications
ation	for road and bridge works.
IS:73	Specification for paving bitumen
Loadings	
IS:875	Code of practice for design loads other than earthquake) for
(Pt. I to V)	buildings and structures.
IS:1893	Criteria for earthquake resistant design of structures.
IS:4091	Code of Practice for design and construction of foundation for transmission line towers & poles.
IRC:6	Standard specifications & code of practice for road bridges, Section-II Loads and stresses.
M.O.T.	Deptt. of railways Bridge Rules.
Safety	
IS:3696	Safety code for scaffolds and ladders.
(Part I & II)	
IS:3764	Safety code for excavation work.
IS:4081	Safety code for blasting and related drilling operations.
IS:4130	Safety code for demolition of buildings.

IS:5121	Safety code for piling and other deep foundations.
IS:5916	Safety code for construction involving use of hot bituminous materials.
IS:7205	Safety code for erection on structural steelwork.
IS:7293	Safety code for working with construction machinery.
IS:7969	Safety code for handling and storage of building materials
IS:11769	Guidelines for safe use of products containing asbestos.

- Indian Explosives Act. 1940 as updated.

Architectural design of buildings

SP:7	National Building Code of India
SP:41	Hand book on functional requirements of buildings (other than industrial buildings)

Miscellaneous

IS:802	Code of practice for use of structural steel in
(Relevant parts)	overhead transmission line towers.
IS:803	Code of practice for design, fabrication and erection of vertical mild steel cylindrically welded in storage tanks.
IS:10430	Creteria for design of lined canals and liner for selection of type of lining.
IS:11592	Code of practice for selection and design of belt conveyors.
IS:12867	PVC handrails covers.
CIRIA	Design and construction of buried thin-wall pipes.
Publication	

REFERENCE CODES AND STANDARDS FOR CONTROL AND INSTRUMENTATION

The design, manufacture, inspection, testing & installation of all equipment and system covered under this specification shall conform to the latest editions of codes and standards mentioned below and all other applicable VDE, IEEE, ANSI, ASME, NEC, NEMA, ISA AND Indian Standards and their equivalents.

Temperature Measurements

1. Instrument and apparatus for temperature measurement - ASME PTC 19.3 (1974).

2. Temperature measurement - Thermocouples ANSI MC 96.1 - 1982.

3. Temperature measuremnet by electrical Resistance thermometers - IS:2806.

4. Thermometer - element - Platinum resistance - IS:2848.

Pressure Measurements

1. a) Instruments and apparatus for pressure measurement - ASME PTC 19.2 (1964).

   b) Electonic transmitters BS:6447.

2. Bourdon tube pressure and vacuum gauges - IS:3624 - 1966.

3. Process operated switch devices (Pr. Switch) BS-6134.

Flow Measurements

Instruments and apparatus for flow measurements - ASME PTC 19.5 (1972) Interim supplement, Part-II.

Measurement of fluid flow in closed conduits - BS-1042.

Electronic Measuring Instrument & Control Hardware/ Software

1. Automatic null balancing electrical measuring instruments - ANSI C 39.4 (Rev. 1973): IS:9319.

2. Safety requirements for electrical and electronic measuring and controling instrument - ANSI C 39.5 - 1974.

3. Compatability of analog signals for electronic industrial process instruments - ISA - S 50.1 (1982) ANSI MC 12.1 - 1975.

4. Dynamic response testing of process control instrumentation ISA - S 26 (1968).

5. Surge Withstand Capability (SWC) tests - ANSI C 37.90 a/IEEE-472 or suitable class of IEC-255-4 equivalent to ANSI C37.90a/IEEE-472.

6. Printed circuit boards - IPC TM - 650, IEC 326 C.

7. General requirement and tests for printed wiring boards - IS 7405 (Part-I) 1973.

8. Edge socket connectors - IEC 130-11.

9. Requirements and methods of testing of wire wrap terminations DIN 41611 Part-2.

10. Dimensions of attachment plugs & receptacles - ANSI C 73 - 1973 (Supplement ANSI C 73 a - 1980).

11. Direct acting electrical indicating instrument - IS:1248 - 1968 (R).

12. Standard Digital Interface for Programmable Instrumentation - IEEE-488.2 - 1990.

13. Information Processing Systems - Local Area Networks - Part 2 : Logical Link Control - IEEE-802.2 - 1989.

14. Standard for Local Area Networks : Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1985.

15. Supplements A, B, C and E to Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1988.

16. Standard for Local Area Networks : Token - Passing Bus Access Method - IEEE-802.4 - 1985.

17. Standard for Local Area Networks : Token - Ring Access Method and Physical Layer Specification - IEEE-802.5 - 1985.

18. IEEE Guide to Software Requirements Specifications - IEEE-830 - 1984.

19. Hardware Testing of Digital Process Computers - ISA RP55.1 - 1983.

20. Electromagnetic Susceptibility of Process Control Instrumentation - SAMA PMC 33.1 - 1978.

21. Interface Between the Data Terminal Equipment and Data Circuit - Terminating Equipment Employing Serial Binary Data Interchange - EIA-232-D-1987.

22. Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment, Part 3 : Radiated Electromagnetic Field Requirements - IEC 801-3-1984.

Instrument Switches and Contact

1. Contact rating - AC services NEMA ICS 2 - 1978 (with revision through May 1983), Part - 2-125, A6000.

2. Contact rating - DC services NEMA ICS 2-1978 Part-2 125, N600.

Enclosures

1. Type of Enclosures - NEMA ICS Part - 6 - 1978 (with Rev. 1 4/80) through 110.22 (Type 4 to 13).

2. Racks, panels and associated equipment - EIA : RS - 310 C- 1983 (ANSI C 83.9 - 1972).

3. Protection class for Enclosures, cabinets, control panels & desks - IS:2147 - 1962.

Apparatus, enclosures and installation practices in hazardous area

1. Classification of hazardous area - NFPA 70 - 1984, Article 500.

2. Electrical Instruments in hazardous dust location - ISA - 512.11, 1973.

3. Instrinsically safe apparatus - NFPA 493 1978.

4. Purged and pressurised enclosure for electrical equipment in hazardous location - NFPA 496-1982.

5. Enclosures for Industrial Controls and Systems - NEMA IS 1.1 - 1977.

Sampling System

1. Stainless steel material of tubing and valves for sampling system - ASTMA 296-82, Grade 7 P 316.

2. Submerged helical coil heat exchangers for sample coolers ASTM D11 92-1977.

3. Water and steam in power cycle - ASME PTC 19.11.

4. Standard methods of sampling system - ASTM D 1066-99.

Annunciators

1. Specifications and guides for the use of general purpose annunciators - ISA S 19.1, 1979.

2. Surge withstand capability tests - ANSI C 37.90a - 1989/IEEE-472 or suitable class of IEC 255-4 equivalent to ANSI C37.90a 1989/IEEE-472

3. Damp heat cycling test - IS:2106

4. Specification for Electromagnetic Susceptibility - SAMA DMC 33, 1/78

Protections

1. Relays and relay system associated with electric power apparatus. ANSI C 37.90, 1 - 1989.

2. General requirements & tests for switching devices for control and auxiliary circuits including contactor relays - IS:6875 (Part-I) - 1973.

3. Turbine water damage prevention - ASME TDP-1-1980.

4. Boiler safety interlocks - NFPA Section 85 B - 1984, 85 C - 1991.

UPS System

1. Practices and requirements for semi-conductor power rectifiers - ANSI C 34.2, 1973.

2. Relays and relays system associated with electrical power apparatus - ANSI C 3.90 - 1983.

3. Surge withstand capability test - ANSI C 37.90 1 -1989.

4. Performance testing of UPS - IEC 146.

5. Stationary cells & Batteries Lead Acid type (with tubular positive plates) specification IS-1651-1991.

6. Recommended practice for sizing large lead storage batteries for generating stations & sub-stations - IEEE-485-1985.

7. Printed Circuit Board - IPC TM 650, IEC 326C.

8. General Requirements & tests for printed wiring boards, IS:7405 (Part-I) 1973.

Control Valves

1. Control valve sizing - Compressible & Incompressible fluids - ISA S 75.01-1985.

2. Face to face dimensions of control valves - ANSI B 16.00 - 1973.

3. ISA Hand Book of Control Valves - (ISBN : B: 1047-087664-234-2).

4. Codes for pressure piping - ANSI B 31.1

5. Control Valve leak class - ISA RP 39.6

Process Connection & Piping

1. Codes for pressure piping "power piping" - ANSI B 31.1.

2. Seamless carbon steel pipe ASTM - A - 106.

3. Forged & Rolled Alloy steel pipe flanges, forged fittings and valves and parts - ASTM - A - 182.

4. Material for socket welded fittings - ASTM - A - 105.

5. Seamless ferritic alloy steep pipe - ASTM - A - 335.

6. Pipe fittings of wrought carbon steel and alloy steel - ASTM - A - 234.

7. Composition bronze of ounce metal castings - ASTM - B - 62.

8. Seamless Copper tube, bright annealed - ASTM - B - 168.

9. Seamless copper tube - ASTM - B - 75.

10. Dimension of fittings - ANSI - B - 16.11.

11. Valves flanged and butt welding ends - ANSI - B - 16.34.

Instrument Tubing

1. Seamless carbon steel pipe - ASTM - A 106.

2. Material of socketweld fittings - ASTM - A105.

3. Dimensions of fittings - ANSI - B - 16.11.

4. Code for pressure piping, welding, hydrostatic testing - ANSI B 31.1.

Cables

1. Thermocouples extension wires/cables - ANSI MC 96.1 - 1992.

2. Requirements for copper conductor-Wiring cables for telecommunications & information processing system - VDE:0815.

3. Colour coding of single or multi-pair cables - ICEA - S - 61-402 (third edition) NEMA WCS - 1979 with revisions thorugh 2/83.

4. Insulation & Sheathing compounds for cables : VDE 0207 (Part-4, 5 & 6).

5. Guide design and installation of cable systems in power generating stations (insulation, jacket materials) - IEEE Std. 422-1977.

6. Rules for Testing insulated cables and flexible cables : VVDE - 0472

7. Requirements of vertical flame propagation test - IEEE 383 - 1974 (R 1980)

8. Standard specification for tinned soft or annealed copper wire for electrical purpose - ASTM B-33-81.

9. Oxygen index and temperature index test - ASTM D - 2863.

10. Smoke density measurement test - ASTMD - 2843.

11. Acid gas generation test - IEC - 754 - 1.

12. Swedish Chimney test - SEN - 4241475 (F3).

13. Teflon (FEP) insulation & sheath test - ASTMD - 2116.

14. Thermocouple compensating cables - Testing requirements & sampling plan IS:8784.

15. PVC insulated electric cables for working voltage upto and including 1100 V - IS:1554 (Part-I).

Cable Trays, Conduits

1. Guide for design and installation of cable systems in power generating staiton (Cable trays, support systems, conduits) - IEEE Std. 422, 1977, NEMA VE-1 1979, NFPA 70-1984.

2. -do- Test Standards. NEMA VE-1-1979.

3. Zinc coating "hot dip" on assembled products for galvanising of carbon steel cable trays - ASTMA - 386-78.

Public Address System

1. Specifications for lod speakers - IS:7741 (Part-I, II and III)

2. Code of safety requirement for electric mains operated audio amplifiers - IS:1301

3. Specification for Public Address Amplifiers - IS:10426.
4. Code of practice for outdoor installation of PA system - IS:1982.
5. Code of practice for installation for indoor amplifying and sound distribution system - IS:1881.
6. Basic environmental testing procedures for electronic and electrical items - IS:9000.
7. Characteristics and methods of measurements for sound system equipment - IS:9302
8. Code of practice of electrical wiring installations (System voltage not exceeding 650 volts) - IS:732
9. Rigid steel conduits for electric wiring - IS:9537 (Part-I and II)
10. Fittings for rigid steel conduits for electrical wiring - IS:2667
11. Degree of protection provided by enclosure for low voltage switchgear and control gear - IS:2147.

Vibration Monitoring System

1. API 670 - 1994
2. BS : 4675 Part-2

ANNEXURE - III

Project : Stage : Package : Supplier : Contractor No. :	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB-SYSTEM :	DOC. NO. : REV. NO. : DATE : PAGE : OF	

S.No.	ITEM	QP/ Insp. Cat.	QP No.	QP Sub-Schedule	QP approval schedule	Proposed sub-supplier	Place	Sub-Suppliers approval status/ category	Sub-supplier Details submission schedule	Remarks

LEGENDS :

1. **SYSTEM SUPPLIER / SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)**

A - For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list alongwith the condition of approval, if any.

DR - For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list.

NOTED - For these items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with "NOTED".

2. **QP/INSPN CATEGORY :**

CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.

CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.

CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.

UNITS/WORKS : Place of manufacturing Place of Main Supplier of multi units/works.

FORMAT NO. : QS-01-QAI-P-1/F3-R0 1 / 1 Engg.Div./QA&I

ANNEXURE - IV

Project : Stage : Package : Contractor : Contractor No. :	STATUS OF ITEM REQUIRING QP & SUB-SUPPLIER APPROVAL	DOC. NO. : REV. NO. : DATE : PAGE : OF	

S.No.	ITEM/SERVICE	QP/Insp. Cat.	QP Sub. Schedule Approval Schedule	Date of Sub-mission	Date of commt. Appl.	Status Code C/II/I	Proposed Sub-suppliers	Place of manufacturing works	Approval Status	Sub-supplier detail submission schedule	Remarks

FORMAT NO. : QS-01-QAI-P-02/F1-R0 1 / 1 Engg.Div./QA&I

297

ANNEXURE - V

Project : Stage : Contractor : Contractor No. : System :	FIELD WELDING SCHEDULE (To be raised by the contractor) Welding Code	DOC. NO. : REV. NO. : DATE : PAGE : OF	

Sl. No.	DRG No. for Weld Location and Identification mark	Description of parts to welded	Matl. Spec.	Dimensions		Process of welding	Type of weld	Electrode filler spec.	WPS No.	Min. pre-heat	Heat treatment		NDT method/ Quantum	RFF		Remarks
											Temp.	Holding time		Spec. No.	ACC Norm Ref.	

NOTES:

SIGNATURE

FORMAT NO.: QS-01-QAI-P-02/F2-R0	1/1	Engg. Div./QA&I