TALCHER THERMAL POWER PROJECT
Stage -III (2 X 660 MW)-NTPC

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING AND STORAGE SYSTEM

SPECIFICATION NO.: PE-TS-497-166-A001

BHARAT HEAVY ELECTRICALS LTD

POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

	TITLE: FUEL OIL HANDLING SYSTEM 2 X 660 MW TALCHER STPP INDEX	SPECIFICATION NO. PE-TS-497-166-A001 REV 00 SHEET 1 OF 1

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2 X 660MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SECTION - I

SPECIFIC TECHNICAL REQUIREMENT

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT PPEI,
NOIDA-INDIA

1.0 INTENT OF SPECIFICATION

1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, painting, forwarding, proper packing and shipment and delivery at site, unloading, handling & transportation at site , Erection & Commissioning including commissioning spares(if applicable), mandatory spares, minor civil works as required on FOR site basis, functional guarantee testing and handing over of FUEL OIL UNLOADING & STORAGE SYSTEM as per details in different sections / volumes of this specification for **2 X 660MW TALCHER TPP.**

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

1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to 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 judgement is not in full accordance herewith.

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

1.5 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 is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information , ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification **within 10 days of receipt of tender documents**. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

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

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

1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or end customer including their consultant as interpreted by BHEL in the relevant context.

PROJECT INFORMATION

2X660 MW TALCHER TPP

CLAUSE NO.	PROJECT INFORMATION

TALCHER TPP STAGE-III (2X660 MW)

1.00.00 BACKGROUND

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

2.00.00 PROJECT HIGHLIGHTS

2.01.00 **Location**

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

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

3.00.00 BASIC INPUTS

3.01.00 **Land**

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

3.02.00 **Water**

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

3.03.00 **FUEL**

3.03.01 **Coal Requirement, Availability and Linkage**

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

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

3.03.03 **Coal Transportation**

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

3.03.03 **Fuel Oil**

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

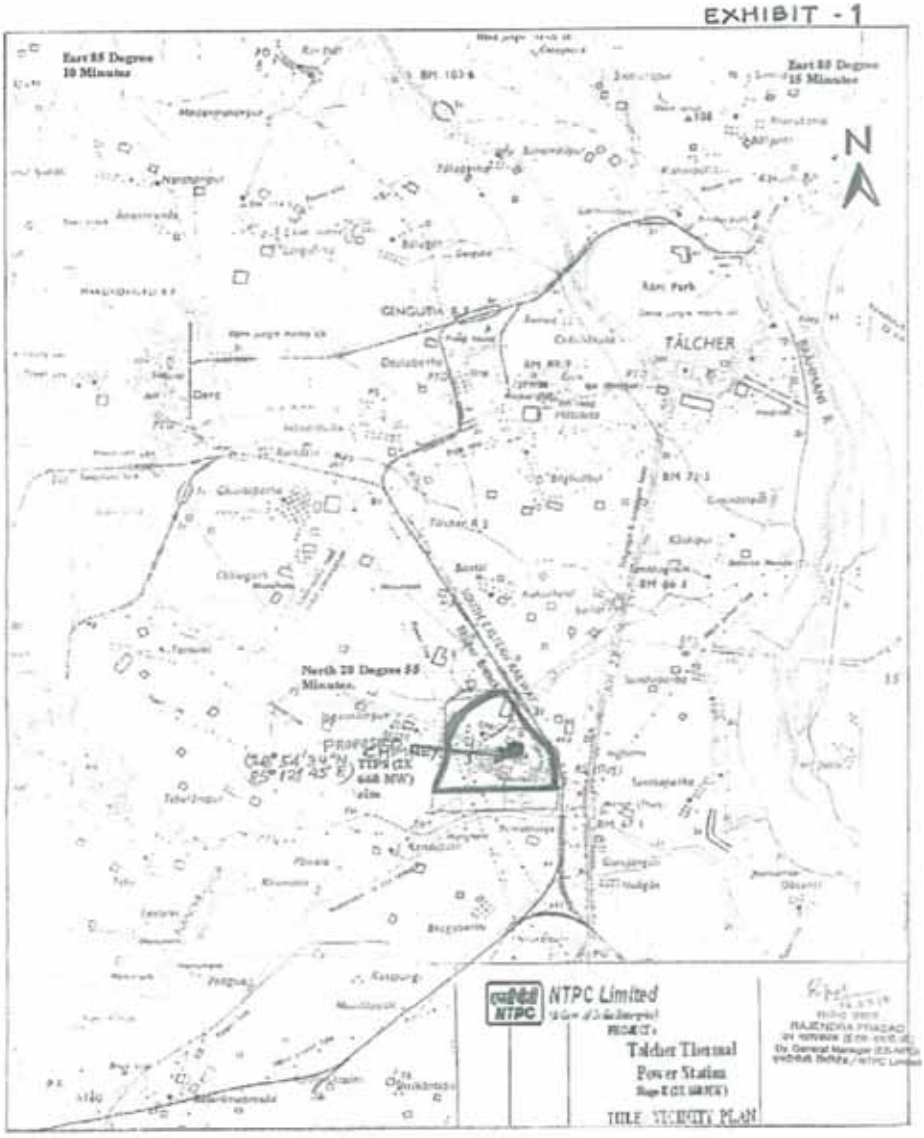
CLAUSE NO.	PROJECT INFORMATION
4.00.00	**STEAM GENERATOR TECHNOLOGY** The steam generators shall be super critical once through type, water tube, direct pulverized coal fired, top supported, balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation. The gas path arrangement shall be single pass (Tower type) or two pass type.
5.00.00	**FLUE GAS DESULPHURIZATION SYSTEM (FGD) & SCR ready system:** The project is envisaged with Flue Gas Desulfurization (FGD) system and DeNOx ready system meeting Ministry of Environment, Forest & Climate Change notification dated 07.12.2015. Limestone to be used for design of FGD system shall be as per the characteristic given at **Annexure-IV-5.**
6.00.00	**CAPACITY** Talcher TPP, Stage-III : 2x660 MW - Present proposal
7.00.00	**BENEFICIARY STATES** The project is being implemented as a regional project for meeting the power demand of Eastern Region Beneficiaries including Orissa – the home-state. The exact allocation of power shall be subject to the approval of Ministry of Power, Govt. of India.
8.00.00	**METEOROLOGICAL DATA** The meteorological data from nearest observatory is placed at **Annexure-II.**
9.00.00	**Plant Water Scheme** The Plant water scheme is included in Part-E of Technical Specification.
9.01.00	**Condenser Cooling (CW) Water System** It is proposed to adopt a recirculating type cooling water system with cooling towers for the project. For the re-circulating type CW system it is proposed to supply clarified water as make up. Circulating water from CW pumps to TG area and from TG area to cooling tower will be carried through pipes/ducts. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity.
9.02.00	**Equipment Cooling Water (ECW) System (Unit Auxiliaries)** All plant auxiliaries shall be cooled by De-mineralized water (DM) in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for TG & its auxiliaries and Steam Generator & auxiliaries (including station auxiliaries) on Unit basis.
9.03.00	**Other Miscellaneous Water Systems** CW system blow down water shall be used for the FGD process requirement, ash slurry pumps sealing, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water system. The service water shall be taken from clarified water tank of Pre-treatment plant. The service (wash water) water collected from various areas and coal handling plant shall be treated as per requirement and reused. The drinking water requirement shall be provided from water treatment plant.

CLAUSE NO.	PROJECT INFORMATION
	The quality of Raw water is given in this sub-section at **Annexure-III**
10.00.00	**POWER EVACUATION SYSTEM** In view of above and considering the present capacity of the project (1320 MW), it is proposed to adopt the step-up/power evacuation voltage as 400kV. Accordingly provision for 4 Nos. of 400 kV line bays has been considered in the generation switchyard. Station supply shall be derived directly from 400kV voltage level through 400kV Class station transformers. The issue of power evacuation of the project shall be taken up with appropriate Transmission Utility as per regulatory provision, based on final power allocation received from Ministry of Power.
11.00.00	**Criteria for Earthquake Resistant Design of Structures and Equipment** All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Part-B of this section.
12.00.00	**Criteria for Wind Resistant Design of Structures and Equipment** All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part-B of this section.
13.00.00	Vulnerability Atlas of India(VAI), prepared by Building Materials, Training and Promotion Council (BMTPC) under Ministry of Housing and Urban Affairs, is a comprehensive document which provides existing hazard scenario for the entire country and presents the digitized State/UT-wise hazard, maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation and construction stage. The VAI provides necessary information for risk analysis and hazard assessment and is available at website www.bmtpc.org. As per Government's directive, it is mandatory for the bidders to refer VAI for multi-hazard risk assessment and include the relevant hazard proneness specific to project location while planning, designing and execution of the project in terms of following details: i) Seismic zone (II to V) for earthquakes ii) Wind velocity iii) Area liable to floods and Probable max. surge height iv) Thunderstorms history v) Number of cyclone storms/sever cyclone storms and max sustained wind specific to coastal region vi) Landslides incidences with Annual rainfall normal vii) District wise Probable Max. Precipitation Accordingly, bidder should refer VAI while planning, designing and execution of the project. However, for design of structures/facilities and equipment, the criteria for earthquake resistant design of structures and equipment, the criteria for Wind Resistant Design of Structures and Equipment and design parameters for drainage facilities, stipulated in the Technical Specification shall be followed. For other information like area liable to floods, probable max. surge height, landslide, thunderstorm, cyclone etc. agencies are required to refer the VAI.

CLAUSE NO.	PROJECT INFORMATION	एनटीपीसी NTPC

ANNEXURE-I

EXHIBIT - 1



TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4540-001A-2	SUB-SECTION-IB PROJECT INFORMATION	PAGE 4 OF 15

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : अंगुल STATION : Angul | अक्षांश LAT. 20°50' | देशांतर LONG. 85°06' | समुद्री तल स्तर से ऊँचाई HEIGHT ABOVE M.S.L. 139 मीटर METRES | पूर्वगणी पर आधारित BASED ON OBSERVATIONS 1971-2000

माह / MONTH		स्टेशन का दाब STATION LEVEL PRESSURE (एच.पी.ए. hPa)	वायु तापमान AIR TEMPERATURE — माध्य MEAN: शुष्क बल्ब DRY BULB (डि. से °C)	नम बल्ब WET BULB (डि. से °C)	दैनिक अधिक तम DAILY MAX (डि. से °C)	दैनिक न्यून तम 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 (अष्टमांश में Oktas of sky): समस्त मेघ ALL CLOUDS	निम्न मेघ LOW CLOUDS	वर्षा RAINFALL: मासिक योग MONTHLY TOTAL (मि.मि. mm)	वर्षा के दिनों की संख्या NO. OF RAINY DAYS	सर्वाधिक आर्द्र माह में योग TOTAL IN WETTEST MONTH WITH YEAR (मि.मि. mm)	सर्वाधिक शुष्क माह में योग TOTAL IN DRIEST MONTH WITH YEAR (मि.मि. mm)	24 घंटों में अधिकतम वर्षा HEAVIEST FALL IN 24 HOURS (मि.मि. mm)	दिनांक और वर्ष DATE AND YEAR	माध्य पवन गति MEAN WIND SPEED (कि.मी. प्र. घं. Kmph)
जनवरी JAN	I	1001.2	17.9	15.4	27.9	15.6	31.0	11.3	35.1	29	5.5	2	76	15.8	1.2	0.5	9.0	0.7	61.7	0.0	48.8	22	
	II	997.6	25.7	18.5						1994		1971	47	15.6	1.1	0.5			1906			1906	
फरवरी FEB	I	999.1	21.1	18.0	30.9	18.2	35.3	12.7	38.3	23	8.8	16	72	18.3	2.0	1.1	30.9	1.6	370.1	0.0	118.1	6	
	II	995.4	29.0	19.9						1967		1971	41	16.0	1.6	0.9			1961			1961	
मार्च MAR	I	996.7	25.3	21.0	35.5	21.0	39.2	15.9	43.1	31	10.2	2	67	21.7	1.5	0.8	25.0	1.7	206.0	0.0	115.0	30	
	II	992.6	33.5	22.1						1999		1971	35	17.4	1.8	1.1			1990			1990	
अप्रैल APR	I	993.1	28.7	24.4	38.9	24.4	42.5	20.0	45.6	2	14.4	19	70	27.3	1.7	0.7	36.9	2.3	152.4	0.0	67.2	2	
	II	988.4	35.6	24.4						1941		1971	38	21.5	2.6	1.6			1997			1965	
मई MAY	I	989.4	30.6	25.9	39.8	26.0	44.3	21.6	47.2	24	15.6	24	68	29.7	1.9	0.9	75.6	3.6	333.1	0.0	105.0	30	
	II	985.7	36.6	25.7						1921		1964	42	24.2	3.2	2.0			1995			1990	
जून JUN	I	985.8	29.7	26.0	36.2	25.9	42.5	21.7	47.2	15	17.4	1	74	30.7	4.3	2.8	210.1	8.5	528.2	39.4	161.2	15	
	II	982.5	32.8	26.3						1967		1964	62	29.0	5.1	3.7			1990	1965		1990	
जुलाई JUL	I	986.1	27.9	25.4	32.1	24.4	36.2	22.4	41.1	3	18.3	20	81	30.5	5.4	3.6	250.3	12.1	552.5	102.4	243.8	25	
	II	983.1	29.4	25.9						1982		1971	76	30.7	5.9	4.6			1932	1985		1932	
अगस्त AUG	I	986.5	27.5	25.3	31.4	23.9	34.5	21.3	37.7	22	14.3	28	83	30.6	5.5	4.0	325.3	13.4	826.0	96.5	257.3	21	
	II	983.9	28.8	25.8						1983		1974	78	31.1	5.9	4.6			1931	1937		1931	
सितम्बर SEP	I	990.9	27.5	25.2	32.1	24.1	34.8	20.5	38.1	7	12.8	24	83	30.5	4.5	3.1	206.5	10.2	569.7	56.1	148.8	6	
	II	987.8	28.9	25.6						1977		1974	76	30.3	5.3	4.0			1921	1919		1939	
अक्टूबर OCT	I	995.8	26.2	23.6	32.3	20.7	34.4	18.6	37.7	21	12.0	28	80	27.2	2.9	1.7	100.8	5.1	404.5	0.0	194.2	19	
	II	992.1	29.3	24.3						2000		1974	66	26.5	3.3	2.3			1973			1999	
नवम्बर NOV	I	999.4	22.4	19.4	30.0	18.2	32.5	13.6	35.1	26	5.6	30	75	20.5	1.8	0.9	35.7	1.3	161.5	0.0	101.4	6	
	II	995.8	27.3	20.9						1997		1970	54	19.7	1.9	1.0			1930			1990	
दिसम्बर DEC	I	1001.7	17.8	15.3	27.7	15.1	30.3	11.5	32.1	23	3.5	4	75	15.5	1.0	0.4	3.1	0.3	39.8	0.0	48.8	14	
	II	997.8	24.7	17.9						1995		1974	49	15.3	1.1	0.4			1991			1997	
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	993.8	25.2	22.0	32.9	21.5	44.1	9.1	47.2	24	3.5	4	75	24.9	2.8	1.7	1300.1	60.9	2693.4	756.1	257.3	21	
	II	990.2	30.1	23.1					5	1921	12	1974	56	23.2	3.3	2.2			1990	1957	8	1931	
वर्षों की संख्या NUMBER OF YEARS	I / II	26	18	18	17	17	17	17	89		89		18	18	26	26	30	30	94	94	100		

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D-1-12(D)

Annexure- (D)

CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All structures shall be designed for wind forces in accordance with IS:875 (Part-3) and as specified in this document. See Annexure – I for site specific information.

Along wind forces shall generally be computed by the Peak (i.e. 3 second gust) Wind Speed method as defined in the standard.

Along wind forces on slender and wind sensitive structures and structural elements shall also be computed, for dynamic effects, using the Gust Factor or Gust Effectiveness Factor Method as defined in the standard. The structures shall be designed for the higher of the forces obtained from Gust Factor method and the Peak Wind Speed method.

Analysis for dynamic effects of wind must be undertaken for any structure which has a height to minimum lateral dimension ratio greater than “5” and/or if the fundamental frequency of the structure is less than 1 Hz.

Susceptibility of structures to across-wind forces, galloping, flutter, ovalling etc. should be examined and designed/detailed accordingly following the recommendations of IS:875(Part-3) and other relevant Indian standards.

It should be estimated if size and relative position of other structures are likely to enhance the wind loading on the structure under consideration. Enhancement factor, if necessary, shall suitably be estimated and applied to the wind loading to account for the interference effects.

Damping in Structures

The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:

a) Welded steel structures : 1.0%

b) Bolted steel structures/ RCC structures : 2.0%

c) Prestressed concrete structures : 1.6%

d) Steel stacks : As per IS: 6533 & CICIND Model Code whichever is more critical.

ANNEXURE-I

SITE SPECIFIC DESIGN PARAMETERS

The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows:

a) The basic wind speed "V_b" at ten metres above the mean ground level : 50 metres/second

b) The risk coefficient "K_1" : 1.08

c) Category of terrain : Category-2

D-1-12(E)

Annexure-(E)

CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All structures and equipment shall be designed for seismic forces adopting the site specific seismic information provided in this document and using the other provisions in accordance with IS:1893 (Part 1 to Part 4). Pending finalization of Part 5 of IS:1893, provisions of part 1 shall be read along with the relevant clauses of IS:1893:1984, for embankments.

A site specific seismic study has been conducted for the project site. The peak ground horizontal acceleration for the project site, the site specific acceleration spectral coefficients (in units of gravity acceleration 'g') in the horizontal direction for the various damping values and the multiplying factor (to be used over the spectral coefficients) for evaluating the design acceleration spectra are as given at Appendix-I.

Vertical acceleration spectral values shall be taken as 2/3rd of the corresponding horizontal values.

The site specific design acceleration spectra shall be used in place of the response acceleration spectra, given at figure-2 in IS:1893 (Part 1) and Annex B of IS:1893 (Part 4). The site specific acceleration spectra along with multiplying factors specified in Appendix-I includes the effect of the seismic environment of the site, the importance factor related to the structures and the response reduction factor. Hence, the design spectra do not require any further consideration of the zone factor (Z), the importance factor (I) and response reduction factor (R) as used in the IS:1893 (Part 1 to Part 4).

Damping in Structures

The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:

a)	Steel structures	:	2%
b)	Reinforced Concrete structures	:	5%
c)	Reinforced Concrete Stacks	:	3%
d)	Steel stacks	:	2%

Method of Analysis

Since most structures in a power plant are irregular in shape and have irregular distribution of mass and stiffness, dynamic analysis for obtaining the design seismic forces shall be carried out using the response spectrum method. The number of vibration modes used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90 percent of the total seismic mass and shall also meet requirements of IS:1893 (Part 1). Modal combination of the peak response quantities shall be performed as per Complete Quadratic Combination (CQC) method or by an acceptable alternative as per IS:1893 (Part 1).

In general, seismic analysis shall be performed for the three orthogonal (two principal horizontal and one vertical) components of earthquake motion. The seismic response from the three components shall be combined as specified in IS:1893.

The spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the structure falls to the left of the peak in the spectral acceleration curve.

For buildings, if the design base shear (V_B) obtained from modal combination is less than the base shear ($\bar{V}_B$) computed using the approximate fundamental period (T_a) given in IS:1893:Part 1 and using site specific acceleration spectra with appropriate multiplying factor, the response quantities (e.g. member forces, displacements, storey forces, storey shears and base reactions) shall be enhanced in the ratio of $\bar{V}_B$/ V_B. However, no reduction is permitted if $\bar{V}_B$ is less than V_B.

Design/Detailing for Ductility for Structures

The site specific design acceleration spectra is a reduced spectra and has an in-built allowance for ductility. Structures shall be engineered and detailed in accordance with relevant Indian/International standards to achieve ductility.

APPENDIX-I

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

1) Peak ground horizontal acceleration (MCE) : 0.16 g

2) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra

   a) for special moment resisting steel frames designed and detailed as per IS:800 : 0.04

   b) for special concentrically braced steel frames designed and detailed as per IS:800 : 0.03

   c) For special moment resisting RC frames designed and detailed as per IS:456 and IS:13920 : 0.024

   d) for RCC chimney, RCC Natural Draft Cooling Tower : 0.08

   e) for liquid retaining tanks : 0.048

   f) for Steel chimney, Absorber tower, Vessels : 0.06

   g) for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/configuration/ materials) : 0.04

3) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted : 0.08

Note: g = acceleration due to gravity

The horizontal seismic acceleration spectral coefficients are furnished as **Annexure – S** in subsequent pages.

ANNEXURE - S

HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS for Talcher TPP
(In units of 'g')

Time Period (Sec)	Damping Factor (as a percentage of critical damping)		
	2%	3%	5%
0	1	1	1
0.03	1	1	1
0.04	1.388	1.338	1.261
0.05	1.790	1.676	1.509
0.06	2.204	2.015	1.748
0.07	2.627	2.355	1.980
0.08	3.059	2.696	2.205
0.09	3.499	3.036	2.424
0.097	3.810	3.275	2.575
0.098	3.810	3.310	2.596
0.1	3.810	3.310	2.640
0.11	3.810	3.310	2.640
0.108	3.810	3.310	2.640
0.11	3.810	3.310	2.640
0.115	3.810	3.310	2.640
0.12	3.810	3.310	2.640
0.125	3.810	3.310	2.640
0.13	3.810	3.310	2.640
0.135	3.810	3.310	2.640
0.14	3.810	3.310	2.640
0.145	3.810	3.310	2.640
0.15	3.810	3.310	2.640
0.2	3.810	3.310	2.640
0.25	3.810	3.310	2.640
0.3	3.810	3.310	2.640
0.35	3.810	3.310	2.640
0.37	3.810	3.310	2.640
0.38	3.810	3.310	2.640
0.39	3.713	3.310	2.640
0.4	3.620	3.310	2.640
0.43	3.367	3.079	2.456
0.45	3.218	2.942	2.347
0.52	2.785	2.546	2.031

Time Period (Sec)	Damping Factor (as a percentage of critical damping)		
	2%	3%	5%
0.555	2.609	2.386	1.903
0.56	2.586	2.364	1.886
0.565	2.563	2.343	1.869
0.57	2.540	2.323	1.853
0.575	2.518	2.303	1.837
0.58	2.497	2.283	1.821
0.585	2.475	2.263	1.805
0.59	2.454	2.244	1.790
0.595	2.434	2.225	1.775
0.6	2.413	2.207	1.760
0.65	2.228	2.037	1.625
0.7	2.069	1.891	1.509
0.75	1.931	1.765	1.408
0.8	1.810	1.655	1.320
0.85	1.704	1.558	1.242
0.9	1.609	1.471	1.173
0.95	1.524	1.394	1.112
1	1.448	1.324	1.056
1.05	1.379	1.261	1.006
1.1	1.316	1.204	0.960
1.15	1.259	1.151	0.918
1.2	1.207	1.103	0.880
1.25	1.158	1.059	0.845
1.3	1.114	1.018	0.812
1.35	1.073	0.981	0.782
1.4	1.034	0.946	0.754
1.45	0.999	0.913	0.728
1.5	0.965	0.883	0.704
1.55	0.934	0.854	0.681
1.6	0.905	0.828	0.660
1.65	0.878	0.802	0.640
1.7	0.852	0.779	0.621
1.75	0.827	0.757	0.603
1.8	0.804	0.736	0.587
1.85	0.783	0.716	0.571
1.9	0.762	0.697	0.556
1.95	0.743	0.679	0.542
2	0.724	0.662	0.528
2.05	0.706	0.646	0.515
2.1	0.690	0.630	0.503

Time Period (Sec)	Damping Factor (as a percentage of critical damping)		
	2%	3%	5%
2.15	0.673	0.616	0.491
2.2	0.658	0.602	0.480
2.25	0.644	0.588	0.469
2.3	0.630	0.576	0.459
2.35	0.616	0.563	0.449
2.4	0.603	0.552	0.440
2.45	0.591	0.540	0.431
2.5	0.579	0.530	0.422
2.55	0.568	0.519	0.414
2.6	0.557	0.509	0.406
2.65	0.546	0.500	0.398
2.7	0.536	0.490	0.391
2.75	0.527	0.481	0.384
2.8	0.517	0.473	0.377
2.85	0.508	0.465	0.371
2.9	0.499	0.457	0.364
2.95	0.491	0.449	0.358
3	0.483	0.441	0.352
3.05	0.467	0.434	0.346
3.1	0.452	0.427	0.341
3.15	0.438	0.427	0.335
3.2	0.424	0.414	0.330
3.25	0.411	0.401	0.320
3.3	0.399	0.389	0.310
3.35	0.387	0.378	0.301
3.4	0.376	0.367	0.292
3.45	0.365	0.356	0.284
3.5	0.355	0.346	0.276

ANNEXURE-IV-1

TABLE-1

LIGHT DIESEL OIL CHARACTERISTICS

AS PER IS 15770-2008

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

Annexure-IV-6

METHANOL CHARACTERSTICS

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

2 X 660 MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SECTION I-A

(SPECIFIC TECHNICAL EQUIREMENT-MECHANICAL)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

1.0.0 SCOPE OF WORK

Design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, painting, forwarding, proper packing, shipment and delivery at site, unloading, handling & transportation at site, Erection & Commissioning, minor civil works as required, functional guarantee, testing and handing over of Fuel Oil System shall be as per details in different sections of this specification.

1.1.0 SCOPE OF SUPPLY

Scope of supply by bidder shall comprise of but not necessarily be limited to the following. P&I Diagrams given with this specification may pls be referred.

a) **Two (2) nos.** of vertical cylindrical, fixed roof type LDO storage tanks each of net **capacity 1700 cum** dully fitted with appurtenances, accessories, instrumentation, controls and fittings etc.

b) **Two (2)** nos twin screw LDO unloading pump motor set of **capacity 500 m3/hr** each with matching simplex strainers (2 Nos for each pump) at their suction.

c) **Two (2) numbers** vertical single screw pumps motor set with all accessories of capacity **5m3/hr** to transfer **recovered oil** from Oil water separator's (OWS) oil pit located near tank farm area to Drain Oil Tank.

d) **Two (2)** number vertical **centrifugal sump** pump motor sets with all accessories of capacity **10 m3/hr.** in Fuel oil Pump house (FOPH) to transfer oil water mixture from FOPH to Oil water separator.

e) **Two (2) numbers** Vertical Single Screw Drain Oil pump motor sets with all accessories of capacity 10**m3/hr** in Fuel oil Pump house (FOPH) to transfer Drain Oil from Drain Oil Tank to LDO Storage Tanks.

f) **One (1) no.** of Rectangular, Carbon Steel Welded, Drain Oil tank of net **capacity 6 cum** dully fitted with appurtenances, accessories, instrumentation, controls and fittings etc.

g) **Five (5)** nos LDO unloading flexible neoprene hoses of size 75NB with minimum length as 8.0m. Each hose shall be to suit the layout in unloading area.

h) **Complete Piping & fittings, Valves, flanges**, fasteners, gaskets, structural supports, pipe trestle within dyke and pump house as required within the terminal point.

i) Nozzle for foam pourer, heat detector on tank roof & pad plates welded to the tanks as per details to be furnished to the successful bidder during detailed engineering for welding supports for water piping and hydrant piping.

j) Platform and approach ladder to the platform for foam pourer nozzle.

k) Sump pumps (1W+1S) where ever required due to layout constraints with in terminal point. Type and capacity of these pumps will be decided during detailed engineering stage without and commercial implication.

l) All mechanical items for oil water separator pit including skimmer pipe, butterfly valve, heating arrangement (if applicable), rung ladder etc. for OWS.

m) Buried MS pipes as required along with their wrapping and coating as required.

n) Pipe-supporting structures over the insert plates for pedestal supported pipes and also on pipe rack supported pipe.

o) All MS structures for cross overs, valve / instruments/ equipment operating & maintenance platforms, approach ladders for access to platforms, trench/pit.

p) Painting of equipment along with their accessories within battery limit.

q) Electrical scope as per enclosure elsewhere in the specification.

r) Instrumentation & control System including control panel, instruments, interlocking & protection devices complete in all respects required for safe, efficient and reliable operation of the plant and to be read in conjunction with C&I potion of specification.

s) C&I Scope as per enclosure elsewhere in the specification.

t) Erection & commissioning spares as required for the complete system.

u) One set of special maintenance tools & tackles, if any. These tools shall not be used for erection/ commissioning purposes and shall be in an unused and new condition when they are handed over to the customer at site. Each tool shall be stamped so as to be identified easily for its use. The tools shall be supplied in a steel toolbox.

v) **Mandatory spares** as per **Annexure-VI** under specification.

w) Initial charge of all lubricants and fluids except LDO

x) All valves, counter- flange with nuts, bolts and gaskets at all the terminal points.

y) All equipment Foundation bolts/ Anchor bolts etc.

z) Flowable non- shrink grout of one grade higher than concrete used for civil work grouting below base plate for all structure/ equipment/Tank & for grouting of foundation / anchor bolts.

aa) Relevant scope of supply as per GTR, GCC & SCC.

bb) Valves in pit outside dyke as required as per latest OISD recommendation complying with requirement whichever is more stringent.

cc) Any changes required to take care of temperature effect to be considered by bidder as part of total cost quoted.

dd) Any other instrument, item required for making the installation complete in all respect and for satisfactory operation of the system for the scope within the terminal point, as well as to meet any statutory requirement relevant to the package, unless specifically EXCLUDED from scope of supply.

1.2.0 SCOPE OF SERVICES

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

a) Unloading, Storage, handling and transportation at site.

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

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

d) Erection & Commissioning of Fuel Oil System.

e) Erection of all foundation bolts/ anchor bolts etc. as required for any equipment. In case these are not erected when foundation is being cast refer point no b above.

f) Inspection & testing, Performance Requirements and functional guarantees.

g) Painting of tank and all other items within scope of supply.

h) Making Good/Repairing/replacement of and damaged done by bidder to adjacent structure, pipes etc. while erecting equipment's related to Fuel Oil system.

i) Electrical scope as per enclosure elsewhere in the specification

j) Preparation of drawing showing common facilities, if any, between BHEL & Vendor supplied equipment.

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

l) Preparation of all drawings as per MDL given under specification.

m) Preparation of e-Learning module for Fuel Oil handling system.

n) Preparation of all necessary drawings/data/ documents for obtaining necessary Approval of statutory authorities like CCOE , IBR , Weight & Measures Department and any other agency/ competent authority related to installation of Fuel Oil Handling System on behalf of the customer. All expenses required to obtain the approval shall also be borne by the successful bidder. Successful bidder shall inform customer well in advance requirement of authority letter along with format for the same. After issuance of authority letter by customer, it will be vendor's responsibility to regularly follow up with the concerned authorities to obtain timely approval from these authorities. Any delay on account of the same, unless any specific information related to above approval to be furnished by customer is delayed by customer, shall be to vendor's account and shall not be used as a reason for extension in contract completion.

Layout drawing to be prepared for statutory approval apart from showing the technical requirements shall necessarily show key plan showing approach to site with mile stone, Survey No., Khasra No, Plot No. etc.

o) Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.

p) Relevant requirements as per GTR, GCC, ECC & SCC.

q) 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.

2.0.0 EXCLUSION

a) Civil work for fuel oil unloading & storage system including

i) Road tanker unloading platform
ii) Tanks & Pumps foundations
iii) Unloading Pump House building
iv) Dyke walls and barbed fencing
v) Encasing of buried pipes, providing culvert for the same, if required.
vi) Hume Pipes, if any
vii) Civil works like pits, wherever required.
viii) Handrails other than those on the storage tanks.
ix) Various cable & pipe trenches, pipe pedestals, drains, sumps, insert plates for pedestals for pipe supports.
x) Pipe rack/trestle outside pump house and dyke area.

However, location, sizing and loads, top of concrete elevations, top of grout elevations etc. and any other input related to above as applicable, shall be given by the vendor.

b) Fire Protection system for fuel oil storage tanks.
c) Air Conditioning / ventilation of Fuel Oil pump house.
d) Control/IO panel for Fuel Oil pump house.
e) Lifting equipment for unloading pump house for maintenance purpose of these pumps. Capacity of lifting equipment is envisaged as **2.0 T with lift as 10.0 m**. Bidder to confirm adequacy of the same.
f) DCS control. However, all logic for implementation of control and monitoring from DCS shall be provided by successful bidder during detail engineering.
g) Exclusion as indicated in Electrical and C&I portion of technical specification
h) Relevant exclusion as per GTR, GCC, SCC & ECC.

3.0.0 SERVICES TO BE PROVIDED BY THE CUSTOMER

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

4.0.0 TERMINAL POINT

LDO : **Near oil unloading area:**

LDO Road Tanker nozzle connection towards LDO Unloading header.

Near Fuel Oil Unloading & Pressurizing Pump House:
Up to 1000 mm outside Pump house wall for suction & return line of LDO. Further routing shall be in BHEL-PC scope.

Drain from dyke area : To OWS during normal condition & to plant drain during rainy season through two-way valve pit. Valves in the valve pit along with limit switch for the same are included in bidder's scope.

Change in location of terminal points by up to 50 meters in plan view and 10 m in elevation view shall have no price implication. Isolation valves at the terminal points shall be in the scope of the bidder.

5.0.0 PERFOMACE REQUIREMENTS

This will comprise of:

5.0.1 PERFORMANCE requirement <u>at shop</u>:

a. The following parameters shall be demonstrated/guaranteed:

S.N.	Unloading period (hours)	Cap (m3/hr)	Head (mWC)	Power (Kw)
ii	LDO unloading pumps	50	By bidder	By bidder

b. Noise & vibration level of all pumps in isolation.

c. Noise level for safety valve to be limited to 105 dB (A)

d. Inspection and testing of all valves as per approved QAP.

5.0.2 Functional Guarantees(PG) at site:

a. All pumps shall be guaranteed for capacity, total dynamic head either in isolation or during parallel operation. The capacity of pumps while operating in parallel will be verified by indication in tank level difference.

b. Each storage tank shall be guaranteed for capacity and stability.

c. Noise level for safety valve to be limited to 105 dBa

d. Entire piping & support for smooth operation

e. All consumable and instruments required during PG Test will be arranged by the bidder. Instruments will be duly calibrated from customer authorized/ approved laboratory. Instruments for PG test and instruments for process control of similar applications are envisaged to be of same make and model having same accuracy level. However, instruments for PG test are also acceptable as per standard and proven practice of the contractor/OEM. **Instruments to be used for PG test shall be additionally supplied over and above the instruments shown in tender P&ID. PG test instruments being used, shall be retained by employer after completion of PG test.**

f. All other machines / components / system shall be acoustically designed for a surface sound pressure level of Lp < 85 dB (A), measured in accordance with ISO 3746 / IEC 651 / BS: 5969 / IS:9779 respectively at a distance of 1.0 m from equipment surface and at a height of 1.5m above ground level. The surface sound pressure level (Lp) shall be averaged over the measurement surface and corrected for effect of background noise and the influence of reflected sound at measurement surface (environmental correction). With sound pressure levels of 85 dB (A) or less according ISO it shall be ensured that maximum surface noise levels of any item of plant of less than 85 dB (A) at 1.0 m from outline and a height of 1.5m from the floor shall be net during normal operating conditions.

g. In case during test 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. However, if the contractor is not able to demonstrate the guarantees, even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by BHEL, after the tests have been completed, BHEL will have the right to Reject the equipment / system / plant and recover the payments already made or a accept the equipment / system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by BHEL.

h. The successful bidder will prepare a document titled "HANDLING OVER PROTOCALL" consisting various activities to be demonstrated by them for handing over of the package.

6.0.0 LAYOUT REQUIREMENTS

a) System layout shall conform to the requirements of the Petroleum Act 1934 & Petroleum Rules 2002, OISD 118 latest edition whichever is more stringent. The layout shall also confirm to all other relevant OISD specifications

b) All established engineering practices with regard to layout of various equipment & piping shall be followed and the same shall be subject to customer approval during detail engineering without any commercial implication.

c) **Piping inside Fuel oil pump house shall be supported using plate and anchor fasteners, no pedestals will be allowed inside Fuel oil pump house.**

d) Tentative Location of items related to Fuel Oil Handling System is shown in enclosed **PLOT PLANS**. This will be finalized during detail engineering based on equipment dimensions and other layout related requirements. There will however be no cost implication on account of the same.

e) To the extent possible, all valves shall be located at grade level for easy operation & maintenance. Where location at grade level is not possible, suitable operating and maintenance platform made of MS grating and access ladder/ staircase/walkways to the same shall be given by the bidder. The platform and walkways will be designed by considering load of at least 750Kg/M2.

f) Where pipes are routed in a manner that it hampers man movement in any area, suitable no. of cross overs made of MS gratings shall be given across such pipes to facilitate easy man movement. Further suitable access ladder of MS construction shall be given for access to equipment/ pipes located in pit/ trench. Such structures shall be designed by considering a load of at least 750Kg/M2.

g) For all pedestal supported pipes, BHEL scope will be limited to pedestal with insert plates. Maximum height of pedestal to be provided by BHEL shall be 100 mm from FGL/FFL in the corresponding area. Structures required above these pedestals for supporting the pipes are included in the scope of the bidder.

h) Layout shall be prepared in a way to avoid the buried piping to the maximum possible extent.

i) Oily water collected in storage tank area, oil unloading area will normally be collected in OWS pit by gravity either through trench (limited to a depth of 0.5 m) or through buried pipe (limited to a depth of 1.0 m) . However, in case depth of pipe between the pit and OWS pit exceeds 1 m or gravity flow is not possible due to layout constraints (which can be reviewed during detail engineering), the oily water waste shall be collected by pumping to OWS pit. Necessary pumps, valves, pipes, pipe supports, and instruments etc. for the same shall be in the bidder's scope.

j) Straight length required before and after control valve s, flow element/ flow meters, shall be provided as per latest standard/ applicable codes.

k) Rainwater collected inside the dyke shall be diverted to storm water drain while contaminated oily waste shall be sent to OWS. All valves required in pits outside the dyke are included in bidder's scope of supply.

l) Instruments to be mounted on tank shall be suitably located so as to have easy access from the staircase without interfering with man movement on the staircase. Wherever this is not possible, suitable platform along with access to the same shall be provided by FO System bidder.

m) Signals from all field instruments shall be first terminated in Junction boxes before transmitting this signal either to Control panel or to I/O rack or to DCS. Junction box is included in bidder's scope. Erection of cable between field instruments to Junction Box is also included in bidder's scope. Scope of cable supply shall be as per project specific scope split sheet given under electrical portion of this specification.

n) All piping shall be arranged to provide clearance for removal of equipment requiring maintenance and easy access to valve and other piping accessories required for operation and maintenance. The layout drawing to be submitted by the successful bidder will necessarily show the valve orientation and access to valve and accessories.

o) Instrument/ LIE/LIR shall not be located in space meant for walkway & maintenance space across the equipment, maintenance bay of building. Location of all instruments shall be marked in layout drawing to ensure correct location of the same.

7.0.0 EQUIPMENT SELECTION & DESIGN CRITERIA

The minimum design criteria/ technical details to be followed for various equipment shall be as per Data Sheets / Design criteria under **Annexure – II** of specification. Any contradictory requirement for specification of particular equipment, and clarifications not having been sought by the bidders, the most stringent requirement as per interpretation of the BHEL will prevail. Successful bidder will furnish detailed data sheets/ specifications / design calculations for various equipment for customer's/ consultant's approval during detail engineering. For items for which specific technical specification is not enclosed, data sheet / dwgs / design calculations for such items shall be subject to customer/ consultant approval during detail engineering. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

8.0.0 SYSTEM WRITE UP & CONTROL

For system write up and control requirement of fuel oil unloading and storage system, pls refer separate **Annexure-I** under specification.

9.0.0 PAINTING / CORROSION PROTECTION REQUIREMENT

During detailed engineering stage, successful bidder shall prepare and submit the painting schedule for FOHS in line with customer specification for each equipment pipe, tanks, structure etc. for customer approval and changes suggested shall be taken care without any commercial implication.

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

a) The Quality plans / checklist for the previous executed jobs for the equipment's / instruments are given under specification**.**

b) The successful bidder shall furnish Quality Plans/ Inspection Check Lists for various item for the package in line with minimum requirement indicated in specification during detail engineering for Customer's approval.

c) For other items for which any specific inspection requirement is not indicated in the specification but the same included in scope of work , vendor specific QPs/ CLs shall be furnished by the successful bidder for Customer/Consultant's review and approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

d) The Field Quality Plan of bidder shall also be submitted by the successful bidder during detail engineering for customer's / consultant's approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

e) For flame proof actuator, motors, junction boxes, instruments etc. as per specification requirement, valid test certificate for the same shall be submitted by the vendor as part of QC documentation. In case valid test certificates are not available, necessary test shall be conducted in line with applicable standard in presence of customer and cost of such test shall be deemed to be included in the contract price

11.0.0 SUB-VENDOR ITEMS

The tentative make of Sub-vendor items is given under **Annexure– III**, same shall be subject to customer approval during detail engineering. Make of any unlisted items shall be subject to customer approval during detail engineering. For such items, bidder to furnish list of sub-vendors during detail engineering stage for BHEL's review and approval. Bidder shall furnish along with his offer the following supporting documentation within 1 month of placement of LOI. Thereafter no request for additional sub-vendor shall be entertained.

a) Documentation to show that the equipment /system have been supplied for a plant of similar or higher capacity.
b) Documentation in the form of certificate that the equipment/system has been **operating satisfactorily for one year as on the scheduled date of bid opening.**

The successful bidder will get the makes of all items approved from Customer/ Consultant during detail engineering within two months of placement of LOI. The complete list will be necessarily be submitted within one month of placement of LOI to ensure timely placement of order for BOIs.

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

Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structural, flanges; counter flanges etc. from approved sub vendor only.

12.0.0 DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The drawings and documents to be submitted with the bid shall strictly be as per list given under **specification**. Any documents other than those indicated in the list will not be reviewed and will not form part of contract.

13.0.0 DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

Tentative list of drawing / document required during detail engineering is attached in **Annexure – IV**. Any other drawings and documents as required by BHEL / Customer / Consultant shall be furnished by the successful bidder during detail engineering stage for which no commercial implication shall be entertained by BHEL.

14.0.0 DRAWINGS DISTRIBUTION SCHEDULE

Vendor needs to submit hard copies of each drawing/document during detail engineering along with editable soft copy of the same as per **customer specification**. However, exact no. of drawings / documents and submission/distribution procedure for the same shall be intimidated to the successful bidder after award of contract and the same shall be complied by the successful bidder without any commercial implication.

15.0.0 DRAWINGS ENCLOSED WITH THE SPECIFICATION

Input drawings for this package are given under **Annexure-V namely:**

a) Plot plan, **PE-DG-497-100-M002**
b) Process & Instrumentation Diagram for FOHS (LDO System), **PE-DG-497-166-A001**
c) GA and Nozzle Orientation of LDO Storage Tanks, **4540-001-130-PVM-B-004**
d) Piping layout in Road Tanker Unloading Area, **PE-V0-497-166-A015**

e) Piping Layout in & around Storage Tank Farm Area, **PE-V0-497-166-A016**
f) Piping Layout in & around Pump House, **PE-V0-497-166-A017**

The flow diagrams are indicative and show the minimum requirement to be followed including minimum requirement of instruments. Any other item and instruments required (within the terminal points) to make the system complete in all respect and for satisfactory operation of the system shall also deemed to have been included by the bidder in their scope.

16.0.0 OTHER REQUIREMENTS

i) **Site Visit before submission of offer.**

Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details wrt 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.

ii) Bidder shall submit detail 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.

iii) The O&M Manual to be submitted by the successful bidder should necessarily address "Checklist of O&M Manual" given under **SECTION-IIB.**

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

v) In case vendor submits revised drawing/doc after approval of the corresponding drawing/doc, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion. However, in case changes are necessitated due to any constraints at customer end, delay in review/ approval of such revised drawing beyond one month will be to customer's account.

vi) Bidder to note that the successful bidder, during detail engineering, will submit the drg/doc through web based Document Management System in addition to hard copies to be submitted as per dwg/ document distribution schedule. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized after award of contract. 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

vii) Engineering for this project is being carried out in 3D environment at BHEL end. Name of engineering platform on which BHEL is doing the project is Smart Plant Suite. This is being done to have automated interface checking and thereby minimising rework at site. Hence, bidder to prepare all layout drawings using 3D Modelling software. These drawings will also be made available to BHEL in soft for checking interface with other agencies in consolidated layout drawings. Bidder's inability to prepare drawing using 3D Modelling software will not be criterion for evaluation of their bid.

viii) 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.

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

xi) Site storage and preservation manual has been placed under SECTION-IIC. Bidder to note down all the requirement of storage and preservation required for several items given under this manual. Bidder shall necessarily follow all the practices given in the manual as applicable for its items/ equipments under scope of supply.

2 X 660MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SECTION IA

(CUSTOMER SPECIFICATION - SPECIFIC REQUIREMENT)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES

FUEL OIL HANDLING SYSTEM

1.00.00 **GENERAL INFORMATION**

1.01.00 The Fuel Oil Handling Plant as specified in this specification shall meet the requirements of two (2) nos. steam generating units of 660 MW capacity each.

1.02.00 Light Diesel Oil (LDO) shall be used for initial ignition, initial start-up of the boiler and up to a load of 30% MCR. This shall also be used for coal flame stabilization up to 50% MCR of the steam generation.

1.03.00 LDO shall be received at site in road tankers and will be unloaded into the LDO storage tanks by LDO unloading pumps. The receiving yard shall be designed to unload Five (05) nos. road tankers at a time.

1.04.00 The LDO shall be pumped to two (2) nos. storage tanks each of capacity 1700 cu. meter. ~~One (1) number day oil tank of capacity 100 cu. meter for auxiliary boiler shall be provided. The day oil tank shall be fed from a separate set of transfer pumps and pipe line.~~

1.05.00 The Light Diesel oil (LDO) shall be received at the power station in road tankers and will be unloaded into the LDO storage tanks by LDO unloading pumps.

1.06.00 A LDO unloading header with five (05) Numbers hose connections for connecting neoprene rubber flexible hoses (05 nos.) to Road tankers shall be provided. One spare connection has been kept in the unloading header.

2.00.00 **SCOPE OF WORK**

The scope of the equipment to be furnished & erected under this specification is detailed hereunder. The items though not specifically mentioned but are needed to make the equipment / system complete and safe from operational view point, shall also be treated as though included and the same shall also be furnished and erected unless otherwise specifically excluded.

2.01.00 **Mechanical Systems**

2.01.01 **Tanks and Accessories**

(a) Two (2) numbers storage tank each of capacity 1700 cu. meter for storage of LDO. Both the tanks shall be located in the same installation.

(c) One (1) number drain oil tank of capacity six (6) cu.m complete with accessories and instrumentation.

2.01.02 **Pump Sets**

a) Two (2) nos. LDO pumps-set each of capacity 50 cu. m/hr complete with all the accessories of drive and mounting as specified for unloading of road tankers.

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES
	b) Two (2) nos. LDO drain pumps-set each of capacity 10 cu.m/hr. complete with all the accessories of drive and mounting as specified. c) Two (2) nos. dirty oil pumps of capacity 5 cu.m /hr and two (2) nos. water pumps of capacity 10 cu.m /hr at the oil water separator pit for pumping out dirty oil and clear water from the oil water separator pit. Water pumping out from separator pit to be reused. e) Two (2) Nos. sump pump set inside unloading pump house of capacity 10 M^3/hr complete with all accessories of drive and mounting as specified.
2.01.03	**Piping System consisting of pipes, valves, fittings, supports, insulation etc.** (a) LDO pipe lines, LDO drain pipe lines, all instrument air lines, complete with all supports, hangers, strainers, bends, flanges, counter flanges, gaskets, valves, fittings etc. All piping required to complete the system shown in tender drawings shall be furnished by contractor as specified. (b) Five (5) numbers neoprene rubber flexible hoses for unloading LDO from Road Tankers each of 75 NB size each of 8000 mm length with coupling & fitting for connecting to road tankers. ~~(c) One (1) no. hand operated monorail Hoist of 2 tonnes capacity alongwith monorail in the fuel oil unloading pump shed~~. (d) One (1) nos. flow meter as indicated in the tender drawings. (e) LDO tanks in the scope of the Bidder shall be provided with fixed fire protection system using foam. Additionally, medium velocity water spray system shall be provided for LDO tanks. All necessary nozzle openings required for above fixed fire protection system on the storage tanks shall be in Bidder's scope of supply.
2.01.04	**Other Service Related to the system and forming part of Bidder's Scope of Work are:** (a) Approval is required from statutory authorities for the entire LDO storage and pumping installation. The contractor shall prepare all necessary drawings / data / documents as per the requirements of the statutory authority and assist the Employer in obtaining the necessary approval from the authorities. (b) For piping system coming under the preview of Indian Boiler Regulations, detailed calculation of pipe thickness shall be submitted and approval as required from the Chief Inspector of Boilers shall be obtained. (c) Submitting detailed design of oil-water separator pit required for the system. The oil water separator pit shall be designed as per API manual.

GUARANTEES UNDER CATEGORY - II

1.02.00 **Noise**

All the plant, equipment and systems covered under this specification shall perform continuously without exceeding the noise level over the entire range of output and operating frequency specified in General Technical Requirement, Part-C Section-VI of the technical specifications.

Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 61672-1 & 2 (latest edition)

Sound pressure shall be measured all around the equipment at a distance of 1.0 m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5 m above the floor level in elevation.

A minimum of 6 points around each equipment shall be covered for measurement. Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the A - weighting scale. The average of A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar shall not exceed the guaranteed value. Corrections for background noise shall be considered in line with the applicable standards. All the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests.

SUB-SECTION–A-19

FUEL OIL UNLOADING SYSTEM

CLAUSE NO.	TECHNICAL REQUIREMENTS

TANKS

1.00.00 **DESIGN AND CONSTRUCTION**

1.01.00 **LDO Storage Tanks**

1.01.01 Tanks shall be designed, fabricated, erected and tested in accordance with the IS: 803, latest edition. Supporting framework wherever required, shall be in accordance with IS: 800, latest revision or equivalent.
Tank shall be designed, fabricated and erected keeping in view of the future provisions for storage of Methanol in place of LDO.

1.01.02 The tanks shall be "Non-pressure" fixed roof type with atmospheric vents and shall be designed for an internal pressure of 66 kgf/m^2.

Tank shall be designed with provisions so that fixed roof type may be converted into floating roof type for future storage of Methanol.

1.01.03 Light Oil Storage along with the associated facilities for the entire installation shall be in accordance with the requirements specified in the existing rules of Chief Controller of Explosives, Government of India.

~~Associated facilities shall include provisions of fire protection facilities which shall be required for change-over to Methanol in future.~~

1.01.04 Tanks shall be made from IS: 2062 quality mild steel plates of tested quality. The plates shall be cold rolled through plate bending machine by several number of passes to true curvature. The tanks shall be of welded construction.

1.01.05 Vessel seams shall be so positioned that they do not pass through vessel connections.

1.01.06 **Tank Connections**

(a) All pipe material required for the tank connection shall be as specified.

(b) Unless otherwise specified, for all flanged connections, Contractor shall furnish suitable counter flanges and necessary nuts, bolts and gasket materials. The flanges and counter flanges shall be fabricated by the Contractor from plates.

(c) Flange faces of all nozzles shall be machined and shall be square with the vessel centerline.

1.01.08 For other salient technical data and test requirements, Refer Table M1 appended to this section.

1.02.00 **Drain Oil Tank**

One drain oil tank shall be furnished to collect the oil drained from various pipes and from the equipments in the unloading pump house. The tank shall conform to IS: 800. The tank shall have accessories as indicated in tender drawing and shall have minimum liquid holding capacity of 6 m^3.
The technical details and design specification for tank shall be as per Table -M1 appended to this Section.

CLAUSE NO.	TECHNICAL REQUIREMENTS
1.03.00	**Vent Line** (a) The vent for LDO tanks and drain oil tank shall be of proven design. (b) The design shall be such as to offer adequate areas for venting. Venting area shall be such that over pressure / vacuum is not created in the tank during maximum filling / draw-off rate. (c) The vent sizing shall be done as per API Standard. (d) The open end of the vent line shall be covered with two layers of fine copper wire gauge of not less than 11 meshes per cm. and fitted with hood.
1.04.00	**Lightning Protection** ~~Contractor shall install a lightning protection system conforming to the requirements of IS-2309 (Ref Clauses 14 for protection of vessel tanks containing flammable liquids). System shall constitute of suitable number of horizontal and vertical air terminals. All the air terminals shall be connected to the risers of underground earth mat provided 300 mm above ground.~~
2.00.00	**PRECUATIONARY MEASURES**
2.01.00	No oil connection shall be made to any tank for any purpose until the tank is ready to be filled with oil.
2.02.00	After oil connections have been made to a tank, no welding or any other hot work shall be carried out on the tank for repairs or any other purpose until all lines connected to the tank have been disconnected, the open ends of the pipelines blanked off and the tank and its vicinity tested and found gas free to the satisfaction of the Engineer / Employer.
2.03.00	When a tank has once contained oil, no welding or other hot work shall be done on it for any purpose until in addition to the requirement of Clause 2.02.00 above, the tank has been completely emptied and the Engineer/Employer issues gas free and written authority for the work.
3.00.00	**CLEANING AND PAINTING**
3.01.00	After erection of tanks all surfaces shall be cleaned thoroughly by wire brushing and sand blasting to remove completely all loose dirt, rust, mill scales and any deleterious material. The surface shall then be prepared in accordance with manufacturers recommendations for applying an approved primer. After preparation of the surfaces in strict conformance to the specification the painting shall be applied. Further please refer separate painting chapter of Technical Specification elsewhere.
3.02.00	Interior surface of the tanks shall be coated with the primer and finish paint as noted below: i) LDO storage Tank — (a) Epoxy red oxide - zinc phosphate primer: 2 coats of 30 microns each (b) Epoxy high build - coating: 2 coats of 100 microns each
3.03.00	All external surfaces (non insulated) of the tanks shall be painted with primer coat of Epoxy resin based zinc phosphate (1 X 100 microns), one intermediate coat of epoxy resin based paint pigmented with titanium dioxide (1 X 100 microns) and finish coat of epoxy paint of approved shade (1 X 75 microns).

3.04.00 Outside surface of bottom plates of all tanks resting on ground shall be given one (1) coat of coal tar epoxy enamel.

4.00.0 **TEST REQUIREMENTS AND TECHNICAL SPECIFICATION AND DATA-SHEETS FOR TANKS**

Test requirements for various equipments described in this sub-section are indicated in the enclosed specification sheets. The requirements indicated herein shall be included in the comprehensive inspection, testing and quality program to be submitted by the contractor and to be finalized with the Employer.

TABLE - M1

4.01.00 **TECHNICAL SPECIFICATION AND DATA-SHEETS FOR TANKS**

4.01.01 (A) **LDO STORAGE TANKS**

		LDO STORAGE TANKS/DAY OIL TANK
i)	Type of Construction	Vertical, Cylindrical, non-pressure, fixed roof type with atmospheric vents
ii)	Codes	Design and construction as per IS: 803
iii)	Design pressure	
	a) Internal Pressure	66 Kgf/m^2
	b) Vacuum	63.5 Kgf/m^2
iv)	Design Temperature	Ambient Temperature
v)	Nominal Capacity m³	As specified
vi)	~~*Dimensions (I.D x height)~~	~~15 m diameter x 10 m ht. (min.) 6 m dia x 4.5 m ht. (min) (for Day Oil tank, if applicable)~~
vii)	Material of construction	
	a) Tank Shell, roof and bottom	IS: 2062 Tested quality steel plates
	b) Structural	IS: 2062 Tested quality steel plates
viii)	Corrosion Allowance (minimum)	---------- 1.8 mm ----------
ix)	Shell Joint efficiency factor	---------- 0.85 ----------
x)	Vent	Tank shall be provided with open and free flow type atmospheric vent, which allows unimpeded flow of vapors out of and allows air into tank and at the same time

CLAUSE NO.	TECHNICAL REQUIREMENTS

prevents rain and air-borne dust from getting into the tank.

xi) Nominal Venting capacity — Shall be obtained by reference to API guide for tank venting (API-2000)

* Note : Bidder has to offer the tanks as per the dimensions indicated at (vi) above. Height of the tank shall mean the vertical distance between tank bottom upto bottom of overflow nozzle.

(B) DRAIN OIL TANK

Type	Carbon Steel Welded, rectangular tank
Code	IS: 800 (latest edition)
Nominal capacity of tank	6 m^3
Size	3 m x 1.5 m x 1.5 m (Minimum Dimensions to be adhered to)
Material of construction	IS: 2062 Tested Quality steel plates
Testing requirements	Hydraulically tested to a pressure of 0.7 bars
Insulation	As required as per approved calculations

5.00.00 PIPING

5.01.00 **Piping**

5.01.01 Piping for 50 mm and larger size shall be butt-welded and small piping below 50 mm shall be socket welded.

5.01.02 Piping shall be capable of withstanding the following minimum pressure (Or actual working pressure or as per clause 5.01.04, whichever is higher):

a) Fuel oil pipe line — 10kg/cm^2 (g) and 90 deg.C

The minimum thickness of the pipe as detailed in this specification shall be adhered to.

5.01.03 All guides anchors braces, dampers, expansion joint and structural steel to be attached to the building/structure trenches etc. shall be provided by Contractor.

5.01.04 For sizes 400 NB and below the pipe material shall be conforming to API-5L Gr.B ERW. The pipe thickness (min.) for oil service shall be as under.

400 NB	:	6.35 mm
350/300 NB	:	6.35 mm
250/200 NB	:	5.56 mm
150 NB	:	4.78 mm
100/80/65 NB	:	3.96 mm

	50 NB	:	3.91 mm
	40 NB	:	3.68 mm
	25 NB	:	3.38 mm
	20 NB	:	2.87 mm
	15 NB	:	2.77 mm

5.01.05 The pipe size shall be selected as per following criteria of velocity of the fluid in the pipeline.

a) Suction side of the pump for oil & water application 0.6-1.2 m/s.

b) Discharge side of the pump for oil & water application 1.0-1.5 m/s.

5.01.06 Fittings for oil service shall be Butt welded fittings, conforming to ANSI B16.9 and material to ASTM-A-234. Fittings of 50mm size and below shall be socket welded conforming to ANSI B16.11, material to ASTM-A-105.

5.01.07 Vents at the highest point and drains at the lowest point shall be provided.

6.00.00 **VALVES**

6.01.00 All valves shall be suitable for most stringent service conditions i.e. flow, temperature and pressure under which they may be required to operate. The valves shall be full bore and sizes of valves shall be the same as that of the parent pipe.

6.02.00 All manually operated valves shall be provided with gear operator of proven quality, reputed make and conforming to internationally accepted standard, if the effort required to operate the valve exceeds 25 kgf.

6.03.00 All valves shall be provided with hand wheels, extension spindles and floor stands or any other arrangement wherever required so that they can be operated manually with ease by a single operator from the nearest operating floors either at a lower or higher elevation as the case may be. Wherever necessary for safety purpose, locking devices shall be furnished with valves.

6.04.00 **Gate Valves**

6.04.01 Gate valves shall be used for isolation purpose sizes above 300 NB for oil lines. The gate valves shall be provided with hand wheel, position indicator and draining arrangement.

6.04.02 Gate valves for sizes up to and including 40 NB shall be of class 800, forged carbon steel valves with solid wedge, OS & Y rising stem, bolted bonnet with deep stuffing box and lantern ring. Trim shall be of 13% chrome steel. Body material shall conform to ASTM A 105 and ends shall be socket welded.

6.04.03 For sizes above 40 NB, valves shall be of class 150/300 (depending on service), Cast Carbon Steel gate valves. Face to face dimensions shall be as per ANSI B 16.10. Body material shall be ASTM A 216 Gr. WCB and ends shall be flanged to ANSI 150/300 lbs rating with raised face. Other particulars shall remain same as above.

6.04.04 The valves shall conform to API-600/API-602 and shall be tested to API 598/IS: 6157 requirements. IBR certificates as necessary shall also be provided.

CLAUSE NO.	TECHNICAL REQUIREMENTS
6.05.00	**Globe Valves**
6.05.01	Globe valves shall be used for regulation purpose for all sizes in oil lines. They shall be provided with hand wheel, position indicator and draining arrangement.
6.05.02	Globe valves for sizes up to and including 40 NB shall be of class 800 forged carbon steel valves with plug type disc. Other particulars shall be same as 6.04.02 above.
6.05.03	For sizes above 40NB, valves shall be class 150/300 (depending on service) Cast Carbon steel globe valves with plug or ball type disc. Other particulars shall be same as 6.04.03 above.
6.05.04	The valve shall conform to BS: 1873/BS: 5352 and shall be tested to BS: 6755/BS: 5146 requirements. IBR certificates as necessary shall also be provided.
6.06.00	**Check Valves**
6.06.01	Check valves shall be used for non return service for all sizes in oil lines.
6.06.02	For sizes up to and including 50NB, check valves shall be of class 800 forged Carbon Steel horizontal lift type, with bolted cover. Valves shall have 13% Chrome Steel trim and body material to ASTM A 105. Ends shall be socket welded.
6.06.03	For sizes above 50NB, check valves shall be of class 150/300 (depending on service) Cast Carbon Steel valves of swing check type having bolted cover. Trim shall be of 13% Chromium Steel and body material to ASTM A 216 Gr. WCB. Ends shall be flanged to ANSI Class 150/300 lb rating with raised face.
6.06.04	The valve shall conform to BS: 1868/BS: 5352/ANSI B16.34 and shall be tested to BS: 5146 / BS: 6755/API 598 requirements. IBR certificates as necessary shall also be provided.
6.07.00	**Oil Line Plug/Ball Valves**
6.07.01	Plug/Ball valves shall be used for isolation purpose in oil lines for sizes up to and including 300 NB. Valves shall be wrench or gear and hand wheel operated and shall have `port' position indicators with CLOSE/OPEN indications marked on valve body.
6.07.02	Ball valves for sizes up to and including 300 NB shall be of class 150 full bore type. Body material for plug/Ball valves shall be ASTM-A-216 GR. WCB. The ball shall be of SS-AISI-316 quality and plug material (for plug valves) shall be hardened steel to ASTM-A-216 Grade WCB with suitable heat treatment. Plug valves shall be self lubricated taper type of proven design.
6.07.03	FO storage tank Inlet/fill line shall be provided with remote operated valves. The details of valves shall be as per clause No.6.07.01 and 6.07.02. The actuator details shall be furnished by the bidder for Employer's approval.
6.07.04	All ball valves shall conform to BS: 5351 and fire safe test shall conform to BS: 6755 part-2/ API 607. All plug valves shall conform to BS: 5353 and fire safe test shall meet the requirements of BS: 6755 part-2. Fire safe certificates shall be submitted to Employer for approval. In absence of the certificates, the fire test shall be carried out by valve supplier.
7.00.00	**HOSES**
7.01.00	The hoses for LDO shall conform to BS: 1435 (latest edition), type S-7. The design temperature of the oil is 105 deg.C. The length of the hose shall be 8000 mm and dia 75 NB.

Both the end connections shall be galvanized in accordance with BS: 729/zinc sprayed as per BS: 2569, Part-1.

7.02.00 **Strainers:**

The strainers at the suction of various pumps shall be simplex type basket strainers. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least six (6) times the internal area of the connecting pipe lines. The strainer element shall be 40 mesh. Pressure drop across the strainers in new connection shall not exceed 1.5 MLC at full flow. The material of construction of various parts shall be as follows:

(a)	Body	:	MS to IS: 2062 (min. 8mm thk) or Pipe to IS:3589 (min. 6.35 mm thk)
(b)	Strainer Element	:	Stainless Steel (AISI 316)
(c)	End connection	:	Flanged

8.00.00 **PUMPS (As applicable)**

Sl. No.	Description	LDO Unloading Pumps	~~LDO Transfer Pumps~~	Drain Oil Pumps	Sump Pumps	Dirty Oil Pumps
1	2	3		4	5	6
1.	Type of pump*	*Twin screw external bearing with Mechanical gear	~~Twin screw external bearing with Mechanical gear~~	Single Screw Vertical	Vertical Centrifugal Submersible Type	Single Screw Vertical
2.	Type of fuel to be handled	LDO/ Methanol	~~LDO/ Methanol~~	LDO/ Sludge	OIL/ Sludge	Dirty Oil at Oil Water Separator pit
3.	Design Viscosity	2-20 CST	~~2-20 CST~~	5-50 CST	5-50 CST	5-50 CST
4.	Pump design/ construction code	API 676	~~API 676~~			
5.	Temperature of fluid	Ambient	~~Ambient~~	Ambient	Ambient	Ambient
6.	No. of pumps	2	~~2~~	2	2	2
7.	Rated capacity in design viscosity range	50 m^3/hr	~~25 m^3/hr~~	10 m^3/hr	10 m^3/hr	5 m^3/hr
8.	Design temperature of fluid	Max. Ambient	~~Max. Ambient~~	Max. Ambient	Max. Ambient	Max. Ambient
9.	Max. temperature to which the pump may be supplied	Max. Ambient	~~Max. Ambient~~	Max. Ambient	Max. Ambient	Max. Ambient
10.	Pump speed (max.)	1500	~~1500~~	1500	1500	1500
	*[Two (2) Nos. pumps shall be installed at sump of unloading pump house and two (2) nos. at Water pit of Oil Water Separator pit]					

Sl. No.	Description		LDO Unloading Pumps	LDO Transfer Pumps	Drain Oil Pumps	Sump Pumps	Dirty Oil Pumps
1	2		3		4	5	6
11.	Drive Motor Type of Enclosure	<---------- TEFC and Flame proof as per IS : 2148 ---------->					
12.	Motor Rating at 50^{0}C.	<-----Shall have minimum 10% margin over and above the maximum load ----> demand in the entire operating range of the pumps					
13.	Materials of construction						
a.	Casing	<-------Cast Iron to IS : 210 Gr. FG 260 ---->			CI to IS:210 Gr. FG 260 / IS:1239(Heavy grade)	CI to IS:210 Gr. FG 260	CI to IS:210 Gr. FG 260 / IS:1239(Heavy grade)
b.	Rotor/ Impeller		SS to AISI-431	SS to AISI-431	SS to AISI-431	2-2.5% Ni Cast Iron	2-2.5% Ni Cast Iron
c.	Shaft		SS to AISI-431	SS to AISI-431	SS to AISI-431	EN-8	SS to AISI-304
d.	Pump Motor base plate		Fabricated steel IS:2062	Fabricated steel IS:2062	---	Fabricated steel IS:2062	---

e ri i e b e r ided i ee e ri eri d e

09.00.00 CONTROL PHILOSOPHY

The basic control philosophy of the fuel oil handling and storage system is described in the succeeding paragraph. The contractor shall provide all the features as specified herein including other features as required for safe and efficient operation of the system.

09.01.00 Light Oil Unloading and Storage

09.01.01 Out of the two (2) tanks, one tank shall be selected manually for filling operations. The other tank shall be in use. After the desired tank is selected the inlet/outlet valves of the selected tank and the tank under use shall be opened / closed automatically.

09.01.02 After the selected tank level reaches High there shall be an alarm followed by tripping of all the unloading pumps when the tank level reaches High-High.

09.01.03 Control interlocks for safe operation of various pumps shall be provided in DDCMIS.

09.01.04 Similar operations and controls shall be provided for inter tank transfer system also.

09.01.05 In case the running LDO unloading pump trips there shall be an alarm and the standby pump will be started manually from local push button.

CLAUSE NO.	TECHNICAL REQUIREMENTS
09.01.06	Signals shall be provided to achieve Control & Operation philosophy as required by the equipment.
09.02.00	**DRAIN OIL / OIL RECOVERY/SUMP PUMPS AND PUMPS IN OIL WATER SEPARATOR**
09.02.01	In case of drain oil pumps and sump pumps there shall be an alarm on level reaching High.
09.02.02	On alarm for HIGH level, or if physically the level is found to be HIGH, respective pumps will be started manually from local push buttons.
09.02.03	In case of low level the pump will trip automatically with provision of low level contacts.
09.02.04	In case the running pump trips due to any other reason the standby pump will be started manually only from local push button.
09.02.05	In case of pumps in oil water separator system both the pumps will be started from the local push button manually or if physically the level is found to be high or there is HIGH level alarm.
10.00.00	**BUILDINGS AND LAYOUT REQUIREMENT**
10.01.00	The fuel oil unloading pump house shall be RCC building.
10.02.00	While deciding the layout of building namely Pump House the Bidder shall consider the following parameters. (a) Working space around the equipment shall be approx.1000 mm as a good engineering practice. (b) Generally 1200 mm passage all around inside periphery of the building shall be provided. (c) Building height shall take care of the following parameters: i) In case of handling of the equipment one over the other, the clearance between moving & stationary equipment shall be 500 mm (minimum). ii) In case of handling of the equipment on the side of the other equipment, ground clearance of moving equipment shall be 2500 mm (minimum). (d) One maintenance bay of 6m (minimum) x the width of the building shall be provided. (e) Two (2) nos. of rolling shutter of size 4000 x 4000 mm (min) shall be provided one at the entrance and the other at exit of maintenance bay. In case entrance & exit of maintenance bay is common i.e. on the same side, only one rolling shutter of size 4000 x 4000 can be provided. (f) ~~For handling of equipments in the pump house One (1) no. hand operated monorail Hoist of minimum 2 tonnes capacity alongwith monorail in the fuel oil unloading pump house shall be provided~~.

CLAUSE NO.	TECHNICAL REQUIREMENTS
4.04.15	**Dust extraction system** Type: Dry type dust extraction system Location: **Truck un-loading points, Junction Towers (limestone/ gypsum discharge & receipt points), limestone crusher house (including belt feeder & vibrating screening feeder) and limestone/gypsum storage Shed/Silo.**
4.04.16	**Service Water System** Service water connections are to be provided in conveyor galleries & tunnels at 50 meter interval and one (1) no. on each floor of Transfer Points, toilets and minimum two (2) nos. on each floor of crusher house. (a.) Flow at each valve : 5 cub. m/hr (b.) Minimum discharge Pressure at tap point : 2 kg/sq.cm (c.) No. of valves operated Simultaneously : 6 nos.
4.04.17	**Ventilation System** **A. Mechanical Ventilation System:** i. Underground Areas Minimum 15 supply air changes and minimum 7 exhaust air changes per hour. ii. Other Areas Minimum 10 supply air changes per hour. **B. Pressurized Ventilation System**: Minimum 15 supply air changes per hour
4.04.18	**Chutes:** Minimum clear cross section of chute: 800 mm X 600 mm (inside both ways)
4.05.00	**FUEL OIL HANDLING AND STORAGE SYSTEM**
4.05.01	Fuel oil unloading & storage system shall be designed to handle light diesel oil (LDO).
4.05.02	Fuel oil system shall meet the requirements of steam generator.
4.05.03	Unloading LDO from minimum five (05) nos. road tankers shall be kept. The Oil from tankers shall be unloaded to unloading header by gravity which shall then be pumped to LDO storage tanks through existing unloading pumps.
4.05.05	An oil water separator pit shall be provided near unloading header area to collect spilled over oil from unloading trench as well as pump house.
4.05.06	Storage tanks shall be designed and /or modified as per IS: 803 (As applicable).
4.05.08	The velocity of oil in gravity flow lines shall be limited to 0.6-1.0 m/s.
4.05.09	The entire fuel oil handling installation (In Bidder's scope) shall have the approval of Chief Commissioner of Explosives, Nagpur.
4.05.10	Dyke size shall be as per OISD-118 guidelines.

SUB-SECTION–A-12

SURFACE PREPARATION & PAINTING

CLAUSE NO.	TECHNICAL REQUIREMENTS

1.00.00 **Specification of surface preparation & painting**

1.01.00 Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.

1.02.00 All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.

1.03.00 Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.

1.04.00 All pipelines shall be Colour coded for identification as per the NTPC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.

1.05.00 **SURFACE PREPARATION**

1.05.01 All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.

1.05.02 The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer.

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

1.06.00 **APPLICATION OF PRIMER/PAINT**

1.06.01 The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.

1.06.02 Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.

1.06.03 Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.

1.06.04 Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.

CLAUSE NO.	TECHNICAL REQUIREMENTS
1.06.05	Following are the Primer/painting schemes envisaged herein: PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104. PS3* - Zinc Chrome primer (Alkyd base) by dip coat. PS4 - Synthetic Enamel (long oil alkyd) to IS2932. PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744 PS9 - Aluminum paint to IS 2339. PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC) PS13 - Rust preventive fluid by spray, dip or brush. PS14 - Weldable primer-Deoxaluminate or equivalent. PS16 - High Build Epoxy CDC mastic `15'. PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.) PS18 - Epoxy based TiO2 pigmented coat PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.) PS-20 - Epoxy based finish paint
1.06.06	All weld edge preparation for site welding shall be applied with one coat of wieldable primer.
1.06.07	For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.
1.06.08	SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.
1.06.09	a) All un-insulated equipments, pipes, valves etc covered in sub-section A-08 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 micron. The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner: ▪ Primer coat – Epoxy based zinc phosphate ▪ Intermediate - Epoxy based TiO2 pigmented coat ▪ Finish coat - Epoxy based finish coat/Two pack polyurethane coat b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 micron. c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard
1.06.10 A)	Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows: Primer : One coat of unmodified epoxy resin along with polymide hardener. Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct

hardener.

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

B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows:

i) For Indoor vessel, tanks, piping, valves & other equipments:

(a) Surface preparation shall be done either manually or by any other approved method.

(b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns.

(c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns.

(d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns.

Total DFT of paint system shall not be less than 150 microns.

ii) For Outdoor vessel, tanks, piping, valves & other equipments:

(a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard.

(b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.

(c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.

(d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied.

Total DFT shall not be less than 300 microns.

1.06.11 Primer/Painting Schedule

Sl. No	Description		Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
				Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping														As per NTPC Colour shade/ coding scheme
1.	All insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.		SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
2.	All un-insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipment etc.	Design temperature < or equal to 60^{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) and Variable Load Hanger (VLH)		SP4*	PS19	1	40	-	-	-	PS17	1	30	70	
4	Piping hangers / supports (other than (3) above. (un-insulated)		SP3/SP5	PS5	2	25	-	-	-	PS4	2	25	100	

	Valves												
5.	Cast/Forged	Design temperature < or equal to 60 degC #	SP3/SP5	PS5	2	35	-	-	-	PS4	2	25	120
		Design temperature above 60 degC	SP3/SP5	PS9*	1	20	-	-	-	PS9*	1	20	40
6.	All auxiliary Structural Steel components for pipe supports	Outside TG building and in SG envelope	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat b) Final coat of paint PS17	2 1	35 30	250
		Within TG building	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat b) Final coat of paint PS17	2 1	25 30	150
7.	Weld Edges		SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25

1. **$ -** The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3rd finish coat (min.DFT 35 Microns) shall be applied at site.
2. For valves below 65NB and temperature upto and including 540 DegC, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint.
3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable.
4. For spring cages, 2 coats of 30 µm (min) zinc-rich epoxy resin primer with zinc content> 80 weight% in dry film followed by 2 coats of 30 µm (min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme.
5. For corrosion protection, all inner parts of the hangers (CLH/VLH) shall be at least in full compliance to Corrosion category C3 as per EN ISO12944.
6. # - For Cast/forged valves upto & including design temperature 60Deg.C, Aluminium painting as per IS-13183 Gr-3 or better with total DFT 40Micron is also acceptable.

B) Steam Generator & Auxiliaries:

1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	PS 4	2 **$**	20 **$**	100 **$**
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40

Note: **1)** SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

2) Painting specification for all other exposed steel surfaces not covered above shall be same as that given in Civil Sub-section, Part-B, Section VI for corrosion protection of steel structures.

C) LOW PRESSURE PIPING													
1	All Piping, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/ PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Color shade/ coding scheme.
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											
D) Fire Detection & Protection System, Compressed air system and Air-conditioning & Ventilation System													
For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-18, Fire Detection & Protection System For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Air Conditioning System. For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Ventilation System. For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section--A-16 compressed air system.													
E) ESP													
1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP4	PS3/ PS3*	1	25	-	-	-	PS 4	1	30	55	
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP4	PS5	2	30	-	-	-	-	-	-	60	

General Notes (Applicable for all above points A to E)

i) Painting specification for all surfaces with surface temperature 95°C or less (un-insulated) that are not covered above shall be same as that given in Civil Sub-section, Part-B, Section-VI for corrosion protection of steel structures.

ii) Painting specification for inside surfaces (such as inner surfaces of ducts/ tanks/ mills/ dampers/ ESP etc.) that are not covered specifically in above clauses, shall be provided with 2 coats of suitable primer i.e. PS5/ PS9 (Total DFT 60/40 micron) based on the temperature.

F) FGD System

(i) Surface preparation shall be blast cleaned conforming *to* Sa *2-1/2* Swiss Standard.

(ii) Primer coat shall consist of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.

(iii) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.

(iv) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat *of* polyurethane of minimum DFT of 25 microns shall be provided.

2 X 660MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SECTION IA

(CUSTOMER SPECIFICATION - GENERAL REQUIREMENT)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

CLAUSE NO.	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 specifications and 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 alongwith 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 EPC Package contract. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure a completely engineered plant shall be 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.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
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

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	(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 the 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 Organization 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 elsewhere 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 and equipment 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.

5.08.00 A detailed list of standards apart from those mentioned in the respective detailed specifications in other parts of Section-VI to which all equipment/systems/civil works should conform as indicated in this Part C and elsewhere in the specification.

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 Specifications. These guarantees shall supplement the general functional guarantee provisions covered under Defect liabilities Section-IV, 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 AVILABILITY 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 furnace, inspection of the entire hot gas path, turbine & equipments, inspection of the steam path and the minor and major overhauls shall be specified in terms of fired hours, clearly defining the spare parts and man-hour 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 an **EPC Package contract**. 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 and power systems, 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 Data Sheets and Technical Specification.

A comprehensive engineering and quality coordination procedure shall be finalized with the successful bidder covering salient features as described in this section of specifications.

8.02.00 The number of copies/prints/CD-ROMs/manuals to be furnished for various types of document is given in **Annexure-VI** 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 the various 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/ 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) Water Balance diagram.

viii) Operation Philosophy and the control philosophy of the Main Plant and other plants.

ix) General Layout plan of the power station incorporating all facilities in Bidder'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.

x) Basic layouts and cross sections of the main plant building (various floor elevations), boiler, fuel oil area, transformer yard, switchyard and other areas included in the scope of the bidder.

xi) 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 of the station.

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

iii) Flow diagram, Process and Instrumentation diagrams along with write up and system description.

iv) Start-up curves for boiler and both turbines and boiler combined together as a unit 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 Employer's specifications as a base for placement of orders on their sub vendors.

viii) Detailed design calculations for components, system, piping etc., wherever applicable including sizing calculations for all auxiliaries like Mills, Fans, BFPs, CEPs, Heaters/ Deaerators, Air cooled Condensers, Vacuum pumps etc.

ix) Boiler pressure part schedule and sizing calculations. Boiler performance data and boiler design dossier.

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

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

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

xiii) 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.

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

xv) Protection system diagrams and relay settings.

xvi) Cables schedules and interconnection diagrams.

xvii) Cable routing plan.

xviii) 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.

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

xx) Sequence and protection interlock schemes.

xxi) Type test reports, insulation co-ordination study report and power system stability study report.

xxii) Control system configuration diagrams and card circuit diagrams and maintenance details.

xxiii) Detailed DDCMIS system manuals.

xxiv) Detailed flow chart for digital control system.

xv) Mimic diagram layout, Assignment for other application engg.

xxvi) Civil and Structural works drawings and documents for all structures, facilities, architectural works, foundations underground and overground works and super-structural works as included in the scope of the bidder civil calculation sheets including structural analysis and design alongwith output results.

xxvii) Underground facilities, levelling, sanitary, land scaping drawings.

xxviii) Geotechnical investigation and site survey reports (if and as applicable).

xxix) Model study reports wherever applicable.

xxx) Functional & guarantee test procedures and test reports.

xxxi) Documentation in respect of Quality Assurance System, and Documentation in respect of Commissioning, as listed out elsewhere in this specification.

The Contractor's 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 finalisation and approval of the Employer the Instruction Manuals shall be submitted as indicated in **Annexure-IV.** 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 at least three (3) months prior to the commencement of erection activities of a 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 tools, tackles, heavy equipments like cranes, dozers, etc.

f) Bill of Materials

g) Procedure for erection and General Safety procedures to followed during erection/installation.

h) Procedure for initial checking after erection.

i) Procedure for testing and acceptance norms.

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

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

l) 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. (This 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 taken 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**

8.03.03.01 **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

i) Design and performance data.

ii) Process & Instrumentation diagrams.

iii) Single line diagrams.

iv) Sequence & Protection Interlock Schemes.

v) Alarm and trip values.

vi) Performance Curves.

vii) General layout plan and layout of main plant building and auxiliary buildings

viii) 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.

8.03.03.02 **PROJECT COMPLETION REPORT**

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

8.03.04 **DRAWINGS**

a) i) All the plant layouts shall be made in computerized 3D modelling system. The Employer reserves the right to review the 3D model at different stages during the progress of engineering. The layout drawings submitted for Employer's review shall be fully dimensioned and extracted from 3D model after interference check.

ii) 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-VI** of Part-C. The soft copies shall be uploaded by the vendors in C-folders, a Web-based system of NTPC ERP, for which a username and password will be allotted 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 attachments/reply to the submitted document(s) can be in .doc, .xls, .pdf, .dwg or .std formats.

iii) Final copies of the approved drawings along with requisite number of hard copies shall be submitted as per **Annexure-VI** of Part-C.

iv) Contractor shall prepare the model of all the facilities located within plant boundary covering facilities in Main Plant Block area and Balance of plant (BOP) area in an integrated & intelligent 3D software solution. Main Plant Block area shall include Transformer Yard, TG building (including all facilities), Boiler area, ESP area, chimney area, FGD area and any other facility located in main plant block. BOP area shall include all facilities pertaining to AHP, CHP, LHP, GHP, DM PT plant, pipe & cable racks and any other facility located within plant boundary.

All piping layouts, equipment layouts, floor plans, ducting layout (Air/flue gas, A/C, Ventilation etc.), General Arrangement drawings and RCC layout of major buildings and structural arrangement 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 & when required by employer.

The complete 3D data (editable model) which shall be utilised for all future detailed engineering related to maintenance, operation, R&M, efficiency improvement of the project etc. Complete 3D model along with as built GADs, layout, isometrics, reports extracted and 3D models for all disciplines , with any other document generated from 3D model and naming conventions with as-built updates along with complete reference databases, component catalogues for all the size range shall be handed over to owner. Apart from the 3D Model, all

drawings like GADs, Isometrics etc. extracted from the model shall also be submitted by the Contractor in Electronic form. 3D model along with complete Project databases shall be submitted at each model review stage and as final as-built. The contractor shall also submit all the configuration files, customization files, templates and all referenced databases.

All input files of software used for design of Equipments / Piping like CAESAR2 files, input files for Pressure vessel design, datasheets etc., shall be handed over to NTPC as per NTPC specifications for handover of Engineering Information.

Further, two Licenses of the used 3D Modelling Software (One for Engineering View and One for Site View) shall be provided along with compatible Hardware for possible review and study of the Model Files being submitted by the Bidder Time to time.

Handover Plan: There shall be continuous handover of documents and data at various stages of the project including rules and trigger points for handover of data to NTPC shall be at 30%, 60% and 90 % of 3D model stage.

Database backup shall be taken every month and handed over to NTPC.

b) All documents/text information shall be in latest version of MS Office/MS Excel/PDF format as applicable.

c) 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.

d) Each drawing submitted by the Contractor (including those of sub-vendors) 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.

e) 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 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 **in line with suggestive MDL**.

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

f) 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.

g) 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.

h) 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.

i) 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/ finalised 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.

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.

j) 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 no. of copies as per **Annexure VI**.

k) 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.

l) 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.

m) 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.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
8.03.05	**e-Learning Package:** e-learning packages shall be supplied for the equipment / system for the following Steam Turbine Generator & auxiliaries and Steam 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, Centralized 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 etc. 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	**Steam Generator & Auxiliaries** Furnace/evaporator, separator & drain collection vessel, superheater, reheater, economiser, startup recirculation & drain system, desuperheating spray system, safety valves, soot blowing system, draft plant including FD & ID fans, PA fan, air preheaters, SCAPH, coal preparation and firing system including raw coal feeder and pulverisers, coal burners, fuel oil system and oil burners, Electrostatic precipitator, NOx control system and Flue gas desulphurisation system, Aux. PRDS system.
8.03.05.03	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 pre-commissioning, 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 Provision for Fail Safe operation of vital Equipments

All the Plant and equipments / Systems supplied under the contract shall be designed following “Fail Safe” concept. In case of failure of Power supply like Electric power, Hydraulic pressure, Pneumatic pressure, Vacuum etc. the system should be designed in such a way that the equipment/Valves/dampers etc. shall always move/remains (as applicable) to safest position as per system requirement to ensure safety of Man and Machinery.

8.05.00 Engineering Co-ordination Procedure

8.05.01 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 :

8.05.02 All engineering correspondence shall be in the name of above coordinators on behalf of the respective organizations.

8.05.03 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 sub-vendor along with his purchase order for sub-vendor'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 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 two (2) 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.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	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.
8.06.00	**ENGINEERING PROGRESS AND EXCEPTION REPORT**
8.06.01	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.
8.06.02	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.
9.00.00	**TECHNICAL CO-ORDINATION MEETING**
9.01.00	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.
9.02.00	The Contractor should note that Time is the essence of the contract. In order to expedite the early completion of engineering activities, the comments of the Employer shall 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.
9.02.01	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.
9.02.02	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.

9.03.0 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.

10.00.00 **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.

11.00.00 **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 shall 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.

12.00.00 **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.

13.00.00 **LUBRICANTS, SERVO FLUIDS AND CHEMICALS**

13.01.00 All the first fill and one year's topping requirement of consumables such as greases, oils, lubricants, servo fluids / control fluids, gases (excluding H_2, CO_2 and N_2 for Generator) 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 include supply of H_2, CO_2 and N_2 as applicable for the Generator till successful commissioning of Generator.

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.
13.02.00	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.
14.00.00	**LUBRICATION**
14.01.00	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.
15.00.00	**MATERIAL OF CONSTRUCTION**
15.01.00	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.
16.00.00	**RATING PLATES, NAME PLATES & LABELS**
16.01.00	Each main and auxiliary item of plant 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.
16.02.00	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.
16.03.00	Such nameplates or labels shall be of white non-hygroscopic 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.
16.04.00	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.

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16.05.00	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.
16.06.00	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.
16.07.00	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/cm^2 (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.
16.08.00	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.
16.09.00	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.
17.00.00	**TOOLS AND TACKLES** The Contractor shall supply with the equipment one complete set of all special tools and tackles and other instruments required and other instruments 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.

18.00.00	**WELDING**
18.01.00	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.
19.00.00	**COLOUR CODE FOR ALL EQUIPMENTS/ PIPINGS/ PIPE SERVICES**
19.01.00	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.
20.00.00	**PROTECTION AND PRESERVATIVE SHOP COATING**
20.01.00	**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 non-metallic protection device. All ends of all valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. All primers/paints/coatings shall take into account the hot humid, corrosive & alkaline, subsoil or over ground 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.
20.02.00	**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 requirements 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.
20.03.00	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.

20.04.00 All other steel surfaces which are not to be painted shall be coated with suitable dust preventive compound subject to the approval of the Employer.

20.05.00 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.

20.06.00 Painting for Civil structures and equipment/system covered under this package shall be done as specified under technical requirements on civil works in relevant part of this specifications.

21.00.00 **QUALITY ASSURANCE PROGRAMME**

21.01.00 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, the Contractor shall adopt suitable quality assurance programme to control such activities at all points, as necessary. 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/IS-14001. 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 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 control including process controls and fabrication and assembly controls.

h) Control of non-conforming items and system for corrective actions.

i) Inspection and test procedure both for manufacture and field activities.

j) Control of calibration and testing of measuring testing equipments.

k) System for Quality Audits.

l) System for indication 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) Furnishing of 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 .Formats for the same will be shared along with QA Coordination procedure.

22.00.00 **GENERAL REQUIREMENTS - QUALITY ASSURANCE**

22.01.00 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. 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 on enclosed format No. QS-01-QAI-P-1/F3-R0. Monthly progress reports shall be furnished.

22.02.00 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, for review and approval.

22.03.00 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.

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22.04.00	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.
22.05.00	The contractor shall submit to the Employer Field Welding Schedule for field welding activities in the format enclosed at **Annexure-V.** 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.
22.06.00	The contractor shall have suitable Field Quality Organization with adequate manpower at Employer's site, to effectively implement the Field Quality Plan (FQP) and Field Quality Management System for site activities. The contractor shall submit the details of proposed FQA setup (organizational structure and manpower) for employer's approval. The FQA setup shall be in place at least one month before the start of site activities.
22.07.00	No material shall be despatched from the manufacturer's works before the same is accepted by Employer's Project Manager/Authorised representative and duly authorised for despatch by issuance of Material Dispatch Clearance Certificate (MDCC / CHP Clearance).
22.08.00	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
22.09.00	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 authorized representative prior to carrying out the welding/brazing.
22.10.00	All brazers, welders and welding operators employed on any part of the contract either in Contractor's/his sub-contractor's works or at site or elsewhere shall be

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	qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer. All welding / brazing procedures qualified / used at shop, will be made available to NTPC during audit / inspection. Procedures to be qualified at site will be submitted to NTPC for approval.
22.11.00	Not Used.
22.12.00	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, other piping shall be as per relevant code. 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
22.13.00	All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.
22.14.00	No welding shall be carried out on cast iron components for repair.
22.15.00	Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only.
22.16.00	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). 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. In general all plates of thickness greater than 40mm & for pressure parts plates of thickness equal to or greater than 25mm shall be ultrasonically tested otherwise as specified in respective equipment specification. All bar stock/Forging of diameter equal to or greater than 40 mm shall be Ultrasonically tested.
22.17.00	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-vendors proposed by the Main contractor for procurement of major bought out items including castings, forgings, 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 on enclosed format as Annexure-III. List of NTPC approved sub vendors against similar Pkg/items is attached as Section-VI, Part-B ,Chapter E-60 Indicative sub-vendor list. The contractor's proposal for any new sub vendor for any of the items identified in indicative sub-vendor list shall necessarily be furnished in the sub vendor questionnaire & main Contractor Evaluation report format attached as Annexure- VII with all relevant documents and main contractor's own assessment report

assessed as per their quality management system for NTPC review and acceptance .

New sub vendor proposal will only be considered for NTPC review, provided the proposal is received sufficiently in time: 90 days prior to ordering date of a Bought-Out Items/Start of Manufacturing so as not to impede the progress of the contract.

Major checks and quality requirements as mentioned below shall necessarily be assessed by main contractor and complied with documentary support in case the same is not the part of their Quality management system.

i. Duly Filled Main supplier Evaluation Report.
ii. Duly Filled Sub-Supplier Questionnaire.
iii. Factory Registration Certificate.
iv. Overall Organization Chart with Manpower details (Design, Manufacturing, Quality etc.)
v. Supply reference list of the Sub-Supplier indicating similar product supply order reference no., customer name, rating of product, date /year of supply, date / year of commissioning.
vi. List of Manufacturing Equipment available with sub vendor.
vii. List of Testing Equipment available with sub vendor.
viii. Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any.
ix. Details of Outsourced Manufacturing Processes, if any.
x. Quality control exercised during receipt, in-process & final inspection.
xi. Compliance of Statutory requirements (As applicable)

After first submission of proposal to NTPC , In absence of relevant documents/ Incompleteness of the proposal, The main contractor will be given a period of maximum 10 days to submit the compliance of the NTPC comments. In case of noncompliance it will be presumed that main contractor is not serious about pursuing the proposal & the proposal will be foreclosed.

The proposed Sub vendor will be assessed broadly on following criteria

i) Quality Management System Compliance including raw material/BOI control, traceability & control over outsources process
ii) Design Capabilities (As applicable)
iii) Manufacturing, Testing & Storage Facility
iv) Processing Capabilities
v) Supply Experience
vi) Safety Aspect

In case of major observations or non-compliance observed during sub vendor works visit (Jointly with the main contractor) with respect to the submitted documents, proposed sub vendor will not be considered for acceptance and Main contractor will be solely responsible in such cases.

Monthly progress reports on sub-vendor detail. Submission / approval shall be furnished preferably on enclosed format at Annexure-IV. Such vendor approval shall not relieve the contractor from any obligation, duty or responsibility under the contract.

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22.18.00	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. Within two (2) 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.
22.19.00	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.
22.20.00	The contractor shall carry out an inspection and testing programme during manufacture in his work and that of his subcontractor'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.
22.21.00	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.
22.22.00	For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.
22.23.00	Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorised representative.
22.24.00	**Environmental Stress Screening** Environmental stress screening test process / procedure for eliminating infant mortile components for DDCMIS / PLC based system & for other systems having

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	substantial electronics components (as determined by employer) like Electronic transmitter, CCTV components, PA systems etc. shall be furnished for NTPC acceptance
22.25.00	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.
22.26.00	**Software Reliability / Quality Certification** Certification from OEM's authorized signatory that software offered with DDCMIS, PLC, CCTV, PA, Pyrometer, CEMS, AAQMS, EQMS, BHMS etc. declaring that the all the offered software(s) had gone through the established software quality test and offered software is not of β-version and offered software is also free from all known bugs as on date of approval of systems documents by NTPC as a part of quality documentation review and approval process during detail engineering.
23.00.00	**QUALITY ASSURANCE DOCUMENTS**
23.01.00	The Contractor shall be required to submit the QA Documentation in soft copies, as identified in respective quality plan with tick (✓)mark.
23.01.01	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, **soft copies will be furnished** not later than two (2) weeks.
23.02.00	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.

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	(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
23.03.00	Similarly, the contractor shall be required to submit soft copies containing QA Documentation pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.
23.04.00	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 two (2) weeks after the despatch of equipment.

23.05.00 **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 deliveries, the complete quality document to the Employer shall be issued not later than two (2) weeks after the date of the last delivery of equipment.

24.00.00 **PROJECT MANAGER'S SUPERVISION**

24.01.00 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, the Contractor shall proceed to comply with the Project Manager's decision.

24.02.00 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.

25.00.00	**INSPECTION, TESTING AND INSPECTION CERTIFICATES**
25.01.00	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.
25.02.00	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.
25.03.00	The Contractor shall give the Project Manager/Inspector fifteen (15) 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 fifteen (15) 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.
25.04.00	The Project Manager or Inspector shall within fifteen (15) 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.
25.05.00	When the factory tests have been completed at the Contractor's or subcontractor's works, the Project Manager /Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Failure on the part of 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.

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25.06.00	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.
25.07.00	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.
25.08.00	To facilitate advance planning of inspection in addition to giving inspection notice as specified at clause no. 25.03.00 - 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.
25.09.00	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.
25.10.00	**ASSOCIATED DOCUMENT FOR QUALITY ASSURANCE PROGRAMME**
25.10.01	List of items requiring quality plan and sub supplier approval. Format No.: QS-01-QAI-P-01/F3-R0 **(Annexure-III).**
25.10.02	Status of items requiring Quality Plan and sub supplier approval. Format enclosed at **Annexure-IV.**
25.10.03	Field Welding Schedule Format enclosed at **Annexure-V.**
25.11.00	**TESTING OF MAJOR DESIGN FEATURES:**
	The major design features of the system shall be demonstrated 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) SOE functionality tests.

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) Connectivity of Switchgear DDCMIS with Switchgear Relay Network.

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 with respect to 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) test report.

25.12.00 **DEMONSTRATION OF APPLICATION ENGINEERING**

25.12.01 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) Calculations (Basic & Performance Calculations).

25.12.02 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 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.

25.12.03 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.

26.00.00 **PRE-COMMISSIONING AND COMMISSIONING FACILITIES**

26.01.00 (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 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.

26.01.00 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.

26.02.00 **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.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	(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. (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.
26.03.00	**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 the** 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, of 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 specifications.

26.04.00 Before start of commissioning of critical equipment, Commissioning Clearance Certificate (CCC) to be submitted by Main contractor. List of the critical equipments **and CCC format will be provided along with QA Coordination procedure.**

27.00.00 **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 withheld 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.

28.00.00 **TRAINING OF EMPLOYER'S PERSONNEL**

28.01.00 The scope of service under training of Employer's engineers shall include a training module covering 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 Steam Generator & ESP Equipment, TG & Auxiliaries and related equipments.

(b) Training for Electric Systems including VFD and Electric power supply system.

(c) Training for other SG/TG related C&I systems/equipments including training on Flame Monitoring System, Furnace and Flame Viewing System , Turbine Supervisory System (TSS) including vibration analyzer, vibration monitoring system axial shift, eccentricity measurements etc. for Main Turbine, BFP Turbine etc. Burner management study, control loop study, misc. system for SG C&I, EHTC, Turbine stress control system, Turbine protection system, ATRS, instrumentation etc.

c1: Training on Engineering, Model building,pre-testing, Post -test fine tuning of Advance process control systems with faculty having experience of atleast 5 years in Model Process Control.

(d) Training for special packages specified elsewhere in Technical Specification, Section-VI.

(e) Training for various C&I systems/equipment supplied includes the following:

i) DDCMIS - Human Machine Interface – Hardware & Operating System

ii) DDCMIS-Human Machine Interface System Engineering & Application Software.

iii) DDCMIS – Control System Hardware and Control system Application Software.

iv) DDCMIS – Operator Training : Use of the system at Works + at site.

v) DDCMIS – Specialized Network security.

(f) Training for power cycle piping/critical piping.

(g) Training for UPS systems Annunciation system, SWAS, PA system, flue gas analyzers, CCTV and 24 VDC system.

(h) Training on following aspects of fieldbus (i) Hardware & Software features (ii) System design, diagnostic and testing (iii) maintenance, troubleshooting and fault analysis.

(i) Training on Non-Intrusive hardwired Electric Actuator and Fieldbus based Electric Actuator along with detail training on Foundation Fieldbus/ Profibus interface used in actuator

(k) Training for numerical relays & networking systems supplied under MV & LT switchgear system.

(l) Training courses on offered PLC system in the following areas:

(a.) Operator training

(b.) Hardware Maintenance training

(c.) Software training

(d.) Any other specialized training as required for system operation and maintenance.

(m) Training for Ash Handling System & Coal Handling Plant Equipment and Auxiliaries

Area	Topics	Mandays
Ash Handling Plant	Product design - Basic design features - Theory & principle of operation - Latest technological trends in Ash handling plant and design Plant Visit - Operational feedback	300

	- O&M history/problems related to Ash handling plant Visit to Manufacturer's Work - Manufacturing process of Ash handling equipments - Testing facilities Operation & Maintenance of Plant - Trouble shooting and fault analysis - Familiarization of special maintenance techniques - Special tool and tackles familiarization	
Coal Handling Plant	Product design - Basic design features - Theory & principle of operation - Latest technological trends in Coal handling plant and design Plant Visit - Operational feedback - O&M history/problems related to Coal handling plant Visit to Manufacturer's Work - Manufacturing process of Coal handling equipments - Testing facilities Operation & Maintenance of Plant - Trouble shooting and fault analysis - Familiarization of special maintenance techniques - Special tool and tackles familiarization	150

n) Training for UF Membranes, RO membranes, Zero Liquid Discharge (ZLD) Chlorine Di-Oxide (ClO_2) generation & dosing system, Condensate Polishing Plant (CPU) and CW Treatment System.

Area	Topics	MANDAYS
UF Membranes	**Product design** -Basic design features -Theory & principle of operation -Latest technological trends in Ultrafiltration membranes and design -CIP & CEB of UF system **Plant Visit**	**7**

	-Operational feedback -O&M history/problems related to UF membranes **Visit to Manufacturer's Work** -Manufacturing process of UF membranes and equipment -Testing facilities **Operation & Maintenance of Plant** -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	

Area	Topics	MANDAYS
RO membranes	**Product design** -Basic design features -Theory & principle of operation -Latest technological trends in RO membranes and design -Failure analysis, types of failures, causes & its evaluation, remedies -CIP of RO system **Plant Visit** -Operational feedback -O&M history/problems related to RO membranes **Visit to Manufacturer's Work** -Manufacturing process of RO membranes and equipment -Testing facilities **Operation & Maintenance of Plant** -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	**7**

Zero Liquid Discharge (ZLD)	**System Design** - Plant water optimization and Scheme to achieve the ZLD - Basic design features - Latest technological trends for ZLD in Thermal Power Plant **Plant Visit** - Operational feedback - O&M history/problems related to plant	5
Chlorine Di-Oxide (ClO_2) generation & dosing system	**System/Product Design** - Basic design features - Theory & principle of operation - Latest technological trends in Chlorine Di-Oxide (ClO2) generation & dosing system and design aspects & Selection criteria. **Plant Visit** - Operational feedback - O&M history/ problems related to ClO2 plant **Performance Test of generator** - Generator capacity performance testing. **Operation & Maintenance of Plant** -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	5
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	3

	-Testing facilities **Operation & Maintenance of Plant** -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	
CW Treatment System	**System/Product Design** - Basic design features - Theory & principle of operation - Latest technological trends and design aspects & Selection criteria. **Operation & Maintenance of Plant** - Operational feedback - O&M history / problems related to plant - Trouble shooting and fault analysis Familiarization of special maintenance techniques - Special tool and tackles familiarization	**3**
Note: One week shall constitute of five (5) man days.		

(o) Training for **Substation Automation System**

PRODUCT	AREAS OF TRAINING REQUIEMENT
Substation Automation System	**PRODUCT/SYSTEM DESIGN** The contractor shall provide training for NTPC personnel comprehensively covering following courses. 1 Computer System Hardware 2 Computer System Software 3 Application Software

MANDAYS: 60 (Total) inclusive of visit to Manufacturer's site)

(p) Training on Erection methodologies for all the Sub-packages, System and Equipments associated with the EPC Package, including a visit to power plant construction site.

The exact details, extent and schedule for training shall be as finalized during detailed engineering and shall be subject to Employer's approval.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
28.03.00	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 etc. and shall include all the related areas like Design familiarization, training on product design features and product design software 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.
28.04.00	Contractor shall also arrange for training of Employer's personnel in respect of fire detection and protection systems and other Balance of Plant equipments.
28.05.00	Contractor shall provide training on application of PAUT (Phased array ultrasonic testing) and TOFD (Time of flight diffraction) techniques for two weeks (at least 80 Hours). The training shall be arranged at least six months prior to the start of erection works of SG & TG works.
28.06.00	Exact details, extent of training and the training schedule shall be finalized based on the Bidder's proposal within two (2) months from placement of award.
28.07.00	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.
28.08.00	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 classroom training. 4. A) Location of classroom training for engineering shall be at Design/Engineering office. B) Classroom training for erection/O&M shall be at location of Manufacturers' works.

28.09.00 **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
Steam Generator and its Auxiliaries including electricals	6.5	9.0	23
Station C&I (Control and Instrumentation)	3.5	5.5	10
Ash Handling Plant	2.0	3.0	5.0
Coal Handling Plant	1.0	1.5	2.5
UF Membranes, RO Membranes, ZLD, Chlorine Di Oxide (ClO2) generation & dosing system, Condensate Polishing Plant (CPU), CW Treatment System	0.2	0.3	0.5
Substation Automation System	0.3	0.7	1
Total	**20**	**29**	**65**

29.00.00 **SAFETY ASPECTS DURING CONSTRUCTION AND ERECTION**

In addition to the requirements given in Erection Conditions of Contract (ECC) the following shall also cover:

i) Working platforms should be fenced and shall have means of access.

ii) 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.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS

30.00.00 **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) meter 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

i) Safety valves and associated vent pipes for which it shall not exceed 105 dBA-115 dBA.

ii) Regulating drain valves in which case it shall be limited to 90 dBA-115 dBA.

iii) Mill noise which will be limited to 85-90 dBA.

iv) TG unit in which case it shall not exceed 90 dBA.

v) For HP-LP bypass valves and other intermittently operating control valves, the noise level shall be within the limit of 90 dBA.

vi) For BFP Motor Noise level shall be within the limit of 90 dBA.

31.00.00 **PACKAGING, TRANSPORTATION AND STORAGE**

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 at site due to improper packing and presevation. 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.

In addition to above, the contractor shall take all necessary measures for storage of all electronic equipment / systems at site in a dust free Air conditioned space ensuring proper temperature & humidity.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS

32.00.00 **ELECTRICAL EQUIPMENTS/ENCLOSURES**

32.01.00 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 specifications.

33.00.00 **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.

33.01.00 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:

1 Temperature	-	Degree centigrade (deg C)
2. Pressure	-	Kilograms per square centimetre (Kg/cm^2). 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.
3. Draught	-	Millimetres of water column (mm wc).
4. Vacuum	-	Millimeters of mercury gauge (mm Hg) or water column (mm Wcl).
5. Flow (Gas)	-	Tonnes/ hour
6. Flow (Steam)	-	Tonnes/ hour
7. Flow (Liquid)	-	Tonnes / hour
8. Flow base	-	760 mm Hg. 15 deg.C
9. Density	-	Grams per cubic centimetre.

33.02.00 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 plan-in connection at rear.

34.00.00 **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. The equipment shall be protected against ESD as per IEC-61000-2. Radio Frequency interference (RFI) and Electro Magnetic Interference (EMI) protection against hardware damage and control system mal-operations/errors shall be provided for all systems as per EN-50082-2 (1995).

35.00.00 **SURGE PROTECTION FOR SOLID STATE EQUIPMENT**

All solid state systems /equipment shall be able to withstand the electrical noise and surge as encountered in actual service conditions and inherent in a power plant and shall meet the requirements of surge protection as defined in ANSI C37.90.1-1989 on its suitable equivalent class of IEC 254-4. Details of the features incorporated and relevant tests carried out. The test certificates. etc. shall be submitted by the Bidder.

36.00.00 **INSTRUMENT AIR SYSTEM**

The instrument air supply system as supplied by the Bidder for various pneumatic control & instrumentation devices like pneumatic actuators, power cylinders, E/P converters, piping / tubing etc.

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.

37.00.00 **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 Bidder. The standard which is to be adopted, will be intimated to the Contractor.

i) Temperature test pockets with stub and thermowell

ii) Pressure test pockets

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
38.00.00	**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.
38.01.00	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.
39.00.00	**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. Backup & Restoration Procedures of DDCMIS, Station LAN & Advance Process Control shall be provided.
40.00.00	**MAKE IN INDIA REQUIREMENTS**
a)	The bidder shall follow Indian laws, regulations and standards. There shall not be any restriction in terms of compliance to codes & standards of foreign origin only. The compliance to equivalent/better Indian as well as other codes & standards, wherever available, shall also be acceptable.
b)	The technologies/ products offered shall be environmentally friendly, consuming less energy, and safe, energy efficient, durable and long lasting under the prescribed operational conditions.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
c)	The bidder/its sub vendor/supplier shall ensure supply of spares, materials and technological support for the entire life of the project.
d)	The bidder shall list out the products and components producing Toxic E-waste and other waste as specified. It shall have an Extended Producers Responsibility (EPR) so that after the completion of the lifecycle, the materials are safely recycled/ disposed of by the contractor and for this, the bidder has to establish recycling/disposal unit as specified.
e)	The equipment/ material sourced from foreign companies will be tested in accredited labs in India before acceptance wherever such facilities are available. The testing shall be carried out in accordance with MOP extant order/guidelines.
f)	The bidder shall have to furnish a certificate regarding cyber security/safety of the equipment/process to be supplied/services to be rendered as safe to connect.
g)	All applicable safety requirements shall be met. Regular safety audit shall be carried out by the manufacturer/ supplier.
h)	Wherever required, the foreign supplier shall establish fully functional service centers in India and shall keep spares/material locally for future needs of Employer.
i)	To protect the security, integrity and reliability of equipment in this package, it is essential to remove vulnerabilities arising out of the possibility of cyber-attack through malware/ Trojans etc. embedded in imported equipments. This requirement shall apply to any item imported for end use or to be used as a component, or as a part in manufacturing, assembling of any equipment or to be used in this package. Contractor shall comply all the requirements of Order No 25-11/6/2018-PG, dated 02/07/2020 (attached as **Appendix-I**), issued by Ministry of Power, Government of India and its subsequent amendments/revisions. Contractor shall furnish declaration of compliance of MOP order dated 02/07/2020 requirements with dispatch of equipment/ item. Further, Contractor shall furnish back up testing certificates, whenever Employer asks the same.
j)	All equipment/materials/parts/items required in this package which are domestically manufactured with sufficient domestic capacity as identified in Annexure-I of MOP order dated 16/11/2021 including its subsequent revisions (copy attached as **Appendix-II**) shall necessarily be sourced from the class-I local suppliers only as per the extant provisions of the Public Procurement (Preference to Make in India) Orders issued by DPIIT and MoP. Any violation w.r.t Make in India and minimum local content (MLC) requirements as specified shall be sole responsibility of the Bidder.

Appendix-I

No.25-11/6/2018-PG
Government of India
Ministry of Power
Shram Shakti Bhawan, Rafi Marg, New Delhi – 110001
Tele Fax: 011-23730264
*****

Dated 02/07/2020

ORDER

Power Supply System is a sensitive and critical infrastructure that supports not only our **national defence**, **vital emergency services** including health, disaster response, **critical national infrastructure** including classified data & communication services, defence installations and manufacturing establishments, logistics services but also the **entire economy** and the **day-to-day life** of the citizens of the country. Any danger or threat to Power Supply System can have catastrophic effects and has the potential to cripple the entire country. Therefore, the Power Sector is **a strategic and critical sector.**

The vulnerabilities in the Power Supply System & Network mainly arise out of the possibilities of cyber attacks through malware / Trojans etc. embedded in imported equipment. Hence, **to protect the security, integrity and reliability of the strategically important and critical Power Supply System & Network** in the country, the following directions are hereby issued :-

(1) All equipment, components, and parts imported for use in the Power Supply System and Network shall be tested in the country to check for any kind of embedded malware/trojans/cyber threat and for adherence to Indian Standards.

(2) All such testings shall be done in certified laboratories that will be designated by the Ministry of Power (MoP).

(3) Any import of equipment/components/parts from "prior reference" countries as specified or by persons owned by, controlled by, or subject to the jurisdiction or the directions of these "prior reference" countries will require prior permission of the Government of India

(4) Where the equipment/components/parts are imported from "prior reference" countries, with special permission, the protocol for testing in certified and designated laboratories shall be approved by the Ministry of Power (MoP).

This order shall apply to any item imported for end use or to be used as a component, or as a part in manufacturing, assembling of any equipment or to be used in power supply system or any activity directly or indirectly related to power supply system.

This issues with the approval of Hon'ble Minister of State for Power and New & Renewable Energy (Independent Charge).

(Goutam Ghosh)
Director
Tel: 011-23716674

To:
1. All Ministries/Departments of Government of India (As per list)
2. Secretary (Coordination),Cabinet Secretariat
3. Vice Chairman, NITI Aayog
4. Comptroller and Auditor General of India
5. Chairperson, CEA
6. CMDs of CPSEs/Chairman of DVC & BBMB/MD, EESL/DG,NPTI/DG,CPRI/DG,BEE/
7. All ASs/JSs/EA, MoP

Copy:
1. PS to Hon'ble PM, Prime Minister's Office
2. PS to Hon'ble MOS(IC) for Power and NRE
3. Sr. PPS to Secretary(Power)

Appendix-II

No. A-1/2021-FSC-Part(5)
Government of India
Ministry of Power
Shram Shakti Bhawan, New Delhi
Dated: 16th November, 2021

ORDER

Subject: Public Procurement (Preference to Make in India) to provide for Purchase Preference (linked with local content) in respect of Power Sector.

Reference: Department for Promotion of Industry and Internal Trade (DPIIT) Notification No. P-45021/2/2017-PP (BE-II) dated 16.09.2020.

The Government of India, Department for Promotion of Industry and Internal Trade (DPIIT) issued Public Procurement (Preference to Make in India), Order 2017, for encouraging 'Make in India' and promoting manufacturing and production of goods and services in India with a view to enhancing income and employment. Subsequently, DPIIT vide order No. P-45021/2/2017-PP (BE-II) dated 4th June, 2020 and further vide order dated 16th September, 2020 have issued the revised Public Procurement (Preference to Make in India) Order 2017.

2. In light of the Public Procurement (Preference to Make in India) Order 2017, this Ministry had notified purchase preference (linked with local content) for Hydro and Transmission sectors vide Order No. 11/05/2018-Coord dated 20.12.2018, for Thermal sector vide Order dated 28.12.2018 and for Distribution sector vide Order dated 17.03.2020. Further, a combined order dated 04.04.2020 was also issued in supersession of all previous orders to indicate equipment/material/components for which there was sufficient local capacity and competition and also to indicate conditions for including suitably in the tenders to be issued by the procurers. In furtherance of Para 19 of the DPIIT Notification No. P-45021/2/2017-PP(BE-II) dated 04.06.2020, Ministry of Power (MoP) issued a revised comprehensive Order dated 28.07.2020 (Annexure-I amended by order dated 17.09.2020).

3. DPIIT Notification No. P-45021/2/2017-PP(BE-II) dated 16.09.2020 has further revised its order dated 04.06.2020. Therefore, in supersession of all the aforementioned orders including order No.10/1/2019-St.Th. (Part-II) dated 20.03.2020 issued by this Ministry, the following has been decided:

i. For the purpose of this order, the definitions of various terms used in the order, and provisions relating to (i) Eligibility of 'Class-I local supplier'/'Class-II local supplier'/'Non-local suppliers' for different types of procurement, (ii) purchase preference (iii) exemption to small purchases and (iv) margin of purchase preference shall be the same as in DPIIT order dated 16.09.2020, referred to above and extracts of the same is given at **Appendix**.

ii. In procurement of all goods and services or works in respect of which there is sufficient local capacity and local competition as in **Annexure-I,** only "Class–I local supplier" shall be eligible to bid irrespective of purchase value. "Class-I local supplier" is a supplier or service provider whose goods, services or works offered for procurement meets the Minimum Local Content (MLC) as prescribed in Annexure-I of this order. "Class-II local supplier" means a

supplier, as defined by DPIIT in its Order No. P-45021/2/2017-PP (BE-II) dated 16-09-2020.

iii. In the procurement of all goods and services or works other than those listed in Annexure-I, only "Class-I local supplier" and "Class-II local supplier" as defined in the order of this Ministry herewith shall be eligible to bid in procurement undertaken by procuring entities, except when Global Tender Enquiry has been issued. In Global tender enquiries, "Non-local suppliers" shall also be eligible to bid along with "Class-I local suppliers" and "Class-II local suppliers". In procurement of all goods, services or works not covered by sub-para 3(ii) above, and with estimated value of purchases less than Rs. 200 crores, in accordance with Rule 161(iv) of GFR, 2017, Global Tender Enquiry(GTE) shall not be issued except with the approval of the competent authority as designated by Department of Expenditure.

iv. For the purpose of this order, 'Works' means all works as per Rule 130 of GFR- 2017, and will also include '*turnkey works*', Engineering, Procurement and Construction (EPC) contracts and service contracts including System Integrator (SI) contracts.

4. The list of items, in respect of which, local capacity with sufficient competition exists as per **Annexure-I,** will be reviewed at regular intervals with a view to increase number of items in this list and also to increase the MLC for each item, wherever it is less than 100%.

5. Purchase preference shall be given to local suppliers in accordance with **para 3A** of DPIIT Order dated 16.09.2020, and extracts of the same are given at **Appendix**.

6. Further, it has been decided to constitute a committee for independent verification of self-declarations and auditor's / accountant's certificates on random basis and in the case of complaints. The composition of the committee is given below:

Member (Planning), Central Electricity Authority (CEA)	Chairperson
Chief Engineer (PSETD), CEA	Member
Chief Engineer (HETD), CEA	Member
Chief Engineer (TETD), CEA	Member
Chief Engineer (DP&R), CEA	Member
As may be co-opted by CEA	External Expert
Chief Engineer (R&D), CEA	Convener

7. Further, it has also been decided to constitute a committee to examine the grievances in consultation with stakeholders and recommend appropriate actions to the Competent Authority in MoP. The composition of the Committee is given below:

Chairperson, CEA	Chairperson
Member (Hydro), CEA	Member

Member (Power System), CEA	Member
Member (Thermal), CEA	Convener

8. The complaint fee of Rs. 2 Lakhs or 1% of the value of the local item being procured (subject to maximum of Rs. 5 Lakhs), whichever is higher, shall be paid in the form of Demand Draft, drawn in favour of **PAO, CEA, New Delhi.** In case the complaint is found to be incorrect, the complaint fee shall be forfeited. In case, the complaint is upheld and found to be substantially correct, the deposited fee of the complainant would be refunded without any interest.

9. All other conditions, not stipulated in this order, shall be as laid down in the DPIIT's order No. P-45021/2/2017-PP (BE-II) dated 16.09.2020.

10. This order shall be applicable in respect of the procurement made by all attached or subordinate offices or autonomous bodies under the Government of India including Government Companies as defined in the Companies Act, and /or the States and Local Bodies making procurement under all Central Schemes/ Central Sector Schemes where the Scheme is fully or partially funded by the Government of India. The aforesaid orders shall also be applicable in respect of projects wherein funding of goods, services or works is by Power Finance Corporation (PFC) /Rural Electrification Corporation (REC) and any Financial Institution in which Government of India/ State Government share exists. This order shall be applicable to Tariff Based Competitive Bidding (TBCB) projects also. Procuring entities as defined in the DPIIT's Order dated 16.09.2020 are advised to revise their tender documents to fully comply with the said DPIIT's Order and the subsequent Orders that would be issued in this regard by DPIIT/ this Ministry from time to time.

11. All tenders for procurement by Central Government Agencies or the States and Local Bodies, as the case may be, have to be certified for compliance of the Public Procurement (Preference to Make in India) 'PPP-MII' Order by the concerned procurement officer of the Government Organization before uploading the same on the portal.

12. Exemption from meeting the stipulated local content is allowed as per clause 13 and 13A of PPP-MII Order dated 16.09.2020, if the manufacturer declares that the item is manufactured in India under a License from a foreign Manufacturer who holds Intellectual Property Rights (IPRs) and there is Transfer of Technology (ToT) with phasing to increase Minimum Local Content. For such items, if any CPSE under the administration of Ministry of Power requests exemption for any item, it shall be considered by Ministry of Power, on case to case basis.

13. In order to further encourage Make in India initiatives and promote manufacturing and production of goods and services in India, general guidelines as enclosed at **Annexure-II** may be adopted in an appropriate manner according to the circumstances by the procuring entities in their tendering process.

14. The procurers may specify the higher values of MLC than those specified in this Order in respect of goods, services or works covered in their tenders and award the weightage to the product of higher MLC for which they have to specify the criteria beforehand in their tender. The values given in Annexure-I are the minimum prescribed values for becoming a class-I local supplier for the products indicated therein.

15. This issues with the approval of Hon'ble Minister for Power and New & Renewable Energy.

(S. Majumdar)
Under Secretary to the Government of India
Tele No. 011- 23356938

To:

1. Secretary to Government of India (All Ministries/ Departments of Government of India) (As per list)
2. Secretary (Coordination), Cabinet Secretariat
3. CEO, NITI Aayog
4. Chief Secretaries of all States/ UTs
5. Comptroller and Auditor General of India
6. Secretary, DPIIT, Chairman of Standing Committee for implementation of Public Procurement Order, 2017
7. Director General, Bureau of Indian Standards (BIS)
8. Joint Secretary, DPIIT, Member-Convener of Standing Committee for implementation of Public Procurement Order, 2017
9. Chairperson, CEA
10. CMDs of CPSEs, CMD NLC, Chairman of DVC/ BBMB/ EESL, DGs of BEE/ CPRI/ NPTI
11. All Additional Secretaries/ JSs/ EA/ CE, Ministry of Power

Copy to:

Director (Technical), NIC with a request to publish the Order on the website of Ministry of Power

APPENDIX

Extracts of important provisions contained in DPIIT Order No. P-45021/2/2017-PP (BE-II) dated 16-09-2020

1. **Definitions** *(Para 2 of DPIIT order)*:
'Local content' means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value, in percent.

'Class-I local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-I local supplier' under this Order.

'Class-II local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-II local supplier' but less than that prescribed for "Class-I Local supplier" under this Order.

'Non-Local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content less than that prescribed for 'Class-II local supplier' under this Order.

'L1' means the lowest tender or lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjudged in the evaluation process as per the tender or other procurement solicitation.

'Margin of purchase preference' means the maximum extent to which the price quoted by a 'Class-I local supplier' may be above the L1 for the purpose of purchase preference.

'Nodal Ministry' means the Ministry or Department identified pursuant to this order in respect of a particular item of goods or services or works.

'Procuring entity' means a Ministry or department or attached or subordinate office of, or autonomous body controlled by, the Government of India and includes Government companies as defined in the Companies Act.

'Works' means all works as per Rule 130 of GFR- 2017, and will also include *'turnkey works'*.

2. **Eligibility of 'Class-I local supplier'/ 'Class-II local supplier'/ 'Non-local suppliers' for different types of procurement** *(Para 3 of DPIIT order)*
(a) In procurement of all goods, services or works in respect of which the Nodal Ministry / Department has communicated that there is sufficient local capacity and local competition, only 'Class-I local supplier', as defined under the Order, shall be eligible to bid irrespective of purchase value.

(b) Only 'Class-I local supplier' and 'Class-II local supplier', as defined under the Order, shall be eligible to bid in procurements undertaken by procuring entities, except when Global tender enquiry has been issued. In global tender enquiries, 'Non-local suppliers' shall also be eligible to bid along with 'Class-I local suppliers' and 'Class-II local suppliers'. In procurement of all goods, services or works, not covered by 3(a)above, and with estimated value of purchases less than Rs 200 crores, in accordance with Rule 161(iv) of GFR, 2017 Global tender enquiry shall not

be issued except with the approval of competent authority as designated by Department of Expenditure.

(c) For the purpose of this Order, works includes Engineering, Procurement and Construction (EPC) contracts and services include System Integrator (SI) contracts.

3. **Purchase Preference** *(Para 3A of DPIIT order)*

(a) Subject to the provisions of this Order and to any specific instructions issued by the Nodal Ministry or in pursuance of this Order, purchase preference shall be given to 'Class-I local supplier' in procurements undertaken by procuring entities in the manner specified here under.

(b) In the procurements of goods or works, which are covered by para 3(b) of DPIIT Order No. P-45021/2/2017-PP(BE-II) dated 16-09-2021 and which are divisible in nature, the " Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:

i. Among all qualified bids, the lowest bid will be termed as L1 If L1 is 'Class-I local supplier', the contract for full quantity will be awarded to L1.

ii. If L1 bid is not a 'Class-I local supplier', 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price for the remaining 50% quantity subject to the Class-I local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such 'Class-I local supplier' subject to matching the L1 price. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price or accepts less than the offered quantity, the next higher 'Class-I local supplier' within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly. In case some quantity is still left uncovered on Class-I local suppliers, then such balance quantity may also be ordered on the L1 bidder.

(c) In the procurements of goods or works, which are covered by para 3(b) of DPIIT Order No. P-45021/2/2017-PP(BE-II) dated 16-09-2021 and which are not divisible in nature, and in procurement of services where the bid is evaluated on price alone, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:

iii. Among all qualified bids, the lowest bid will be termed as L1. If L1 is 'Class-I local supplier', the contract will be awarded to L1,

iv. If L1 is not 'Class-I local supplier', the lowest bidder among the 'Class-I local supplier', will be invited to match the L1 price subject to Class-I local supplier's quoted price falling within the margin of purchase preference, and the contract shall be awarded to such 'Class-I local supplier' subject to matching the L1 price.

v. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price, the 'Class-I local supplier' with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly. In case none of the 'Class-I local supplier' within the margin of purchase preference matches the L1 price, the contract may be awarded to the L1 bidder.

(d) "Class-II local supplier" will not get purchase preference in any procurement, undertaken by procuring entities.

4. **Applicability in tenders where contract is to be awarded to multiple bidders** *(Para 3B of DPIIT order)*-
In tenders where contract is to be awarded to multiple bidders subject to matching of L1 rates or otherwise, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:
a) In case there is sufficient local capacity and competition for the items to be procured, as notified by the Nodal Ministry, only 'Class-I local supplier' shall be eligible to bid. As such, the multiple supplier who would be awarded the contract, should be all and only 'Class-I local suppliers'.

b) In other cases, 'Class-II local suppliers' and 'Non-Local suppliers' may also participate in the bidding process along with 'Class-I local supplier' as per provisions of this order.

c) If 'Class-I local supplier' qualify for award of contract for at least 50% of the tendered quantity in any tender, the contract may be awarded to all the qualified bidders as per award criteria stipulated in the bid documents. However, in case 'Class-I local supplier' do not qualify for award of the contract for at least 50% of the tendered quantity, purchase preference should be given to the 'Class-I local supplier' over 'Class-II local supplier'/'Non-local suppliers' provided that their quoted rate falls within 20% margin of purchase preference of the highest quoted bidder considered for award of contract so as to ensure that the 'Class-I local suppliers' taken in totality or considered for award of contract for at least 50% of the tendered quantity.

d) First purchase preference has to be given to the lowest quoting 'Class-I local supplier', whose quoted rates fall within 20% margin of purchase preference subject to its meeting the prescribed criteria for award of contract as also the constraints of maximum quantity that can be sourced from any single supplier. If the lowest quoting 'Class-I local supplier', does not qualify for purchase preference because of aforesaid constraints or does not accept the offered quantity, an opportunity may be given to next higher 'Class-I local supplier' falling within 20% margin of purchase preference, and so on.

e) To avoid any ambiguity during bid evaluation process, the procuring entities may stipulate its own tender specific criteria for award of contract amongst different bidders including the procedure for purchase preference to 'Class-I local supplier' within the broad policy guidelines stipulate in sub-paras above.

5. **Exemption of small purchases** *(Para 4 in DPIIT order)*: Procurements where the estimated value to be procured is less than Rs. 5 lakhs shall be exempt from this Order. However, it shall be ensured by procuring entities that procurement is not split for the purpose of avoiding the provisions of this Order.

6. **Minimum Local Content** *(Para 5 in DPIIT order)*: The 'local content' requirement to categorize a supplier as 'Class-I local supplier' is minimum 50%. For 'Class-II local supplier', the local content requirement is minimum 20%. Nodal Ministry/Department may prescribe only a higher percentage of minimum local content requirement to categorize a supplier as 'Class-I local supplier'/'Class-II local supplier'. For the item for which Nodal Ministry/Department has not prescribed higher minimum local content notification under the order, it shall be 50% and 20% for 'Class-I local supplier'/'Class-II local supplier' respectively.

7. Vide DPIIT OM No. P-45021/102/2019-BE-IIPart(1) (E-50310) dated 4.03.2021 services such as transportation, insurance, installation, commissioning, training and after sales service support like AMC/CMC etc. shall not be considered as local value addition. Bidders offering imported products will fall under the category of Non- local suppliers. They can't claim themselves as Class-I local suppliers/Class-II local suppliers by claiming the services such as transportation, insurance, installation, commissioning, training and after sales service support like AMC/CMC etc. as local value addition.

8. **Margin of Purchase Preference** *(Para 6 of DPIIT order)*: The margin of purchase preference shall be 20%.

9. **Specifications in Tenders and other procurement solicitations** *(Para 10 of DPIIT order)*:
   a. Every procuring entity shall ensure that the eligibility conditions in respect of previous experience fixed in any tender or solicitation do not require proof of supply in other countries or proof of exports.
   b. Procuring entities shall endeavour to see that eligibility conditions, including on matters like turnover, production capability and financial strength do not result in unreasonable exclusion of 'Class-I local supplier'/ 'Class-II local supplier' who would otherwise be eligible, beyond what is essential for ensuring quality or creditworthiness of the supplier.
   c. Procuring entities shall, within 2 months of the issue of this Order review all existing eligibility norms and conditions with reference to sub-paragraphs 'a' and 'b' above.
   d. **Reciprocity Clause:**
      i. When a Nodal Ministry/Department identifies that Indian suppliers of an item are not allowed to participate and/ or compete in procurement by any foreign government, due to restrictive tender conditions which have direct or indirect effect of baring Indian companies such as registration in the procuring country, execution of projects of specific value in the procuring country etc. it shall provide such details to all its procuring entities including CMDs/CEOs of PSEs/PSUs, State Governments and other procurement agencies under their administrative control and GeM for appropriate reciprocal action.
      ii. Entities of countries which have been identified by the nodal Ministry/Department as not allowing Indian companies to participate in their Government procurement for any item related to that nodal Ministry shall not be allowed to participate in Government procurement in India for all the items related to that nodal Ministry/Department, except for the list of items published by the Ministry/Department permitting their participation.
      iii. The stipulation in (ii) above shall be part of all tenders invited by the Central Government procuring entities stated in (i) above. All purchase on GeM shall also necessarily have the above provisions for items identified by nodal Ministry/Department.
      iv. State Governments should be encouraged to incorporate similar provisions in their respective tenders.
      v. The term 'entity' of a country shall have the same meaning as under the FDI Policy of DPIIT as amended from time to time.
   e. Specifying foreign certification/ unreasonable technical specifications/ brands/ models in the bid document is restrictive and discriminatory practice against local

suppliers. If foreign certification is required to be stipulated because of non-availability of Indian Standards and/ or for any other reason, the same shall be done only after written approval of Secretary of Department concerned or any other authority having been designated such power by the Secretary of the Department concerned.

f. "All administrative Ministries/Departments whose procurement exceeds Rs. 1000 Crore per annum shall notify/ update their procurement projections every year, including those of PSEs/PSUs, for the next 5 years on their respective website."

Annexure-I

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
	(A) Common items for Transmission, Distribution and Generation Sector	
1	Power Transformers (up to 765 kV, including Generator transformers)	60
2	Instrument Transformer (up to 765 kV)	60
3	Transformer Oil Dry Out System (TODOS)	60
4	Reactors up to 765 kV	60
5	Oil Impregnated Bushing (up to 400 kV)	60
6	Resin Insultated Paper (RIP) bushings (up to 145 kV)	50
7	Circuit Breakers (up to 765 kV AC - Alternating Current)	60
8	Disconnectors/Isolators (up to 765 kV AC)	60
9	Wave trap (up to 765 kV AC)	60
10	Oil Filled Distribution Transformers up to & Including 33 kV [Cold Rolled Grain Oriented (CRGO)/Amorphous, Aluminium/Copper wound]	60
11	Dry Type Distribution Transformer upto and including 33 kV (CRGO/Amorphous, Aluminium/Copper wound)	60
12	Conventional Conductor	60
13	Accessories for Conventional conductors	60
14	High Temperature/High Temperature Low Sag (HTLS) conductors (such as Composite core, GAP, ACSS, INVAR, AL59) and Accessories	60
15	Optical ground wire (OPGW) – all designs	60
16	Fiber OpticTerminal Equipment (FOTE) for OPGW	50
17	OPGW related Hardware and Accessories	60
18	Remote Terminal Unit (RTU)	50
19	Power Cables and accessories up to 33 kV	60
20	Control cables including accessories	60
21	XLPE Cables up to 220 kV	60
22	Substation Structures	60
23	Transmission Line Towers	60
24	Porcelain (Disc/Long Rod) Insulators	60
25	Bus Post Insulators (Porcelain)	60
26	Porcelain Disc Insulators with Room Temperature Vulcanisation (RTV) coating	50
27	Porcelain Longrod Insulators withRoom Temperature Vulcanisation (RTV) coating	50
28	Hardware Fittings for Porcelain Insulators	60
29	Composite/Polymeric Long Rod Insulators	60
30	Hardware Fittings for Polymer Insulators	60
31	Bird Flight Diverter (BFD)	60
32	Power Line Carrier Communication (PLCC) System (up to 800 kV)	60
33	Gas Insulated Switchgear (up to 400 kV AC)	60
34	Gas Insulated Switchgear (above 400 kV AC)	50
35	Surge/Lightning Arrester (up to 765 kV AC)	60
36	Power Capacitors	60
37	Packaged Sub-station (6.6 kV to 33 kV)	60
38	Ring Main Unit (RMU) (up to 33 kV)	60
39	Medium Voltage (MV) GIS Panels (up to 33 kV)	60
40	Automation and Control System/Supervisory Control and data Acquisition (SCADA) System in Power System	50
41	Control and Relay Panel (including Digital/Numerical Relays)	50
42	Electrical Motors 0.37 kW to 1 MW	60
43	Energy Meters excluding smart meters	50
44	Control & power cables and Accessories (up to 1.1 kV)	60
45	Diesel Generating (DG) set	60

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
46	DC system (DC Battery & Battery Charger)	60
47	AC & DC Distribution Board	60
48	Indoor Air Insulated Switchgear (AIS) upto 33 kV	60
49	Poles (PCC, PSCC, Rolled Steel Joist, Rail Pole, Spun, Steel Tubular)	60
50	Material for Grounding/earthing system	60
51	Illumination system	60
52	Overhead Fault Sensing Indicator (FSI)	50
53	Power Quality Meters	50
54	Auxilliary Relays	50
55	Load Break Switch	50
	(B) Hydro Sector	
56	Hydro Turbine & Associated equipment	
	a) Francis Turbine	60
	b) Kaplan Turbine	60
	c) Pelton Turbine	50
57	Main Inlet Valve & Associated Equipment	60
58	Penstock Protection Valve and Associated Equipment	60
59	Governing system & Accessories	60
60	Generator for Hydro Project & Associated Equipment	60
61	Static Excitation System	60
62	Workshop Equipment	60
63	Cooling Water System	60
64	Compressed Air System	60
65	Drainage/Dewatering System	60
66	Fire Protection System	60
67	Heating, Ventilation & Air Conditioning System (HVAC)	60
68	Oil Handling System	60
69	Mechanical Balance of Plant (BOP) Items	60
	(C) Thermal Sector	
	Boiler Auxiliaries	
70	Air Pre-Heater	60
71	Steam Coil Air Pre Heater (SCAPH)	60
72	Steam soot blowers [wall blowers & Long Retractable Soot Blower (LRSB)]	60
73	Auxiliary Steam Pressure Reducing & Desuperheating (PRDS)	60
74	Fuel oil system	60
75	Seal air Fan	60
76	Ducts and dampers	60
77	Duct expansion joints	60
78	Blowdown tanks	60
79	Coal burners and oil burners	60
80	Coal mills	60
81	Gear Box of Coal Mill	50
82	Coal feeders	60
83	Primary Air Fans	60
84	Forced Draft Fans	60
85	Induced Draft Fans	60
86	Forced Draft (FD)/Induced Draft (ID)/ Primary Air (PA) Fan Servo Motor Assembly	50
87	Tubes (Carbon Steel)	50
88	Steam pipes (Carbon Steel)	50
89	Steam drum	50
90	Separator	50
91	Selective Catalytic Reduction (SCR)	50

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
	Electro-Static Precipitators (ESPs)	
92	Casing	60
93	Electrodes	60
94	Rapping System	60
95	Hopper Heaters	60
96	Transformer Rectifiers	60
97	Insulators	60
	Turbine & Auxiliaries	
98	Turbine (High Pressure/Intermediate Pressure/Low Pressure)	50
99	Condensate Extraction Pumps	60
100	Condenser On line Tube Cleaning System (COLTC)	60
101	Debris filters	60
102	Deaerator	60
103	Drain Cooler and Flash Tank	60
104	ECW Pump	50
105	Plate Heat Exchanger	50
106	Self- cleaning filters	50
107	Condensate Polishing Units (CPUs)	60
108	Chemical Dosing System	60
109	Oil Filter	60
110	Gland Steam Condenser	60
111	Oil Purifying Centrifuge	50
112	Water Cooled Condenser	50
113	Boiler Feed Pumps (BFPs)	50
	Generator and Auxillieries	
114	Generator (including Seal Oil System, Hydrogen Cooling System, Stator water cooling system)	60
	Electrical Works	
115	Control and metering equipment	60
	Control & Instrumentation System (C&I System)	
116	Thermocouples	50
117	Measuring instruments [Resistance Temperature Detectors (RTDs)], Local gauges	50
118	Actuators (Pneumatic and conventional electric)	50
119	Interplant Communication/ Public Address (PA) system except IP based	50
	Coal Handling Plant	
120	Conveyors	60
121	Wagon Tippler	60
122	Side Arm Charger	60
123	Paddle feeder	60
124	Crushers & Screens	60
125	Dust suppression (dry fog & plain water) system	60
126	Air Compressors	50
127	Magnetic separators & metal detectors	60
128	Coal Sampling System	60
129	Stacker cum reclaimer	60
130	Belt weighing & monitoring system.	60
131	Wheel & axle assembly (without bearings) for Bottom Opening Bottom Release (BOBR) Wagons	60
	Ash Handling System	
132	Clinker grinder	60
133	Water jet ejectors	60
134	Scrapper chain conveyor	60
135	Dry fly ash vacuum extraction system	60
136	Pressure pneumatic conveying system	60

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
137	Ash water & ash slurry pumps	60
138	Compressors, air dryers & air receivers	50
139	Ash water recovery system	60
	Raw Water Intake & Supply System	
140	Travelling water screens	60
141	Raw water supply pumps	60
142	Valves, RE joints etc.	60
	Water Treatment System and Effluent Treatment System	
143	Clarification plant	60
144	Filtration plant	60
145	Ultra filtration plant	50
146	Reverse Osmosis (RO) plant and its membrane	55
147	De-Mineralised water plant (DM Plant)	60
148	Chlorination plant	60
149	Chemical dosing system	60
150	Effluent Treatment Plant	60
	Circulationg Water (CW) & Auxiliary Circulating Water (ACW) System	
151	CW & ACW Pumps	60
152	Butter Fly (BF) valves, Non-return Valves (NRVs) etc.	60
153	Rubber Expansion (RE) joints	60
154	Air release valves	60
	Cooling Towers (NDCT/ IDCT)-Natural-Draft and Induced Draft Cooling Tower	
155	Water Distribution System	60
156	Spray nozzles	60
157	Packing	60
158	Drift eliminators	60
159	Cooling Tower (CT) Fans (for Induced Draft Cooling Towers IDCT)	60
160	Gear boxes, shafts & motors (for IDCT)	60
	Air Conditioning & Ventilation System	
161	Split & window air conditioners	60
162	Chilling/ condensing unit [upto 500 ton of refrigeration(TR)]	55
163	Air Handling Unit (AHU) and Fresh air unit	60
164	Cooling Towers	60
165	Air Washing Units (AWUs), axial fans, roof extractors	60
166	Ducts, louvers & dampers	60
	Flue Gas Desulphurization (FGD)	
167	Spray Nozzles,	50
168	Spray header	50
169	Oxidation Blowers	50
170	Limestone wet Ball Mill	50
171	Slurry Handling Pumps for FGD system	50
172	Booster Fans for FGD system	50
173	Carbon Steel Ducts and Dampers for FGD	60
174	Storage Tanks and Silos	60
175	Process Water Pump for FGD system	50
	(D) Other Common Items	
	Fire protection and detection system	
176	Motor driven fire water pumps	60
177	Diesel engine driven fire water pumps	60
178	Hydrant system for the power plant.	60
179	High velocity water spray system	60
180	Medium velocity water spray system	60
181	Foam protection system	60
182	Inert gas flooding system	60

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
183	Fire tenders	60
184	Portable fire-extinguishers	60
185	Cranes, EOT cranes, gantry crane & chain pulley blocks etc.	60
186	Elevator	60

(E) Minimum Local Content percentages in Engineering, Procurement & Construction (EPC) / Turnkey project

In case the contract is awarded through the EPC route, the contractor should comply with the requirement of MLC for individual items as listed in Annexure-I and should purchase these items only from Class-I Local supplier. In addition, MLC for complete EPC project may also be prescribed as below:

	(1) Package Based Works	Minimum Local Content (%)
1	Boiler	60
2	TG System (Water Cooled Condenser)	60
3	Ash Handling Plant	60
4	Coal Handling Plant	60
5	Electro-static Precipitator (ESP)	60
6	Circulating Water (CW) System	60
7	Cooling Tower	60
8	Water Treatment System	60
9	Air Conditioning System (below 500TR)	60
10	Flue Gas Desusphurisation (FGD) System	60
11	Station Control & Instrumentation (C&I)	50
12	Hydro Power Projects (Electro-Mechanical Works)	60
	Gas based generation	
	Overall Gas Turbine Package (on finished Product basis)	
13	< 44 MW	60
14	44 –145 MW	50
	Overall Combined Cycle Gas Turbine (CCGT) Package (on finished Product basis)	
15	< 44 MW	60
16	44 – 145 MW	60
17	> 150 MW	60
	(2) Project as a whole	
1	Works and service contracts in Power Sector	60
2	Transmission Line with Conventional conductors (ACSR, AAAC, AL-59 etc.)	60
3	Transmission Line with High temperature Low Sag (HTLS) conductors	60
4	HVAC Substation Air Insulated (AIS)	60
5	HVAC Substation Gas Insulated (GIS)	60
6	HVDC Substation	60
7	Distribution Sector	60

Annexure-II

General guidelines to be adopted selectively in an appropriate manner by the procuring entities in their tender documents.

1. The bidder shall have to be an entity registered in India in accordance with law.
2. The bids shall be in the language as prescribed by the tenderer/procurer.
3. The bids shall be in Indian Rupees (INR) (in respect of local content only).
4. Indian subsidiaries of foreign bidders shall have to meet the qualifying criteria in terms of capability, competency, financial position, past performance etc.
5. The bidder shall follow Indian laws, regulations and standards.
6. To be eligible for participation in the bid, foreign bidders shall compulsorily set up their manufacturing units on a long term basis in India as may be specified by the tenderer/ procurer.
7. Similar or better technology than the technology offered in respect of material, equipment and process involved shall be transferred to India. Along with the transfer of technology, adequate training in the respective field shall also be provided.
8. Country of origin of the equipment/material shall be provided in the bid.
9. For supply of equipment / material from the country of origin other than India, the bidder shall submit performance certificate in support of satisfactory operation in India or a country other than the country of origin having climatic and operational conditions including ambient temperature similar to that of India for more than _____ years (to be specified by the procurer).
10. The technologies/ products offered shall be environmental friendly, consuming less energy, safe, energy efficient, durable and long lasting under the prescribed operational conditions.
11. The supplier shall ensure supply of spares, materials and technological support for the entire life of the project.
12. The manufacturers/ supplier shall list out the products and components producing Toxic E-waste and other waste as may be specified. It shall have an Extended Producers Responsibility (EPR) so that after the completion of the lifecycle, the materials are safely recycled / disposed of by the Manufacturer/ supplier and for this, the Manufacturer/supplier along with procurer has to establish recycling / disposal unit **or** as may be specified.
13. Minimum Local Content requirement for goods, services or works shall be in accordance with the conditions laid down in respective Order(s) of the sectors on Public Procurement (Preference to Make in India) to provide for purchase preference (linked with local content).

14. The equipment/ material sourced from foreign companies may be tested in accredited labs in India before acceptance wherever such facilities are available.
15. The Tender fee and the Bank Guarantee (BG) shall be in Indian Rupees only.
16. The bidder shall have to furnish a certificate regarding cyber security/safety of the equipment/process to be supplied/services to be rendered as safe to connect.
17. Applicable safety requirements shall be met. Regular safety audit shall be carried out by the manufacturer/ supplier.
18. Statutory laws/regulations including the labour and environmental laws shall be strictly complied with during supply, storage, erection, commissioning and operation process. A regular compliance report shall be submitted to the procurer/appropriate Authorities.
19. Formation of new joint venture in India shall be permitted only with the Indian companies.
20. Tendering by the agent shall not be accepted.
21. In case local testing is not considered necessary by the procurer, theoriginal test report in the language prescribed by the procurer may be accepted. The translated test report shall not be accepted unless it is notarised.
22. Certification/compliance as per the Indian Standards/ International Standards/ Indian Regulations/ specified Standards shall be mandatory, where ever applicable.
23. Quality assurance of the product shall be carried out by the procurer or an independent third party agency appointed by the procurer. Manufacturing Quality Plan as approved by the procurer shall be followed by the manufacturer/supplier.
24. Wherever required by the procurer, foreign supplier shall establish fully functional service centers in India and shall keep spares/material locally for future needs of utilities.
25. Arbitration proceedings shall be instituted in India only and all disputes shall be settled as per applicable Indian Laws.

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

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	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

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	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	Guidelines 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 handbook 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 polyester 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.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	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 Handbook 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.

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	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	Handbook 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 Allied Works	
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	Handbook 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).

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	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

एनटीपीसी NTPC	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. N.	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

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.'**

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

एनटीपीसी NTPC	Project : Stage :: Package : Contractor : Contractor No. :	STATUS OF ITEM REQUIRING QP& SUB-SUPPLIER APPROVAL	DOC. NO.: REV. NO.: DATE : PAGE : OF

S. N.	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 1/1 Engg. Div. / QA&I

ANNEXURE-V

एनटीपीसी NTPC	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	REF		Remarks
											Temp.	Holding time		Spec. No.	ACC Norm Ref.	

NOTES:

SIGNATURE

FORMAT	1/1	**Engg. Div. / QA&I**

S. No.	Description of Drgs./Docs.	No. of Prints	No. of 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 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

एनटीपीसी NTPC

CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन

MAIN CONTRACTOR'S PROPOSAL CUM EVALUATION REPORT

मुख्य संविदाकार प्रस्ताव सह मुल्यांकन रिपोर्ट

Ref No: संदर्भ सं.:		***Date:*** तिथिः	
i.	***Main Contractor*** मुख्य संविदाकार		
ii.	***Project*** परियोजना		
iii.	***Package Name*** पैकेज का नाम	***Package No*** पैकेज सं.	
iv.	***Proposed Item/Scope of Sub-contracting*** उप-संविदा(अनुबंध) का प्रस्तावित मद/ दायरा		
v.	***Item covered under*** *निम्नलिखित के अंतर्गत शामिल मद*	***Schedule-1*** */अनुसूची- 1*	***As per contract clause No-*** *अनुबंध के अनुसार खंड सं.-- -*
		Schedule-2 *अनुसूची- -2*	
vi.	***If item is Schedule-1 and proposed sub-vendor is indigenous, Main Contractor to explain how the contractual provisions will be fulfilled*** /यदि मद अनुसूची **-1** है और प्रस्तावित उप-विक्रेता स्वदेशी है, तो मुख्य संविदाकार को स्पष्ट करना होगा कि संविदा/अनुबंध के प्रावधान कैसे पूरे किए जाएंगे		
vii.	***Name and Address of the proposed Sub-vendor's works*** /प्रस्तावित सब-वेंडर का नाम तथा पता		
viii.	***PO placement date/ Start of manufacturing (if self-manufactured) as per L2 network*** **पीओ नियोजन की तिथि / एल-** 2 **नेटवर्क के अनुसार विनिर्माण (यदि स्व-निर्मित है) की शुरुआत**		

ix.	***Item Description (Type/Size/Rating/Scope of Sub-Contracting)*** मद का विवरण (प्रकार / आकार / रेटिंग / उप-अनुबंध का दायरा)	***Total quantity of proposed item envisaged in this package (Nos/ Running Meters/ Kgs/ Tons etc)*** इस पैकेज में परिकल्पित प्रस्तावित मद की कुल मात्रा (संख्या / क्रियाशील मीटर / किलोग्राम / टन आदि)	***Quantity proposed to be procured from proposed sub-vendor (Nos/ Running Meters /Kgs /Tons etc)*** प्रस्तावित उप-विक्रेता (संख्या / क्रियाशील मीटर / किलोग्राम / टन आदि) से खरीदी जाने वाली मात्रा	***Timeline for quantity requirements as per project schedule & whether the proposed Sub-vendor equipped with adequate capacity to supply proposed order quantity in time*** / परियोजना समय सूची के अनुसार मात्रा आवश्यकताओं के लिए समय-सीमा और क्या प्रस्तावित उप-विक्रेता समय पर प्रस्तावित मांग की मात्रा की आपूर्ति करने में पूरी तरह से सक्षम है

x.	***Supply experience of the proposed sub-vendor (including supplies to Main Contractor, if any) for similar item/scope of sub-contracting, for last 3 years (Note:- Only relevant experience details w.r.t. proposed item/scope of subcontracting to be brought out here)*** पिछले **3** वर्षों के लिए उप-अनुबंध के समान मद / दायरे के लिए प्रस्तावित सब-वेंडर (मुख्य संविदाकार हेतु

एनटीपीसी NTPC	**CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन** **MAIN CONTRACTOR'S PROPOSAL CUM EVALUATION REPORT** **मुख्य संविदाकार प्रस्ताव सह मुल्यांकन रिपोर्ट**

आपूर्ति, यदि कोई हो, सहित) का आपूर्ति अनुभव (नोट: - उप-अनुबंध के प्रस्तावित मद / दायरे के संबंध में केवल प्रासंगिक अनुभव के विवरण का उल्लेख हो

Project/Package परियोजना/पैकेज	***Customer Name*** ग्राहक का नाम	***Supplied Item (Type/Rating/Model /Capacity/Size etc)*** आपूर्त्तित मद (प्रकार/रेटिंग /मॉडल /क्षमता/आकार आदि)	***PO ref no/date*** पीओ संदर्भ सं. /तिथि	***Supplied Quantity*** आपूर्ति की मात्रा	***Date of Supply*** आपूर्त्ति की तिथि

We confirm that as per our assessment, the proposed sub-vendor has requisite capabilities & supply experience and is suitable for supplying the proposed item/scope of sub-contracting/हम अपने आकलन के अनुसार इस बात की पुष्टि करते हैं कि, प्रस्तावित उप-विक्रेता के पास अपेक्षित क्षमता और आपूर्ति करने का अनुभव है और उप-अनुबंध के दायरे /प्रस्तावित मद की आपूर्ति के लिए उपयुक्त है।

Name: नाम:		***Desig:*** पद:		***Contact No:*** दूरभाष सं.:		***Sign:*** हस्ताक्षर:		***Date:*** तिथि:	

Company's Seal/Stamp:- कंपनी का मुहर:-

एनटीपीसी NTPC	**CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन** **SUB-VENDOR QUESTIONNAIRE/ सब-वेंडर प्रश्नावली**

i.	***Item/Scope of Sub-contracting*** **उप-संविदा(अनुबंध) का मद/ दायरा**			
ii.	***Address of the registered office*** पंजीकृत कार्यालय का पता	***Details of Contact Person*** संपर्क व्यक्ति का विवरण ***(Name, Designation, Mobile, Email)*** (नाम, पदनाम, मोबाइल, ईमेल)		
iii.	***Name and Address of the proposed Sub-vendor's works where item is being manufactured*** प्रस्तावित उप-विक्रेता के कार्यों का नाम और पता, जहां मद का निर्माण किया जा रहा है	***Details of Contact Person:*** संपर्क व्यक्ति का विवरण ***(Name, Designation, Mobile, Email)*** (नाम, पदनाम, मोबाइल, ईमेल)		
iv.	***Annual Production Capacity for proposed item/scope of sub-contracting*** **उप-संविदा(अनुबंध)** के प्रस्तावित मद / दायरे के लिए वार्षिक उत्पादन क्षमता			
v.	***Annual production for last 3 years for proposed item/scope of sub-contracting*** **उप-संविदा(अनुबंध)** के प्रस्तावित मद / दायरे के लिए पिछले 3 वर्षों का वार्षिक उत्पादन			
vi.	***Details of proposed works*** **प्रस्तावित कार्यों का विवरण**			
1.	***Year of establishment of present works*** वर्तमान फैक्टरी की स्थापना का वर्ष			
2.	***Year of commencement of manufacturing at above works*** उपरोक्त फैक्टरी में निर्माण कार्य शुरू होने का वर्ष			
3.	***Details of change in Works address in past (if any*** पूर्व में फैक्टरी स्थल में परिवर्तन का विवरण (यदि कोई हो))			
4.	***Total Area*** कुल क्षेत्र			
	Covered Area शामिल क्षेत्र			
5.	***Factory Registration Certificate*** फैक्टरी पंजीकरण प्रमाण पत्र	***Details attached at Annexure – F2.1*** विवरण अनुलग्नक- एफ 2.1 पर संलग्न है		
6.	***Design/ Research & development set-up*** डिजाइन / अनुसंधान और विकास सेटअप ***(No. of manpower, their qualification, machines & tools employed etc.)*** (श्रमिकों की संख्या, उनकी योग्यता, मशीन और उपलब्ध उपकरण आदि)	***Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design)*** ***Details attached at Annexure – F2.2*** ***(if applicable)*** लागू / लागू नहीं, अगर विनिर्माण मुख्य संविदाकार / खरीददार के डिजाइन के अनुसार है) विवरण अनुलग्नक –एफ 2.2 पर संलग्न है। (यदि लागू हो)		
7.	***Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc)*** मैनपावर विवरण के साथ समग्र संगठन का चार्ट(डिजाइन / विनिर्माण / गुणवत्ता आदि)	***Details attached at Annexure – F2.3*** विवरण अनुलग्नक – F2.3 में संलग्न है।		
8.	***After sales service set up in India, in case of foreign sub-vendor(Location, Contact Person, Contact details etc.)*** भारत	***Applicable / Not applicable*** लागू / लागू नहीं		

	में बिक्री सेवा की स्थापना के बाद, विदेशी उप-विक्रेता के मामले में(स्थल , संपर्क व्यक्ति, संपर्क विवरण आदि)	***Details attached at Annexure – F2.4*** विवरण अनुलग्नक -2.4 पर संलग्न है।
9.	***Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any*** फ्लोचार्ट सहित विनिर्माण प्रक्रिया निष्पादन योजना , जिसमें आउटसोर्स प्रक्रिया, यदि कोई हो, सहित कच्चे माल से तैयार उत्पाद तक विनिर्माण के विभिन्न चरणों को दर्शाया गया हो,	***Details attached at Annexure – F2.5*** विवरण अनुलग्नक - F2.5में संलग्न है।
10.	***Sources of Raw Material/Major Bought Out Item*** कच्चे माल के स्रोत / खरीदे हुए मुख्य मद	***Details attached at Annexure – F2.6*** विवरण अनुलग्नक - F2.6में संलग्न है।
11.	***Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing*** कच्चे माल / खरीदे हुए मद, प्रक्रियाबद्ध, अंतिम परीक्षण, पैकिंग करते समय गुणवत्ता नियंत्रण	***Details attached at Annexure – F2.7*** विवरण अनुलग्नक - F2.7 पर संलग्न है
12.	***Manufacturing facilities (List of machines, special process facilities, material handling etc.)*** विनिर्माण सुविधा(मशीनों की सूची , विशेष प्रक्रिया सुविधाएं, सामग्री रख-रखाव आदि)	***Details attached at Annexure – F2.8*** विवरण अनुलग्नक - F2.8में संलग्न है।
13.	***Testing facilities (List of testing equipment)*** परीक्षण सुविधाएं(परीक्षण उपकरण की सूची)	***Details attached at Annexure – F2.9*** विवरण अनुलग्नक – F2. 9 में संलग्न है।
14.	***If manufacturing process involves fabrication then-*** यदि निर्माण प्रक्रिया में फेब्रिकेशन की गई है तो- ***List of qualified Welders*** पात्र वेल्डर की सूची ***List of qualified NDT personnel with area of specialization*** विशेषज्ञता के क्षेत्र सहित पात्र एनडीटी कार्मिकों की सूची	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure – F2.10*** विवरण अनुलग्नक - F2.10में संलग्न है। ***(if applicable)*** लागू / लागू नहीं
15.	***List of out-sourced manufacturing processes with Sub-Vendors' names & addresses*** सब-वेंडर द्वारा बाह्य स्रोतों (उनके नाम और पते सहित)से करवाएं गए निर्माण प्रक्रियाओं की सूची	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure. –F2.11*** विवरण अनुलग्नक - F2.10में संलग्न है। ***(if applicable)*** (यदि लागू हो)
16.	***Supply reference list including recent supplies*** नवीनतम आपूर्ति सहित आपूर्ति संदर्भ सूची	***Details attached at Annexure – F2.12*** विवरण अनुलग्नक - F2.12 में संलग्न है। ***(as per format given below)*** (नीचे दिए गए प्रारूप के अनुसार)

Project/ package परियोजना /पैकेज	*Customer Name* ग्राहक का नाम	*Supplied Item (Type/Rating/Model /Capacity/Size etc)* आपूर्ति की गई वस्तु (प्रकार / रेटिंग / मॉडल / क्षमता / आकार आदि)	*PO ref no/date* पीओ संदर्भ सं. / तिथि	*Supplied Quantity* आपूर्ति की मात्रा	*Date of Supply* आपूर्ति की तारीख

17.	***Product satisfactory performance feedback letter/certificates/End User Feedback*** उत्पाद के संतोषजनक प्रदर्शन संबंधी फीडबैक पत्र / प्रमाण पत्र / अंतिम उपयोगकर्ता फ़ीडबैक	***Attached at annexure - F2.13*** अनुलग्नक F2. 3पर संलग्न है
18.	***Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product***	***Applicable / Not applicable*** लागू / लागू नहीं

	(similar or higher rating) प्रस्तावित उत्पाद (एक समान या उच्च रेटिंग वाले) के लिए टाइप टेस्ट रिपोर्ट (टाइप टेस्ट विवरण, रिपोर्ट संख्या, एजेंसी, जांच की तारीख) का सारांश नोट: - रिपोर्ट प्रस्तुत करने की आवश्यकता नहीं है ***Note:- Reports need not to be submitted***	***Details attached at Annexure – F2.14*** विवरण अनुलग्नक - F2.1 4में संलग्न है ***(if applicable)*** (यदि लागू हो)
19.	***Statutory / mandatory certification for the proposed product*** प्रस्तावित उत्पाद के लिए वैधानिक / अनिवार्य प्रमाणीकरण	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure – F2.15*** ***(if applicable)*** (यदि लागू हो)
20.	***Copy of ISO 9001 certificate*** आईएसओ 9001 प्रमाण पत्र की प्रति ***(if available***(यदि उपलब्ध हो)	***Attached at Annexure – F2.16*** अनुलग्नक में संलग्न - F2.1 6 है
21.	***Product technical catalogues for proposed item (if available)*** प्रस्तावित मद के लिए उत्पाद तकनीकी कैटलॉग (यदि उपलब्ध हो)	***Details attached at Annexure – F2.17*** विवरण अनुलग्नक - F2.1 7 में संलग्न है

Name: ***नाम:***		***Desig:*** ***पद:***		***Sign:*** ***हस्ताक्षर:***		***Date:*** ***तिथि:***	

Company's Seal/Stamp:- कंपनी की मुहर / मोहर: -

2 X 660MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SECTION - IA

QUALITY ASSURANCE AND INSPECTION REQUIREMENT

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT PPEI,
NOIDA-INDIA

STANDARD CHECL LIST FOR :Insulation & Cladding
PACKAGE-FULE OIL SYSTEM
PROJECT-
CHECL LIST NO.:PE-QP-XXX-166-A801
REV.NO. 0
DATE: 31/03/2012

SL. No.	TESTS/CHECKS	QUANTUM OF CHECKS	REFERENCE DOC./ ACCEPTANCE NORMS	AGENCY				REMARKS
				M	C	N	D	
1.0	Review of Manufacturer's TC for Mineral wool	Sampling as per IS:8183	Appd.Data Sheet/ IS:8183	P	V	V	√	Ref, Note 1
2.0	Review of Material TC for Aluminium sheet	One/Lot	Appd.Data Sheet/ IS:737	P	V	V	√	Ref. Note 2
2.1	Dimensional Check	At random (10%)	-do-	P	V	V	√	
3.0	Packing & Marking	100%	IS:8183/Mfr's Std.	P	V	V	√	

Legend:
Records identified with "√"shall be essentially included by contractor in QA documentation
M= Manufacturer, C= Main Vendor
N= BHEL/Customer
P= Perform, W= Witness, V= Verification
Note:1.MTC Will comprise the tests in line with IS:8183
2. MTC will Comprise of chemical & mechanical properties.

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD CHECK LIST FOR: PRESSURE REDUCING VALVE

PACKAGE-FULE OIL SYSTEM

PROJECT-

CHECK LIST NO.:PE-QP-XXX-166-A802

REV.NO. 0

DATE: 31/03/2012

SL. No.	TESTS/CHECKS	QUANTUM OF CHECKS	REFERENCE DOC./ ACCEPTANCE NORMS	AGENCY M	C	N	D	REMARKS
1	Review of Material TC for body & diaphragm	One/Lot	Appd.Data Sheet/ Relevant Std.	P	V	V	√	
2	Hydro test of body	100%	Appd.Data Sheet	P	W	V	√	
3	End Connection	100%	-do-	P	W	V	√	
4	Check for IBR TC	100%	-do-	P	V	V	√	

Legend:
Records identified with ' √ ' shall be essentially included by contractor in QA documentation
M= Manufacturer, C= Main vendor/Sub vendor
N= BHEL/Customer,
P= Perform, W= Witness, V= Verification
Note: 1.For IBR Valves, no physical inspection is carried out by contractor/customer.Material will be accepted based on review of IBR Test Certificates.

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

PEM MAUX

STANDARD QUALITY PLAN FOR

STRUCTURAL STEEL

QUALITY PLAN NO.:PE-QP-XXX-166-A803
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 DATE: 31/03/2012
SHEET 1 OF 1

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY D	AGENCY M	AGENCY C	AGENCY CU	REMARKS
1	2	3	4	5	6	7	8	9			10		11
1.0	Structural	a) Chemical Composition	M	Chemical Analysis	Sample	IS:2062/ Spec./Drg.	IS:2062/ Spec./Drg.	Mfr's TC	✓	P	V*	V	
		b) Mechanical test	M	Mechanical Properties	-do-	-do-	-do-	Mfr's TC	✓	P	V*	V	
		c) Dimensional conformity	M	Measurement	100%	-	-	Mfr's TC	✓	P	W**	V	

* In case material is procured from dealer, and co-related TCs are not available, check test on identified sample will be carried out at recogonised testing laboratory.
** In case material is despatched directly from SAIL/IISCO plant to project site, the witnessing required is waived and material will be accepted on challan & MTC of SAIL/IISCO

LEGEND:
RECORDS INDENTIFIED WITH "✓" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENT.
M - MANUFACTURER
C - MAIN VENDOR
CU - BHEL/CUSTOMER/NOMINATED INSPECTION AGENCY
"P" PERFORM, "W" WITNESS AND V VERIFICATION

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

PEM MAUX

STANDARD QUALITY PLAN FOR STEEL PLATE

QUALITY PLAN NO.:PE-QP-XXX-166-A804

PACKAGE-FULE OIL SYSTEM

PROJECT-

REV.NO. 0 DATE: 31/03/2012

SHEET 1 OF 1

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS CHECKED	CATEGORY	TYP/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	Steel Plate	a) Chemical Composition	MA	Chemical Analysis	Sample	IS:2062/ Spec./Drg.	IS:2062/ Spec./Drg.	Mfr's TC	3		2*,1	
		b) Mechanical test	MA	Mechanical Properties	-do-	-do-	-do-	Mfr's TC	3		2*,1	
		c) Dimensional conformity	MA	Measurement	100%	-	-	Mfr's TC	3	2**	1	

* In case material is procured from dealer, and co-related TCs are not available, check test on identified sample will be carried out at testing laboratory.

** In case material is despatched directly from SAIL/TISCO plant/Stock yard to project site, the witnessing required is waived and material will be accepted on MTC of SAIL/TISCO

LEGEND

CR - Critical characteristics
MA - Major characteristics
MI - Minor characteristics

P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL 4-CUSTOMER
2 - Vendor
3 - Sub-vendor

MAIN VENDOR/SUB-VENDOR (SIGN WITH DATE & STAMP)

REVIEWING AGENCY (SIGN WITH DATE & STAMP)

APPROVING AGENCY (SIGN WITH DATE & STAMP)

STANDARD CHECK LIST FOR: :Safety Relief Valve
PACKAGE-FULE OIL SYSTEM
PROJECT-
CHECK LIST NO.:PE-QP-XXX-166-A805
REV.NO.0
DATE:31/03/2012

SL. No.	TESTS/CHECKS	QUANTUM OF CHECKS	REFERENCE DOC./ ACCEPTANCE NORMS	AGENCY				REMARKS
				M	C	CU	D	
1	Review of Material TC for body & stem	One/Lot	Appd.Data Sheet/ Relevant Std.	P	V	V	√	
2	Hydro test of body	100%	Appd.Data Sheet	P	W	V	√	
3	Set pressure	100%	-do-	P	W	V	√	
4	Check for IBR TC	100%	-do-	P	V	V	√	

Legend:
Records identified with ' √ shall be essentially included by contractor in QA documentation
M= Manufacturer, C= Main vendor
CU=BHEL/Customer
P= Perform, W= Witness, V= Verification
For IBR Valves, no physical inspection carried out by contractor/customer.Material will be accepted based on review of IBR test certificates.

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD CHECK LIST FOR : PLUG VALVE
PACKAGE-FULE OIL SYSTEM
PROJECT-
CHECK LIST NO.:PE-QP-XXX-166-A806
REV.NO.-0
DATE: 31/03/2012

SL. NO.	TESTS/CHECKS	QUANTUM OF CHECKS	REFERENCE DOCUMENT/ ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
					D	M	C	CU	
A.	RAW MATERIAL								
	Valve Body & Plug:								
1	Chemical Composition	1/Heat	Appd. Data Sheet/ Relevant Std.	Material TC	√	P	V	V	
2	Tensile, Elongation	1/Heat							
B.	FINAL INSPECTION								
1	Visual Exam.	100%	Appd.Drg./Data Sheet	Inspn. Report	√	P	W	W	
2	Dimensional Check	100%	Appd.Drg./Relevant Std.	-do-	√	P	W	W	
3	Hydro Test of Body & Seat	-do-	Appd. Data Sheet/No leakage	-do-	√	P	W	W	
4	Pneumatic Test for Seat	-do-	Appd. Data Sheet/No leakage	-do-	√	P	W	W	
5	Performance/Operation test	-do-	Smooth operation/ Full travel	-do-	√	P	W	W	
6	Painting	100%	Tech. spec/Mfr's std.	-do-	√	P	V	V	

Note:
1. All material of construction shall be as per approved drawing/Data sheet
2. For Actuator operating valves - actuator test certificates shall be furnished to BHEL for review.

Legend
M= MANUFACTURER
C = MAIN VENDOR
CU= BHEL/Customer
P= PERFORM; W= WITNESS; V= VERIFICATION
√ Marked document to be furnished along with QA Doc. Pkg.

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD QUALITY PLAN FOR

SUMP PUMP

QUALITY PLAN NO.:PE-QP-XXX-166-A807

PACKAGE-FULE OIL SYSTEM

PROJECT-

REV.NO. 0 **DATE:** 31/03/2012

SHEET 1 OF 2

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M	AGENCY C	AGENCY CU	AGENCY D	REMARKS
1	2	3	4	5	6	7	8	9	10				11
1.0	**RAW MATERIAL**												
1.1	CASING/ROTOR(IMPELLER) HOUSING	i) SURFACE DEFECTS	MAJOR	VISUAL	100%	APPD.DATA SHEET/ DRG./	APPD.DATA SHEET/ DRG./	IR & TC	P	V	-		
		ii) DIMENSIONAL CONFORMITY		MEASUREMENT	100%	MFR's DRG./IS:210 Gr.	MFR's DRG./IS:210 Gr.						
		iii) MECHANICAL & CHEMICAL TEST		PHYSICAL PROPERTIES/ CHEM. ANALYSIS	1/HEAT	FG 200/RELEVANT STD.	FG 200/RELEVANT STD.						
		iv) HARDNESS TEST		MEASUREMENT	100%								
1.2	IMPELLER	i) SURFACE DEFECTS	MAJOR	VISUAL	100%	APPD.DATA SHEET/DRG.	APPD.DATA SHEET/DRG.	IR & TC	P	V	-		
		ii) DIMENSIONAL CONFORMITY		MEASUREMENT	100%	MFR's DRG./	MFR's DRG./						
		ii) MECHANICAL & CHEMICAL TEST		PHYSICAL PROPERTIES/ CHEM. ANALYSIS	1/HEAT	RELEVANT STD.	RELEVANT STD.						
		iv) HARDNESS		MEASUREMENT	100%								
		v) DYPENETRATION TEST (AFTER MACHINING)		DYEPENETRATION TEST	100%	ASTM E165	NO LINEAR INDICATION	IR & TC	P	V	V	✓	
1.3	SHAFT	i) DIMENSIONAL CONFORMITY	MAJOR	MEASUREMENT	100%	MFR's DRG./	MFR's DRG./	IR & TC	P	V	-		
		ii) MECHANICAL & CHEMICAL TEST		PHYSICAL PROPERTIES/ CHEM. ANALYSIS	1/HEAT	APPD. DATA SHEET/ MFR's CATALOGUE	MFR's CATALOGUE/ RELEVANT STD.						
		iii) UT DIA > 50MM **		UT	100%	ASTM A388	ASTM A388		P	V	V	✓	(**) WHEN BACKWALL ECHO IS SET TO 100% OF FSH IN SOUND AREA: 1) DEFECT ECHO NOT TO EXCEED 20% OF FSH 2) BACK WALL ECHO HEIGHT TO BE 80% MIN. OF FSH. FREQ. 2 MH_Z MIN.
1.4	SHAFT SLEEVE	i) CHEMICAL ANALYSIS	MAJOR	CHEMICAL	1/HEAT	MFR's STD./MFR's	RELEVANT STANDARD/	IR & TC	P	V	-		
		ii) HARDNESS		MEASUREMENT	100%	CATALOGUE	IS						
1.5	WEARING RINGS	i) MECHANICAL & CHEMICAL TEST	MAJOR	PHYSICAL PROPERTIES/ CHEM. PROPERTIES	1/HEAT	MFR's STD./MFR's CATALOGUE	RELEVANT STANDARD/ IS	IR & TC	P	V	-		
		ii) HARDNESS		MEASUREMENT	100%								

LEGEND:
RECORDS INDENTIFIED WITH " ✓ " SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENT.
M - MANUFACTURER
C - MAIN VENDOR
CU - BHEL/CUSTOMER
INDICATE "P" PERFORM "W" WITNESS AND V VERIFICATION
IR - INSPECTION REPORT, MTC - MTRL./MFR'S TEST CERTIFICATES

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD QUALITY PLAN FOR SUMP PUMP

QUALITY PLAN NO.:PE-QP-XXX-166-A807
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0
SHEET 2 OF 2
DATE: 31/03/2012

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M	AGENCY C	AGENCY CU	AGENCY D	REMARKS
1	2	3	4	5	6	7	8	9	10				11
2.0	**INTERNAL TEST**												
2.1	CASING	SOUNDNESS OF CASTING	MAJOR	HYDROSTATIC TEST	100%	HYDROSTATIC TEST AT 200% OF PUMP RATED HEAD OR 150% SHUT OFF HEAD WHICHEVER IS HIGHER FOR 30 MTS.	NO LEAKAGE	IR & TC	P	V	V	✓	
2.2	SHAFT	DP ON SHAFT	MAJOR	DPT	100%	ASME E165	NO LINEAR DEFECTS	IR & TC	P	V	V	✓	
2.3	IMPELLER	RESIDUAL UNBALANCE	MAJOR	DYNAMIC/STATIC BALANCING	100%	ISO 1940 GR.6.3	ISO 1940 GR.6.3	IR & TC	P	V	V	✓	
3.0	**FINAL INSPECTION**												
3.1	OVERALL DIMENSION	DIMENSIONAL	MAJOR	MEASUREMENT	100%	APPD. DRAWING/ MFR's DRAWING	APPD. DRAWING/ MFR's DRAWING	IR & TC	P	W	W	✓	
3.2	PERFORMANCE TEST WITH LAB MOTOR	i) Q V/s HEAD ii) Q V/s POWER iii) Q V/s EFFICIENCY iv) NOISE LEVEL & VIBRATION	CRITICAL	MEASUREMENT	100%	APPD.DRG./MFR's DRG./APPROVED. DATASHEET/HIS	APPD.DRG./MFR's DRG./APPROVED. DATASHEET/HIS 85 dBA MAX. AT 1Mtr, & 75 MICRON MAX.	IR & TC	P	W	W	✓	
3.3	STRIP TEST	STRIP TEST	CRITICAL	VISUAL (WEAR & TEAR)		**	NO UNDUE WEAR	IR & TC	P	W	W	✓	
3.4	REVIEW OF DOCUMENTATIONS					APPD. QAP	APPD. QAP		V	V	V	✓	
3.5	PAINTING	VISUAL	MINOR	VISUAL	100%	SPECIFICATION/ PAINTING SCH-EDULE/Mfr's Std.	SPECIFICATION/ PAINTING SCH-EDULE/Mfr's Std.	IR	P	V	-		** STRIP DOWN TEST ON 100% BASIS SHALL BE DONE INCASE ABNORMAL PERFORMANCE OTHERWISE SAME SHALL BE RESTRICTED TO BEARING INSPECTION ONLY
	NOTE: ALL MATERIAL OF CONSTRUCTION SHALL BE AS PER APPROVED DATA SHEET/DRAWING												

LEGEND:
RECORDS INDENTIFIED WITH " ✓ " SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENT.

M - MANUFACTURER
C - MAIN VENDOR
CU - BHEL/CUSTOMER
INDICATE "P" PERFORM "W" WITNESS AND V VERIFICATION
IR - INSPECTION REPORT, MTC - MTRL./MFR'S TEST CERTIFICATES

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD QUALITY PLAN FOR BALL VALVE

QUALITY PLAN NO.:PE-QP-XXX-166-A808
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 **DATE:** 31/03/2012
SHEET 1 OF 3

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY D	AGENCY M	AGENCY C	AGENCY CU	REMARKS
1	2	3	4	5	6	7	8	9				10	
1.0	**MATERIALS:**												
1.1	BODY & END PIECE	CHEMICAL COMPOSITION	CRITICAL	CHEM. TEST	ONE/ HEAT	APPD.DRG./ DATA SHEET	APPD.DRG./ DATA SHEET/ RELEVANT STD.	MATRL. TC/ MFR'S TC	✓	P	V	V	
		MECHANICAL PROPERTIES	- DO -	MECH. TEST	ONE/HEAT/ HEAT TREAT-MENT BATCH	- DO -	- DO -	- DO -	✓	P	V	V	
		HEAT TREATMENT	- DO -	REVIEW OF HT CHART	100%	- DO -	- DO -	- DO -/HT CHART	✓	P	V	V	
		IDENTIFICATION & CORRELATION	MAJOR	VISUAL	100%	- DO -	- DO -	INTERNAL RECORD		P	V	-	
		SURFACE DEFECTS	- DO -	- DO -	100%	MSS-SP-55	FREE FROM DEFECTS	- DO -	✓	P	V	-	
		DIMENSIONAL	- DO -	MEASU-REMENT	100%	APPD. DRG./ RELEVANT STD.	APPD. DRG./ RELEVANT STD.	LOG BOOK		P	V	-	

LEGEND:
RECORDS, IDENTIFIED WITH ' ✓ ' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.

M: MANUFACTURER .
C:MAIN VENDOR, CU: BHEL/CUSTOMER
INDICATE "P" PERFORM, "W" WITNESS AND "V" VERIFICATION

MAIN VENDOR/SUB-VENDOR (SIGN WITH DATE & STAMP) **REVIEWING AGENCY (SIGN WITH DATE & STAMP)** **APPROVING AGENCY (SIGN WITH DATE & STAMP)**

STANDARD QUALITY PLAN FOR BALL VALVE

QUALITY PLAN NO.:PE-QP-XXX-166-A808
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 **DATE: 31/03/2012**
SHEET 2 OF 3

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY D	AGENCY M	AGENCY C	AGENCY CU	REMARKS
1	2	3	4	5	6	7	8	9	10				11
1.2	BALL, SPINDLE, GLAND, LEVER FASTENERS	CHEMICAL COMPOSITION	CRITICAL	CHEM. TEST	ONE/ HEAT	APPD.DRG./ DATA SHEET	APPD.DRG./ DATA SHEET/ RELEVANT STD.	TEST CERT.	✓	P	V	V	
		MECHANICAL PROPERTIES	- DO -	MECH. TEST	ONE/HEAT/ HEAT TREAT-MENT BATCH	- DO -	- DO -	- DO -	✓	P	V	V	
		HEAT TREATMENT (as applicable)	- DO -	REVIEW OF HT CHART	100|%	- DO -	- DO -	- DO -/ HT CHART	✓	P	V	V	
		SURFACE DEFECTS	MAJOR	- DO -	100%	MSS-SP-55	FREE FROM DEFECTS	- DO -	✓	P	V	-	
		DIMENSIONS	- DO -	MEASU-REMENT	100%	APPD. DRG./ RELEVANT STD.	- DO -	LOG BOOK		P	V	-	
1.3	BODY SEAL, STEM SEAL, GLAND PACKING	DIMENSIONS	- DO -	- DO -	100%	- DO -	- DO -	INTERNAL RECORD		P	V	-	
		TEMPERATURE RESISTANCE	- DO -	TEMP. CHECK	100%	PTFE /RELE-VANT STD.	RELEVANT STD.	TEST CER-TIFICATE	✓	P	V	V	
2.0	**IN-PROCESS INSPECTION:**												
2.1	MACHINING OF BODY END-PIECE GLAND BALL, SPINDLE	DIMENSIONS	-DO-	MEASU-REMENT	100%	MFG. DRG.	MFG. DRG.	LOG BOOK		P	V	-	
		SURFACE FINISH	- DO -	VISUAL	100%	- DO -	MFG. DRG./MFG. STD.	- DO -		P	V	-	
2.2	BALL, SPINDLE	HARDNESS	-DO -	HARDN-ESS TEST	100%	APPD. DRG./ DATA SHEET/ TECH.SPEC.	APPD. DRG./ DATA SHEET/ TECH.SPEC./MFG. STD.	TEST CERT.	✓	P	V	V	
		SURFACE DEFECTS	CRITICAL	DPT	100%	ASTM-E-165	NO LINEAR INDICATION	INTERNAL RECORD	✓	P	V	-	

LEGEND:
RECORDS, IDENTIFIED WITH ✓ ' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.

M: MANUFACTURER .
C: MAIN VENDOR, CU: BHEL/CUSTOMER
INDICATE "P" PERFORM, "W" WITNESS AND "V" VERIFICATION

MAIN VENDOR/SUB-VENDOR (SIGN WITH DATE & STAMP) **REVIEWING AGENCY (SIGN WITH DATE & STAMP)** **APPROVING AGENCY (SIGN WITH DATE & STAMP)**

STANDARD QUALITY PLAN FOR BALL VALVE

QUALITY PLAN NO.:PE-QP-XXX-166-A808
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 **DATE:** 31/03/2012
SHEET 3 OF 3

SL .NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY D	AGENCY M	AGENCY C	AGENCY CU	REMARKS
1	2	3	4	5	6	7	8	9	10				11
2.3	BALL & SEAT	BLUE MATCH	CRITICAL	BLUE MATCHING	100%	THE SURFACE WILL BE SMOOTH & WILL HAVE UNIFORM METAL TO METAL CONT-ACT	SAME AS COL.7	LOG BOOK	✓	P	V	V	
3.0	**ASSEMBLY**	DIMENSIONS	MAJOR	MEASUR-EMENT	*AS PER NOTE-1 BELOW	APPD. DRG./ RELEVANT STD.	APPD. DRG./ RELEVANT STD.	INTERNAL RECORD	✓	P	W	W	
		OPENING & CLOSING	- DO -	OPERA-TION	- DO -	SMOOTH OPERA-TION OF VALVE	- DO -	- DO -	✓	P	W	W	
4.0	**TESTING:**												
4.1	SHELL	LEAKAGE	CRITICAL	HYDRO-STATIC	*AS PER NOTE-1 BELOW	APPD. DRG./ DATA SHEET	NO LEAKAGE	TEST CER-TIFCATE	✓	P	W	W	
4.2	SEAT	- DO -	- DO -	- DO -	- DO -	- DO -	- DO -	- DO -	✓	P	W	W	
4.3	SEAT	- DO -	- DO -	AIR	- DO -	- DO -	- DO -	- DO -	✓	P	W	W	
4.4	FIRE SAFE TEST REPORT WITNESSED BY LLOYD/BV SHALL BE FURNISHED FOR REVIEW								✓	P	V	V	
4.5	REVIEW OF QA DOCUMENTATION AS PER APPD. QP								✓	P	V	V	
5.0	**PAINTING :**	QUALITY & THICK-NESS OF PAINT	MAJOR	VISUAL & MEASU-REMENT	100%	TECH. SPEC./ DATA SHEET/ MFG. STD.	SAME AS COL.7	INTERNAL RECORD		P	V	-	
6.0	**PACKING:**		MAJOR	VISUAL	100%			INTERNAL RECORD		P	-	-	

NOTE-1:
100% BY MANUFACTURER
10% BY TECHNO
For Actuator operating valves - Actuator test certificate shall be furnished to BHEL for review.
For Fire safe valves - valves are to be accepted based on fire test certificates

LEGEND:
RECORDS, IDENTIFIED WITH ' ✓ ' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.

M: MANUFACTURER .
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INDICATE "P" PERFORM, "W" WITNESS AND "V" VERIFICATION

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD QUALITY PLAN FOR
CS PIPE -ERW

QUALITY PLAN NO.:PE-QP-XXX-166-A809
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 **DATE: 31/03/2012**
SHEET 1 OF 1

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY D	AGENCY M	AGENCY C	AGENCY CU	REMARKS
1	2	3	4	5	6	7	8	9			10		11
1.0	ERW PIPE	a) Physical & Chemical test	M	Physical & Chemical Properties	Sample	IS:1239 Pt.1/ API 5L Gr. B/ Appd. Data sheet	IS:1239 Pt.1/ API 5L Gr. B/ Appd. Data sheet	MTC/ Mfr's TC	✓	P	V	V	Refer Note-1
		b) Dimensional conformity	M	Measurement	At random	-do-	-do-	MTC/ Mfr's TC	✓	P	V	V	
		c) Hydro test	M	Leak test	100%	-do-	-do-	MTC/ Mfr's TC	✓	P	V	V	

Note-1: In case material is procured from dealer, and co-related Mfr's TCs are not available, check test on identified sample will be carried out at testing laboratory and hydro test at pressure 1.5 times of design pressure on10% of total quantity will be witnessed by BHEL.

LEGEND:
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M - MANUFACTURER
C - MAIN VENDOR
CU - BHEL/CUSTOMER
"P" PERFORM, "W" WITNESS AND V VERIFICATION

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD QUALITY PLAN FOR
CCS /CFS GATE,GLOBE & CHECK VALVE
(UP TO 50 NB-FCS #800 & 1 NO. 50 NB GLOBE VALVE #600) (65 NB & ABOVE CCS # 150)

QUALITY PLAN NO.:PE-QP-XXX-166-A810
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 **DATE: 31/03/2012**
SHEET 1 OF 2

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY D	AGENCY M	AGENCY C	AGENCY N	REMARKS
1	2	3	4	5	6	7	8	9			10		11
1	**Raw Material:**												
	Body, bonet, gld.,Flange, Disc, / wedge	Chem. & mech. Test	CR	Chem.& mech.Test	Per Heat	Appd.Drg/.	Relevant Standard	MTC	✓	P	V	V	Body will carry the heat mark for co-relation with CMT
		Dimensions	MR	Measurement	100%	Mfg. Drg./ Data Sheet	Mfg. Drg./ Data Sheet	IR	✓	P	V	V	
		Surface quality	MR	Visual	100%	Mfg. Drg./ Data Sheet	Defect Free	IR	✓	P	V	V	
1.1	Stem,body seat ring,gland.	Chem. & mech. Test	CR	Chem.& mech.Test	Per Heat	Appd.Drg./Relevant Std.	Appd.Drg./Relevant Std.	MTC	✓	P	V	V	
1.2	Fasteners	Chem. & mech. Test	MR	Chem.& mech.Test	Per Heat	Appd.Drg./Relevant Std.	Appd.Drg./Relevant Std.	IR	✓	P	V	V	
1.3	Gasket & gland packing	Compliance to PO	MR	Measurement	100%	Appd.Drg./Relevant Std.	Appd.Drg./Relevant Std.	IR	✓	P	V	V	
2.0	**In Process Inspection**												
2.1	Machining of valves components	Surface quality	MR	Visual	100%	Mfg. Drg.	Mfg. Drg.	IR	✓	P	V	V	
		Dimension	MR	Measurement	100%	Mfg. Drg.	Mfg. Drg.	IR	✓	P	V	V	
2.2	Spindle	Surface finish	MR	Measurement	100%	Mfg. Drg.	Mfg. Drg.	IR	✓	P	V	V	
2.3	Wedge / disc , seatring, stem & back seat	Lapping	MR	Blue Matching	100%	100% metal to metal contact	100% metal to metal contact	IR	✓	P	V	V	

LEGEND:
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M MANUFACTURER/SUB-CONTRACTOR
C CONTRACTOR/NOMINATED INSPECTION AGENCY,
N CUSTOMER. INDICATE "P" PERFORM "W" WITNESS AND
V VERIFICATION AS APPROPRIATE CHP
SHALL INDENTIFIED IN COLUMN "N"
IR - INSPECTION REPORT, CMT-CERTIFICATE OF MATERIAL &TEST

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD QUALITY PLAN FOR
CCS /CFS GATE,GLOBE & CHECK VALVE
(UP TO 50 NB-FCS #800
(65 NB & ABOVE CCS # 150)

QUALITY PLAN NO.:PE-QP-XXX-166-A810
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 **DATE: 31/03/2012**
SHEET 2 OF 2

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY D	AGENCY M	AGENCY C	AGENCY N	REMARKS
1	2	3	4	5	6	7	8	9			10		11
3.0	**Testing & Final Inspection**												
3.1	Performance	Operation	CR	Manual	100%	Appd. Drg./Data Sheet	Should be smooth	IR	✓	P	W	W*	
3.2	Shell &Sheet / backseat	Pr. Testing	CR	Hyd. Testing	100%	Appd. Drg./Data Sheet	Relevant Standard / Data Sheet	CMT	✓	P	W	W*	
3.3	Seat	Pr. Testing	CR	Pneumatic Testing	100%	Appd. Drg./Data Sheet	Relevant Standard / Data Sheet	CMT	✓	P	W	W*	Not Applicable for Check Valve
3.4	Valve Assembly	1. Chk. For completeness/ Visual Inspection	MR	Visual	100%	Appd. Drg. / Tech. Spec./ Data Sheet	Appd. Drg./Data Sheet	IR	✓	P	W	W*	
		2. Dimention	MR	Measurement	10%	Appd. Drg./Data Sheet	Appd. Drg./Data Sheet	IR	✓	P	W	W*	*RANDOM 10% BY CUSTOMER
		3. Wear Travel / valve lift	MR	Manual	100%	Appd. Drg.	Appd. Drg.	IR	✓	P	W	W*	
4.0	**Painting & Packaging**												
		1. Painting & Packaging	MR	Manual	100%	Appd. Drg. / Tech. Spec.	Appd. Drg. / Tech. Spec.	IR		P	V		
		2. Tagging	MR	Manual	100%	Appd. Drg. / Tech. Spec.	Appd. Drg. / Tech. Spec.	PS / RS		P	V		

LEGEND:
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M MANUFACTURER/SUB-CONTRACTOR
C CONTRACTOR/NOMINATED INSPECTION AGENCY,
N CUSTOMER. INDICATE "P" PERFORM "W" WITNESS AND
V VERIFICATION AS APPROPRIATE CHP
SHALL INDENTIFIED IN COLUMN "N"
IR - INSPECTION REPORT, CMT-CERTIFICATE OF MATERIAL &TEST

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD QUALITY PLAN FOR

OIL STRAINER

QUALITY PLAN NO.:PE-QP-XXX-166-A811
PACKAGE-FULE OIL SYSTEM

PROJECT-

REV.NO. 0 **DATE: 31/03/2012**
SHEET 1 OF 2

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D	AGENCY M	AGENCY C	AGENCY CU	REMARKS
1	2	3	4	5	6	7	8	9		10			11
1.0	**Raw Material**												
1.1	Body, flange, dished end	Physical & Chemical Properties	MA	Physical & Chemical Test	1/Sample	Appd. Drg.	Appd. Drg./ Mfg.Std.	Mtrl.TC	√	P	V	V	
1.2	Screen	1. Chem. composition	MA	Chem. Test	1/Sheet	- do -	- do -	- do -	√	P	V	V	
		2. Dimension, Mesh Size	MA	Meas.	100%	- do -	- do -	log book		P	V	V	
2.0	**In Process**												
2.1	Welding Procedure Specification	Parameter	MA	Verification	100%	ASME-IX	ASME-IX	QW-482	√	P	V	V	BHEL approved WPS & PQR Shall be furnished for review.
2.2	Procedure Qualification Record & Welder Qualification	Weld Soundness/ Qualification	MA	Qualification test RT	100%	ASME-IX	ASME-IX	QW-483/484	√	P	V	V	
3.0	Weld fit up	Dimension alignment orientation	MA	Meas./ Visual	100%	Appd. WPS	Appd. WPS	log book		P	V	V	
4.0	Weldments - Final Run (all welds)	Surface Defect	MA	Penetration Test	10%	ASTME-165	No defects	- do -	√	P	V	V	
4.1	Root run (butt welds & back gauged welds)	-do-	MA	-do-	100%	-do-	-do-	-do-	√	P	V	V	

LEGEND:
RECORDS INDENTIFIED WITH " √ " SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENT.

"M" MANUFACTURER
"C" MAIN VENDOR
CU - BHEL/CUSTOMER
INDICATE "P" PERFORM "W" WITNESS AND"
V" VERIFICATION

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD QUALITY PLAN FOR

OIL STRAINER

QUALITY PLAN NO.:PE-QP-XXX-166-A811
PACKAGE-FULE OIL SYSTEM

PROJECT-

REV.NO. 0 **DATE: 31/03/2012**
SHEET 2 OF 2

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY D	M	C	CU	REMARKS
1	2	3	4	5	6	7	8	9	10				11
5.0	Assembly of Internal Fittings Basket placement	Orientation Location of Tapping Points & fitting of Internals	MA	Visual & Meas.	100%	Appd. Drg.	Appd. Drg./ Mfg.Std.	log book		P	V	V	
6.0	Final Assembly												
6.1	Final Inspection	Completeness Cleanliness Dimension	MA	Visual & Meas.	100%	- do -	Appd. Drg./ Data Sheet	Inspection Report		P	W	W	
		Leak tightness	CR	Hyd. Test at 1.5 times of design pr. for 30 min.	100%	- do -	No leakage	Test Record	√	P	W	W	
7.0	Review of QA Documents as per QP												

LEGEND:
RECORDS INDENTIFIED WITH "√" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENT.

"M" MANUFACTURER
"C" MAIN VENDOR
CU - BHEL/CUSTOMER
INDICATE "P" PERFORM "W" WITNESS AND"
V" VERIFICATION

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD QUALITY PLAN FOR POSITIVE DISPLACEMENT PUMP (SINGLE/TWIN SCREW PUMP)

QUALITY PLAN NO.:PE-QP-XXX-166-A812
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 DATE: 31/03/2012
SHEET 1 OF 2

SL. NO. 1	COMPONENT & OPERATIONS 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6	REFERENCE DOCUMENT 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9	AGENCY D	M	C 10	CU	REMARKS 11
1.0	**Raw Material & Bought Out Items**												
1.1	Casing, stuffing box & end cover	i) Chemical test	MA	Chemical Analysis	Sample/ heat	Appd. Data Sheet/ Appd. Drg./ IS:210 FG260	Same as Cl.7	Material TC	√	P	V	V	
		ii) Physical test	MA	Physical Properties	Sample/ heat	- do -	Same as Cl.7	Material TC	√	P	V	V	
		iii) Hardness	MA	Meas.	At random	As per Appd. Data Sheet	- do -	Material TC	√	P	V	V	
1.2	Shaft, Rotor,Step-up gear,Timing gear	i) Chemical test	MA	Chemical Analysis	Sample/ heat	As per Appd. Data Sheet/ Drg.	Same as Cl.7	Material TC	√	P	V	V	
		ii) Physical test	MA	Physical Properties	- do -	- do -	Same as Cl.7	Material TC	√	P	V	V	
		iii) Heat treatment	MA	Heat treatment	100%	- do -	- do -	HT Chart	√	P	V	V	
		iv) Hardness	MA	Meas.	- do -	- do -	- do -	- do -	√	P	V	V	
1.3	Bearing	Make, size & bearing No.	MA	Visual	100%	Mfg. Drawing/ Mfg.Catalogue	- do -	Log Book		P	-	-	
2.0	**In Process Control**												
2.1	Machining of all Components	i) Dimension	MA	Meas.	100%	- do -	- do -	- do -		P	V	V	
		ii) Surface finish	MA	Visual	100%	- do -	- do -	- do -		P	-	-	
2.2	Casing	Pressure test	MA	Hyd.Test with water	100%	1.5 x max. discharge pr. for 15 minutes.	No leakage/Seepage	Test Report	√	P	V	V	
2.3	Shaft, Rotor/Screw, Step-up gear, timing gear	1. Internal Defects	CR	UT(after skin - machining)	100%	ASTM A388	Refer Note.1 (page2)	Test Report	√	P	V	V	
		2. Surface Defects	CR	DPT(after - final machining)	100%	ASTM E:165	No linear indication >1.6mm	Test Report	√	P	V	V	
		3. Case Hardness of timinng gear	CR	Hardness	100%	EN-36 to BS970/ As per data sheet	After case carburising, hardened & tempered to have tooth hardness of 56 to 59 HRC	H T report	√	P	V	V	NA
2.4	Balancing of Rotor Assly.	Static & Dynamic	CR	Balancing	100%	VDI 2060 Cl. 6.3/ ISO 1940 Gr.6.3	ISO 1940 Gr.6.3	Test Report	√	P	V	V	only in case of Twin Screw Pump

LEGEND:
RECORDS INDENTIFIED WITH "√" " SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENT.

"M" MANUFACTURER
"C" MAIN VENDOR
"CU" BHEL/CUSTOMER,.
"P" PERFORM "W" WITNESS AND
"V" VERIFICATION

MAIN VENDOR/SUB-VENDOR (SIGN WITH DATE & STAMP) | **REVIEWING AGENCY (SIGN WITH DATE & STAMP)** | **APPROVING AGENCY (SIGN WITH DATE & STAMP)**

STANDARD QUALITY PLAN FOR POSITIVE DISPLACEMENT PUMP (SINGLE/TWIN SCREW PUMP)

QUALITY PLAN NO.:PE-QP-XXX-166-A812
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 DATE: 31/03/2012
SHEET 2 OF 2

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY M	AGENCY C	AGENCY CU	REMARKS
1	2	3	4	5	6	7	8	9	D		10		11
3.0	**Assembly Control Final Inspection & Testing:**												
3.1	Pump Assembly	i) Completeness, correctness, overall dimension	MA	Visual & Meas.	100%	Appd. Drg.	Same as Cl.7	Log Book	√	P	W	W	
3.2	Performance Test - with test bed motor	1.Performance for capacity, head,power consp., speed, efficiency.	CR	Performance Test	100%	VDMA/ HIS/Appd. Data sheet	Appd. Data sheet/curves/ VDMA/HIS	Test Report	√	P	W	W	
		2. NPSHR for twin Screw pump	CR	- do -	10%	-do-	Appd. Data sheet/curves Appd. Document	- do -	√	P	W	W	
		3. Vibration/Noise	CR	- do -	100%	Appd. Data Sheet/ Value given in Cl.8	75 micron at bearings 85 dbA measured at a distance of 1 mtr.	- do -	√	P	W	W	Noise & vibration value measured at shop is for reference only.
		4. Relief valve set pr.	CR	- do -	100%	Appd. Data Sheet	Same as Cl.7	- do -	√	P	W	W	
3.3	Review of QA Documentation as per approved QP			-	-	-	-	-		V	V	V	
3.4	Painting	Surface Preparation & shade of painting	MA	Visual	100%	As per Mfg. Std.	Same as Cl.7	-		P	V	-	

Note: 1. Defect giving echo height more than 20% on total CRT Screen height shall be treated as unacceptable..
Defect causing reduction in backwall echo less than 80% of Screen height shall be treated as unacceptable. Frequency 2 MHz min.
2. In case of mismatch in material in QP with Data Sheet, the material indicated in approved data sheet will be final.

LEGEND:
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MAIN VENDOR/SUB-VENDOR (SIGN WITH DATE & STAMP) | **REVIEWING AGENCY (SIGN WITH DATE & STAMP)** | **APPROVING AGENCY (SIGN WITH DATE & STAMP)**

STANDARD QUALITY PLAN FOR
CS PIPE -SEAMLESS

QUALITY PLAN NO.:PE-QP-XXX-166-A813
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0 **DATE: 31/03/2012**
SHEET 1 OF 1

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY D	AGENCY M	AGENCY C	AGENCY CU	REMARKS
1	2	3	4	5	6	7	8	9			10		11
1.0	SEAMLESS PIPE	a) Physical & Chemical test	M	Physical & Chemical Properties	Sample	ASTM A106 Gr.B/ Appd. Data sheet	ASTM A106 Gr.B/ Appd. Data sheet/ Relevant Std.	MTC/ Mfr's TC	✓	P	V	V	Refer Note-1
		b) Dimensional conformity	M	Measurement	100%	-do-	-do-	MTC/ Mfr's TC/IR	✓	P	V	V	
		c) Hydro test	M	Leak test	100%	-do-	-do-	MTC/ Mfr's TC	✓	P	V	V	

Note-1: In case material is procured from dealer, and co-related Mfr's TCs are not available, check test on identified sample will be carried out at testing laboratory and hydro test at pressure 1.5 times of design pressure on10% of total quantity will be witnessed by BHEL

LEGEND:
RECORDS INDENTIFIED WITH " ✓ " SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENT.

M - MANUFACTURER
C - MAIN VENDOR
CU - BHEL/CUSTOMER
"P" PERFORM, "W" WITNESS AND V VERIFICATION

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD CHECK LIST FOR OIL HOSE

CHECK LIST NO.:PE-QP-XXX-166-A816
PACKAGE-FULE OIL SYSTEM
PROJECT-
REV.NO. 0
SHEET 1 OF 1
REV.NO. 0 **DATE: 31/03/2012**

SL. NO. 1	COMPONENT & 2	CHARACTERISTICS 3	TYPE OF CHECK 4	REFERENCE DOCUMENT 5	ACCEPTANCE NORMS 6	FORMAT OF RECORD 7	AGENCY M	AGENCY C 8	AGENCY N	REMARKS 9
1	Material for									
1.1	Synthetic Rubber	Polymer Confirmation	Chemical Analysis	Appd.data sheet/ Relavent Code	Same as Cl.7	Lab Test Certificate	P	V	V	
1.2	Canvas	Mechanical Test	Tensile	-do-	-do-	- do -	P	V	V	
1.3	Bonding Agents	Bonding Strength	Properties	-do-	-do-	- do -	P	V	V	
1.4	End Fittings	Chem. & Mech. Test	Chem.& Mech properties	-do-	-do-	- do -	P	V	V	
2	In Process Inspection									
2.1	Compound									
	Oil Resistance	i) Oil Resistance test	Oil Resistance check	-do-	-do-	Lab Test Report	P	V	V	
		ii) Heat Resistance	Heat Resistance check	-do-	-do-	Lab Test	P	V	V	
2.2	Sheeting	i) Visual Inspection	Visual	Mfg. Drg.	Mfg. Drg.	Inspn. Report	P	-	-	
		ii) Dimension	Meas.	- do -	- do -	- do -	P	-	-	
2.3	Hose Making	i) Visual Inspection	Visual	- do -	- do -	- do -	P	-	-	
		ii) Dimensional	Meas.	- do -	- do -	- do -	P	-	-	
2.4	Wrapping	Tightening	Visual	- do -	- do -	- do -	P	-	-	
2.5	Flange	Dimension	Meas.	- do -	- do -	- do -	P	-	-	

LEGEND:

"M" MANUFACTURER/SUB-CONTRACTOR
"C" CONTRACTOR/NOMINATED INSPECTION AGENCY,
"N" CUSTOMER. INDICATE "P" PERFORM "W" WITNESS AND
"V" VERIFICATION AS APPROPRIATE CHP
SHALL INDENTIFIED IN COLUMN "N"

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD CHECK LIST FOR
OIL HOSE

CHECK LIST NO.:PE-QP-XXX-166-A816
PACKAGE-FULE OIL SYSTEM

PROJECT-

REV.NO. 0
SHEET 1 OF 1
REV.NO. 0 **DATE:** 31/03/2012

SL. NO. 1	COMPONENT & 2	CHARACTERISTICS 3	TYPE OF CHECK 4	REFERENCE DOCUMENT 5	ACCEPTANCE NORMS 6	FORMAT OF RECORD 7	AGENCY M 8	AGENCY C 8	AGENCY N 8	REMARKS 9
2.6	Vulcanising	Complete Assembly	Hardness	Mfg.Std./Appd.Drg Appd.Data Sheet	Same as Cl.7	Inspn. Report	P	V	V	
3	Final Inspection									
	Finished Product Check for completen	i) Confirmatory Test	Conformity	Appd.data sheet/ Relavent Code	- do -	T.C.	P	V	V	
		ii) Dimension (includ-ing end connection)	Measurement	Appd. Drg.	- do -	Inspn. Report	P	W	W	
		iii) Pressure Test	Hydraulic Test	Appd.data sheet/ Relavent Code	No leakage	- do -	P	W	W	
		iv) Vacuum Test	Vacuum	- do -	Same as Cl.7	- do -	P	W	W	
		v) Elongation	Measurement	- do -	- do -	- do -	P	V	V	
		vi) Electric Continuity	Elec. Cont.	- do -	- do -	- do -	P	V	V	

LEGEND:

"M" MANUFACTURER/SUB-CONTRACTOR
"C" CONTRACTOR/NOMINATED INSPECTION AGENCY,
"N" CUSTOMER. INDICATE "P" PERFORM "W" WITNESS AND
"V" VERIFICATION AS APPROPRIATE CHP
SHALL INDENTIFIED IN COLUMN "N"

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

STANDARD CHECK LIST
STANDARD CHECK LIST FOR: CS-FITTINGS (FORGED/SEAMLESS)
PACKAGE-FULE OIL SYSTEM
PROJECT-
CHECK LIST NO.:PE-QP-XXX-166-A817
REV.NO. 0
DATE: 31/03/2012 **Sheet 1 of 1**

SL. NO.	TESTS/CHECKS	QUANTUM OF CHECKS	REFERENCE DOCUMENT./ ACCEPTANCE NORMS	AGENCY M	C	N	D	REMARKS
1	2	3	4	5				6
1	Visual and Dimensional Checks for each size and type	100% by Manufacturer and 10% by BHEL	Appd. Data Sheet/ Relevant Standard	P	W	W	✓	Inspn. Report shall be furnished
2	Check for Logo mark & Specification	-do-	-do-	P	V	V		
3	Check for TC of mother pipe/forgings	100%	-do-	P	V	V	✓	Manufacturer's TCs of mother pipe/forgings shall be furnished
4	Cross check for Mech/Chem properties of mother pipe/forging	One/Heat	-do-	P	V	V	✓	-do-

LEGEND:
RECORDS INDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.

M= MANUFACTURER/SUB-CONTRACTOR
C= CONTRACTOR/NOMINATED INSPECTION AGENCY,
N= CUSTOMER
P= PERFORM; W= WITNESS; V= VERIFICATION

MAIN VENDOR/SUB-VENDOR
(SIGN WITH DATE & STAMP)

REVIEWING AGENCY
(SIGN WITH DATE & STAMP)

APPROVING AGENCY
(SIGN WITH DATE & STAMP)

TANKS AND VESSELS

1. Material Tests (Chemical Analysis, Mechanical Tests & other tests) as per applicable material standard of all components (plates, forgings etc)

2. Only Qualified welders as per approved WPS and PQR shall be deployed for fabrication of tanks.

3. Dimensional checks, during in-process and final inspection, shall be carried out for alignments, circularity, verticality, orientation of connections, slope of bottom plate etc.

4. NDT on weld joints shall be done as per relevant / applicable standard. However, minimum requirement of NDT, as given below, shall be complied:

a. 100% DPT on root run (butt welds / back-gouged welds).

b. 100% DPT on all finished welds.

c. 10% RT on butt-welded seams (which shall cover all 'T' / Cross-joints) as per design code / Standard.

5. All tanks shall be subjected to hydraulic test to 150 % of the Design pressure for a duration of 30 minutes. Other tests, (as per relevant design standard), given below shall be applicable as per relevant code/standard.:

a. Vacuum test for bottom plate seam testing and annular plate.

b. Air / vacuum test for roof testing.

FUEL OIL PUMPS/DRAIN OIL PUMP/WATER PUMP

1. Material Tests (Chemical Analysis, Mechanical Tests & other tests) as per applicable material standard of all components (plates, forgings etc)

2. All forged / rolled bars (for pump rotors / screws) shall be subjected to Ultrasonic Test (for diameter>= 40mm) at proof machine condition and DPT / MPI after finish machining.

3. Rotating parts i.e. Screws / Rotors, Impellers (other than single screw pump) shall be statically and dynamically balanced as per requirements of code ISO: 1940 Gr. 6.3/IS 21940 or better.

4. The machined surfaces of castings shall be subjected to DP Test.

5. Pump casing shall be hydraulically tested at a pressure 150% of specified shut off head or 2 times working pressure (whichever is higher) for leak tightness for a duration of 30 minutes.

6. All pumps shall be performance tested as per relevant / applicable code/standard.

PIPING, VALVES, STRAINERS AND FITTINGS:

FOR PIPES, VALVES, FITTINGS AND SPECIALITIES REFER QA CHAPTER OF LP PIPING.

INSULATION

1. Rockwool/Mineral Wool/Glass Wool shall be tested as per relevant standard. However, Thermal Conductivity type test shall be carried out minimum once in a year as per relevant code/standard.

2. Lagging/Cladding shall be tested as per relevant Standard to meet data sheet requirements.

MONORAIL HOISTS

FOR HOISTS REFER QA CHAPTER "EOT CRANES AND HOISTS",

FLEX HOSES

Tests such as Adhesion property before and after aging and swelling, tensile, elongation at break for rubber and vacuum test, pressure test, burst/proof pressure test, dimension of finished hose shall be carried out as per relevant code/standard.

2 X 660MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

ANNEXURE-I

(SYSTEM WRITE UP)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT PPEI, NOIDA-INDIA

1.0 SYSTEM DESCRIPTION

Light Diesel Oil (LDO) shall be used as initial ignition, initial start-up of the boiler and up to a load of 30% MCR. This shall also be used for coal flame stabilization up to 505 MCR of the steam generator. The Fuel Oil Handling System to be considered comprises unloading & storage of LDO and methanol in near future. The basic operation & control philosophy of fuel oil unloading & storage system is described in succeeding sections. The bidder shall provide all the features as specified herein including other features as required for safe, efficient and trouble free operation of the system**.**

Fuel Oil Characteristics (LDO & Methanol) are provided under **Project information**.

1.1 LIGHT DIESEL OIL SYSTEM

1.1.1 LDO shall be delivered to power station by five (5) nos road tankers. The road tankers shall be unloaded through flexible metallic / neoprene unloading hoses of **min. 8.0m length** with fire safe type ball valve for isolation and a hose stand for each unloading hose. The LDO unloading header will have 5 Nos. unloading points and one no spare connection.

1.1.2 LDO from unloading header shall be pumped to LDO storage tank with the help of Two (2) Nos (1W+1S) unloading pumps as indicated in the P&ID for LDO Unloading and Storage system. The LDO unloading pumps are of rotary positive displacement, twin screw type or Centrifugal type and provided with matching capacity simplex strainers at their suction with interconnecting piping and valves as shown in the P&I diagram for LDO System, Drwg No. **- PE-DG-497-166-A001.** Since, the LDO unloading pumps shall be used **for unloading Methanol also in near future**, desired pump (Screw /centrifugal type) shall be selected accordingly.

1.1.3 Two (2) nos. LDO storage tanks of net capacity 1700 m3 are envisaged.

1.1.4 Interconnecting piping, valves and instruments as indicated in the Process & Instrumentation diagram for LDO system under specification.

1.2 DRAIN OIL SYSTEM, SUMP SYSTEM & OIL WATER SEPARATION

1.2.1 The drains from Fuel oil unloading pumps and their strainers shall be collected by gravity in a drain oil tank to be located in the Fuel oil unloading cum forwarding pump house. This oil from drain oil tank shall be pumped to LDO storage tanks by drain oil pumps (1 W + 1 S).

1.2.2 All oil drain headers will have a size not less than 25 NB and adequately sloped.

1.2.3 A single chamber oil water separator(OWS) is envisaged for separating the oil water mixture generated in fuel oil area. The oil separated through gravity in OWS shall be collected in oil pit, through an 80 NB perforated skimmer MS pipe and then this oil will be pumped to LDO storage tank with the help of two (2) nos., 1 W + 1 S, vertical screw recovery oil pumps of capacity 5 m^3/hr each. The separated water with traces of oil shall be pumped to effluent treatment (ETP) plant through sump pumps (1W + 1S) of sufficient capacity by ETP supplier.

During rainy season, water from unloading area and tank dyke area having very little or no trace of oil shall be routed from sump outside Tank dyke area to nearest plant drain, not to the OWS facility.

The above scheme for oil water separation is shown in P&I diagram for LDO System given under specification.

1.2.4 Two (2) nos Sump Pumps (1W+1S) shall be provided inside Fuel oil pump house(FOPH) to pump the surface drain from FOPH to Oil water separator. For detailed scheme refer P&ID for LDO system.

2.0 INSTRUMENTATION & CONTROL

2.1 Operation and Control of Fuel Oil unloading and storage system will be from DCS (BHEL scope) based control panel provided in Fuel oil pump house.

2.2 Instrumentation shall be as shown in Process & Instrumentation Diagram for LDO unloading & Storage system given under this specification.

2.3 Following functions shall be done through DCS:

2.3.1 Filling any of the LDO/LDO storage tanks by ensuring proper and safe selection of these tanks. Simultaneous filling and emptying of same LDO storage tanks will be avoided. Signals from motorized valves at the inlet and outlet of storage tanks shall be used for this purpose.

2.3.2 Start the LDO unloading pumps **through DCS** for filling the tanks after ensuring safe start permissive. The safe start permissive shall comprise of:

- MCC healthy
- Selected storage tank level not HI (high).
- Pump suction header inlet pressure not LO (low).
- DP across pump suction strainer not HI (high).
- Valve at tank inlet is open

2.4 Stop the running unloading pump(s) **through DCS** in case of annunciation for Level HI in corresponding tanks.

2.5 Stop/Trip the running LDO unloading pump(s) automatically in case of following:

- Level HI-HI in corresponding tanks.
- Pressure Hi in pump discharge header
- DP across corresponding suction strainer is HI.

2.6 Start standby unloading pump **through DCS** only in case running pumps trips either due to any mechanical or electrical failure

2.7 Start standby drain oil pump **through DCS** only in case running pumps trips either due to any mechanical or electrical failure

2.8 Start the sump pump in respective areas **through DCS** on receipt of level alarm HI or if physically the level is found to be high after ensuring safe start permissive. The safe start permissive shall comprise of:

- MCC healthy

2.9 Stop the running sump pump automatically in case of annunciation for Level LO in sump

2.10 Start standby sump pump **through DCS** only in case running pump trips either due to any mechanical or electrical failure.

2.11 Signals (annunciation & indication) from various switches / transmitters.

2.12 Running status (on/off) of all pumps.

2.19 All signals from the field instruments will be first terminated on a field mounted Junction box (JB) before transmitting the signals to DCS.

2 X 660 MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

ANNEXURE-II

(EQUIPMENT DESIGN CRITERIA)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT PPEI, NOIDA-INDIA

1. EQUIPMENT SELECTION & DESIGN CRITERIA/ DATA SHEET

1.1 FO STORAGE

S.No.		**LDO STORAGE TANKS**	**Drain Oil tank**
1	Storage Medium	LDO	Drain Oil
2	No. of Tanks	As per scope of supply	
3	Type of Construction	Vertical Cylindrical, non-pressure type with atmospheric vents fitted with flame arrestor fixed cone roof type.	Steel construction, rectangular type
4	Effective Tank Capacity (m^3)	1700	10
5	Dimensions	15.0 m dia x 13.3 m ht	3.0 x 1.5 x 1.5 m ht
6	Design & Construction Code	IS 803 / API650	IS-800/ standard hand book
7	Design Pressure	Atmospheric	Atmospheric
8	Corrosion allowance	1.8 mm	
9	Material of construction	IS 2062 Gr A/B with minimum plate thickness as 6.0 mm.	
10	Venting Capacity	As per API 2000 / equivalent	
11	Joint efficiency	85 % on all butt welded joints	

NOTES:

a. Design and GA drwg of LDO tanks will be done by BHEL. Bidder to provide the design calculation of roof structure (Stadd analysis), basic design (for information) and fabrication drawings of tanks in line with GA drwg prepared by BHEL. Other Technical requirement of LDO storage tank and Drain oil tank are given under customer specification.

1.2 UNLOADING PUMPS, DRAIN OIL PUMPS & SUMP PUMPS

a. Refer Customer specification for technical requirement of Pumps.
b. Piping in discharge side of pump shall in no case be lower than pump discharge nozzle size.
c. Head / discharge pressure of various pumps shall be decided during detailed engineering stage based on layout requirement & pressure drop. In addition to the head calculated, margin of 1 kg/cm2 to be considered while selecting the unloading pump head.
d. For selecting motor rating, criteria shall be as follows:
   - 15% margin over BHP at unloading pump design head.

1.3 STRAINERS FOR LDO UNLOADING PUMPS

S.No.	Characteristics	Value
01	Type	Simplex Type
02	Fluid	HSD/HFO
03	Flow Rate	To match pump flow rate
04	Operating Pressure, maximum kg/cm^2 (g)	Suction head of pump plus margin (bidder specific subject to customer approval)
05	Operating temperature, ° C	60
06	Design Pressure , kg/cm^2 (g)	1.1 times the operating pressure , min.
07	Design Temperature, ° C	65
08	Fluid Viscosity	As per Fuel Oil Characteristics

09 a)	Pressure drop in clean condition	0.15 kg/cm2
09 b)	Maximum permissible pressure drop under 50 % clogged condition	0.3 kg/cm2
10	Screen basket data	
a)	Dia of perforations	As per customer specification
b)	Minimum thickness	Bidder specific subject to customer approval.
11	End Connection details	
a)	Inlet & outlet size	Shall match connected upstream and downstream pipe size
b)	Type	Flanged
c)	Details / Standard	IS: 6392 /ANSI B 16.5 /Equivalent.
12	Material of Construction	
a)	Body	Fabricated from IS 2062/ Seamless pipe to ASTM A 106
b)	Cover	Fabricated from IS 2062 PLATES
c)	Screen basket	As per customer specification
d)	Bolts & Nuts	As per customer specification

1.4 DATA SHEET FOR OIL HOSES

S.No	Characteristics	Value
1	Type	Flexible rubber hose confirming to BS 1435 type S-7 / IS 10733
2	Size	80 NB X 8.0 m long for HSD/HFO Any other fitting required to match the HSD/HFO nozzle shall also be provided by bidder.
3	Quantity	As indicated in scope of supply
4	Temperature of fluid handled, °C	Capable of handling oil Up to 105 °C temperature
5	Type of end connection	To match road tanker / railway wagon unloading nozzle
6	Testing	As per BS 1435 / IS 10733
7	Other technical details	As per customer specification.

1.5 VAVES

Valves shall be provided as per Technical requirement given under customer specification.

1.6 PIPES, FITTINGS & FLANGES

S N	Item	Material Standard	Dimension Standard /other details
1	PIPING		

A	Fuel oil and waste oil piping	API 5L Gr.B ERW	Dimensions as per ASME B36.10/Equivalent. Socket welded as per B16.11 for size up to 50NB. Butt-welded as per B16.25 for size above 50NB. Flanged as per ANSI 16.5 or SW near equipment.
2	**FITTINGS (ELBOW, TEES AND REDUCERS)**		
A	**FUEL OIL AND WASTE OIL FITTINGS**		
	Up to 50 NB	Forged carbon steel to ASTM A 105	SW ends to ANSI B 16.11
	Above 50 NB	Carbon Steel to ASTM A 234, Gr.WPB	BW ends to ANSI B 16.9
3	**SLIP ON FLANGES / BLIND FLANGES**		
A	Flanges for Fuel oil, Auxiliary steam and waste oil service	ASTM A 105	As per ANSI B16.5, Class 150 / BS 4504 / other equivalent standard
4	**GASKETS**		
A	Gaskets for Fuel oil, Auxiliary steam and waste oil service	Spiral Wound SS 316	
5	**BOLTS / STUDS**	ASTM A 193 Gr. B7	
6	**NUTS**	ASTM A 194 Gr 2H	

2 X 660MW TALCHER TPP

TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

ANNEXURE - III

(SUB-VENDOR LIST)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA

	TECHNICAL SPECIFICATION FOR FUEL OIL HANDLING SYSTEM SUB-VENDOR LIST	SPECIFICATION NO. PE-TS-XXX-166-A001	
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SUB-VENDOR LIST - FUEL OIL UNLOADING AND STORAGE SYSTEM

SL. NO	ITEM	SUB-VENDORS	PLACE	TECHNICAL LIMIT
MECHANICAL				
1	GATE, GLOBE AND CHECK (CARBON STEEL VALVES)	A.V. VALVES LTD	AGRA	
		ATAM VALVES PVT. LTD.	JALANDHAR	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	
		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.	MUMBAI	LIMIT AS PER VD FILE AS ATTACHED IN SHEET 2
		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, SCNRV/300/350, SCNRV/600/250.
		V.K. VALVES PVT. LTD.,	JALANDHAR	
		WEIR BDK VALVES	NEW DELHI	
		AUDCO -L&T	CHENNAI / COIMBATORE	
		OSWAL INDUSTRIES		
		HITECH	AHMEDABAD	
		KSB WATER PUMPS / VALVES	COIMBATORE	
		KBL	KONDHAPURI	
		HAWA ENGINEERS	AHMEDABAD	
		BHEL	GOINDWAL	
		FOURESS ENGG	MUMBAI	UPTO 600 NB, CL-300 & 300NB CL-600
		FOURESS ENGG	AURANGABAD	

2	CS BALL VALVES	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	(1) BALL VALVES: FCS/FSS - 1/2" TO 2" #800 & CCS/CSS - 2.1/2" TO 4" # 150 (2) BALL VALVES: GUN METAL VALVES SIZE 15 NB TO 80 NB - UPTO PN16.0
		DEMBLA VALVES LTD.	THANE	
		M/S GM ENGINEERING	RAJKOT	
		HAWA VALVES (INDIA) PVT. LTD.	THANE	SIZE UP TO 2" & #800 WITH MOC AS FCS & FSS AND FOR SIZE FROM 65 NB TO 150 NB & #150 WITH MOC AS CCS AND CSS.
		INTERVALVE (INDIA) LTD.	PUNE	STEEL BALL VALVES UPTO 50NB, #800 AND 65NB TO 150NB. #150
		LEADER VALVES LTD.	JALANDHAR	CAST STEEL UPTO 200 MM, CLASS 150/300.
		MICROFINISH VALVES PVT LTD.	HUBLI	
		NILON VALVES PRIVATE LIMITED	AHMEDABAD	
		SURYA VALVES AND INSTRUMENTS MFG CO.	CHENNAI	FOR CARBON STEEL/STAINLESS STEEL UPTO SIZE 200NB.
		UNIFLOW	CHENNAI	
		VALTECH INDUSTRIES	MUMBAI	FORGED CARBON & ALLOY STEEL BALL VALVES, SCREWED TYPE BALL VALVES RATING 800, SIZES UPTO 50 & CC& ALLOY STEEL BALL VALVES RATING 150 , SIZES 65 TO 200 FLANGED TYPE.
		VAAS AUTOMATION PVT. LTD.	DELHI	
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	DELHI	
		PEC	NASHIK	(UPTO 400 NB CLASS 150)
		L&T VALVES	COIMBATORE	
		L&T VALVES (AUDCO)	CHHENNAI	
		FLOW CHEM	AHMEDABAD	(UPTO 350 NB CLASS 150)
		BELGUAM AQUA VALVES	BELGAUM	UPTO 200 NB, CL 150
3	**CS PLUG VALVES**	FLOWSERVE (AUDCO)	CHENNAI	
		MICROFINISH	HUBLI	
		WEIR BDK	HUBLI	UPTO 150 NB CLASS 300 & UPTO 400 NB CLASS 150
		FISHER XOMOX	CHENNAI	
		LEADER VALVES LTD.	JALANDHAR	
4	**SUMP PUMP (VERTICAL**	DARLING PUMPS PVT. LTD	INDORE	
		FLOWMORE LTD.	GURGAON	

	CENTRIFUGAL)	SU MOTORS PVT. LTD.	MUMBAI	
		VARAT PUMP AND MACHINERY PVT. LTD.	KOLKATA	
		WPIL LIMITED	KOLKATA	
		SAM TURBO INDUSTRY LTD	COIMBATORE	
		KISHORE	PUNE	
		AQUA MACHINERY	AHMEDABAD	
		FLOWMORE PUMP	GHAZIABAD	
		M&P	PUNE	
		B & C ENGG(BECON WEIR)	CHENNAI	
5	SCREW PUMPS	ROTO PUMPS	NOIDA	
		TUSHACO	MUMBAI	
		UT PUMPS	FARIDABAD	
6	API 5L ERW PIPE	TISCO	JAMSHEDPUR	
		SURYA ROSHNI	BAHADURGARH	UP TO 400 NB
		JINDAL	GHAZIABAD	UP TO 350 NB
		MSL	RAIGAD	200 TO 500 NB
		SAIL	ROURKELA	
		RATNAMANI	KUTCH	UP TO 400 NB
7	ASTM A 106, CS SEAMLESS PIPE	ISMT	AHMED NAGAR	UP TO 150 NB
		MSL	RAIGAD	UP TO 350 NB
		JINDAL SAW LTD	NASHIK	
		REMI METAL GUJRAT LTD	BHARUCH	UP TO 150 NB HOT FINISH & UPTO 100NB COLD FINISH
		ISMT	BARAMATI	UP TO 200 NB
8	CS ERW PIPE (IS 1239 / 3589)	SURYA ROSHNI	BAHADURGARH	UPTO 400 NB ERW PIPES AS PER IS 1239/3589 AND SAW AS PER IS 3589
		JINDAL	GHAZIBAD/HISSAR	UP TO 350 NB
		MSL	RAIGAD	200-500 NB ERW PIPES AS PER IS 3589
		SAIL	ROURKELA	
		WELSPUN	ANJAR/BHARUCH	UPTO 400 NB ERW PIPES AS PER IS 1239/3589 AND SAW AS PER IS 3589
		INDUS TUBE	GAUTAM BUDDH NAGAR	UP TO 300 NB
		RATNAMANI	KUTCH /AHMEDABAD / CHHATRAL	UPTO 400 NB ERW PIPES AS PER IS 3589 AND SAW AS PER IS 3589
		TATA TUBE	JAMSHEDPUR	UPTO 150 NB ERW PIPES AS PER IS 1239
		PSL	CHENNAI/VIZAG/ KUTCH/DAMAN	SPIRAL WELD SAW AS PER IS 3589
		LALIT PROFILE	THANE	SPIRAL WELD SAW AS PER IS 3589
		SAMSHI PIPES INDUSTRIES	VADODARA	SPIRAL WELD SAW AS PER IS 3589

		MUKUT PIPES	RAJPURA	LONGITUDINAL SAW (SINGLE SIDE WELD) AS PER IS 3589
		INDUS TUBES	G B NAGAR	UPTO 300 NB ERW PIPES AS PER IS 1239/3589
		MANN IND	INDORE	SPIRAL WELD SAW AS PER IS 3589
		SURENDRA ENGG	RAJPURA	SPIRAL WELD SAW AS PER IS 3589
		PRATIBHA PIPES & STRUCTURE PVT LTD	THANE	SPIRAL WELD SAW AS PER IS 3589
		JCO GAS PIPE	CHINDWARA	SPIRAL WELD SAW AS PER IS 3589
		NUKAT TANKS AND VESSELS	TARAPUR	LONGITUDINAL SAW (SINGLE SIDE WELD) AS PER IS 3589
		DADU PIPES	SIKRANDRABAD	UPTO 300 NB ERW PIPES AS PER IS 1239/3589
		APL APOLLO TUBES LTD	SIKRANDRABAD	IS3589 UPTO 250 NB
9	**SUCTION HEATER**	PARKAIRE	DELHI	
		MVS	DELHI	
		MELCON	DELHI	
		GASO ENERGY	PUNE	
		INDCON	DELHI	
		TEMASME	NOIDA	
10	**PRESSURE REDUCING VALVE & DESUPERHEATER**	CIRCOR (EARLIER MAZDA)	AHMEDABAD	
		SPIRAX MARSHALL	PUNE	
		LEADER VALVES LTD.	JALANDHAR	
		SPX CORPORATION, USA	M/S SPX FLOW TECHNOLOGY INDIA PVT. LTD, GUJARAT	
		CONTROL COMPONENT INDIA PVT. LTD.	NOIDA	
		DAUME REGELARMATUREN GMBH,	GERMANY	
		HOLTER REGELARMATUREN GMBH & CO.	GERMANY	
		INSTRUMENTATION LTD.	PALAKKAD	
11	**STRAINERS (DUPLEX / SIMPLEX BASKET TYPE)**	GENERAL MECHANICAL WORKS PVT LTD	VADODARA	
		GRAND PRIX	FARIDABAD	
		GUJARAT OTOFILT	VATVA , AHMEDABAD	
		FILTRATION ENGRS	MUMBAI	
		JAYPEE INDUSTRIES PVT. LTD.	NEW DELHI	
		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI	
		OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI	
		BHATIA ENGINEERING CO.	NEW DELHI	SIMPLEX ONLY
		FILTERATION ENGINEERS (I) PVT. LTD.	MUMBAI	SIMPLEX ONLY
		SUNGOV ENGINEERING PVT. LTD.	CHENNAI	

		SAROJINI ENTERPRISE	HOWRA	SIMPLEX ONLY
12	**CONTROL VALVE**	SPX CORPORATION, USA	M/S SPX FLOW TECHNOLOGY INDIA PVT. LTD. (AHMEDABAD)	
		CONTROL COMPONENT INC.	USA	
		DRESSER VALVE INDIA PVT. LTD	COIMBATORE	
		DAUME REGELARMATUREN GMBH,	GERMANY	
		EMERSON PROCESS MANAGEMENT CHENNAI LIMITED	CHENNAI	
		FORBES MARSHALL ARCA PVT.LTD.	PUNE	
		WEIR VALVES & CONTROLS UK LTD.	UK	
		HOLTER REGELARMATUREN GMBH & CO.KG	GERMANY	
		INSTRUMENTATION LTD.	PALAKKAD	
		KOSO INDIA PRIVATE LIMITED,	NASHIK	
		LESLIE CONTROLS, INC	USA	
		MIL CONTROLS LTD.	THRISSUR	
		METSO SINGAPORE PTE. LTD.,	SINGAPORE	
		PARCOL S.P.A	ITALY	
		R.K.CONTROL INSTRUMENTS PVT. LTD.	THANE	
		RINGO VALVULAS S.L,	SPAIN	
		SEVERN GLOCON INDIA PVT. LTD.	CHENNAI	
		SHENJIANG VALVE CO. LTD.	CHINA	
		VALVITALIA S.P.A. ,	ITALY	
		WALDEMAR PRUSS ARMATURENFABRIK GMBH	GERMANY	
13	**STEAM TRAP**	SPIRAX MARSHALL	PUNE	MAIN CONTRACTOR COC +MANUFACTURER STANDARD TC SHALL BE SUBMITTED FOR ISSUING DESPATCH CLEARANCE
		UNIKLINGER	PUNE	
		LEADER	JULLANDHAR	
		CRECENT VALVE MFG CO LTD	MUMBAI	
		PENNANT ENGINEERING	PUNE	
14	**THERMAL INSULATION**	GOENKA ROCKWOOL (INDIA) PVT.LTD.	RAIPUR	
		LLOYD INSULATIONS (INDIA) LTD.	NEW DELHI	
		MINWOOL ROCK FIBRES LTD.	RAJNANDGAON	
		POLYBOND INSULATION PRIVATE LIMITED,	BHILAI	
		ROCKWOOL (INDIA) PVT. LTD.	HYDERABAD	
		SHREERAM EQUITECH PRIVATE LIMITED	DURG	
		THERMOCARE ROCKWOOL INDIA PRIVATE LTD.	CHATTISGARH	

		LOPINUS ROCKWOOL	GWALIOR	
15	STRUCTURAL STEEL / MS-PLATE	SAIL		
		ESSAR STEEL		
		TISCO		
		RINL		
		JINDAL		
		M/S UTTAM VALUE STEEL (LLOYDS)		
		ISPAT		
		JSW		
		INDIAN IRON & STEEL CO. LTD		
16	SAFETY RELIEF VALVE	SPIRAX MARSHALL	PUNE	
		FISCHER SANMAR	CHENNAI	
		BHEL	TRICHY	
		KEYSTONE	BARODA	
		LEADER	JULLANDHAR	
17	PAINT	ASIAN PAINT		
		BERGER		
		KANSAI NEROLAC		
		JOTUN		
		SHALIMAR		
		JENSON & NICHOLSON (I) LTD		
		CDC CARBOLINE (I) LTD.		
		ADDISON PAINTS LTD		
		GRAND POLYCOAT		
		BOMBAY PAINTS		
		HEMPLE PAINTS (SINGAPORE)		
		AKZONOBEL COATINGS		
18	FITTINGS (MS/SS)	PIPE FIT ENGINEERS	VADODARA	
		GUJRAT INFRA PIPES	VADODARA	
		MS FITTINGS	KOLKATA	
		TUBE PRODUCT	VADODARA	
		SIDDARTH & GAUTAM	FARIDABAD	
		EBY	MUMBAI	
		NL HAZRA	KOLKATA	
		EXCEL METAL		
		INTERTECH		
		FITTECH		
		METAL LLOYDS	MUMBAI	
		TRUE FORGE	FARIDABAD	
19	OIL HOSE	D WREN & CO	KOLKATA	
		SUDEEP INDUSTRIES	KOLKATA	
		HYDROKRIMP	MUMBAI	
		PRESIDENCY RUBBER	KOLKATA	

20	STEAM AND CONDENSATE HOSE	ALLZFLEX ENGINEERS	VADODARA	
		SUDEEP INDUSTRIES	KOLKATA	
21	FLOWMETER (CORIOLIS TYPE)	EMERSON PROCESS MANAGEMENT	CHENNAI	
		E&H	CHENNAI	
		KROHNE MARSHALL	PUNE	
22	ALUMINUM CLADDING	BHARAT ALUMINIUM COMPANY LTD	DELHI	
		CHONGQING LANREN ALUMINIUM CO. LTD., CHINA	CHINA	
		HINDALCO INDUSTRIES LTD	MUMBAI	
		NATIONAL ALUMINIUM COMPANY LTD.	ODISHA	
23	METALLIC EXPANSION BELLOWS	AEROSUN TOLA EXPANSION JOINT CO. LTD.,	CHINA	
		B. D. ENGINEERS	AHMEDABAD	
		FLEXICAN BELLOWS AND HOSES PVT. LTD.	BARODA	
		FLEXATHERM EXPANLLOW PVT. LTD.	VADODARA	
		LONESTAR INDUSTRIES	CHENNAI	
		MB METALLIC BELLOWS PVT. LTD.	CHENNAI	
		METALLIC BELOWS INDIA PVT. LTD.	CHENNAI	
		QINHUANGDAO NORTH METAL HOSE CO. LTD.,	CHINA	
		TEDDINGTON ENGINEERED SOLUTIONS LTD.	UK	
ELECTRICAL AND C&I				
24	LEVEL TRANSMITTER (RADAR AND ULTRASONIC TYPE)	K TEK (ABB)	FARIDABAD	
		E & H	AURANGABAD	
		MEGNETROL	BELGIUM	ONLY RADAR TYPE
		EMERSON PROCESS MGT	PAWANE	
		MOORE INDUSTRIES INTERNATIONAL INC.	USA	
		SIEMENS LIMITED	MUMBAI	
		SMART INSTRUMENTS LTD, BRAZIL	MUMBAI	LD-301 & T-301 TRANSMITTER FROM M/S SMART EQUIPMENTS BRAZIL.
		HONEYWELL AUTOMATION INDIA LIMITED	DELHI	
		TOSHNIWAL INDUSTRIES PVT. LTD.,	AJMER	
		V. AUTOMAT & INTRUMENTS (P) LTD.	DELHI	
		YOKOGAWA INDIA LIMITED,	BANGALORE	
		SIEMENS MILTRONICS	CANADA	ONLY RADAR TYPE
		NIVELCO	HUNGRY	ONLY RADAR TYPE
		HAWK	AUSTRALIA	ONLY RADAR TYPE
25	LT MOTORS	CROMPTON GREAVES LIMITED	AHMEDNAGAR	
		KIRLOSKAR ELECTRIC COMPANY	BANGALORE /	

	LT MOTORS		HUBLI	
		SIEMENS	MUMBAI	
		ABB	BANGALORE / FARADABAD	
		BHARAT BIJLEE	MUMBAI	
		JYOTI	VADODARA	
		MARATHON	KOLKATA	
		NGEF	BANDALORE / HUBLI	
		BHARAT ELECTRIC (BHEL)		
		LHP	SOLAPUR	
26	PRESSURE / DP / TEMP.SWITCH	SOR	USA	
		GIC(GAUGES BOURDON)	PANVEL	
		HERION	GERMANY	
		ITT BARTON	USA	
		DELTA CONTROL	UK	
		ASHCROFT	USA / GERMANY	
		TRAFAG	RANIPET	
		INDFOSS	GHAZIABAD	
		ASHCROFT	GANDHINAGAR	
		SWITZER	CHENNAI	EXCEPT 9000 SERIES
27	LEVEL INDIATOR FLOAT AND BOARD TYPE	FLOW STAR	FARIDABAD	
		SCIENTIFIC DEVICES	MUMBAI	
		GAUGES BOURDEN	PANVEL	
		PUNE TECHTROL	PUNE	
		SBEM	PUNE	
		LEVCON	KOLKATA	
		SIGMA	MUMBAI	
		CHEMTROL		
		DK INSTRUMENT	KOLKATA	
		V AUTOMAT	DELHI	
28	PRESSURER / DP GAUGE / TEMPERATURE GAUGE (DIAL TYPE)	H GURU (SI)	BANGALORE	
		H GURU INDUSTRIES	MUZAFFARPUR / RISHRA	
		AN INSTRUMENT	KOLKATA	
		GOA THERMOSTATIC	GOA	
		WAAREE	VAPI	
		MANOMETER	MUMBAI	
		GLUCK	MUMBAI	
		FORBES MARSHALL	HYDERABAD	
		ASHCROFT	GANDHINAGAR	
		WIKA	PUNE	
		GAGES BOURDON	MUMBAI / GOA	
		BAUMER TECHNOLOGIES INDIA PVT. LTD.	MUMBAI	

		BOSE PANDA INSTRUMENTS PVT.LTD.	KOLKARA	ONLY PRESSURE AND DP GAUGE
		BUDENBERG GUAGE CO.LTD.	UK	ONLY TEMPERATURE GAUGE
		GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	GOA	
29	RTD /THERMOCOUPLE ASSEMBLY	PYROELECTRIC	GOA	
		GIC(THERMAL INSTRUMENTS)	MAHARASHTRA	
		TEMPSENS	UDAIPUR	
		DETRIVE	MUMBAI	
		TECHNO INSTRUMENTS	GUJRAT	
		TEMPSENS INSTRUMENT (I) PVT LTD	UDAIPUR	
		TM TECNOMATIC SPA	ITALY	
		TOSHNIWAL INDUSTRIES PVT. LTD.,	AJMER	
		THERMAL INSTRUMENT INDIA PVT. LTD.	MUMBAI	
		BAUMER TECHNOLOGIES INDIA PVT. LTD.	MUMBAI	
		GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	GOA	
30	ELECTRICAL ACTUATORS	ROTORK	BANGALORE	
		ROTORK	CHENNAI	
		AUMA	BANGALORE	
		LIMITORK	FARIDABAD	
31	LEVEL SWITCH (FLOAT AND DISPLACER TYPE)	TRAC	HYDERABAD	
		LEVCON	KOLKATA	
		DK INSTRUMENTS	KOLKATA	
		SBEM	PUNE	
		SBEM	PUNE	
		FLOW STAR	FARIDABAD	
		SIGMA	MUMBAI	
		V AUTOMAT	DELHI	
32	TEMPERATURE TRANSMITTER	EMERSON PROCESS MGT	PAWANE	
		MOORE	USA	
		ABB	FARIDABAD	
		YOKOGAWA	BANGLORE	MAKE YOKOGAWA, JAPAN
		ABB LIMITED	FARIDABAD	
		ENDRESS + HAUSER (INDIA) PVT. LTD.,	DELHI	
		MOORE INDUSTRIES INTERNATIONAL INC.	USA	
		SIEMENS LIMITED	MUMBAI	
		SMART INSTRUMENTS LTD, BRAZIL	MUMBAI	
		HONEYWELL AUTOMATION INDIA LIMITED	DELHI	
		TOSHNIWAL INDUSTRIES PVT. LTD	AJMER	
		YOKOGAWA INDIA LIMITED,	BANGALORE	

33	AIR FILTER REGULATOR	PLACKA INSTRUMENT	CHENNAI	
		SHAVO NORGEN	MUMBAI	
		FISHER SANMAR	CHENNAI	
34	SOLENOID VALVE	AVCON	MUMBAI	
		ROTEX	BARODA/VV NAGAR	
		SMC	NOIDA	
		NUCON	HYDERABAD	
		ASCO	CHENNAI	
35	LOCAL CONTROL PANEL	PYROTECH	UDAIPUR	
		POSITRONICS	VADODARA	
		JACKSON	NOIDA	
		CONTROL DEVICE	KOLKATA	
		ROCKWELL AUTOMATION INDIA LTD	GHAZIABAD	
		SIEMENS LIMITED	DELHI	
		SCHNEIDER ELECTRIC INDIA PVT.LTD.	DELHI	
		JOSPER	NOIDA	
		I C A	MUMBAI	
		INDIAN SWITCH GEAR	VADODARA	
		SWITCHING CKT	KOLKATA	
36	JUNCTION BOX	PYROTECH	UDAIPUR	
		POSITRONICS	VADODARA	
		JACKSON	NOIDA	
		CONTROL DEVICE	KOLKATA	
		JOSPER	NOIDA	
		I C A	MUMBAI	
		AJMERA INDUSTRIAL & ENGINEERING WORKS	MUMBAI	
		FLEXPRO ELECTRICALS PVT. LTD.	GUJARAT	
		K.S.INSTRUMENTS PVT.LTD.	BANGALORE	
		SUCHITRA INDUSTRIES	BANGALORE	
		SHRENIK & COMPANY,	AHMEDABAD	
		HOFFMAN	BANGALORE	
		RITTAL	BANGALORE	
		SWITCHING CKT	KOLKATA	
37	CABLE LUGS (NON FLAME PROOF)	3D	UMERGAON	
		DOWELL	MUMBAI	
		CHITRA	NASIK	
38	CABLE GLANDS (NON FLAME PROOF)	ARUP	KOLKATA	
		SUNIL	KOLKATA	
		QPIE	KOLKATA	
		COMMET	MUMBAI	
39	CABLE GLAND,	AJMERA	MUMBAI	

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	LUGS, JB (FLAME PROOF)	BALIGA	CHENNAI	
		FLEXPRO	NAVSARI	
40	BATTERY CHARGER FOR PLC	CHLORIDE POWER	KOLKATA	
		CHABBI	JALGAON	
		AMAR RAJA	TIRUPATI	
		STATCON	NOIDA	
		HBL POWER SYSTEM	HYDERABAD	
		JEMA ENERGY	SPAIN	
		MASS-TECH CONTROLS PVT.LTD.	MUMBAI	
		DUBAS	BANGALORE	
		CALDYNE	KOLKATA	
41	DC LEAD ACID / NI-CD BATTERIES	AMCO SAFT INDIA LTD	BANGALORE	NI-CD BATTERIES ONLY
		EXIDE INDUSTRIES LTD	DELHI	LEAD ACID BATTERIES ONLY.
		HBL POWER SYSTEMS LTD	HYDERABAD	NI/CD AND TUBULAR TYPE FOR LEAD ACID
		HOPPECKE BATTERIEN GMBH & CO.KG,	GERMANY	
		AMAR RAJA	TIRUPATI	
		SAFT	FRANCE/SWEDEN	
42	CONTROL / POWER 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	
43	PLC BASED PANELS	SIEMENS	NASIK	
		SCHNEIDER	NASIK	
		ROCKWELL	SAHIBABAD	
		GE INTELLIGENT PLATFORM	BANGALORE	
		HONEYWELL AUTOMATION INDIA LIMITED ,	PUNE	
		ABB	BANGALORE	
44	OWS/PC	HP/COMPAQ /DELL/HCL/IBM/LENOVO		

45	PRINTER	HP/CANNON/EPSON/XEROX/IBM/LEXMARK		
6	INSTRUMENT FITTINGS	AURA INCORPORATED	DELHI	
		ASTEC VALVES & FITTINGS PVT. LTD.,	MUMBAI	
		ARYA CRAFTS & ENGINEERING PVT. LTD.	MUMBAI	
		COMFIT & VALVE PVT. LTD.	NANDASAN	
		FLUIDFIT ENGINEERS PVT. LTD.	MUMBAI	REGISTERED AS PER 22ND ELECTRICAL AND C&I MISCC MEETING DTD. 15.01.2014
		FLUID CONTROLS PVT. LTD.	MUMBAI	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
		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	FINANCIAL LIMIT REVIEWED ON 05.06.2014
47	CABLE TRAY SUPPORT SYSTEM - BOLTABLE	AM-TECH ENGG.SERVICES	PUNE	
		INDUSTRIAL PERFORATION (I) PVT.LTD.	KOLKATA	
		INDMARK FORMTECH PVT. LTD.	PUNE	
		PREMIER POWER PRODUCTS (CAL) PVT. LTD.	KOLKATA	GALVANISATION TO BE DONE AT ITS OWN PLANT OR FROM BHEL-PEM APPROVED GALVANIZERS.
		RATAN PROJECTS & ENGINEERING CO. PVT.LTD.	KOLKATA	
		STEELITE ENGINEERING LTD.	MUMBAI	
48	CABLE TRAY SUPPORT SYSTEM-WELDED(GALV)	ASSOCIATED POWER STRUCTURES PVT. LTD.	G. I. D. C., MAKARPURA, VADODARA-GUJARAT	WORKS ADDRESSES ARE APPLICABLE FOR MANUFACTURING AND GALVANISING.
		INDUSTRIAL PERFORATION (I) PVT.LTD.	DUM DUM KOLKATA-WEST BENGAL	
		INDMARK FORMTECH PVT. LTD.	MIDC BHOSARI PUNE-MAHARASHTRA	GALVANIZING UNIT LOCATED AT PHAS-3, E-11/1, MIDC, PUNE ,
		JAMNA METAL COMPANY	DSIDC, NARLA INDL. AREA DELHI	
		PREMIER POWER PRODUCTS (CAL) PVT. LTD.	KOLKATA,-WEST BENGAL	GALVANISATION TO BE DONE AT ITS OWN PLANT OR FROM BHEL-PEM APPROVED GALVANIZERS.
		PATNY SYSTEMS (P) LTD	SARDAR PATEL	

	CABLE TRAY SUPPORT SYSTEM-WELDED(GALV)		ROAD SEUNDRABAD	
		PASSIVE INFRA PROJECTS PVT. LTD.	VAISHALI, PITAMPURA DELHI-	
		RUKMANI ELECTRICAL & COMPONENTS PVT LTD	KOLKATA-WEST BENGAL-INDIA	GALVANISATION TO BE DONE AT ITS OWN PLANT OR FROM BHEL-PEM APPROVED GALVANIZERS.
		RATAN PROJECTS & ENGINEERING CO. PVT.LTD.	P.K. TAGORE STREET, MAIN BUILDING KOLKATA-WEST BENGAL	GALVANISATION TO BE DONE AT ITS OWN PLANT OR FROM BHEL-PEM APPROVED GALVANIZERS. ADDITIONAL WORKS AT "SANKRAIL INDUSTRIAL PARK, BHAGABATIPUR MAUJA, DHULAGARH, HOWRAH-711302" APPROVED
		RABI ENGINEERING WORKS PVT. LTD.	R.N. GUHA ROAD, DUM DUM, KOLKATA-WEST BENGAL	GALVANISATION TO BE DONE AT ITS OWN PLANT OR FROM BHEL-PEM APPROVED GALVANIZERS.
		SARAL INDUSTRIES	INDUSTRIAL AREA-1 SULTANPUR ROAD RAE BARELI-UTTAR PRADESH	REGISTERED IN PERMANENT CATEGORY ALONG WITH GALVANIZER M/S SARAL PROJECTS AND PROCESSORS , ,
		UNITECH FABRICATORS AND ENGINEERS PVT LTD	M.B.RAOD , BIRATI KALABAGAN KOLKATA KOLKATA-WEST BENGAL	GALVANISATION TO BE DONE AT ITS OWN PLANT OR FROM BHEL-PEM APPROVED GALVANIZERS.
49	CABLE TRAY SUPPORT SYSTEM-WELDED(UNGALV)	RASHTRIYA ISPAT NIGAM LIMITED	AMBAWADI AHEMDABAD-	
		STEEL AUTHORITY OF INDIA LTD.	ISPAT BHAWAN LODI ROAD NEW DELHI-	
50	CABLE TERM.& JOINT KITS	3M ELECTRO AND COMMUNICATION INDIA P.LTD	RAJENDRA PLACE, DELHI	
		HARI CONSOLIDATED PVT.LTD.,NEW DELHI	JHANDEWALAN, NEW DELHI-DELHI	HEAT SHRINKABLE TYPE ONLY.
		RAYCHEM RPG PRIVATE LIMITED	JANAKPURI NEW DELHI	
		YAMUNA CABLE ACCESSORIES PVT. LTD.	AMBALA ROAD, JAGADHRI YAMUNANAGAR-HARYANA	
51	LIMIT SWITCH	BCH	NEW DELHI	
		SIEMENS	NEW DELHI	
		JAIBALAJI	NEWDELHI	
52	ANNUNCIATOR	IIC	MUMBAI	
		MINILEC	AHEMDABAD	
		PROCON	CHENNAI	

53	INTERPOSING RELAY	ECONIX	MUMBAI	
		PHEONIX	DELHI	
54	SELECTROR SWITCH	SCHENIDER	INDIA	
		SIEMENS	INDIA	
		L&T	INDIA	
		KAYCEE	INDIA	
55	INDICATION LAMPS, PUSHBUTTON, AUX. CONTACTOR, AUX. RELAYS	SCHENIDER	INDIA	
		SIEMENS	INDIA	
		ABB	INDIA	
		L&T	INDIA	
56	TIMER	BCH	INDIA	
		EAPL	INDIA	
57	PNEUMATIC ACTUATOR/CYLINDER(METALLIC)	SCHRADDER	MUMBAI	
		NUCON	HYDERABAD	
		ROTEX	MUMBAI	
		VAAS	CHENNAI	

The make of Sub-vendor items shall be generally as indicated above which is subject to customer / BHEL approval during detail engineering.

Make of any unlisted items shall be subject to customer / BHEL approval during detail engineering. For such items, bidder to furnish list of sub-vendors during detail engineering stage for Customer / BHEL's review and approval. Bidder shall furnish following supporting documentation within 1 month of placement of LOI. Thereafter no request for additional sub-vendor shall be entertained.

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

b) Documentation in the form of certificate that the equipment/system has been operating satisfactorily for two years as on the scheduled date of bid opening.

The successful bidder will get the makes of all items approved from Customer/ Consultant during detail engineering within two months of placement of LOI. The complete list will be necessarily be submitted within one month of placement of LOI to ensure timely placement of order for BOIs

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

Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structural, flanges; counter flanges etc. from approved sub vendor only.

SUB-SECTION–E-60

INDICATIVE VENDOR LIST

Disclaimer for Indicative Vendor List

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

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

1.3 In case the successful bidder chooses to propose additional sub-vendors with relevant experience after the award of the contract such sub-vendors will be considered in terms of Clause no: 19.1 of GCC, provided the proposals are received sufficiently in time: 90 days prior to ordering date of a Bought Out Items/Start of Manufacturing so as not to impede the progress of the contract.

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

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

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

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

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13	AIR COOLED OIL GUN ASSEMBLY	I			BHEL	TRICHY	A				
		I			SIGMA POWER	TRICHY	A				
		I			DOOSAN	SOUTH KOREA	A				
14	HFO/LFO PUMPS										
		I			ALEKTON	CHENNAI	A				
		I			UT PUMPS	FARIDABAD	A				
		I			ROTO PUMPS LTD.	GREATER NOIDA	A				
		I			ALLWEILER INDIA PVT.LTD.	GERMANY	A				
		I			BOURMANN	GERMANY	A				
		I			TUSHACO PUMPS PVT LTD/ALLWEILER INDIA PVT.LTD.	DAMAN	A				
		I			LEISTRITZ PUMPEN GmbH	GERMANY	A				
		I			KRAL	AUSTRIA	A				
15	SOOT BLOWERS(LRSB, WALL DESLAGGER, ROTARY BLOWER, TEMP PROBE)	I			BHEL	TRICHY	A				
		I			CLYDE BERGMANN	NOIDA	A		UNDER THE SUPERVISION OF M/S CLYDE BERGMANN, GERMANY		

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23	METALLIC EXPANSION JOINT FOR PIPES	I			METALLIC BELLOWS	CHENNAI	A		UP TO 2200 NB		
		I			LONESTAR	CHENNAI	A		UP TO 2200 NB		
		I			FLEXICON BELLOWS & HOSES	VADODARA	A		UP TO 2200 NB		
					FLEXATHERM EXPANLLOW PVT LTD	VADODARA	A		UPTO 2000 NB		
24	LIGHT BONDED MINERAL WOOL	II			PUNJSTAR INSULATION FIBRE COMPANY	BHILAI	A				
		II			SHREERAM EQUITECH	DURG	A				
		II			GOENKA ROCKWOOL (INDIA) LTD	RAIPUR	A				
		II			LLOYDS INSULATION	BHILAI	A				
		II			THERMOCARE ROCKWOOL PVT LTD	RAJNANDGAON	A				
		II			MINWOOL ROCK FIBRES LTD	RAJNANDGAON	A				
		II			LAPINUS ROCKWOOL LTD	GWALIOR	A				
		II			ROCKWOOL INDIA	MEDAK AP	A				
		II			DHANBAD ROCKWOOL INSULATION PVT LTD	DHANBAD	A				
		II			MINSULATE MFG CO. LTD	JAMSHEDPUR	A				
		II			POLYBOND PROJECTS PVT LTD	DURG	A				
		II			HI-TECH ROCK FIBRE LTD	RAJNANDGAON	A				
		II			ROCKWOOL INDUSTRIES	BHILAI	A				

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		I			BABCOCK WILCOX ESPANOLA	SPAIN	A		CONVENTIONAL VALVES -CAST GATE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 10 INCH CAST GLOBE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 3 INCH		
		I			HP VALVES OLDENZAAL B V	NETHERLAND	A		CONVENTIONAL VALVES -CAST GATE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 10 INCH CAST GLOBE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 3 INCH		
27	SAFETY VALVES(SPRING TYPE)	I			DRESSER INDUSTRIES	USA	A				
		I			SAMPELL AG	GERMANY	A				
		I			TYCO (PENTAIR VALVES & CONTROLS	USA	A				
		I			FUKUI SEISAKUSHO CO LTD	JAPAN	A				
		I			RIENEKE GMBH	GERMANY			HYDRAULIC TYPE		
		I			BOPP & REUTHER	GERMANY	A		HYDRAULIC TYPE		
		I			MIEWA CORPORATION	JAPAN	A		(1) SAFETY VALVE SIZE 1/2" TO 6" & 150 TO 4500 CLASS		
		I			BHEL	TRICHY	A				
		I			PENTAIR SANMAR LTD	PUDUKOTTAI	A		AUX STEAM SYSTEM: UP TO 6" SIZE AND CLASS UP TO 600		

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		I			FAINGER LESER VALVES P LTD	AURANGABAD	A		SIZE(INELT/OULET): 200/300 MM APPLICABLE TO MAX DESIGN TEMPERATURE:474 DEG C & PRESSURE:47 KG		
28	ELECTROMATIC RELIEF VALVE (ERV)	I			VALVES TECHNOLOGIES	USA	A		(A) 1.5"X3" CLASS 3100- F91 MATERIAL (B) 2.5"X4", CLASS 1500-F91 MATERIAL		
		I			FUKUI SEISAKUSHO CO LTD	JAPAN	A				
		I			SAMPELL AG	GERMANY	A				
		I			DRESSER INDUSTRIES	USA	A				
		I			MIEWA CORPORATION	JAPAN	A		SIZE UPTO 65MM & UPTO 4500 CLASS		
29	PLUG VALVE	I			FLOW SERVE INDIA CONTROLS	KANCHIPURAM	A		SIZE: 25 TO 300 MM, CLASS 150 & 300		
		I			3Z CORP.	SOUTH KOREA	A				
		I			HAWA VALVES	MUMBAI	A		UP TO 10" SIZE AND 300 CLASS		

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		I			FEEDERS LIOYDS	SIKANDRABAD	A		PRIMARY STRUCTURE - MAIN COLUMNS, AUX COLUMNS, BUILT UP BEAMS, BOXES, BUCKSTAY (WELDED & BOLTED TYPE)		
		I			L&T HEAVY FORGING & SPECIAL STEEL	HAZIRA	A		CEILING GIRDER		
		I			VASAN INDUSTRIES	PUDUKKOTTAI	A		BOILER PRIMARY STRUCTURES(WELDED AND BOLTED TYPE)		
		I			REGIONAL ENGINEERING WORKS	THUVVAKKUDY			BOILER PRIMARY STRUCTURE(WELDED AND BOLTED TYPE)		
		I			VRINDA ENGINEERS	PANAGARH, WB	A		COAL BUNKERS		
		I			GREAT INDIA FABRICATORS	YAMUNANAGAR	A		BOILER PRIMARY STRUCTURES EXCLUDING CEILING GIRDER(WELDED AND BOLTED TYPE), LIMITATIONS AS PER APPROVAL CONDITIONS		
31	ELECTRO FORGED GRATINGS	II			INDIANA GRATINGS PVT. LTD	PUNE	A				
		II			KARDEANAND UDYOG	PUNE	A				
		II			PREMIER POWER PRODUCTS LTD	HOWRAH	A				
		II			BHOLA RAM STEEL PVT. LTD	PATNA					
		II			PINAX STEEL INDUSTRIES PVT LTD	PATNA	A				

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		II			GREATWELD STEEL GRATING PVT. LTD	PUNE	A				
		II			VIN FAB ENGG. PVT LTD.,	MUMBAI	A				
32	TANKS & VESSELS(IBD, CBD, FLASH TANK ETC)	I			KPHE	SOUTH KOREA	A				
		I			SV TANKS & VESSELS	MUMBAI	A				
		I			PROGEN SYS TECH LTD	CHENNAI	A		UP TO 4 KSC PR		
		I			FAB TECH	PUNE	A				
		I			UNITECH MACHINES LTD	SAHARANPUR	A		UP TO 10 KSC PR		
		I			SEAM IND P LTD	NAGPUR	A		UP TO 10 KSC PR		
		I			SHAKTI HI TECH CONST PVT LTD	CHENNAI	A		UP TO 10 KSC PR		
		I			SOUTHERN HEAVY ENGG & FAB PVT LTD	CHENNAI			UP TO 10 KSC PR		
		I			ALTECH INFRASTRUCTURE(I) PVT LTD	ALWAR	A		UP TO 16 KSC PR		
		I			SEAM INDUSTRIES PVT LTD	NAGPUR	A		UP TO 16 KSC PR		
33	FITTINGS(GRADE 91/92)	I			PETROL RACCORD SPA	ITALY	A		FORMED AND FORGED FITTINGS 91/92 GRADE		
		I			BOKOYOUNG METAL CO.	SOUTH KOREA	A		FORGED FITTINGS AS PER SA-182 F92 GRADE (REDUCERS, NOZZLE, HALF COUPLING ETC.)		

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	NOTE -1 : For final Sub-QR approval , document required to be submitted as per Sub-QR requirements given in the specification. **NOTE-2:** Vendors under 'A' are approved and accepted by NTPC with/without conditions in the past. Similar conditions as the case may be for the vendor shall be applicable for this project and tied up in the quality plan. **NOTE-3:** Predespatch inspection for Alloy/SS Grades needs to be tied up by Main contractor or Third-party inspection agency as required. **NOTE-4 : ($)** Review of Mill TC for Raw Material to be done by NTPC and shall be included in the QP of corresponding equipment. **NOTE-5:** Raw Material for 91 and above Grade Material Fittings to be from NTPC approved sources as per Raw Material vendor List. **NOTE-6:**For Motorized/Pneumatic actuated valves the suppliers for actuators shall be from NTPC approved list, Refer NTPC C&I list.										

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	LEGENDS/ संकेतिका SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY /प्रणाली आपूर्तिकर्ता / सब – वेंडर की स्वीकृति की स्थिति की श्रेणी (SHALL BE FILLED BY NTPC एनटीपीसी द्वारा भरा जाए A – **For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list along with the condition of approval, if any./** इन मदों के लिए प्रस्तावित वेंडर एनटी स्वीकार्य है। अनुमोदन की शर्त, , यदि कोई हो, के साथ-साथ पत्र "क" में इंगित किया जाए । DR – **For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list.** एनटीपीसी द्वारा इन मदों की समीक्षा के लिए "विस्तृत ब्यौरे की आवश्यकता" होगी। सूची में " में इंगित किया जाना चाहिए। **QP/INSPN CATEGORY**: क्यूपी / निरीक्षण की श्रेणी: **CAT-I** / श्रेणी- I: For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC. इन मदों के लिए गुणवत्ता योजनाओं को एनटीप अनुमोदित किया जाता है और एनटीपीसी द्वारा अंतिम स्वीकृति भौतिक निरीक्षण के दौरान उपलब्ध गवाह के आधार पर दी जाएगी। **CAT-II** / श्रेणी- II: For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of do as per approved QP. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है। हालाँकि एनटीपीसी द्वारा कोई भौतिक निरीक्षण नहीं किया जाएगा। एनटीपीसी द्वारा अंतिम स्वीकृति अनुमो के अनुसार दस्तावेजों की समीक्षा के आधार पर दी जाएगी। **CAT-III/** श्रेणी-III : For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conf (COC) by Main Contractor. **UNITS/WORKS** इकाईयां / कार्य: Place of manufacturing/ निर्माण का स्थान Place of Main Supplier of multi units/works/बहु- इकाइयों / कार्यों के मुख्य सप्लाइर का स्थान.									

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					KSB	Pune	A				
					Hyundai	S Korea	A				
					KBL	Pune	A				
					Flowserve	Coimbatore	A				
	Debris Filter/ Self Cleaning Strainer	I			GEA-BGR	Chennai	A				
					Multitex	Gr.Noida	A				
52	LP Pipes & Fittings (CS & SS)	I			Remi	Tarapur,India	A		SS		
					Apex	Alwar	A		SS (up to 150NB)		
					Ratnamani	Ahmedabad	A		SS		
					ISMT	India	A		CS (up to 400 NB)		
					Maharashtra Seamless Ltd.	Maharashtra	A		CS (up to 400 NB)		
					Tube Products Incorporate	Ahmedabad	A				
					TK Corporation	S Korea	A				
					Dee development	Palwal	A				
					Jindal Saw	India	A		CS (up to 400 NB)		
					Tata	India	A		ERW		
					Surya	India	A		ERW		
					JINDAL PIPES LTD	India	A		ERW		
					WELSPUN	India	A		ERW		
					Lalit Pipes & pipes Ltd.,	Thane	A		EFW Pipes		
					Ratnamni Metals and Tubes Ltd.,	Gandhinagar	A		EFW Pipes		
53	Butterfly Valves (* Also for steam services)	I			Fouress Engg. *	Bangalore	A		upto 2600 NB		
					IL *	Palakkad	A		upto 2200 NB		
					BHEL *	Bhopal, India	A				
					Kriloskar Bros. Ltd	Pune	A				
					L&T	Chennai	A				
					Trillium Flow	Hubli	A				
					Tyco	Halol	A				
					L&T	Coimbatore	A				

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		I			NADI AIRTECHNICS PVT LTD	CHENNAI	A		Up to 15000 CMH	
					ADVANCE VENTILATION PVT LTD	KUNDALI. SONEPAT	A		up to 40000 CMH	
					SK SYSTEMS PVT LTD	KUNDALI PHASE-II, SONEPAT, HARYANA	A		up to 50000 CMH	
					ALMONAROD (P) LIMITED	CHENNAI	A		Up to 14000 CMH	
4	PIPES-MS- (BLACK/ GI) AS PER IS IS:3589 >1000NB	I			STEEL AUTHORITY OF INDIA LIMITED	ROURKELA	A			CW,CT,MUW
					WELSPUN	ANJAR	A		SAW UPTO 2600 NB	
					WELSPUN	BHARUCH	A		SAW UPTO 1300 NB	
					MAN INDUSTRIES	INDORE	A		SAW UPTO 1400 NB	
					SAMSHI	VADODARA	A		SAW 450 TO 2540 NB	
					MUKAT TANKS & VESSELS	TARAPUR	A		SAW 200 TO 1200 NB	
					MUKAT PIPES	RAJPURA	A		SAW UPTO 1800 NB	
					LALIT PIPES AND PIPES LTD	THANE	A		SAW 350 TO 1400 NB	
					RATNAMANI	CHATRAL	A		SAW 600 TO 2600 NB	
					RATNAMANI	KUTCH	A		SAW 400 TO 3600 NB	
					PSL HOLDINGS LIMITED	DAMAN	A		SAW 450 TO 1600 NB	
					PSL INTERNATIONAL LTD.	CHENNAI	A		SAW 450 TO 1600 NB	
					PSL LIMITED	KUTCH	A		SAW 450 TO 1600 NB	
					PSL LIMITED	VISAKHAPATNAM	A		SAW 450 TO 1600 NB	
					JCO PIPES	CHHINDWARA	A		SAW UPTO 1600 NB	
					SURYA GLOBAL STEEL TUBE LTD	ANJAR	A		SAW UP TO 2032 OD	
					CAPACITE STRUCURES PVT LTD	THANE	A		406.4 MM TO 3874 MM OD	
5	PIPES & FITTINGS-GRP	I			EPP COMPOSITES PVT LTD	RAJKOT			UP TO 900MM	WTP,CT
					GRAPHITE INDIA	NASIK			UP TO 1000MM	
					SHRIRAM SEPL COMPOSITES LTD	CHENNAI			UP TO 1100MM	
					BALAJI FIBER REINFORCE PVT LIMITED	VADODARA			UP TO 650MM	
					MEGHA FIBRE GLASS INDUSTRIES PVT LTD	MEDAK			UP TO 900MM	
6	SERVICE VESSEL-CPU & OTHER PR VESSELS >= 10 BAR WORKING PRESSURE	I			DRIPLEX WATER ENGINEERING INTERNATIONAL PVT LIMITED	BHADARBAD	A			WTP,CPU,CAS,CHP, LHP&GHP,AHP
					BGR ENERGY SYSTEMS LTD (ENVIRONMENTAL ENGG. DIV.)	PONNERI	A		UPTO 3000MM DIA & THICKNESS UPTO 28 MM	
					ISHAN EQUIPMENTS PRIVATE LIMITED	VADODARA	A		UPTO 2900 MM DIA & THICKNESS UPTO 28 MM	
					JASMINO POLYMERTECH PVT LTD	TALOJA	A		DIA 2800MM, THICNKESS 25MM DESIGN PRESSURE UP TO 47.5 KSC	

एनटीपीसी NTPC	Project/ परियोजना : TALCHER-III Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)	DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 04-02-2022 PAGE/ पृष्ठ :	

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					BELCO POLLUTION CONTROL PVT LTD	GREATER NOIDA	A		UPTO 3200MM DIA & THICKNESS UPTO 30 MM	
7	PUMPS- HORIZONTAL & VERTICAL CENTRIFUGAL -UP TO 300KW	(UP TO 60 KW CAT-II , ABOVE 60 KW CAT-I)			KIRLOSKAR BROTHERS LTD	KIRLOSKARWADI	A			WTP,CW, CPU,FDPS,CHP, LHP &GHP,AC & VENTILATION,MUW, AHP
					WILO MATHER & PLATT	PUNE	A			
					WILO MATHER & PLATT	KOLHAPUR	A			
					SAM TURBO	COIMBATORE	A		FLOW UP TO 1500 CUM/HR AND POWER RATING UP TO 425 KW	
					FLOWMORE LTD	GHAZIABAD	A			
					BEST AND CROMPTON	CHENNAI	A			
					JYOTI LTD	VADODARA	A			
					WPIL	GHAZIABAD	A			
					KISHORE PUMPS	PUNE	A		UPTO 500M3/HR ONLY RUBBERLINED PUMPS ALSO	
					GRUNDFOS PUMPS INDIA PVT LTD	CHENNAI	A		HORIZONTAL UP TO 30 KW ONLY AND VERTICAL UP TO 45 KW ONLY (FOR	
					SINTECH PRECISION	GHAZIABAD	A		HORIZONTAL UP TO 400 KW MOTOR RATING AND VERTICAL UP TO 30 KW MOTOR RATING	
					KSB	PUNE	A			
					KSB	NASHIK	A			
					FLOWSERVE INDIA CONTROLS PVT LTD	COIMBATORE	A		HOIZONTAL CENTRIFUGAL PUMP UP TO 75 KW ONLY	
					SU MOTOR	MUMBAI	A		HORIZONATL UPTO 500M3/HR ONLY RUBBERLINED PUMPS AND VERTICAL CENTRIFUGAL PUMPS UP TO 100CMH ONLY	
					BHARAT PUMPS AND COMPRESSORS	NAINI	A		FLOW UP TO 2200 M3/HR AND HEAD UP TO 60 MWC	
8	PUMPS -VT -UP TO 300KW	I			FLOWMORE LTD	GHAZIABAD	A			WTP, CW
					KIRLOSKAR BROTHERS LIMITED	KIRLOSKARWADI	A			
					WPIL LTD	KOLKATA	A			
					WPIL LTD	GHAZIABAD	A			
					JYOTI LTD	VADODARA	A			
					XYLEM WATER SOLUTIONS INDIA PVT LTD	VADODARA	A			
					FLOWSERVE INDIA CONTROLS PVT LTD	COIMBATORE	A		UP TO 1025 KW	
					SINTECH PRECISION	GHAZIABAD	A			
					WILO MATHER & PLATT	PUNE	A			

एनटीपीसी NTPC	Project/ परियोजना : TALCHER-III Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब -वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)	DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 04-02-2022 PAGE/ पृष्ठ :	

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9.A	VALVE-DUAL PLATE CHECK > 600MM OR CLASS > 300 (VALVE- DUAL PLATE CHECK UP TO 600MM & CLASS 300: CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			ADVANCE VALVE PVT LTD	GR. NOIDA	A		DUAL PLATE CHECK VALVES CI UPTO 1000 NB CLASS 125, DUPLEX SS UP TO 600NB CLASS 600.	WTP,CW, CPU,FDPS,CAS,LP PIPING
					LEADER VALVES	JALANDHAR	A		UP TO 900MM CLASS 150 , SS 200NB CLASS#300	
					R & D MULTIPLE	VALSAD	A		CI/ CS UP TO 800NB PN 10	
9.B	VALVE-BALL > 100 MM OR CLASS > 800; (VALVE- BALL UP TO 100 MM & CLASS 800:CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			TRILLIUM FLOW	HUBLI	A		SS BALL VALVES UP TO 500MM AND CLASS #600, CS BALL VALVES UP TO 250 MM AND CLASS# 900, CS/ SS BALL VALVES UP TO 100 MM AND CLASS # 1500.	WTP, CPU,FDPS,CAS,FOH,CHP, LHP&GHP,AHP
					MICRO FINISH VALVES PVT. LTD.	HUBLI	A		400NB CLASS#600 AND UP T0 600NB CLASS#300	
					FLOW CHEM INDUSTRIES	KALOL	A		100NB CLASS#600,200NB CLASS#300, 50 NB CLASS#800	
					L&T VALVES LIMITED	COIMBATORE	A		UPTO 150NB, CLASS #150/300, AND UPTO 50NB, CLASS #800	
					PRECISSION ENGG CO VALVES PVT LTD	NASIK	A		FCS UP TO 50NB CLASS 800, CCS UP TO 400NB CLASS 150.	
					BELGAUM AQUA VALVE PVT LTD	BELGAON	A		FCS UP TO 50NB CLASS 800, CCS UP TO 200NB CLASS 150.	
					G M ENGINEERING PRIVATE LTD	RAJKOT	A		UP T0 400 NB AND CLASS #600	
9.C	VALVE-BUTTERFLY > 600MM OR CLASS>150 (VALVE-BUTTERFLY UP TO 600MM & CLASS 150::CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			INTERVALVE POONAWALA LTD	PUNE	A		SGI / CI / D2 1400MM PN10, SGI / CI 1000MM PN16,CS/SS 500MM PN16, SS 400MM CLASS#300, MS FABRICATED UPTO 2000NB	WTP, CW,CT,CPU,FDPS,CAS, AC& VENTILATION, MUW,CHP, LHP&GHP,LP PIPING,AHP
					TRILLIUM FLOW	HUBLI	A		CI/ DI BUTTERFLY VALVE UP TO 1000MM AND PN16 AND UP TO 1800MM AND PN10,CCS UP TO 1050MM CLASS 150 AND UP TO 1800MM AND PN16 SS - UP TO 400NB PN-16 ,FABRICATED 800MM CLASS#150.	
					PENTAIR VALVES	HALOL	A		FOR SS UP TO 500 NB PN-10, CI- UP TO 900NB PN-10, UP TO 500NB PN-16, 450MM CLASS#300., MS FABRICATED UPTO 2800NB, PN6.	
					FOURES ENGINEERING	BANGALORE	A		CAST SGI/CI/ MS FABRICATED- UP TO 1200 PN-10, UP TO 350 PN-16 ,2400 MM	
					KIRLOSKAR BROTHERS LTD	KONDHAPURI	A		CAST SGI/CI/CS 1400 MM PN16 , SS 300 MM PN16 , 1800MM CLASS 150, MS FABRICATED 900 NB PN40,MS FABRICATED 2800NB, PN6.	
					R & D MULTIPLE	VALSAD	A		CAST SGI/CI/MS FABRICATED- UP TO 1800 MM PN-10/CLASS # 75, ,1100MM PN25,1400MM CLASS#150 ,MS FABRICATED	
					ADVANCE VALVES PVT LTD	GREATER NOIDA	A		METAL SEATED, TRIPLE ECCENTRIC, SS BFV OF SIZE UPTO 100NB, AND PRESSURE RATING UPTO CLASS #300.	
					BRAY CONTROLS INDIA PVT. LTD	KANCHIPURAM	A		UPTO 450 MM AND CLASS#600	
					INSTRUMENTATION LTD.	PALAKKAD	A		UPTO 2200NB CLASS # 75	
					HAWA ENGINEERS	AHMEDABAD	A		CI/ CS & FABRICATED UPTO 1200MM, CLASS #150, SS UPTO 250MM, CLASS#150	
					CRANE PROCESS FLOW	SATARA	A		UP TO 900MM PN10	

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					L & T VALVES LIMITED	COIMBATORE	A		UP TO 900MM CLASS 150	
					DEMBLA VALVES	THANE	A		UP TO 2200MM CLASS#75	
9.D	VALVE-CONVENTIONAL GATE / GLOBE / CHECK > 600NB OR CLASS > 300	II			LEADER VALVES	JALANDHAR	A		CS GATE 600MM CLASS#600, SS GLOBE 600MM CLASS#600, CS CHECK 600MM AND CLASS#600	WTP, CW,CT,CPU,FDPS,CAS, AC& VENTILATION, MUW,CHP, LHP&GHP,LP PIPING,AHP
					HAWA ENGINEERS	AHMEDABAD	A		FCS / FSS 50 NB CLASS 800.	
					FOURES ENGINEERINGS	THANE	A		400NB CLASS 600 AND 50NB CLASS 800.	
					BHEL IVP	GOINDWAL	A		GATE UP TO 300 NB CLASS 600. GLOBE 250 NB CLASS 400, CHECK 150NB CLASS 600.	
					HITECH ENGG PVT LTD	AHEMDABAD	A		50 NB CLASS 800.	
					KSB PUMPS LTD	COIMBATORE	A		300NB CLASS 2500.	
					NITON VALVES INDIA PVT LTD	NAVI MUMBAI / AURANGABAD	A		CS GATE 900 NB CLASS 600, CHECK 300 NB CLASS 600.	
					L&T VALVES LIMITED	COIMBATORE			650 MM CLASS 600, 50 NB CLASS 800.	
					TRILLIUM FLOW	HUBLI	A		CONVENTIONAL CCS GATE / GLOBE / CHECK VALVES UP TO 600MM AND CLASS # 1500, CSS GATE/ GLOBE/ CHECK VALVES UP TO 200MM AND CLASS # 600, FCS GATE / GLOBE / CHECK VALVES UP TO 50MM AND CLASS # 2500.	
9.E	VALVE- DIAPHGRAGM TYPE	I			CRANE PROCESS FLOW	SATARA	A		UP TO 300NB PN10	WTP,CPU
					WEIR BDK	HUBLI	A		UPTO 250 NB - PN 10, 350MM PN6	
					PROCON ENGINEERS	MUMBAI	A		UPTO 200 NB AND PN 10/CLASS #150	
9.F	VALVE-PLUG > 100 MM OR CLASS > 800(VALVE-PLUG UP TO 100 MM & CLASS 800:CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			TRILLIUM FLOW	HUBLI	A		SOFT SEATED 400MM AND CLASS #150, 300NB CLASS#300	WTP,CPU,CHP, LHP&GHP, FOH,AHP
					XOMOX SANMAR	TRICHY	A		UP TO 600MM AND CLASS#300	
					FLOWSERVE INDIA CONTROLS	CHENNAI	A		METALLIC SEATED 400NB CLASS#150, 300NB CLASS #300, 50NB CLASS #800	
10	PUMP -SUBMERSIBLE>= 30KW	I			KSB	NASHIK	A		130 KW	WTP,CT, CPU,CHP, LHP&GHP, FOH,AHP.LP PIPING,FDPS
					KIRLOSKAR BROTHERS LTD	KIRLOSKARWADI	A			
					AQUA MACHINERY	AHMEDABAD	A		UP TO 235 KW	
					WPIL	GHAZIABAD	A			
11	RUBBER EXPANSION JOINT>=1600NB (RUBBER EXPANSION JOINT < 1600NB: CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			CORI ENGINEERS PVT LTD	CHENNAI	A		UPTO 2800 MM	ACW, ECW, CW,CT
					SRM EXOFLEX PVT LTD	KOLKATA	A		UPTO 2800 MM	
12	FAN ASSEMBLY-COOLING TOWER				PAHARPUR COOLING TOWERS LTD	SAHIBABAD	A		WITH SOLID FAN BLADES 288" AND 336 " DIA, WITH FOAM CORED FAN BLADES WITH 10METERS AND 10.97 METERS	CT
					PAHARPUR COOLING TOWERS LTD	BHASA	A		60" TO 288" FAN DIA	
					PAHARPUR COOLING TOWERS LTD	KOLKATA	A		60" TO 288" FAN DIA	

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1	BRANCH PIPE , COUPLING & NOZZLE (SS & GM)	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					FDPS
2	FIRE EXTINGUISHER	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					FDPS
3	WATER MONITOR	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					
4	PIPES-MS- (BLACK/ GI) AS PER IS:1239 & IS:3589 UPTO 1000 NB	II			(BIS MARKED, MANUFACTURERS WITH VALID BIS LICENSE)					WTP,CW,CT,CPU,FDPS,AC&VENTILATION,CHP,LHP&GHP,AHP
5	FIRE HOSE	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					FDPS
6	HYDRANT VALVE	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					
7	PIPES FOR IDLERS IS 9295	III			BIS APPROVED SOURCES WITH VALID BIS LICENSE					FDPS
8	BLOWERS -CENTRIFUGAL >=5KW	II			MAIN CONTRACTOR APPROVED SOURCES					WTP
9	ClO2 GENERATOR	II			MAIN CONTRACTOR APPROVED SOURCES					WTP
10	JOINT /FITTING COATING MATERIAL(SLEEVE) FOR 3 LPE PIPES	II			MAIN CONTRACTOR TO PROPOSED VENDOR FOR NTPC APPROVAL					MUW
11	PIPING FABRICATION -HP>300PSI	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU
12	PUMP-METERING/DOSING	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU
13	PUMP - PP- ACID/ ALKALI UNLOADING	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU
14	PUMPS-SCREW TYPE	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU,FOH
15	RUBBER LINING OF TANKS/ VESSELS/ PIPES/ VALVES/FITTINGS	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU
16	RO PRESSURE TUBE	II			MAIN CONTRACTOR APPROVED SOURCES					WTP
17	TUBE SETTLER MEDIA	II			MAIN CONTRACTOR APPROVED SOURCES					WTP
18	WRAPPING & COATING MATERIAL -ANTI CORROSIVE TAPE	II			MAIN CONTRACTOR APPROVED SOURCES					CW,CT,LP PIPING, FDPS
19	DRIFT ELIMINATOR-PVC	II			MAIN CONTRACTOR APPROVED SOURCES					CT
20	FAN CYLINDER SEGMENTS-FRP-COOLING TOWER	II			MAIN CONTRACTOR APPROVED SOURCES					CT
21	COOLING TOWER FILLS	II			MAIN CONTRACTOR APPROVED SOURCES					CT
22	SHAFT-CARDON TYPE-CW PUMP	II			MAIN CONTRACTOR APPROVED SOURCES					CW
23	DUST EXTRACTION SYSTEM	I			MAIN CONTRACTOR's APPROVED SOURCES				BOIs SHALL BE FROM NTPC APPROVED SOURCES	CHP, LHP/GHP
24	DUST SUPPRESSION SYSTEM (PLAIN WATER)	I			MAIN CONTRACTOR's APPROVED SOURCES				BOIs SHALL BE FROM NTPC APPROVED SOURCES	CHP, LHP/GHP
25	DUST SUPPRESSION SYSTEM (DRY FOG)	I			MAIN CONTRACTOR's APPROVED SOURCES				BOIs SHALL BE FROM NTPC APPROVED SOURCES	CHP, LHP/GHP
26	PIPE-SS ASTM A 312	II			MAIN CONTRACTOR's APPROVED SOURCES					
27	PIPE-CS SEAMLESS ASTM A 106	II			MAIN CONTRACTOR's APPROVED SOURCES					

Note-1 Items for which Sub-QR is enviisaged, vendors are accepted subject to Sub-QR clearance from NTPC Engg.

A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list along with the condition of approval, if any./ इन मदों के लिए प्रस्तावित वेंडर एनटीपीसी को स्वीकार्य है। अनुमोदन की शर्त,, यदि कोई हो, के साथ-साथ पत्र "क" में इंगित किया जाए ।

DR – For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list. एनटीपीसी द्वारा इन मदों की समीक्षा के लिए "विस्तृत ब्यौरे की आवश्यकता" होगी। सूची में "DR" पत्र में इंगित किया जाना चाहिए।

QP / INSPECTION CATEGORY:

CAT-I / श्रेणी- I: For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है और एनटीपीसी द्वारा अंतिम स्वीकृति भौतिक निरीक्षण के दौरान उपलब्ध गवाह

CAT-II / श्रेणी- II: For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया

CAT-III/ श्रेणी-III : For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor.

UNITS/WORKS इकाईयां / कार्य: Place of manufacturing/ निर्माण का स्थान Place of Main Supplier of multi units/works/बहु- इकाइयों / कार्यों के मुख्य सप्लाइर का स्थान.

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33	132 KV cable termination & straight through jointing kits	CAT I							
					Iljin	South Korea	A		
					ABB Kabeldon	Sweden	A		
					Pfisterer AG	Switzerland	A		
					Tyco Electronics Raychem GmbH	Germany	A		
34	Air Insulated Non Segregated phase type LT busduct	CAT I							
					C&S Electric	G.Noida	A		
					C&S Electric	HARIDWAR	A		
					Unilec	Gurgaon	A		Upto 3200 A
					Stardrive	Chennai	A		
					Spaceage Swgr Ltd	Bawal	A		
					REEP	Chennai	A		
					Enpro	Chennai	A		
					Nitya Electrocontrols	Noida	A		
34.1	Sandwitched type LT Busduct	CAT I							
					Henikwon	Malaysia	A		
					C&S	HARIDWAR	A		
35	SPBD	CAT I							
					BHEL	Rudrapur	A		
					C&S	Greater Noida	A		
					C&S	Haridwar	A		
					GODREJ & BOYCE MANUFACTURING COMPANY LTD	Bangalore	A		
					Powergear	Hindupur	A		
					Powergear	Chennai / Bangalore	A		
					KGS Engg.	Chennai	A		
36	LT MOTOR	CAT I							
					ABB	FARIDABAD	A		UPTO 55KW
					ABB	BANGALORE	A		
					JYOTI LTD.	VADODARA	A		
					TIPM	JAPAN	A		UPTO 15 KW (NON FLAME PROOF)
					HYOSUNG	SOUTH KOREA	A		
					WEG	BRAZIL	A		
					HYUNDAI	SOUTH KOREA	A		
					LHP	SOLAPUR	A		
					CGL	AHMEDNAGAR	A		RQP, FOR FLAME PROOF MOTOR
		Refer Note 7			TMEIC	JAPAN (NAGASAKHI)	A		
					NGEF	BANGALORE	A		UPTO 15 KW
					BHARAT BIJLEE	MUMBAI	A		RQP, FOR FLAME PROOF ALSO
					KEC	BANGALORE/ HUBLI*	A		*UPTO 90KW, RQP, FOR FLAME PROOF ALSO

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					MARATHON	KOLKATA	A		RQP (UPTO 690V & 600 KW) FOR FLAME PROOF ALSO
					ABB	SWEDEN	A		UPTO 55KW
					HAVELL	NEEMRANA	A		UP TO 90KW
					KAWAMATA	JAPAN	A		UP TO 75 KW
					TIPS	JAPAN	A		UP TO 45KW
36.1	**DC Motor**	**CAT I**							
					CGL	MANDIDEEP	A		
37	**LT VFD Control Panel**	**CAT I**							
					Powertech	Sonepat	A		Upto 55 KW with following conditions: i) VFD from Schneider- France, upto 415V, 50KW. ii) Enclosure & bought out items shall be from NTPC acceptable makes & iii) Engineering support for integration will be provided by Schneider/ Authorized integrator of Schneider
					DANFOSS	Oragadam	A		(upto 690V, 1200kW), VFD drives with VFD sourced from Danfoss-Denmark/USA and Panel sourced from Rittal
					YASAKAWA	Japan	A		VFD from Yasakawa- Japan, Upto 415V, 132KW
					ROCKWELL AUTOMATION	SAHIBABAD	A		VFD from Rockwell(Allen Bradley)- USA, (Upto 415 V, 600 KW)
					ABB	BANGALURU	A		VFD from ABB-Finland, Upto 690V, 750 KW
					SIEMENS	NASIK	A		VFD from SIEMENS- Germany, Upto 690V,900KW
					VACON	BANGALORE	A		VFD(NXP model) from VACON Finland, upto 400KW,415V and upto 900KW, 690V

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11	ON LOAD TAP CHANGER	CAT III							
12	OFAF COOLER	CAT III							
13	RADIATORS	CAT II							
14	REGNENERATIVE MAINTENANCE FREE BREATHER	CAT III							
15	CMS System	CAT I							
16	CMS PANEL	CAT II							
17	TRANSFORMER TESTING & MAINTENANCE EQUIPMENTS	CAT III							
	L2 LIST OF BUS DUCTS								
1	Air Pressurisation Equipment	CAT II							
2	Hot Air Blower	CAT II							
3	LAVT Cubicle / NG Cubicle/ Marshalling Box	CAT II							
4	CT for IPBD	CAT II							
5	Epoxy Seal off bushing / Insulators	CAT II							
NOTE	**L2 LIST OF SWITCH GEAR**								SOURCES FOR THESE ITEMS SHALL BE FINALIZED DURING DETAILED ENGINEERING AND MQP FINALIZATION
1	Numerical Relays	CAT I							SUB-QR CLEARED VENDORS ARE ACCEPTABLE FOR NUMERICAL RELAYS
2	Silver Plating	CAT III							
3	LV Air Circuit Breaker	CAT I							
4	LT CT/PT/CBCT/ Control Transformer	CAT II							
5	MV Vacuum Type Circuit Breaker	CAT I							
6	MV CT / PT & CBCT	CAT I							
7	MCBs	CAT III							
8	ENERGY METER	CAT III							
9	H.V. Fuse	CAT III							
10	Terminal Blocks (Control)	CAT III							
11	Surge Capacitors	CAT II							

NOTES:

Note - 1 : Vendors to submit project specific documents as per Sub-QR requirements in case the Vendor is approved under collaboration agreement.

Note - 2: Vendors under 'A' are approved and accepted by NTPC with/without conditions in the past. Similar conditions as the case may be for the vendor shall be applicable for this project and tied up in the quality plan.

Note - 3: Main contractor approved sub vendors are acceptable those are evaluated / assesesed as per Main contractor Quality Management System for vendor approval. Main contractor to inform the finaly selected vendor to NTPC as soon as PO is placed for these items. In case of sub-QR Note-1 is also applicable.

Note - 4 : BOI shall be reviewed and finalised during MQP approval for items/ systems where ever applicable.

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S. N. क्र.सं	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी

Note - 5: Category of inspection for LT Cables:

	For Total Contract Quantity per Size	*Category Of Inspection*
	For cable total quantity ≤ 2.5 KM	Cat-III - submission of TC & Certificate of Conformance by Main Contractor for the manufacturers having successfully supplied to any NTPC project-site through Corporate contracts for atleast 2 years
	For cable total quantity above 2.5 km & up to ≤ 10 km per size/ type	Cat-II for the manufacturers having successfully supplied to any NTPC project-site through Corporate contracts for atleast 2 years
	For cable total quantity above 10 km per size/ type	Cat-I

Note - 6: Category of inspection for Cable Trays & Cable Tray Flexible Support System:

	For Total Contract Quantity per Size	*Category of Inspection*
	For cable total quantity ≤ 2.5 KM	Cat-III - submission of TC & Certificate of Conformance by Main Contractor for the manufacturers having successfully supplied to any NTPC project-site through Corporate contracts for atleast 2 years
	For cable total quantity above 2.5 km & up to ≤ 10 km per size/ type	Cat-II for the manufacturers having successfully supplied to any NTPC project-site through Corporate contracts for atleast 2 years
	For cable total quantity above 10 km per size/ type	Cat-I

Note - 7:

i) For Motors less than 50 KW: CAT-III. Acceptance of Motor less than 50 KW is based on COC of the Manufacturer and the Main Contractor confirming as follows: "It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate and tested in accordance with approved drawing /data sheets".

ii) For Motors 50 KW and less than 75 KW : CAT- II. Acceptance of Motor is based on NTPC review of Routine Test inspection report as per **IS: 12615** / applicable standards duly witnessed by main contractor along with COC of the Manufacturer and the Main Contractor confirming as follows: "It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing /data sheets".

iii) For Motors 75 KW & above : CAT- I . AS PER NTPC APPROVED QUALITY PLAN (To be submitted seperately for NTPC review & approval).

Note - 8:

NTPC approved Galvanizers:

	1. M/s M J Engg,Delhi	7. M/s National Galvanizer, Kolkata	13. M/s Gurpreet Galvanizer, Hyderabad	19. Unitech Fabricators & Galvanizers- Hoogly
	2. M/s A.V. Engg, Kolkata	8. M/s Unistar Galvanizer, Kolkata	14. M/s Sigma, Mumbai	
	3. M/s Inar Profiles, Vishakapatnam	9. M/s B.P. Project. Kolkata	15. M/s Radhakrishnan Shetty, Chennai	
	4. M/s Anand Udyog, Mumbai	10. M/s Bajaj Pune	16. Karamtara Mumbai	
	5. M/s Techno Engg,Chandigarh	11. M/s Electrocare Industries, Mumbai	17. Poona Galvanizers Pune	
	6. M/S Steelite Engg, Mumbai	12. M/s B.G. Shirke, Pune	18. Neha Galvanizer-Kolkata	

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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Note - 9: Relevant certificates shall be submitted for NTPC approval.Approval conditions attached to above identified vendors, as applicable shall be adhered to.

Note - 10 : Indigenous sub-vendors for Annexure-I items are acceptable subject to meeting the MLC (Minimum Local Content) in line with latest MOP order.

LEGENDS / संकेतिका

SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY /प्रणाली आपूर्तिकर्ता / सब –वेंडर की स्वीकृति की स्थिति की श्रेणी (SHALL BE FILLED BY NTPC एनटीपीसी द्वारा भरा जाएगा)

A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list along with the condition of approval, if any./ इन मदों के लिए प्रस्तावित वेंडर एनटीपीसी को स्वीकार्य है। अनुमोदन की शर्तें, , यदि कोई हो, के साथ-साथ पत्र "ए" में इंगित किया जाए ।

DR – For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list. एनटीपीसी द्वारा इन मदों की समीक्षा के लिए "विस्तृत ड्रॉर्ट की आवश्यकता" होगी। सूची में "DR" पत्र में इंगित किया जाना चाहिए।

QP/INSPN CATEGORY: क्यूपी / निरीक्षण की श्रेणी:

CAT-I / श्रेणी- I: For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है और एनटीपीसी द्वारा अंतिम स्वीकृति भौतिक निरीक्षण के दौरान उपलब्ध गवाह के आधार पर दी जाएगी।

CAT-II / श्रेणी- II: For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है। हालाँकि एनटीपीसी द्वारा कोई भौतिक निरीक्षण नहीं किया जाएगा। एनटीपीसी द्वारा अंतिम स्वीकृति अनुमोदित क्यूपी के अनुसार दस्तावेजों की समीक्षा के आधार पर दी जाएगी।

CAT-III/ श्रेणी-III : For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor.

UNITS/WORKS इकाईयां / कार्य: Place of manufacturing/ निर्माण का स्थान Place of Main Supplier of multi units/works/बहु- इकाइयों / कार्यों के मुख्य सप्लाइर का स्थान.

: Control measure of item covered in quality plan of main item.