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

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

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
21.	DG set Control panel / Synchronising panel	I	14			L&T-	Mumbai / Coimbatore	A		
						GE	Bangalore	A		
						Siemens	Mumbai	A		
						C&S Electric	Noida / Hardwar	A		
						Schneider	Nasik	A		
						Unilec	Gurgaon	A		
						Switching Circuits	Kolkata	A		
						Tricolite	Sahibabad / Mancsar	A		
						Hindustan Control & equipment Ltd	Kolkata	A		With fabrication & painting at unit II & MP Electrical Narendrapur
						Maktel	Vadodara	A		
						Jakson	Greater Noida	A		
						Vidyut Control	Gaziabad	A		
						Adlec Power	Rohad (Jhajjar)	A		
						Pyrotech	Udaipur	A		
						Anand Power Ltd.	Noida	A		
						Positronics	Vadodara	A		
						M/s Sterling Generators Pvt Ltd	Silvasa	A		For DG Set Control Panel only
						Contro & Schematics	Hyderabad	A		
22.	Industrial /welding receptacles & boxes	III				Schneider	Nasik	A		
						M/s BCH	Faridabad	A		

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
						M/s Ajmera	Mumbai	A		
						M/s. Sakthi & Crown	Chennai	A		
						Additionally Any make's model with VDE or CE or UL or CSA marking or BIS approved with CML no		Refer Note-3		
23.	Lighting mast with raise & lower type lantern carriage	I	15			M/s Bajaj	Pune	A		
						M/s Skipper	Howrah	A		
						M/s. B.P. Project,	Hoogly	A		
24.	Lighting pole / steel tubular pole	I	16			BIS licensee as per IS 2713 with valid CMLnumber		A		
25.	Lighting poles polygonal type	I				M/s Bajaj	Pune	A		
						M/s B.P. Projects	Hoogly	A		
26.	PVC conduit/hume pipe/lighting wire/GI pipes/HDPE pipe/Structural Steel	III				BIS licensee / ISI marked with valid CML number		A		
27.	GI steel rigid conduit/ epoxy conduit	III				BIS licensee with valid CML number		A		

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL. STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
28.	Trefoil clamps/Earthing & Lighting Protection Material/Sheet Steel/ FRP cable trench cover/drum lifting jack/Earth wire/ FRP/Aluminum Ladder/Dimmer & Passive Infrared Sensors	III				Main Contractor Approved Sources		Noted		
29.	FAN with regulators & Exhaust Fan	III				M/s Crompton		Noted		
						M/s Orient				
						M/s Khaitan				
						M/s Polar				
						M/s GEC				
						M/s Havells				
						M/s Bajaj				
30.	FQP of DG Set Installation.	I	G-01							
31.	FQP of Cables & Accessories	I	G-02							

Bharat Heavy Electricals Limited ★ PS-MKTG Delhi

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

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

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

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

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

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

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL. STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS

1. M/s M J Engg,Delhi 2. M/s Jamna Metal,Delhi 3. M/s A.V. Engg, Kolkata 4. M/s Inar Profiles, Vishakapatnam 5. M/s Anand Udyog, Mumbai 6. M/s Techno Engg,Chandigarh 7. M/S Steelite Engg, Mumbai	8. M/s National Galvanizer, Kolkata 9. M/s Unistar Galvanizer, Kolkata 10. M/s B.P. Project. Kolkata 11. M/s Bajaj Pune 12. M/s Electrocare Industries, Mumbai 13. M/s B.G. Shirke, Pune 14. M/s Gurpreet Galvanizer, Hyderabad 15. M/s Sigma, Mumbai	16. M/s Radhakrishnan Shetty, Chennai 17. Karamtara Mumbai 18.Poona Galvanizers Pune 19. Neha Galvanizer- Kolkata 20. Unitech galvanizers- Hoogly 21. Gurpreet galvanizers-Hyderabad 22- DMP Projects- Kolkata	*Additional galvanizer/s , if any , proposed by manufacturer through main contractor during detailed engineering shall be reviewed & assessed by NTPC as per the merits of the case.*

Note-3 : VDE / CE / UL / CSA MARKING FOR PRODUCT QUALITY: SELF CERTIFICATION/VALID CERTIFICATION FROM THIRD PARTY AGENCY OR BIS APPROVAL LETTER WITH CML NO. FOR PRODUCT QUALITY SHALL BE SUBMITTED FOR NTPC's INFORMATION

NTPC

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

(JATIN GAHLAWAT)
BHEL

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	PROJECT: PATRATU STPS EXPANSION PHASE - I (3X800MW) Package: EPC Sub Package : Switchyard Contract No.: CS-9585-601-2			ANNEXURE - LIST OF ITEMS REQUIRING QUALITY PLAN APPROVAL AND ACCEPTABLE SUB-VENDOR AS PROPOSED BY M/S. BHEL					DOC.NO. : 9585-601-2 REV.NO. : 0 DATE : 03.04.2017	
S.No.	Item Description	QP/Insp Cat	QP#9591-001C QVE-Q	QP Sub-schedule	QP Approval Schedule	Proposed Sub-Supplier	Place	Sub-Supplier Approval status/ category	Sub-supplier details submission schedule	Remarks
1	400 kV Gas Insulated Switchyard	I	10			GE T&D	CHENNAI	A		
	(Item subject to Sub QR approval)					HYOSUNG	KOREA	A		
						XIAN	CHINA	A		
						ABB	VADODARA	DR		
						SIEMENS	AURANGABAD	DR		
2	400kV Capacitor Voltage Transformers	I	50			GE	Hosur	A		
	(Item subject to Sub QR approval)					ABB	Vadodara	A		
						BHEL	Bhopal	A		
						CGL	Nasik	A		
3	400 kV Surge Arrestors	I	60			OBLUM	Hyderabad	A		
	(Item subject to Sub QR approval)					CGL	Nasik	A		
						LAMCO	Hyderabad	A		
4	400 kV Wave Trap	I	70			GE	Hosur	A		
						BPL	Palghat	A		
						BPEG	CHINA	A		
						QUALITY POWER	SANGLI	DR		
5	Bus Post Insulator	I	80			ADITYA BIRLA	Halol	A		
						IEC	Bhopal	A		
						MODERN INSULATORS	Abu Road	A		
						WSI	Chennai	A		
6	Disc Insulator	I	90			ADITYA BIRLA	RISHRA (WB)	A		
						BHEL	Bhopal	A		
						IEC	Bhopal	A		
						MODERN INSULATOR	ABU ROAD	A		
						WSI	Chennai	A		
7	Aluminium Tube	I	100			Alom Extrusions	Kolkatta	A		
						HINDALCO	ALUPURAM	A		
						HINDALCO	Renukut	A		
						Jindal AL Tube	Bangalore	A		
						SUDAL	Nasik	A		
8	ACSR Conductor	I	110			APAR	Silvassa	A		
						DIAMOND	Vadodra	A		
						GUPTA POWER INFRA	Bhubaneshwar	A		

Bharat Heavy Electricals Limited PS-MKTG Delhi

C & M Deptt.

(Meneka Kashyap) NTPC

S.No.	Item Description	QP/Insp Cat	QP#9591-001C QVE-Q	QP Sub-schedule	QP Approval Schedule	Proposed Sub-Supplier	Place	Sub-Supplier Approval status/ category	Sub-supplier details submission schedule	Remarks
						ANVIL CABLES	JAMSHEDPUR	A		
						JSK	Silvassa	A		
						SHARAVATHY	Bangalore	A		
						DYNAMIC CABLES PVT LTD	JAIPUR	A		
						HUIL	GUWAHATI	DR		
						HUIL	GWALIOR	A		
						SHASHI CABLES	LUCKNOW	A		
9	1.1kV Grade Power, Control Cables	I	120							Refer Cabling List
10	Substation Automation System BCU, GRP, Energy Meter, Numerical Relays Switchyard Protection	I	130			ABB	Peenya	A		
	(item subject to Sub QR approval)					SIEMENS	Kalwa	A		
						SCHNEIDER	Noida	A		
						GE	Chennai	A		
						BHEL	Bhopal	A*		* Approved only for C&R panel
11	Components for Control & Relay Panels, Protection Panels, Islanding Scheme & Bay Control Unit									* : Inspection category of the item shall be same as mentioned in MQP of SAS
a	Energy Meter	*				Conzerv	Bangalore	A		
	(item subject to Sub QR approval)					Elster	Mumbai	A		
						GEC Meters	UK	A		
						Landis & GYR	Switzerland	A		
						SEMS	Udaipur	A		
b	EVENT LOGGER	*				GE T&D	UK / FRANCE	A		
						HATHWAY	UK	A		
c	TIME SYNCHRONIZING EQUIPMENT	*				ARBITER	USA	A		
						HOPF	GERMANY	A		
						HATHWAY	UK / USA	A		
						SERTEL	CHENNAI	A		
						SIEMENS	GERMANY	A		
						Masibus	Gandhinagar	A		
d	RELAY TEST KIT	*				OMICRON	USA/AUSTRALIA	A		
						DOBBLE	USA	A		
						MEGGER	UK	A		
e	DISTURBANCE RECORDER	*				GE T&D	USA	A		
						SIEMENS	GERMANY	A		
						ABB	FINLAND	A		

Bharat Heavy Electricals Limited PS-MKTG Delhi

C & M Deptt. Engg. Div./QAI

S.No.	Item Description	QP/Insp Cat	QP#9591-001C QVE-Q	QP Sub-schedule	QP Approval Schedule	Proposed Sub-Supplier	Place	Sub-Supplier Approval status/ category	Sub-supplier details submission schedule	Remarks
						HATHWAY	UK	A		
1	LARGE VIDEO SCREEN (LVS)	*				DELTA	Gurgaon	A		
						BARCO	Noida	A		
						Planner	USA	A		
6	RELAYS	*				ABB	Sweden / Bangalore	A		
	(Item subject to Sub QR approval)					GE T&D	UK/CHENNAI	A		
	(NUMERICAL AND AUXILLARY)					SCHNEIDER	UK/France	A		
						SIEMENS	GERMANY	A		
						SCHNEIDER	Noida/Chennai	DR		
12	Instrumentation Cable	I	140							Refer C&I List
13	BMK	I	150			BCH	FARIDABAD	A		
						C&S	Noida	A		
						Jakson	Noida	A		
						MAKTEL	VADODARA	A		
						Pyrotech	Udaipur	A		
						Schneider	Nashik	A		
						Spaceage Switchgear	Gurgaon	A		
						Unilec Switchgear	Gurgaon	A		
						Industrial Switchgear & controls	Thane	DR		
						MILESTONES	GURGAON	DR		
						ULTIMA SWITCHGEARS	ROORKEE	DR		
						Samcom Industrial Controls	Thane	DR		
						RST Electricals	Sahibabad	DR		
						Nitya Electrocontrols Pvt Ld	Noida	A		
						ENTERPRISING ENGINEERS	BHOPAL	DR		
						VIKAS POWER EQUIPMENTS PVT. LTD.	LUCKNOW	DR		
14	Lighting Pole	III	160							Refer Elect. Eq. List
15	Clamps & Connectors and Welding Sleeves	III				EMTT	Kolkata	A		
						EXALT	MUMBAI	A		
						KLEMMEN	Chennai	A		
						PEE VEE ENGG	Bangalore	A		
						Raychem	Vadodara	A		
						Vensun Techo Links	Chennai	DR		
						Premier Power Products	Chennai	DR		
						Deccan Engg Works	Bangalore	A		
16	Insulator Hardware	II	170			EMI	Mumbai	A		
						EMTT	Kolkatta	A		

Bharat Heavy Electricals Limited PS-MKTG Delhi

Bharatiya Vidyut Vikas Nigam Limited Distt-Ramgarh(Jharkhand) C & M Engg. Div./QAI

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S.No.	Item Description	QP/Insp Cat	QP#9591-001C QVE-Q	QP Sub-schedule	QP Approval Schedule	Proposed Sub-Supplier	Place	Sub-Supplier Approval status/ category	Sub-supplier details submission schedule	Remarks
						IAC	Kolkatta	A		
						ITPL	Mumbai	A		
						RUL	Kolkatta	A		
						TAG CORPORATION	CHENNAI	A		
						Raychem (Tyco)	Bangalore	DR		
17	LIGHTING MAST	III						A		Refer Elect. Eq. List
18	AC KIOSK	I	180			I COMM TEL	HYDERABAD	A		
						Isolloyd	Baddi	A		
						JINDAL MECTEC	GURGAON	A		
						U-FOAM	HYDERABAD	A		
						SVARN TELECOM	HARDWAR	A		
19	JB (All Types) / Lighting Panel	II	190			C&S	Noida	A		
						Jakson	Greader Noida	A		
						MAKTEL	BARODA	A		
						Pyrotech	Udalpur	A		
						Schneider	Nashik	A		
						Space Switchgear	Gurgaon	A		
						TRICOLITE	SAHIBABAD	A		
						Unilec Switchgear	Gurgaon	A		
						DANISH	JAIPUR	DR		
						Nitya Electrocontrols	Noida	DR		
						MILESTONES	GURGAON	DR		
						ULTIMA SWITCHGEARS	ROORKEE	DR		
						ENTERPRISING ENGINEERS	BHOPAL	DR		
						VIKAS POWER EQUIPMENTS PVT. LTD.	LUCKNOW	DR		
20	OPGW CABLE	I	200			SUZHOU FURUKAWA	NOIDA	A		Accessories under CAT-III from
						STERLITE TECHNOLOGIES	SILVASSA	A		
21	Leakage Current Analyser	III				ISA	ITALY	A		
						APPLIED TECHNO PRODUCTS PVT. LTD.	GURGAON	DR		
						Scope T&M	Pune	A		
						DOBLE ENGG	USA	A		
						JOSTS ENGINEERING CO. LTD.	DELHI	DR		
						HI-TECH SYSTEMS & SERVICES LTD.	KOLKATA	DR		
22	SF6 GAS FILLING AND EVACUATING PLANT, GAS RECYCLING & PURIFYING PLANT, GAS LEAKAGE DETECTOR	III				AI QUALITEK	USA	A		
						DILO	GERMANY	A		
						ENERVAC	CANADA	A		
						VACCUUM PLANT INDUSTRIES	PUNE			

Bharat Heavy Electricals Limited PS-MKTG Delhi

C&M Department Bharat Heavy Electricals Limited Distt-Ramgarh (Jharkhand)

S.No.	Item Description	QP/Insp Cat	QP#9591-001C QVE-Q	QP Sub-schedule	QP Approval Schedule	Proposed Sub-Supplier	Place	Sub-Supplier Approval status/ category	Sub-supplier details submission schedule	Remarks
						WIKA	USA	A		
						Manik Motors	Hyderabad	DR		
23	OPERATIONAL ANALYSER WITH DCRM KIT	III				OMICRON	USA	A		
						DOBBLE	USA	A		
						SCOPE	PUNE	A		
						VIC	USA	A		
24	GS Flat / MS Flat / 40 MM Dia. M.S. Rod / M.S. Earth Rods/U Clamp / GI Earth Pipe / GI Pipe / GI Conduit (Including Bends) / PVC Pipes	III				Main Contractor Approved Sources				
25	Cable Tray, Bends, Coupler Plates	III								Refer Cabling List
26	Cable glands	III								Refer Cabling List
27	Cable Lugs	III								Refer Cabling List
28	Lighting Fixtures & Luminaries	III								Refer Elect. Eq. List
29	Industrial Receptacles	III								Refer Elect. Eq. List
30	GS Earthwire / Lighting Wire	III				Main Contractor Approved Sources				
31	Transmission Line Tower Accessories (Danger Plate, Vibration Dampers, Number Plate, Phase Plate, Circuit Plate,Hanger Rod, ACD, Bird Guard, J Bolt, U Bolt, D Shackle, Barbed Wire, etc)	III				Main Contractor Approved Sources				
32	EOT Crane	I								Refer CHP List
33	Air Conditioning and Ventilation System	III								Refer AC Ventilation List
34	Fire Protection System	III								Refer Fire Protection List
35	AC for AC Kiosk	III								Refer AC Ventilation List

Note

1 SYSTEM SUPPLIERS/SUB-SUPPLIERS APPROVAL STATUS CATEGORY(SHALL BE FILLED BY NTPC)
A-For this items proposed vendor is acceptable to NTPC.To be indicated with letter "A" in the list along with condition of approval,if any
DR-For those items "Detailed required for NTPC review.To be identified with letter "DR" in the list.

Bharat Heavy Electricals Limited PS-MKTG Delhi

C & M Deptt. Bharat Vidyut Vigyam Limited Distt-Ramgarh(Jharkhand)

S.No.	Item Description	QP/Insp Cat	QP#9591-001C QVE-Q	QP Sub-schedule	QP Approval Schedule	Proposed Sub-Supplier	Place	Sub-Supplier Approval status/ category	Sub-supplier details submission schedule	Remarks
	NOTED- For these items vendors are approved by Main Supplier & accepted by NTPC without specific vendor approval from NTPC. To be identified with "NOTED"									
2	QP / INSPN CATEGORY CAT-I :For these items the Quality Plans approved by NTPC & final acceptance will be on physical inspection witness by NTPC CAT-II For these items the Quality Plans approved by NTPC.However no physical inspection shall be done by NTPC.The final acceptance by NTPC shall be on basis of documents as approved QP CAT-III For these items Main supplier approves the Quality Plans. The final acceptance by NTPC shall be on basis of certificate of conformance by the main supplier.									
3	UNITS/WORKS : Place of manufacturing Place of Main Supplier of multi units/works.									
4	For GIS at Sr. No. 1 above, BHEL will follow their Standard procedures & Corporate guidelines and shall comply with circulars / Instructions etc. issued by GOVT. / Relevent statutary bodies while tendering. However, for new vendors, BHEL shall take approval from NTPC prior to order placement.									

(ABHINAV GUPTA, BHEL) (DIPTOSH, BHEL) (SEVHIK, BHEL) (Mukesh Kalyan) NTPC

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 28.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
1	DDC MIS / HMI System	I				SIEMENS	Gurgaon / Germany	#				# - Final acceptance subjected to system specific acceptance from NTPC Engg
		I				M/s BHEL (MAX DNA)	Bangalore	#				
2	Operator work stations	III				Main Contractor approved Sources		A				
3	Flame Monitoring System (SCANNER)	II				Forney	USA	A				
		II				ABB	Bangalore	A				Bought out item shall be finalised during detailed engineering
		II				Durag	Bangalore	A				
		II				BFI	Germany	A				
		II				BHELSCAN	Trichy	A				
		*				Fossil Power System Inc.	Canada	DR				
4	HEA Igniter	III				Unison Industries	USA	A				
		III				Durag	Germany	A				
		II				Durag	Bangalore	A				Make Durag, Germany
		III				Ignition system INC	USA	A				
		III				Tesi	Italy	A				
		I				Hindustan Thermometer	Ambala	A				Conditional
		*				Hornworthy Peabody Combustion Inc.	UK	DR				
		*				Forney	USA	DR				
5	Furnace Flame viewing system (High Temperature CCTV Components)	II				Diamond Power	USA / Sweden	A				
		II				TLT Engg Pvt. Ltd.	Kolkata	A				M/s Dimanond Power, USA / Sweden make system
		II				Mirion	UK	A				
		II				Toshniwal Industries	Ajmer	A				M/s Mirion, UK make System
		II				Lenox	USA	A				
		II				Hi Tech System and Service	Kolkata	A				M/s Lenox, USA make System
		II				Durag	Germany	A				
		II				Durag	Bangalore	A				M/s Durag, Germany make System
		II				Sabota GmbH	Germany	A				
		II				Piper GmbH	Germany	A				
		*				Tempsens	Udaipur	DR				System Integrator for Piper GmbH, Germany.
6	Coal Flow Monitoring System	II				PROMECON	GERMANY	A				
		II				SWR Engg	GERMANY	A				
		II				EU Tech	GERMANY	A				
		*				Transweing	India	DR				
		*				Technomark Engginers & Consultant	India	DR				M/s BHEL will forward only two proposals after detail review of NTPC Technical specification requirements
		*				Slock Redeller	India	DR				
		*				Greenbank Engery Systems	UK	DR				

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Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Thermal Power Station Distt-Ramgarh Jharkhand C & M Deptt.

NTPC	PROJECT : Patratu STPS Phase-I (3 X660MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 26.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		*				Berthold	Germany	DR				requirements.
		*				EDIT	Germany	DR				
7	Acoustic pyrometers	II				M/s Scientific Environment Instrument Inc	USA	A				
		II				M/s Bonnenberg + Drescher GmbH,	Germany	A				
		II				Lucent	Delhi	A				M/s Scientific Environmental Instrument Inc., USA make system
		II				Hi Tech	Kolkata	A				M/s Bonnenberg + Drescher GmbH, Germany make system
		*				Hanaefertech	Korea	DR				
8	Coal feeder control system	II				Stock	USA	A				
		II				Merick	USA	A				
		I				Stock Redeller	Bangalore	A				Main components from Stock, USA
		I				Merick	Bangalore	A				Main components from Merick, USA
		I				BHEL	Trichy	A				
9	Acoustic Coal Flow Detector	III				Stock	USA	A				
		III				Merrick	USA	A				
		*				Stock Redeller	Bangalore	DR				
		*				Merrick	Bangalore	DR				
10	On line carbon in Ash Analyser	II				Greenbank Engery Systems	UK	A				
		II				ABB	Bangalore	A				
		II				Promecon	GERMANY	A				
		II				Berhold Technologies	Germany	A				
		*				M and W	Denmark	DR				M/s BHEL will forward only one proposal after details review of NTPC Technical specification requirements.
		*				EMERSON	India	DR				
		*				Yokogawa	Bangalore	DR				
		*				Forbes Marshall	Pune	DR				
11	Furnace Exit Gas Temperature Probe	III				Main Contractor approved Sources	India /UK/USA					
12	Boiler tube leak detection system	II				Procon	UK	A				
		II				Raman Instruments	Delhi	A				M/s Procon, UK make System
		II				Acoustic Monitoring International Inc.	USA	A				
		II				Hi Tech System and Service	Kolkata	A				M/s AMI, USA make System
		II				Instotech	South Africa	A				
		II				Rectusan	Korea	A				
		II				BHELSONIC	Trichy	A				
13	Coal bunker Level monitor	%				%						% - Type, vendor and inspection category will be decided during detail Engineering

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
14	Tube thicknes Meter	III				Main Contractor approved sources		A				
15	POSITIVE DISPLACEMENT FLOW METER/ TRANSMITTER	III				BROOKS	USA	A			Sub QR	Calibration reports to be submitted.
		III				BOPP & ROUTHER	GERMANY	A				
		III				OVAL	JAPAN	A				
		II				Toshniwal corporation Hyvac	Chennai	A				Up to 4 Inch only
16	Coriolios Type Mass Flow meter	III				Main Contractor approved Sources		A			Sub QR	
17	Control Valve for Start Up System	II				CCI	USA/Switzerland/Korea	A				
		II				Tyco Sampell	Germany	A				
		II				EMERSON (Fisher)	USA/France/Japan	A				Reference list and performance feedback are to be submitted.
		*				Dressor Masoneilan	France	DR				
		II				KOSO	Japan / Nasik	A				
		II				HORA	Germany	A				
		II				CCI	Sricity	A				
18	Control valves for Soot blower pressure reducing ,SH/ RH Attemperation.	II				CCI	USA/Sweden /Korea / Austria	A				
		II				Dressor Masoneilan	France	A				
		II				HORA	Germany	A				
		II				EMERSON (Fisher)	USA/France /Japan	A				
		II				Spx Copes Vulcan	USA	A				only for SH / RH Attemperation, for Soot blower application Reference to list to be provided.
		II				KOSO	JAPAN	A				
		II				Tyco Sampell	Germany	A				
		II				Leslie	USA	A				
		I				Dressor	Coimbatore	A				Up to 2500 Class
		I				IL	Palakkad	A				Up to 2500 Class
		I				KSB MIL	Ajmaye	A				
		I				KOSO	Nasik	A				
		I				EMERSON	Chennai	A				Up to 2500 Class
		I				Flow Serve	Bangalore	A				Up to 2500 Class
		I				CCI	Sricity	A				
		*				Copes Vulcan	UK	DR				
		*				Circor (Leslie)	Coimbatore	DR				
19	Control Valve for BFP Recirculation.	II				CCI	USA / Austria / Korea	A				
		II				EMERSON (Fisher)	USA/France/Japan	A				
		II				Dressor Masoneilan	France	A				
		II				HORA	Germany	A				
		*				Sempell	Germany	DR				M/s BHEL will forward only three proposals after details review of NTPC Technical specification
		*				Leslie	USA	DR				
		I				CCI	Sricity	A				

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Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Thermal Power Station C & I Dept. Dist-Ramgarh(Jharkhand)

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

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		*				KOSO	Japan / Nasik	DR				requirements.
		*				Nakikata	Japan	DR				
		*				Parcol Spa	USA	DR				
		*				Yamatake	Japan	DR				
		*				BOPP & ROUTHER	Germany	DR				
		*				KSB MIL	Alwaye	DR				
20	Control valve for feedwater flow Control	II				CCI	USA/Austria /Korea	A				
		II				Dressor Masoneilan	France	A				
		II				HORA	Germany	A				
		II				EMERSON (Fisher)	USA/France /Japan	A				
		II				Sampell	Germany	A				
		II				KOSO	Japan	A				
		*				LESLIE	USA	DR				M/s BHEL will forward only three proposals after details review of NTPC Technical specification requirements.
		I				CCI	Sricity	A				
		*				Parcol Spa	USA	DR				
		*				WEIR VALVES and Controls	UK	DR				
		*				KOSO	Nasik	DR				
		*				KSB MIL	Alwaye	DR				
		I				Emerson Process Management	Channai	A				
		*				BOMAFA Special valve solutions Pvt. Ltd.	Ahmedabad	DR				
		*				Suzhou delan enfery science and tehnology co. Ltd.	China	DR				
21	Control Valve (other than Sr. No. - 17 to 20)	II				CCI	USA/Switzerland/Korea	A				
		II				Tyco Sampell	Germany	A				
		II				EMERSON (Fisher)	USA/France/Japan / Chennai	A				
		II				Dressor Masoneilan	France	A				
		II				KOSO	Japan	A				
		II				HORA	Germany	A				
		II				CCI	Sricity	A				
		II				Spx Copes Vulcan	USA	A				
		II				Dressor	Coimbatore	A				
		II				IL	Palakkad	A				
		II				KSB MIL	Alwaye	A				
		II				KOSO	Palakkad	A				
		II				EMERSON	Chennai	A				
		II				Flow Serve	Bangalore	A				
		II				Copes Vulcan	UK	A				
		II				Leslie	USA	A				
		II				Parcol Spa	Italy	A				
		II				KOSO	Nasik	A				

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Bharat Heavy Electricals Limited PS-MKTG Delhi

Bharat Heavy Electricals Limited Distt. Ramgarh (Jharkhand) C.E. Deptt.

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

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

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

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

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

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

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

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

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

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

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

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

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

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		*				PMT Engineers	Ahemdabad	DR				
		*				Flowtech	Kolkatta	DR				
		*				Parker Hannfin India Pvt Ltd		DR				
42	Instrument valves	III				BHEL	Trichy	A				
		II				Excel Hydro	Mumbai	A				
		II				Instrumentation Ltd.,	Palghat	A				
		III				Swagelok	USA	A				
		III				Parker	USA	A				
		II				HP Valves and fittings	CHENNAI	A				
		II				Fluid control Pvt. Ltd.	Pune	A				
		II				Baldota	Mumbai	A				
43	Valve manifolds	III				Excel hydro	Mumbai	A				
		III				SCHNEIDER	Germany	A				
		III				Anderson Greenwood	USA	A				
		III				Astech	Mumbai	A				
		III				HP Valves and fittings	CHENNAI	A				
		II				Fluid control Pvt. Ltd.	Pune	A				
		III				Microprecision	Faridabad	A				
		III				Parker	USA	A				
		III				Swagelock	USA	A				
		III				Baldota	Mumbai	A				
		*				Metpress Engg. works	Kolkata	DR				
		*				Flow tech	Kolkata	DR				
44	Local Instrument Enclosure/Rack	I				Pyrotech	Udaipur	A				
		I				Instrumentation Limited	Kota	A				
		I				Sajas electrical	Trichurapalli	A				
		I				Prammen	Puddukottai	A				
		I				Chemin	Pondicherry	A				
		*				Forbes Marshall	Pune	DR				
		*				Positronics	Vadodara	DR				
		*				Procon	Chennai	DR				
45	Instrument Cables	I				Paramount	Khuskhera	A				PVC,FRLS type,ROP
		I				Polycab	Daman	A				PVC,FRLS type,ROP
		I				Delton	Faridabad	A				PVC,FRLS type,ROP
		I				KEI	Bhiwadi	A				PVC,FRLS type
		I				Elkey Telelinks	Faridabad	A				PVC,FRLS type
		I				CORDS	Chopanki	A				PVC,FRLS type,ROP
		I				CORDS	Kaharani	A				PVC,FRLS type,ROP
		I				Nicco	Kolkata	A				PVC,FRLS type
		II				TEW & C	USA	A				
		II				Habia cables	Sweeden	A				
		II				Kerpen cables	Germany	A				
		II				Lapp cables	Germany	A				
		II				Thermo electra Bv	Netherland	A				
		I				Universal Cable	Satna	A				PVC,FRLS type
		I				Thermocables	Hyderabad	A				PVC,FRLS type

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

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

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

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

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

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

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

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

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C & M Deptt. Bharat Heavy Electricals Limited Distt. Ramgarh (Jharkhand)

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR : BHEL Ltd	VENDOR AS APPROVED BY	DATE : 28.04.2017
	CONTRACT NO : CS-9585-001-2		

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

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

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

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

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 28.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		III				COSA XENTAUR	USA	A				through Spectrum automation faridabad
		*				VAISHALA	Sweden / Japan	DR				
		*				DWER	USA	DR				
		*				Endee	Mumbai	DR				
		*				Nivo Controls	Indore	DR				
		*				Bartec GMBH	Germany	DR				
77	Blank Panels / Cabinets	III				Rittal	Bangalore	A				
		III				Hoffman	BANGALORE	A				
		III				Pyrotech	Udaipur	A				
		III				BHEL	Bangalore	A				
		III				Schneider	Bangalore	DR				
78	CCTV Components (IP)	*				Sony	Japan	DR				
		*				Siemens	Pondichery	DR				
	Integrators will be decided during detail Engineering.	*				Dv Tel	USA	DR				
		*				Honey Well	Gurgaon	DR				
		II				Bosch	Bangalore	A				With Bosch Software
		II				Axis	Sweden	A				With Bosch Software
		*				Pelco	USA	DR				
		II				Axis	Sweden	A				With Milestone Software
79	Control Desk, Server / PC Rack for Unit Control room and Auxiliary control room.	I				Pyrotech works Space	Udaipur	A				
		I				Cosmos	Noida	A				
		I				Adarsh Control	Bangalore	A				
		*				Chemin Controls	Pondichery	DR				
		*				Harmoney Systems	New Delhi	DR				
80	Digital Indicators	III				Masibus	Gandhi Nagar	A				For Non mosaic mounting
		III				ABB	Germany	A				
		III				Foxboro	UK	A				
		III				Yokogawa	Japan	A				
		III				Gossen / Metrowatt / Camille Bauer	Germany	A				
		III				Siemens	Germany	A				
		III				Chino	Japan	A				
		III				Weigell Messgerate	Germany	A				
		III				Pyrotech	Udaipur	A				For Non mosaic mounting
		*				Chino Corporation	Mumbai	DR				
		*				Yokogawa	Bangalore	DR				For Non mosaic mounting and submit only two proposals
		*				Lektrotek	Pune	DR				
		*				Telcherm	Chennai	DR				
81	Dust Emision Monitor	III				Land Instrument International	UK	A				Land Combustion Division
		III				Durag	Germany	A				
		III				Sick Maihak	Germany	A				
		III				Emerson Process Management	Ireland	A				
		III				Codel	UK	A				

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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NTPC	PROJECT : Patratu STPS Phase-I (3 X800MW)	LIST OF ITEMS REQUIRING QP	
	PACKAGE : EPC PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR :BHEL Ltd	VENDOR AS APPROVED BY	DATE : 28.04.2017
	CONTRACT NO : CS-9585-001-2		

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		II				Forbes Marshall	Pune	A				Main kit from M/s Codel, UK
82	Electrical Indicating Instruments (Mosaic Compatible)	III				Siemens	Germany	A				
		III				Gossen / Metrowatt / Camille Bauer	Germany	A				
		III				Ganz	Germany	A				
		III				Weigell Messgerate	Germany	A				
83	Flue Gas Analyser (CO)	III				Codel	UK	A			Sub QR	
		III				Emerson Process Management	Pawane	A				Analyser from M/s Emerson, Germany / USA.
		III				Land Instrument International	UK	A				Land Combustion Div
		III				Sick Maihak	Germany	A				
		III				Siemens	Germany	A				
84	Flue Gas Analyser (CO2)	*				Codel	UK	DR			Sub QR	
		*				Sick Maihak	Germany	DR				
		*				Kitiwake Procal Ltd.		DR				
85	Flue Gas Analyser (SO2 and Nox)	III				Sick Maihak	Germany	A			Sub QR	
		III				Emerson Process Management	Pawane	A				Analyser from M/s Emerson, Germany / USA.
		III				Siemens	Germany	A				
		III				Fuji Electric	Japan	A				
		*				Yokogawa	Japan	DR				
		*				Codel	UK	DR				
		*				ABB	Gloucestershire	DR				
86	Flue Gas Analyser (O2 Analyser (HT))	II				SECO	Chennai	A			Sub QR	Main Contractor Can propose additional vendor for this item
		III				Marathon Monitor	USA	A				
87	Flue Gas Analyser (O2 Analyser (LT))	III				Emerson (Rosemount)	Pawane	A			Sub QR	Make EMERSON, USA
		III				Forbes Marshall	Pune	A				Make Enotec, Germany : Model Oxitec 5000 series
		III				ICE	Mumbai	A				Make Ametek, USA
		III				Yokogawa	Bangalore	A				Make Yokogawa, Japan
		III				ABB	Bangalore	A				Make ABB, UK
		*				AMETEK (P and AI division)	Singapore	DR				
		*				Enotec	Germany	DR				
		*				Fuji Electric	Japan	DR				
		*				Teledyne	USA	DR				
88	Flue Gas Analyser Panel	I				Chemtrol	Goa	A			Sub QR	
		I				Emerson Process Management	Navi Mumbai	A				
		I				Pyrotech	Udaipur	A				
		I				Analytical Instrument Company	Kota	A				Analyser from M/s Fuji, Japan
		I				Yokogawa	Bangalore	DR				
		I				Adage	Mumbai	A				
		*				Marvel Engg Company	Chennai	DR				

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Bharat Heavy Electricals Limited PS-MKTG Delhi

C & M Dept. Patratu Water Supply Scheme Limited Distt-Ramgarh (Jharkhand)

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

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		*				Forbes Marshell Codel	Pune	DR				
						ICE(Asia) Private India	Mumbai	DR				
89	Graphic Interface Unit	III				Rockwell Automation		A				
		III				Digital Instruments and Control System (Proface)	Bangalore	A				Proface Brand
		III				Red Lion	USA	A				
		III				Schnieder Electric		A				
90	Hand Held Calibrator	III				Main contractor approved sources		A				Compatible with the Transmitter to be Supplied & Subject to meeting NTPC specification requirement
91	Hart Management System	III				Yokogawa	India	A				
		III				Emerson Process Mgmt	USA / Singapore / India	A				
		III				P & F	Germany / Bangalore	A				
		III				MTL	Chennai	A				
		*				Stahl	Germany	DR				
92	Impact Head Type Flow Element	II				Detriech / Emerson	USA	A			Sub QR	
		II				Midwest	USA	A				
		II				Veris Inc	USA	A				
		*				TM Technomatic SPA	Itely	DR				
93	Isolator	III				Main contractor approved sources						
94	Master Slave Clock System	II				Hopf	Germany	A				
		I				Sertel	Chennai	A				
		II				Hathway	USA	A				
		II				Moser Baer AG	Switzerland	A				
		II				Mein Berg	Germany	A				
		I				Sands	Chennai	A				
		I				Masibus	Gandhinagar	A				
		*				Signals & System	Chennai	DR				
95	Mosaic Tiles / Console Items	III				Pro-Plan	Germany	A				Earlier Boyko Strey
		III				Tew	Germany	A				Earlier Subklew
94	Network Components	III				Main contractor approved sources						
96	Online Mercury Analyser	III				Durag	Bangalore	A			Sub QR	Make Durag, Germany
		*				Malhak	Germany	DR				Main Contractor Can propose additional vendor for this item
		*				Thermo	USA	DR				
97	P A System (IP Based)	*				Commend	Austria	DR				
		*				Stantaphone Zenitel	Norway	DR				
		*				Armtel	Russia	DR				
		*				Industronic Industrie Electronic GmbH and Co. KG	Germany	DR				
		*				LARAON Enginners and Consultants Pvt. Ltd.	Gurgaon	DR				
		*				Alshan Technologies India Pvt. Ltd.	Bangalore	DR				

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

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

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

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

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

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
119	Turbine supervisiory instruments along with vibration analysis system.	II				GE BENTLY	USA	A				
	Refer Note - 1	II				MEGGITT (VIBROMETER)	SWITZERLAND	A				
		II				SHINKAWA	JAPAN	A				
		I				GE	Pune	A				For GE Bently, USA System
		I				MEGGITT (VIBROMETER)	Bangalore	A				For Meggitt, Switzerland System
		I				Forbes Marshall	Pune	A				For Shinkawa, Japan system
		*				EMERSON	INDIA	DR				
		*				Bruel and Kjaer		DR				
		*				Rockwell Automation	Sahibabad	DR				
		*				SKF	USA / India	DR				
		*				BHEL EDN	Bangalore	DR				
120	SWAS (Sampling Handling System and Dry Panel)	I				Emerson Process Management	Navi Mumbai	A			Sub QR	
		I				Forbes Marshall	Pune	A				
		I				Lowe	UK	A				
		I				ABB	Bangalore	A				Conditional
		I				Yokogawa	Bangalore	DR				
		I				Analyser Instrument Co. Ltd.	Kota	DR				
		I				Steam Equipment	Pune	A				
		*				Flow Line Instrumant	Bangalore	DR				
		*				Instrumentation Limited	Kota	DR				
		*				Chemin Controls	Pondichery	DR				
121	SWAS Analyser (Chloride)	III				ABB	UK	A			Sub QR	
		III				Orion	USA	A				Orion Brand
		*				OKK	Japan	DR				
122	SWAS Analyser (Conductivity)	III				Hach	Switzerland	A			Sub QR	Polymetron Brand
		III				Emerson Process Management	Navi Mumbai	A				
		III				Yokogawa	Japan	A				
		III				ABB	UK	A				
		*				Honeywell	USA	DR				
		*				OKK	Japan	DR				
		*				Orion	USA	DR				
123	SWAS Analyser (Dissolved Oxygen)	III				Orion	USA	A			Sub QR	Orion Brand
		III				Hach	Switzerland	A				Polymetron Brand
		III				Emerson Process Management	USA	A				
		III				ABB	UK	A				
		*				Honeywell	USA	DR				
		*				OKK	Japan	DR				
124	SWAS Analyser (Hydrazine)	III				Hach	Switzerland	A			Sub QR	Polymetron Brand
		III				Orion	USA	A				Orion Brand
		III				ABB	UK	A				

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

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

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVIQ	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
		*				DKK	Japan	DR				
		*				Rosemount Analytical Inc Irvine		DR				
125	SWAS Analyser (pH)	III				ABB	UK	A			Sub QR	
		III				Hach	Switzerland	A				Polymetron Brand
		III				Emerson Process Management	Navi Mumbai	A				
		III				Yokogawa	Japan	A				
		*				Honeywell	USA	DR				
		*				DKK	Japan	DR				
		*				Orion		DR				
126	SWAS Analyser (Phosphate)	III				Hach	USA	A			Sub QR	
		III				Hach	Switzerland	A				Polymetron Brand
		III				ABB	UK	A				
		*				DKK	Japan	DR				
		*				Orion	USA	DR				
		*				Rosemount Analytical Inc Irvine		DR				
127	SWAS Analyser (Silica)	III				Hach	USA	A			Sub QR	
		III				Hach	Switzerland	A				Polymetron Brand
		III				ABB	UK	A				
		*				DKK	Japan	DR				
		*				Orion	USA	DR				
		*				Rosemount Analytical Inc Irvine		DR				
128	SWAS Analyser (Sodium)	III				Hach	Switzerland	A			Sub QR	Polymetron Brand
		III				Orion	USA	A				Orion Brand
		III				ABB	UK	A				
		*				DKK	Japan	DR				
129	SWAS Analyser (Turbidity)	III				ABB	UK	A			Sub QR	
		III				Emerson	USA	A				
		III				WTW	Germany	A				
		III				E & H	Germany	A				
		*				DKK	Japan	DR				
130	Operator Testing Simulator					Main Contractor will propose the vendors during detail Engineering.						
131	Concentration Analyser					Main Contractor will propose the vendors during detail Engineering.						
132	Electromagnetic Flow Meter	II				Krohne Marshal	Pune	A			Sub QR	
		II				E & H	Aurangabad	A				
		II				Emerson	Pawane	A				
		III				Yokogawa	Japan / China	DR				Only Ref list and catalouges to be submitted.
		III				SIEMENS	Germany	DR				
133	Fiber Optic Generator End winding VMS	II				Vibro System INC	Canada	A				
		II				MC-Monitoring SA	Switzerland	A				Note-6
134	H2 Gas Analyser Cabinet	II				ABB	Bangalore	A				H2 Gas Analyser Germany
		II				Adage Automation	Mumbai	A				H2 Gas Analyser siemens Germany Model Calomat-6
		II				Yokogawa	Bangalore	A				H2 Gas Analyser from yokogawa Japan
		II				Siemens	India	A				H2 Gas Analyser siemens Germany

Bharat Heavy Electricals Limited PS-MKTG Delhi

Bharat Heavy Electricals Limited Electronics Plant Hazaribagh Dist-Ramgarh (Jharkhand) Deptt.

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

No.	Major Equipment	QP Inspection Category	QP No. 9585-001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Sub QR	Remark
135	Sight Flow Indicator	III				BHEL Approved Sources		A				
136	Amonia Analyser	*				Sick Maihak	Germany	DR				
		*				Emerson Process Management	Pawane	DR				
		*				Siemens	Germany	DR				
		*				Fuji Electric	Japan	DR				
		*				Thermofisher	Mumbai	DR				
		*				Yokogawa	Banglore	DR				
		*				Dongwoo Optron		DR				
137	AAQMS	I				Environment SA India Pvt. Ltd.	Bangalore	A			Sub QR	Analysers for Environment SA, France : Multipoint Calibrator from M/s L N Industrial, Switzerland and Metrological Sensors from M/s LSI Lastem SRL, Italy.
		I				Chemtrols	GOA	A				Analysers for Teledyne API, USA: Metrological Sensors & SPM from M/s Metone Instruments, USA.
		I				Thermo Electron LLS India PVt. Ltd.	Mumbai	A				Analysers for M/s Thermoenvironmental Instruments Inc., USA & Metrological Sensors from M/s Metone Instruments, USA.
		*				Land Combustion	UK	DR				
		*				Thermofisher	India / USA	DR				
138	EQMS	*				SEPL	Pune	DR			Sub QR	
		*				AICPL	Kota	DR				
		*				Nevco	Surat	DR				
		*				Thermofisher	Mumbai	DR				
		*				Themax	Pune	DR				
		*				Supreme Technology	Mumbai	DR				
139	RESIDUAL CHLORINE ANALYSER	III				E & H	GERMANY	A				
						EMERSON PROCESS	PAWANE	A				
						HACH	USA	A				
140	ORP ANALYZER	III				Emerson process	USA/Pawane	A				
						ABB	UK/USA	A				
						HACH	Switzerland	A				
						Yokogawa	Japan	A				
141	CL2 Leak detector	III				W&T	Germany	A				
142	Flame Scanner Cable	I				Thermocable	Hyderabad	A				
		I				Delton cables	Faridabad	A				

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Bharat Heavy Electricals Limited PS-MKTG Delhi

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

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

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

LEGENDS :

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

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

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

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

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

CAT-III:

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

* - Inspection category will be decided during vendor evaluation.

NOTE - 1 : EMPTY CABINETS, COMPUTERS, SIGNAL ISOLATOR/ MULTIPLIER, MCB, TB, POWER SUPPLY ETC. SHALL ALSO BE ACCEPTABLE FROM INDEGENEOUS SOURCES AGREED BY NTPC IN QP. IF THE TOTAL INTEGRATED PANEL AND FAT IS CONDUCTED INDEGENEOUSLY ITEM TO BE TREATED AS CAT - I.
NOTE - 2 : Mandatory Spare will be treated as CAT-III
NOTE - 3 : For the items not appearing in the preaward list, bidder and NTPC will mutually discussed in future.

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

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

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

Engg. Div/QA&I

Bharat Heavy Electricals Limited PS-MKTG Delhi

26 07 26.

PRASHANT P. PATIL
DGM (QA-C&F)

Amit Yadav
Mgr. MKTG.
BHEL

C & M Deptt.

NTPC	PROJECT: PATRATU STPP-I (3X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
	PACKAGE: EPC					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	05.04.2017
	CONTRACT NO.: CS-9585-001-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
1.	**CEMENT**	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
2.	**CONSTRUCTION CHEMICALS - ADMIXTURES, PLASTISIZERS, RETARDERS WATER PROOFING COMPOUNDS GROUTS**	III	-	SIKA INDIA LTD	-	N	
				CICO TECHONOLOGIES LTD	-	N	
				FOSROC CHEMICALS (I) PVT LTD	-	N	
				BASF	-	N	
3.	**FALSE CEILING - GLASS REINFORCED GYPSUM SYSTEM, MINERAL FIBRE BOARD SYSTEM, PREPAINTED COIL COATED STEEL SYSTEM**	III	-	SAINT GOBAIN	NEW DELHI	N	
				HUNTER DOUGLOUS	MUMBAI	N	
				TIGER STEEL	PUNE/MUMBAI	N	
				INTERARCH	NOIDA	N	
				LLOYD INSULATION	-	N	
				MG INDUSTRIES	FARIDABAD	N	
				ARM STRONG	NEW DELHI	N	
4.	**PAINT AND PAINTING SYSTEM**	III	-	BERGER	-	N	
				SHALIMAR PAINTS	-	N	
				JENSON AND NICHOLSON	-	N	
				KANSAI NEROLAC	-	N	
				AKZO NOBEL	-	N	
				ASIAN PAINTS	-	N	
5.	**COLOUR COATED SHEET (FOR COIL)**	I	-	UNION STEEL	KOREA	A	
				DONGBU STEEL	KOREA	A	
				BHUSHAN STEEL AND STRIPS LTD.	RAIGAD	A	
				ESSAR STEEL LTD	PUNE	A	
				NATIONAL STEEL AND AGRO	DHAR	A	

Bharat Heavy Electricals Limited PS-MKTG Delhi

Patratu Vidyut Utpadan Nigam Limited C & M Deptt

05/04/17

NTPC	PROJECT: PATRATU STPP-I (3X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
	PACKAGE: EPC					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	05.04.2017
	CONTRACT NO.: CS-9585-001-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
				JSW STEEL COATED PRODUCTS LTD	KAMLESHWAR	A	Formerly JSW ISPAT Steel Ltd
				BHUSHAN STEEL LTD.	SAHIBABAD	A	
				JSW LTD	THANE	A	
				BHUSHAN POWER & STEEL LTD	SAMBALPUR (ODISHA)	A	
				TATA BLUESCOPE STEEL LTD	JAMSHEDPUR	A	*AL-ZN COIL FOR CLADDING
6.	**PROFILERS FOR DECKING/ CLADDING SHEETS**	I		UNIMET PROFILES LIMITED	DHARUHERA	A	
				MULTICOLOUR STEEL INDIA LIMITED	GURGAON	A	
				ISOLLOYD	SOLAN	A	
				NATIONAL STEEL AND AGRO	DHAR	A	
				ERA BUILD SYS	RUDRAPUR	A	
				TATA BLUE SCOPE	PUNE	A	HINJEWARI WORKS
				TATA BLUE SCOPE	BHIWADI	A	
				PENNAR INDUSTRIES	ISNAPUR	A	FOR DECKING
				PENNAR INDUSTRIES	TARAPUR	A	FOR CLADDING
				METALKRAFT FORMING INDUSTRIES PVT. LTD.	MEDAK (AP)	A	
				BHUSHAN POWER & STEEL LTD	SAMBALPUR (ODISHA)	A	
				ALFA STEEL BUILDING SOLUTIONS	HOSUR	A	
7.	**ELECTROFORGED GRATING**	II		INDIANA GRATING	PUNE	A	
				PREMIER POWER PRODUCTS (CALCUTTA) PVT LTD	HOWRAH	A	

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

05/04/17

	PROJECT: PATRATU STPP-I (3X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
NTPC	PACKAGE: EPC					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	05.04.2017
	CONTRACT NO.: CS-9585-001-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
				GREATWELD	PUNE	A	
				BHOLA RAM STEELS	PATNA	A	
				ANKIT ELECTROGRATING	RAIPUR	A	
				KANADE ANAND UDYOG	THANE	A	
				SUTTATTI ENTERPRISES	PUNE	A	
				PINAX STEEL INDUSTRIES	PATNA	A	
8.	GI PIPES	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
9.	PVC WATER STOP	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
10.	BITUMEN ASPHALT	III	-	ALL GOVERNMENT REFIINARIES	-	-	
11.	PLASTIC/ PVC PIPES	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
12.	BITUMEN IMPREGNATED FIBER BOARD JOINT FILLER , BITUMEN SEALING COMPOUND	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
13.	CERAMIC / VITRIFIED TILES	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
14.	ACID / ALKALI RESISTANCE TILES, AR BRICKS, AR CEMENT (POTASSIUM SILICATE BASED CEMENT MORTAR, PHENOLIC BASED RESIN CEMENT) AR BITUMASTIC	III	-	CARBORANDUM UNIVERSAL	CHENNAI	N	
				GOOD EARTH MINERALS	MORBI	N	
				PELICAN	BHIWADI	N	
				CAMBRIAN	ALWAR	N	
				KERATECH	VADODARA	N	
				CHAMPION CERAMICS	CHAMPA	N	
				SUNSHINE CERAMICS	CHAMPA	N	
				MAHAKOSHAL POTTRIES	KATNI	N	

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

05/05/17

ANNEXURE-I

	PROJECT: PATRATU STPP-I (3X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
एनटीपीसी NTPC	PACKAGE: EPC					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	05.04.2017
	CONTRACT NO.: CS-9585-001-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
				PERFECT ACID WARE	JABALPUR	N	
				BABA BAIDNATH REFRACTORIES	PURULIA	N	
15.	FIRE PROOF DOORS	III	-	NAVAIR INTERNATIONAL LTD.	NEW DELHI	N	Prototype tested from CBRI/CPRI
				SHAKTI MET DOOR	HYDERABAD	N	
				SUPER STEEL	DELHI	N	
				SIGNUM FIRE PROTECTION	NAGPUR	N	
				RADIANT SAFE DOORS	AHMEDABAD	N	
16.	PARTICLE BOARDS, PLYWOOD, MDF	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
17.	ALUMINUM SECTIONS	III	-	HINDALCO	-	N	
				INDALCO	-	N	
				BALCO (VEDANTA)	-	N	
				NALCO	-	N	
				ALOM EXTRUSIONS LTD	-	N	
				JINDAL	-	N	
18.	HIGH SOLID CONTENT LIQUID APPLIED URETHANE BASED ELASTOMERIC MEMBRANE FOR WATER PROOFING	III	-	STP	-	N	
				IWL INDIA LTD	-	N	
				LLOYDS	-	N	
				CICO TECHONOLOGIES LTD	-	N	
				MK PETRO	-	N	
19.	SANITARY ITEMS	III		PARRYWARE	-	N	
				HINDWARE	-	N	
				SEABIRD	-	N	
				ORIENT	-	N	

Bharat Heavy Electricals Limited PS-MK-G Delhi

Patratu Vidyut Utpadan Nigam Limited C & M Deptt.

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G.V. Patel 05/04/17

	PROJECT: PATRATU STPP-I (3X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
एनटीपीसी NTPC	PACKAGE: EPC					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	05.04.2017
	CONTRACT NO.: CS-9585-001-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
				HINDUSTAN	-	N	
				CERA	-	N	
20.	**CP BRASS TAP AND OTHER SANITARY FITTINGS**	III	-	GEM	-	N	
				PARKO	-	N	
				JAQUAR	-	N	
				MARC	-	N	
21.	**POLYTHENE WATER STORAGE TANKS**	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
22.	**RCC PIPES**	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
23.	**STOP LOG GATES, TRASH RACK AND LIFTING BEAM**	I		GENERAL MECHANICAL WORKS	BARODA	A	
				TRIVENI	NOIDA	A	
				MACMET	KOLKATA	A	
				PRADEEP STRUCTURES	HOWRAH	A	
				RED FAB	HYDERABAD	A	
				L&T	KANCHIPURAM	A	
				BSBK ENGG	NOIDA	A	
24.	**PTFE BEARING / ELASTOMERIC BEARING**	III		ALL CURRENT MORTH / RDSO APPROVED VENDORS		-	
25.	**FABRIC EXPANSION COMPENSATOR**	I		KELD ELLENTOFT INDIA LTD	CHENNAI	A	
				EAGLE BURGMANN KE PRIVATE LTD	CHENNAI	A	
				FRENZELIT EXPANSION JOINT PVT. LTD	BANGALORE	A	
26.	**MINERAL WOOL FOR THERMAL**	I		ROCKWOOL INDIA LTD.	HYDERABAD	A*	A*: subject to

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

	PROJECT: PATRATU STPP-I (3X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
एनटीपीसी NTPC	PACKAGE: EPC					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	05.04.2017
	CONTRACT NO.: CS-9585-001-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
	INSULATION			PUNJSTAR INSULATION FIBRE COMPANY	BHILAI	A	carrying out K-value test at CBRI Roorkee / NTPC approved lab.
				LAPINUS	MALANPUR (MP)	A*	
				MINWOOL	RAJANANDGAON	A*	
				LLOYD INSULATION	BHILAI	A*	
				SHREERAM EQUITECH PVT. LTD.	DURG	A	
				GOENKA ROOKWOOL (I) PVT, LTD.	RAIPUR	A	
				U.P. TWIGA	BULENDSHAHAR	A	
27.	**CHIMNEY ELEVATOR***	I		MEKASTER ENGG. & EQPT (P) LTD.,	HALOL, GUJARAT	A	
				ALIKRAFT ENGINEERS PVT. LTD.	SAVIL (VADODARA)	A	
				UNIVERSAL CONSTRUCTION MACHINARY & EQUIPMENTS	PUNE	A	
28.	**GEOTEXTILE**	III		GARWARE WALL ROPES Ltd	PUNE	N	
				TENCATE GEOSYNTHETICS ASIA	MALAYSIA	N	NON WOVEN
29.	**GEOMEMBRANE (HDPE LINER)**	II		D P WIRES PVT. LTD	RATLAM	A	
				CLIMAX SYTHETICS PVT. LTD	VADODARA	A	
				SHIVALIK AGROPOLY	PARWANOO	A	
30.	**CI PIPES**	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE		-	

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

05/04/17

ANNEXURE-I

	PROJECT: PATRATU STPP-I (3X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
एनटीपीसी NTPC	PACKAGE: EPC					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	05.04.2017
	CONTRACT NO.: CS-9585-001-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
31.	**GALAVANISED STEEL STRUCTURES (FOR TRANSMISION LINE, LATTICE & PIPE)**	I		VIJAY TRANSMISSION LTD	RAIPUR	A	Subject to clearance of Provenness criteria for Transmission Line Structures
				UNITECH POWER TRANSMISSION LTD	NAGPUR	A	
				ASSOCIATED POWER STRUCTURES	VADODARA	A	
				R.S. INFRAPROJECTS PVT. LTD	SURAJPUR	A	
				NEW MODERN TECHNOMECH	MAYURBHANJ (ORRISA)	A	
				GOOD LUCK STEEL TUBES	SIKANDRABAD	A	
				UNIQUE STRUCTURES & TOWERS LTD.	RAIPUR	A	
				VATCO ELEC-POWER PVT. LTD.	NAVIMUMBAI (GALVANISING AT SIGMA GALVANISER NAVI MUMBAI)	A	
				R.S. INFRAPROJECTS PVT. LTD	GHAZIABAD	A	
				ADVANCE STEEL TUBE ,	SAHIBABAD	A	
				SANGAM STRUCTURES LTD.	ALLAHABAD	A	
				RICHARDSON & CRUDDAS (1972) LTD	NAGPUR	A	
32.	**HIGH PERFORMANCE MOISTURE COMPATIBLE CORROSION RESISTANT COATING SYSTEM**	III		CECRI LICENSED SOURCES		-	
33.	**MS PIPES (IS:3589, WELDED PIPES)**	III		BIS APPROVED SOURCES HAVING VALID BIS LICENCE		-	

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

G.V. 05/04/17

	PROJECT: PATRATU STPP-I (3X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
एनटीपीसी NTPC	PACKAGE: EPC					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	05.04.2017
	CONTRACT NO.: CS-9585-001-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
34.	**Factory Fabricated Steel Structure** (Subject to clearance of Provenness criteria)	I		JSW SEVERFIELD	BELLARY	A	
				CAPACITE STRUCTURES Ltd.	Palghar	A	
				ATMASTCO PVT LTD	DURG	A	
				Corefab Projects Pvt Ltd	Bhilai	A	
				Indiana Gratings Pvt Ltd	PURANDAR	A	Acceptable for Columns & Beams (maximum single piece size up to 15 MT)
				JINDAL STEEL & POWER LTD.	RAIGARH	A	
				JINDAL STEEL & POWER LTD.	Angul	A	
				ALLIANCE INTEGRATED METALIKS LTD	RAJPURA	A	
				MIURA INFTASTRUCTURE LTD.	BHILAI	A	Acceptable upto maximum single piece weight of 30 MT
				BHEL	RANIPET	DR	
35.	**PRE ENGINEERED BUILDINGS**	I		INTERARCH	PANT NAGAR	A	
				DEVASHISH INFRASTRUCTURE PVT. LTD	VADODARA	A	
				EVEREST STEEL	ROORKEE	A	

Bharat Heavy Electricals Limited PS-MKTG Delhi

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

G.V. Patel 05/04/17 (B.H.E.L)

ANNEXURE-I

NTPC	PROJECT: PATRATU STPP-I (3X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
	PACKAGE: EPC					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	05.04.2017
	CONTRACT NO.: CS-9585-001-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS

LEGENDS:

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

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

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

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

2. QP/INSPN CATEGORY:

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

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

CAT-III : For these items Main Supplier approves the Quality Plans.

UNITS/ WORKS : Place of manufacturing Place of Main Supplier of multi units/works.

NOTE 1: For the items placed in CAT-III for Civil Works, the review and final acceptance shall be done by NTPC-EIC/ FQA on the basis of MTC / certificate of conformance in line with Indicative FQP / Technical Specifications.

Maidasani
(Ajay Maidasani)
NTPC

Bharat Heavy Electricals Limited
PS-MKTG
Delhi

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

G.V. Rajasekhar 05/04/17.
(G.V.RAJASEKHAR)
MANAGER – COMMERCIAL
BHEL – PSWR.

ANNEXURE-III

FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES

FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE AND GUARANTEE TESTS

The term "Performance Guarantees" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Functional Guarantees". Similarly the term "Performance Tests" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Guarantee Test(s)".

The term "BMCR" (Boiler Maximum Continuous Rating) appearing in the Technical Specification shall mean the maximum continuous steam output of Steam Generator (as defined Cl. No. 1.02.00 Sub-section A-02, Part-B) at super heater outlet at rated parameters.

The term "TMCR" (Turbine maximum continuous rating) appearing in the technical specification shall mean 800 MW electrical power output at generator terminals (power at generator terminals as per clause indicated in this sub-section) under rated steam parameters, 0% cycle make-up and 160 mmHg (abs) condenser pressure unless used in conjunction with a different cycle make-up and/or a different condenser pressure and /or a different throttle steam pressure.

1.00.00 PERFORMANCE GUARANTEES

1.00.01 General Requirements

a) The Contractor shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in these specifications.

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

c) The Contractor shall conduct performance test and demonstrate all the guarantees covered herein, during performance guarantee/acceptance test. The various tests which are to be carried out during performance guarantee/acceptance test are listed in this Sub-section. The guarantee tests shall be conducted by the Contractor at site in presence of Employer on each unit individually.

d) All costs associated with the tests including cost associated with the supply, calibration, installation and removal of the test instrumentation, shall be included in the bid price.

e) It is the responsibility of the contractor to perform the Performance

Guarantee/Acceptance test as specified in this subsection. The performance tests will be performed using only the normal number of Employer supplied operating staff. Contractor, vendor or other subcontractor personnel shall only be used for instructional purposes or data collection. At all times during the Performance Tests the emissions and effluents from the Plant shall not exceed the Guaranteed Emission and Effluent Limits.

f) The Contractor shall make the plant ready for the performance guarantee tests.

g) All instruments required for performance testing shall be of the type and accuracy required by the code and prior to the test, the contractor shall get these instruments calibrated in an independent test Institute approved by the Employer. All test instrumentation required for performance tests shall be supplied by the contractor and shall be retained by him upon satisfactory completion of all such tests at site. All calibration procedures and standards shall be subjected to the approval of the Employer. The protecting tubes, pressure connections and other test connections required for conducting guarantee test shall conform to the relevant codes.

h) Tools and tackles, thermowells (both screwed and welded) instruments/devices including flow devices, matching flanges, impulse piping & valves etc. and any special equipment, required for the successful completion of the tests, shall be provided by the contractor free of cost.

i) The Performance / Acceptance test shall be carried out as per the agreed procedure. The PG test procedure including demonstration tests shall be submitted within 90 days of the date of Notification of Award and finalization of the PG test procedure shall be done within 180 days from the date of Notification of Award. After the conductance of Performance test, the contractor shall submit the test evaluation report of Performance test results to Employer promptly but not later than one months from the date of conductance of Performance test. However, preliminary test reports shall be submitted to the Employer after completing each test run.

The P&G test procedures shall be submitted for equipments/ system & subsystem under Contractor's scope for all Guarantees under category I, II & III as mentioned below, as per latest International codes / standard including correction curves, meeting the specification requirements along with sample calculations & detailed activity plan of preparation (including test instrumentation), conductance and evaluation of Guarantees.

j) The contractor shall submit for Employer's approval the detailed Performance Test procedure containing the following:

a) Object of the test.

b) Various guaranteed parameters & tests as per contract.

c) Method of conductance of test and test code.

d) Duration of test, frequency of readings & number of test runs.

e) Method of calculation.

f) Correction curves.

g) Instrument list consisting of range, accuracy, least count, and location of instruments.

h) Scheme showing measurement points.

i) Sample calculation.

j) Acceptance criteria.

k) Any other information required for conducting the test.

k) In case during performance guarantee tests it is found that the equipment/system has failed to meet the guarantees, the Contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent. However if the specified performance guarantee(s) are still not met but are achieved within the Acceptable Shortfall Limit specified at clause 1.01.02 of this subsection, Employer will accept the equipment/system/plant after levying liquidated damages as per clause 1.01.02 of this sub-section. If, however, the demonstrated guarantee(s) continue to be more than the stipulated Acceptable Shortfall Limit, even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by the Employer, after the tests have been completed, the Employer will have the right to either of the following:

i) **For Category-I Guarantees**

Reject the equipment/system/plant and recover from the Contractor the payments already made

OR

Accept the equipment/system/plant after levying Liquidated Damages as specified hereunder. The liquidated damages, for shortfall in performance indicated in clause 1.01.02 for this sub-section are on per unit basis and shall be levied separately for each unit, except for the rate indicated for auxiliary power consumption for station auxiliaries which is on station basis. The liquidated damages shall be prorated for the fractional parts of the deficiencies. The performance guarantees coming under this category shall be called `Category - I' Guarantees.

ii) **For Category-II Guarantees**

Reject the equipment/plant/system and recover from the Contractor the payments already made. The performance guarantees under this category shall be called 'Category - II ' Guarantees. Conformance to the performance requirements under Category -II is mandatory.

iii) **For Category-III Guarantees**

Reject the equipment / system/plant & recover from the Contractor the payments already made.

OR

Accept the equipment/system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by the EMPLOYER. Such damages shall, however be limited to the cost of replacement of the equipment(s) / system(s) replacement of which shall remove the deficiency so as to achieve the guarantee performance. These parameters/capacities shall be termed as category - III, guarantees.

1.01.00 GUARANTEES UNDER CATEGORY I

Bidder to guarantee auxiliary power consumption for Sewage Tr eatment Plant for continuous drives as specified. Bidder to note that technical loading will be applicable as per the 'Notes' indicated in 'GUARANTEED AUXILIARY POWER CONSUMPTION FIGURES' format enclosed in Vol-III of this technical specification.

a) **Adjustment factor for bid evaluation-**

US $ 2,179/- (US Dollar Two Thousand One Hundred Sevent y-Nine only) per KW increase in the Auxiliary power consumption from the requirements stipulated in Annexure-III A.

b) **Amount of Liquidated Damages Applicable for Category-I Guarantees. (Please Ref. Notes Below)**

US $ 3,025 /- (US Dollar Three Thousand Twenty-Five only) per 1 KW increase in Auxiliary Power Consumption during performance guarantee test from the requirements stipulated in Annexure-I A of this technical specification.

(+) 1.0% of the guaranteed Auxiliary Power Consumption shall be acceptable shortfall with LD.

Notes:-

1. If the contract currency is other than US dollars, then the liquidated damages shall be in equivalent amount in contract currency based on Bill selling exchange rate of State Bank of India prevailing on 08.03.2018.
2. All these liquidated damages for short fall in performanc e shall be deducted from the contract price as detailed in accompanying General Conditions of Contract (GCC)/ Special Conditions of Contract (SCC).
3. Contractor's aggregate liability to pay liquidated damages for failure to attain the functional guarantee shall not exceed twenty-five percent (25%) of the Contract Price.

1.02.00 GUARANTEE UNDER CATEGORY –II

NIL

1.03.00 GUARANTEE UNDER CATEGORY –III

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 651 or BS 5969 or IS 9779.

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

A minimum of 6 points around each equipment shall be covered for measurement. Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the A - weighting scale. The average of A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 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.

Note: Demonstration test for Sewage treatment plant shall be performed so as to achieve parameters as per Clause no 14.0, sub clause 4.2 of Vol II-B, Section C1.

ANNEXURE-IIIA

ESTIMATED AUXILIARY POWER CONSUMPTION FIGURES

S.NO.	DESCRIPTION OF EQUIPMENT	NO OF EQUIPMENT		TOTAL ESTIMATED AUXILIARY POWER CONSUMPTION FOR WORKING DRIVES AT MOTOR INPUT TERMINAL (IN KW) (For Complete sewage treatment plant)
		WORKING	STANDBY	
1	Complete Sewage treatment plant (Considering all working drives as per technical specification)			**56**
				Total (Kw)

ANNEXURE IV

DRAWING/ DOCUMENTS REQUIREMENT & DISTRIBUTION SCHEDULE

After award of LOI, the drawing documents listed in MDL are minimum drawing/documents, which shall be submitted by the bidder for BHEL and Customer approval. However, any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial & delivery implication to BHEL.

The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

Every revised submission incorporating BHEL/Customer comments shall be resubmitted within 7 day by bidder.

Bidder to further note that the submitted drawings/revised drwaing, should be complete in all respects. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/ discussion required to complete the drawings , the bidder shall himself depute his personal to BHEL's / Customer's office for across the table discussions/ finalizations/ submissions of drawings.

- (a) List and schedule of drawings/documents to be submitted after award of contract shall be as per MDL.

- Bidder to note that drawings/documents submission shall be through web based Document Management System. Bidder would be provided access to the DMS for drawings/documents approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.
  - Internet explorer version – Minimum Internet Explorer 7
  - Internet speed – 2 mbps (Minimum preferred)
  - Pop ups from our external DMS IP (124.124.36.198) should not be blocked
  - Vendor's internal proxy setting should not block DMS application's link
    - (http://124.124.36.198/wrenchwebaccess/login.aspx)

  - DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.
  - For quick access bidder may refer the link http://bhelpem.com/DMSManuals/DMSManuals.html

- Bidder shall submit soft copy/hard copy/CD ROMs of all the finally approved drawings and O&M Manuals as required by Customer/Customer consultant/BHEL-site/BHEL-PEM. The exact number of hard copies/CD ROMs of these documents to be submitted shall be notified to the bidder at the time of detailed engineering and bidder shall submit the same without any commercial/delivery implications to BHEL/Customer.

- All the drawing documents along with the O&M manual (of all the revisions) are necessarily to be submitted in soft copies in addition to hard copies.

- Bidder to submit soft copies of all the drawing and document along with quality plans for BHEL review and approval.

- Editable copy of all the drawings and documents shall be provided.

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

- All the drawings shall be prepared on computer auto cad and other documents (like datasheet etc.) on MS office software. Bidder not complying to the requirement shall not be considered. For the execution of the contract regular meeting (generally once in 15 days or as per project requirement) is required.

- Vendor to come for meeting with the concerned dealing persons as per BHEL or customer requirement in a short notice.

- Bidder to submit instrument schedule, cable schedule and valve schedule in MS- Excel format during detailed engineering.

- Bidder to also furnish the auto cad copy/MS-Excel/MS-word (as applicable) of the following documents after award of contract. However, any other auto cad copy/MS-Excel/MS-word of any other document as per the insistence of BHEL and customer will also be submitted by the bidder without any delivery and commercial implication to BHEL and customer.

  - P&IDs .
  - Equipment lay out of sewage treatment plant.
  - Equipment Cable tray layout of sewage treatment plant.
  - Civil assignment drawings.
  - Piping lay out drawing of sewage treatment plant.

- In addition to above requirement, bidder shall also be furnishing the following documents pertaining to Electric Hoist/ Chain Pulley Block for BHEL/ NTPC approval: -

  - **Chain Pulley Block: -**
  - Manufacturing Quality Plan
  - GA Drawing for Chain Pulley Blocks with detail BOM and Painting details
  - O & M Manual

  - **Electric Hoist:-**
  - Manufacturing Quality Plan
  - GA Drawing for Electric Hoist, DSL arrangement and Painting details
  - Schematic Circuit Diagram
  - Mechanism Sizing Calculation
  - Detailed BOM/BOQ for crane
  - O & M Manual

Other requirements

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

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

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

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

- **e-Learning Package/Module:**
  e-learning packages shall be supplied for the equipment / system for the complete sewage treatment plant along with associated electrical and C&I system. Bidder to refer Section-D for detail.

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

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

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

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

Sl. No.	DOCUMENT / DRAWING NO.	DRAWING / DOCUMENT TITLE	SCHEDULE OF SUBMISSION FROM LOI	SIZE
	BASIC ENGINEERING DRAWING/ DOCUMENT			
1	PE-V0-434-673-A001	P&I Diagram for Sewage Treatment Plant	4	A1
2	PE-V0-434-673-A007	Design Calculation of Sewage Sump Pits (As applicable)	14	A4
3	PE-V0-434-673-A002	Layout of Sewage Treatment Plant	4	A1
4	PE-V0-434-673-A020	Operation & Control Philosophy SEWAGE TREATMENT PLANT	6	A4
5	PE-V0-434-673-A008	PROCESS DESIGN AND SIZING CALCULATION INCLUDING PRESSURE DROP CALCULATIONS (STP)	4	A4
6	PE-V0-434-673-A025	Sub Vendor List & inspection criteria for SEWAGE TREATMENT PLANT	4	A4
	MANUFACTURING DRAWING/DOCUMENTS			
7	PE-V0-434-673-A016	Data Sheet of Agitator FOR SEWAGE TREATMENT PLANT	10	A4
8	PE-V0-434-673-A005	MECH. GA DRAWINGS OF ALL SEWAGE SUMPS AND TANKS FOR SEWAGE TREATMENT PLANT	10	A1
9	PE-V0-434-673-A006	MECH. GA DRAWINGS OF STP BUIDLING	10	A1
10	PE-V0-434-673-A040	QAP for Control Cable & screened control cables	10	A4
11	PE-V0-434-673-A039	Data sheet Control Cable & screened control cables	10	A4
12	PE-V0-434-673-A015	TECHNICAL DATA SHEET FOR METERING PUMPS FOR SEWAGE TREATMENT PLANT	10	A4
13	PE-V0-434-673-A034	MECH. GA OF LAMELLA TUBE SETTLER CLARIFIER FOR SEWAGE TREATMENT PLANT	10	A1
14	PE-V0-434-673-A013	TECHNICAL DATA SHEET- INSTRUMENTS SEWAGE TREATMENT PLANT	10	A4
15	PE-V0-434-673-A010	DATA SHEET OF VALVES SEWAGE TREATMENT PLANT	10	A4
16	PE-V0-434-673-A027	QAP FOR METERING PUMPS WITH MOTOR FOR SEWAGE TREATMENT PLANT	10	A4
17	PE-V0-434-673-A036	TECHNICAL DATA SHEET OF MOTOR for SEWAGE TREATMENT PLANT	10	A4
18	PE-V0-434-673-A026	QAP FOR SUBMERSIBLE WITH MOTOR SEWAGE TREATMENT PLANT	10	A4
19	PE-V0-434-673-A011	TECHNICAL DATA SHEET OF SUBMERSIBLE PUMPS SEWAGE TREATMENT PLANT	10	A4
20	PE-V0-434-673-A035	QAP FOR VALVES SEWAGE TREATMENT PLANT	10	A4
21	PE-V0-434-673-A012	TECHNICAL DATA SHEET OF SCREW AND HORIZONTAL CENTRIFUGAL PUMPS FORSEWAGE TREATMENT PLANT	10	A4
22	PE-V0-434-673-A028	QAP FOR BLOWERS WITH MOTOR FOR SEWAGE TREATMENT PLANT	10	A4

23	PE-V0-434-673-A033	QAP FOR LAMELLA CLARIFIER TUBE SETTLER FOR SEWAGE TREATMENT PLANT	10	A4
24	PE-V0-434-673-A014	TECHNICAL DATA SHEET OF BLOWERS SEWAGE TREATMENT PLANT	10	A4
25	PE-V0-434-673-A041	GA DRAWING FOR ELECTRIC HOIST, DSL ARRANGEMENT AND PAINTING DETAILS	12	A3
26	PE-V0-434-673-A042	SCHEMATIC CIRCUIT DIAGRAM FOR ELECTRIC HOIST	12	A4
27	PE-V0-434-673-A043	MECHANISM SIZING CALCULATION FOR ELECTRIC HOIST	12	A4
28	PE-V0-434-673-A044	MANUFACTURING QUALITY PLAN FOR ELECTRIC HOIST	12	A4
29	PE-V0-434-673-A045	MANUFACTURING QUALITY PLAN FOR CHAIN PULLY BLOCK	12	A4
30	PE-V0-434-673-A046	GA DRAWING FOR CHAIN PULLEY BLOCK WITH DETAIL BOM WITH PAINTING DETAILS	12	A3

	DETAIL ENGINEERING DOCUMENT			
30	PE-V0-434-673-A037	CABLE TRAY/ TRENCH & CONDUIT ROUTING DIAGRAM OF STP	12	A1
31	PE-V0-434-673-A004	YARD PIPING LAYOUT OF STP	16	A1
32	PE-V0-434-673-A003	PIPING LAYOUT OF STP (INSIDE AREA)	10	A1
33	PE-V0-434-673-A017	Instrument Schedule SEWAGE TREATMENT PLANT	12	A4
34	PE-V0-434-673-A021	Valve Schedule SEWAGE TREATMENT PLANT	12	A4
35	PE-V0-434-673-A019	ELECTRICAL LOAD DATA SEWAGE TREATMENT PLANT	8	A4
36	PE-V0-434-673-A022	O & M Manual FOR SEWAGE TREATMENT PLANT	24	A4
37	PE-V0-434-673-A018	Cable Schedule FOR SEWAGE TREATMENT PLANT	16	A4
38	PE-V0-434-673-A023	Painting Schedule FOR SEWAGE TREATMENT PLANT	10	A4
39	PE-V0-434-673-A032	ENGINEERING BOQ FOR SEWAGE TREATMENT PLANT	20	A4
40	PE-V0-434-673-A030	ERECTION PROCEDURE SEWAGE TREATMENT PLANT	16	A4
41	PE-V0-434-673-A047	ERECTION PROCEDURE FOR ELECTRIC HOIST	16	A4
42	PE-V0-434-673-A048	O & M Manual FOR ELECTRIC HOIST AND CHAIN PULLEY BLOCK	24	A4
43	PE-V0-434-673-A031	PG TEST FOR SEWAGE TREATMENT PLANT	20	A4
44	PE-V0-434-673-A038	DCS ENGINEERING DOCUMENTS FOR STP	12	A4

Notes:

1. The above drawing list is tentative and shall be fi nalized with the successful bidder after placem ent of order. While som e of the drawings indicated above may not be applicable, som e additional drawings m ay also be required based on scope of work.

DRAWING/DOCUMENTS DISTRIBUTION SCHEDULE

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

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

Note:

- Quantity of prints may change during detailed engi neering stage based on BHEL / Customer requirement. However, the same will be adhered by the bidder without any delivery/commercial implication to BHEL.
- All the drawing documents along with the O&M manual (of a ll the revisions) are necessarily to be submitted in soft copies in addition to hard copies.
- Bidder to submit soft copies of all the drawing and document along with quality plans for BHEL review and approval.
- The date of submission of drawing documents shall be considered as the date of submission of hard and soft copes whichever is later.
- All the drawings shall be prepared on computer auto c ad and other documents (like dat asheet etc.) on MS office software. Bidder not complying to the requirement shall not be considered. For the ex ecution of the contract regular meeting (generally once in 15 days or as per project requirement) is required.
- Bidder has to come for meeting with the concerned dealing persons as per BHEL or customer requirement in a short notice.
- Bidder to submit instrument schedule, cable schedule and valve schedule in MS- Excel format during detailed engineering.
- Bidder to also furnish the auto cad copy / MS-word (as applicable)/MS-Excel (as applicable) of the following documents after award of contract. However, any other auto cad copy/MS-Excel/MS-w ord of any other document as per the insistence of BHEL / customer will also be submitted by the bidder wit hout any delivery/commercial implication to BHEL.
    - P&IDs .
    - Equipment lay out of the sewage treatment plant area.
    - Equipment Cable tray layout for sewage treatment plant
    - Equipment earthing layout sewage treatment plant area
    - Civil scope drawings.
    - Piping lay out drawing for sewage treatment plant area and yard piping layout.
    - Valve schedule.
    - Instrument schedule.
    - Any Other Dwg/Docs as required.

ANNEXURE-V

MANDATORY SPARES

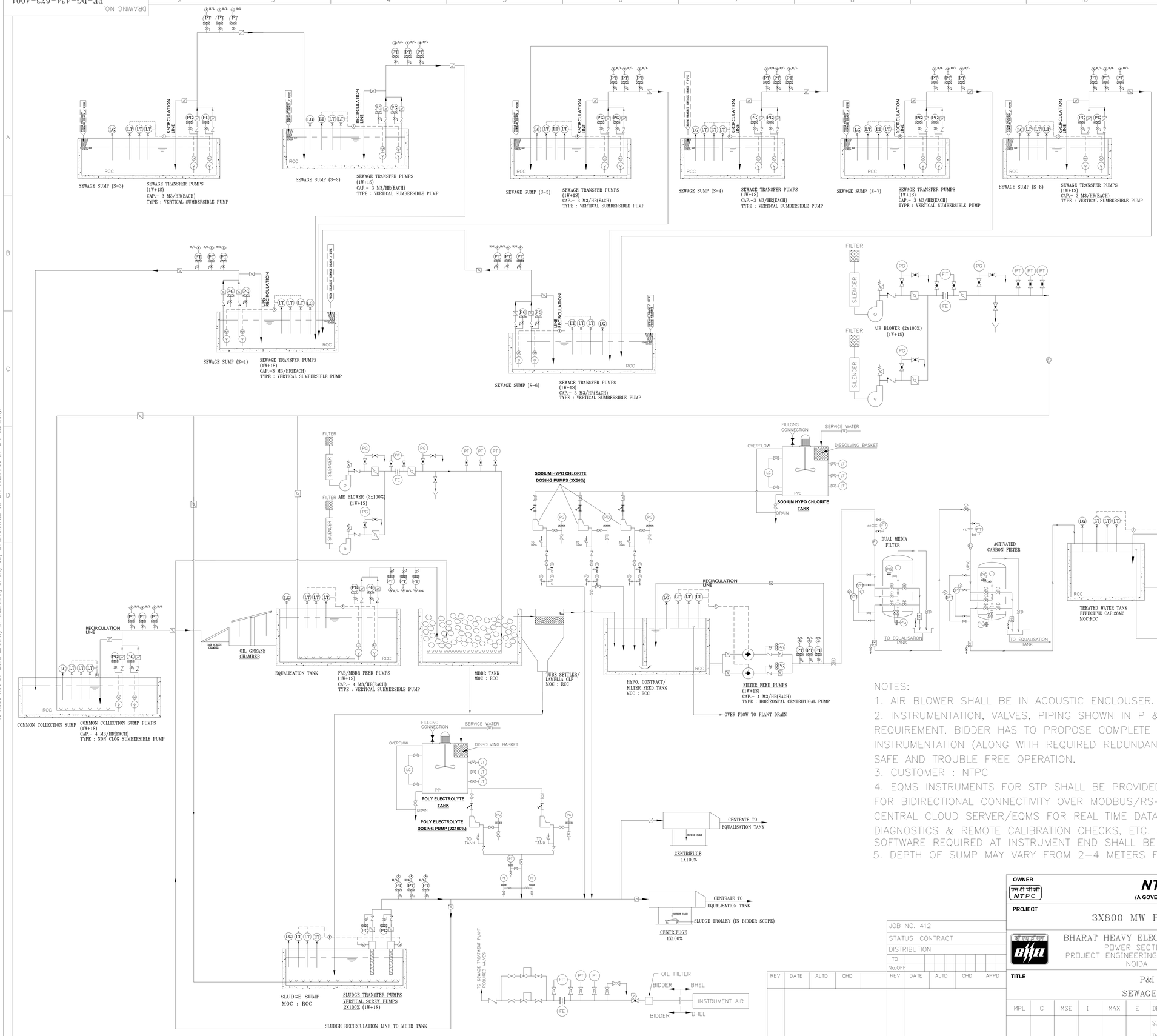
SI. NO.	PARTICULARS	QUANTITY
	CONTROL & INSTRUMENTATION-DM PLANT	
1.00.00	**MEASURING INSTRUMENTS**	
1)	Electronic Transmitters	
	(i) Transmitters of all types and model. (for the measurement of Pressure, differential pressure, flow, level, etc.) including local indication (if applicable)	10 % or 1 no. of each type and model whichever is more
(ii)	RTD's*	1 no. of each type
(iii)	Thermo well	1 no. of each type
	* (With head assembly, terminal block and nipple)	** (to be divided into various insertion lengths in proportion to main population)
3)	Local Indicators (Non-Electrical type) -As applicable for the package as per the following items	
(i)	Temperature gauges	1 no. of each range and type
(ii)	Pressure gauges	1 no. of each range and type
(iii)	Differential Pressure Gauges,	1 no. of each range and type
(iv)	Level gauges	1 no. of each range and type
(v)	Flow gauges excluding Rota meters	1 no. of each range and type
(vi)	All types of Rota meters	1 no. of each range and type
4)	Process Actuated Switch Devices -As applicable for this package, as per the following items	
(i)	Temperature switches	1 no. of each range and type
(ii)	Pressure switches	1 no. of each range and type
(iii)	Differential Pressure switches	1 no. of each range and type
(iv)	Level switches	1 no. of each range and type
(v)	Flow switches	1 no. of each range and type
5)	Solenoid Valves	10 % or 1 no. of each type and model whichever is more
6)	Limit Switches (for Pneumatic Valves and Manual valves)	2 no. of each type
7)	Analyzers	
	i) PH Analyzer (a) Flow Through type cell and Electrode (b) Electronic Transmitter unit without sensor (c) Pre-fabricated cable with connector	 1 no of each type 1 no of each type 1 set
	ii) Conductivity Analyzer (a) Flow Through type cell and Electrode (b) Electronic Transmitter unit without Sensor (c) Pre-fabricated cable with connector	 1 no of each type 1 no of each type 1 Set

	iii) Silica Analyzer (a) Main PCB assembly (b) Power supply Cards(if applicable) (c) Rubber Tubes & Capillary Tubes (d) Pre-fabricated cable with connector (e) Solenoid Valves (f) All Chemical Reagents for 12 month operation(Supply to be staggered as per the shelf life)	1 no of each type 1 no of each type 1 set 1 set 1 set 1 set
	iv) Sodium Analyzer (a) Main PCB assembly (b) Power supply Cards(if applicable) (c) Rubber Tubes & Capillary Tubes (d) Pre-fabricated cable with connector (e) Solenoid Valves (f) All Chemical Reagents for 12 month operation(Supply to be staggered as per the shelf life)	1 no of each type 1 no of each type 1 set 1 set 1 set 1 set
2.00.00	**PROCESS CONNECTION PIPING (FOR IMPULSE PIPING/TUBING, SAMPLING**	
	PIPING/TUBING AND AIR SUPPLY PIPING AS APPLICABLE)	
1)	2 way, 3way, 5way valve manifolds and model	1 no. of each type, class, size
2)	Filter regulator and model	1 no. of each type, class, size
3.00.00	CONTROL VALVES, ACTUATORS AND ACCESSORIES	
1	Pneumatic and electro-hydraulic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more.
2	Diaphragms, O' rings, seals etc. of all types make etc.	100%
3	Pressure Gauges of all types, make, rating etc.	10% or 2 nos. of each type whichever is more
4	Solenoid valves (if applicable)	10% or 2 nos. of each type whichever is more
5	Positioner units /smart positioners (complete unit)& accessories (link assembly)	10% or 1 no. of each type whichever is more
6	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more
7	Air lock relays	10% or 2 nos. of each type whichever is more
3.00.01	**PNEUMATICALLY OPERATED ISOLATION / BLOCK VALVES, ACTUATORS & ACCESSORIES (For all ON/OFF valves supplied under this package even if one or more of these items are also specified elsewhere under mandatory spares)**	
1.	Pneumatic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more
2.	Diaphragms, O' rings, seals etc. of all types make etc.	100%

3.	Limit switches (complete unit)& accessories (link assembly)	10% or 2 Nos., whichever is more
4.	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more

Notes:

1) Identification: Each spare shall be clearly marked and labelled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.



LEGEND

	SPRING LOADED RELIEF VALVE
	GATE VALVE
	HORIZONTAL CENTRIFUGAL PUMP
	NON RETURN VALVE
PS	PRESSURE SWITCH
LAH LS	HIGH LEVEL SWITCH WITH ALARM
LAL LS	LOW LEVEL SWITCH WITH ALARM
	BUTTERFLY VALVE
PG	PRESSURE GAUGE
LS H	HIGH LEVEL SWITCH
LS L	LOW LEVEL SWITCH
	ALARM
	INTERLOCK
	DIAPHARM VALVE
FI	FLOW INDICATOR
	BALL VALVE
TI	TEMPERATURE INDICATOR
pH	PH INDICATOR
FS	FLOW SWITCH
	DIAPHRAGM SEAL
PS	PRESSURE SWITCH
	SUBMERSIBLE PUMP
	METERING PUMP
M	MOTOR
LI	LEVEL INDICATOR
TM	TURBIDITY METER
	RCC
	'Y' TYPE STRAINER
	PNEUMATIC OPERATED

NOTES:

1. AIR BLOWER SHALL BE IN ACOUSTIC ENCLOUSER.
2. INSTRUMENTATION, VALVES, PIPING SHOWN IN P & ID ARE BARE MINIMUM REQUIREMENT. BIDDER HAS TO PROPOSE COMPLETE P & ID WITH ALL NECESSSARY INSTRUMENTATION (ALONG WITH REQUIRED REDUNDANCY), PIPING AND VALVES FOR SAFE AND TROUBLE FREE OPERATION.
3. CUSTOMER : NTPC
4. EQMS INSTRUMENTS FOR STP SHALL BE PROVIDED BY BIDDER WITH PROVISION FOR BIDIRECTIONAL CONNECTIVITY OVER MODBUS/RS-232/RS-485 WITH EMPLOYERES CENTRAL CLOUD SERVER/EQMS FOR REAL TIME DATA MONITORING, REMOTE DIAGNOSTICS & REMOTE CALIBRATION CHECKS, ETC. ALL NECESSARY HARDWARE AND SOFTWARE REQUIRED AT INSTRUMENT END SHALL BE PROVIDED BY THE CONTRACTOR.
5. DEPTH OF SUMP MAY VARY FROM 2-4 METERS FROM FGL

REV	DATE	ALTD	CHD		REV	DATE	ALTD	CHD	APPD

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

OWNER
एन टी पी सी NTPC
NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT
3X800 MW PATRATU STPP EXT. PHASE-I

भा ह वि लि BHEL
BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
MAX	DRN	PC		25.03.19
	DESN	VK		25.03.19
	CHD	SB		25.03.19
	APPD	AK		25.03.19

TITLE
P&I DIAGRAM FOR
SEWAGE TREATMENT PLANT

MPL	C	MSE	I	MAX	E	DEPT.	SCALE
						SIGN	
						DATE	

DRAWING No.
PE-DG-434-673-A001
OF REV 00

SIZE-A1

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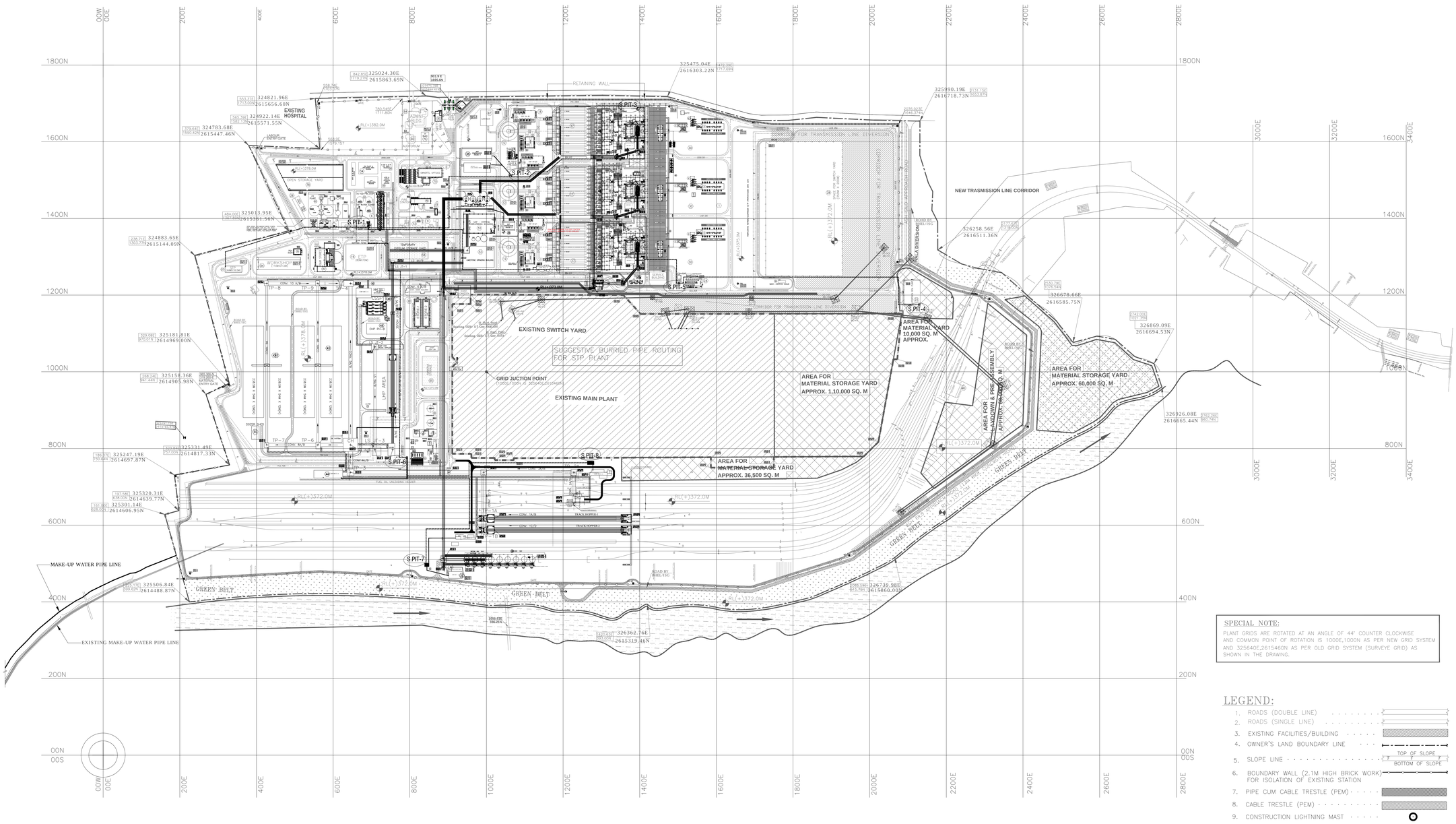

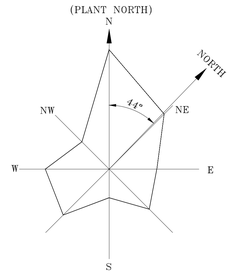

WIND ROSE

LIST OF BUILDING/EQUIPMENT SHOWN

S.No.	ZONE	DESCRIPTION
1.	D-8	ACC
2.	C-8, D-8 & E-8	ACC CONDENSATE STORAGE TANK
3.	C-8, D-8 & D-8	ACC MCC ROOM
4.	C-8, D-8 & D-8	ACC VACUUM HOGGING PUMP HOUSE
5.	D-4	ACW CHLORINE DICOXIDE DOSING SYSTEM
6.	D-5	ACW COOLING TOWER
7.	D-9	ACW PUMP HOUSE
8.	D-4	ACW TREATMENT SYSTEM
9.	D-5	AUX. BOILER
10.	C-7, D-7 & E-7	BOILER
11.	D-4	CHEMICAL LAB
12.	D-6, D-6 & E-6	CHIMNEY
13.	-	CMB
14.	E-7	CONDENSATE STORAGE TANKS
15.	E-7	CONDENSATE TRANSFER PUMP HOUSE
16.	D-4	CPU REGEN. BUILDING
17.	C-7, D-7 & E-7	ESP
18.	C-6, D-6 & D-6	ESP CONTROL ROOM
19.	E-4	ETP
20.	F-5	FO - FARM AREA (HFO, LDO, DOT)
21.	G-5	FO - FUEL OIL PUMP HOUSE
22.	G-5	FO - OIL TANKER UNLOADING
23.	E-8	H2 GEN PLANT
24.	E-8	MAIN PLANT & MRS COMPRESSOR HOUSE
25.	C-7, D-7 & D-7	MRS
26.	D-4	RAW WATER PUMP HOUSE
27.	E-3	STP
28.	D-9	SWITCHYARD
29.	D-7, D-7 & E-7	TG BUILDING
30.	D-8, D-8 & E-8	TRANSFORMER YARD
31.	E-3	WEIGH BRIDGE
32.	H-5	AHP BA & FA SILO MCC
33.	D-7, D-7 & E-7	AHP BOTTOM ASH CONVEYER
34.	D-7, D-7 & E-7	AHP BOTTOM ASH SILO
35.	D-6	AHP COMPRESSOR HOUSE-1
36.	D-6	AHP COMPRESSOR HOUSE-2
37.	D-6	AHP FLY ASH INTERMEDIATE SILO
38.	H-6	AHP FLY ASH SILO
39.	E-9	MISC. SWITCH GEAR BLDG.
40.	F-11	CHP- LDCO SHED
41.	H-5	SILO UTILITY BLDG.
42.	E-5	CHP-COAL CONVYER
43.	F-4, F-4	CHP-COAL STOCK PILE A,B,C,D
44.	G-4	CHP-CRUSHER HOUSE
45.	-	-
46.	-	-
47.	G-5	CHP-PUMP HOUSE-A (ON GROUND FLR OF LS CRH)
48.	E-5	CHP-PUMP HOUSE-B
49.	E-5	CSSP
50.	F-3	DOZER SHED
51.	D-6	LHP - GYPSUM, DEWATERING BUILDING
52.	E-6	LHP - LIMESTONE CRUSHER HOUSE
53.	E-5	LHP - TEMPORARY GYPSUM STORAGE SHED
54.	D-4	DM PLANT
55.	D-5	DM PLANT - ACID ALKALIE STORAGE
56.	D-5	DM PLANT N-PIT & BACKWASH
57.	D-6, D-6 & E-6	FGD - ABSORBER
58.	-	-
59.	D-6, D-6	FGD CONTROL ROOM
60.	D-4	PT CHEMICAL HOUSE
61.	D-4	PT CLARIFIER
62.	D-4	PT PLANT
63.	D-4	DM TANKS
64.	C-5	ADMIN BUILDING
65.	F-5	AMMONIA STORAGE
66.	C-5	AUDITORIUM
67.	C-6	CANTEEN
68.	D-8	DG SETS
69.	D-8 & D-8	FIRE FIGHTING - DRILL TOWER
70.	D-5	FIRE FIGHTING - FIRE STATION
71.	D-7	FIRE FIGHTING - FIRE WATER BOOSTER PUMP HOUSE
72.	D-5	FIRE FIGHTING - FIREWATER PUMP HOUSE
73.	D-5	FIRE FIGHTING - FIREWATER TANKS
74.	G-5	FIRE FIGHTING - FOAMING PUMP HOUSE
75.	E-4	FGA BUILDING
76.	D-5	IT BUILDING
77.	C-5	GATE COMPLEX
78.	D-4	OPEN STORAGE YARD
79.	D-5	OWNERS OFFICE
80.	C-5	SAFETY PARK
81.	E-5	OWNER'S STORES (CONSTRUCTION)
82.	E-4	STORES (O&M)
83.	C-5	TIME OFFICE
84.	E-3	WORKSHOP

SPECIAL NOTE:

PLANT GRIDS ARE ROTATED AT AN ANGLE OF 44° COUNTER CLOCKWISE AND COMMON POINT OF ROTATION IS 1000E,1000N AS PER NEW GRID SYSTEM AND 325640E,2615460N AS PER OLD GRID SYSTEM (SURVEYE GRID) AS SHOWN IN THE DRAWING.

LEGEND:

1. ROADS (DOUBLE LINE)
2. ROADS (SINGLE LINE)
3. EXISTING FACILITIES/BUILDING
4. OWNER'S LAND BOUNDARY LINE
5. SLOPE LINE — TOP OF SLOPE / BOTTOM OF SLOPE
6. BOUNDARY WALL (2.1M HIGH BRICK WORK) FOR ISOLATION OF EXISTING STATION
7. PIPE CUM CABLE TRESTLE (PEM)
8. CABLE TRESTLE (PEM)
9. CONSTRUCTION LIGHTNING MAST

REFERENCE DRGS:

SL No.	TITLE	DRG. NUMBER	SCOPE
1	REFERENCE PLOT PLAN	9585-999-POC-F-001	NTPC

NOTES:-

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. FINISH FLOOR LEVEL = RL (+)375.50 M,CORRESPONDS TO PLANT EL 0.0M (GROUND FLOOR OF STG BUILDING) FINISHED GROUND LEVEL OF BOP AREAS AS MARKED.
3. LOCATION/SIZE OF BOP FACILITIES IS TENTATIVE ONLY

SCALE: 40 0 40 80 120 160M

REV.	DATE	ALTD	CHD	APPD
2	27.09.2018	RC	BKA	JJ
1	DRAWING REVISED AS PER LATEST GAs OF DIFFERENT FACILITIES & NTPC COMMENTS ON REV. 1			

REV.	DATE	ALTD	CHD	APPD
1	16.07.2018	RC	BKA	JJ
1	DRAWING REVISED AS PER LATEST GAs OF DIFFERENT FACILITIES & NTPC COMMENTS ON REV. 0			

JOB NO. 434
STATUS CONTRACT
DISTRIBUTION

NTPC DRG NO.: 9585-001-999-POC-F-001

CUSTOMER: NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

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DEPT CODE		NAME	SIGN	DATE
M	DRN	VKS		26.03.2018
	DESN	DEEPAK/RC		26.03.2018
	CHD	BKA		26.03.2018
	APPD	JJ		26.03.2018

TITLE: PLOT PLAN

DEPT. | SCALE 1:425 | SIGN

DRAWING NO. PE-DG-434-100-M001

SHEET 1 OF 1 | REV. 2 | SIZE-A0

COMPUTER FILE NAME: 434_100_M001

DATASHEET–A FOR STP

Sl. No.	DESCRIPTION	
1.0	**Capacity of STP**	75 m3/day
2.0	**Common Collection Sump**	
i)	Numbers Required	One (1) no.
ii)	Capacity	As per system requirement
iii)	MOC	RCC
iv)	Type of Aeration	Coarse Bubble Diffused Aeration Type
v)	Type of Diffusers	Coarse bubble diffusers with retrievable arrangement
vi)	No. of Diffusers	As per system requirement
vii)	No. of chain pulley block/electric hoist and capacity	One no., chain pulley bock or electrical hoist as per specification requirement, capacity as per specification requirement.
viii)	Handrail	To be provided by bidder
3.0	**Common Collection Sump Pumps**	
i)	Numbers Required	2 nos. (1W+1S)
ii)	Type	Non-clog sump pumps ,Submersible grinder type
iii)	Flow	4.0 m3/hr (minimum)
iv)	Head	As per process requirement
v)	Particle Size	Up to 20 mm
vi)	MOC	Casing – Cast Iron to IS 210 FG 260 Impeller- SS304
vii)	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
4.0	**Screen Chamber**	
i)	Numbers required	1 no.
ii)	Bar screen chamber MOC	RCC
iii)	Bar screen chamber capacity	As per process requirement
iv)	Type	Perforated sheet
v)	Cleaning	Manual
vi)	Angle of inclination	60°
vii)	Bar MOC	SS-304 fitted with SS frame
viii)	Velocity	<1.0 m/sec
ix)	Spacing of bar`	10 mm
5.0	**Oil & Grease chamber**	
i)	Numbers required	1 no.
ii)	Oil & grease chamber MOC	RCC
iii)	Oil & grease chamber capacity	As per process requirement

6.0	**Oil & Grease Trap**	
i)	Numbers Required	One (1) no.
ii)	Flow (m3/hr)	As per process requirement
iii)	MOC	RCC with baffle arrangements
iv)	Perforated pipe MOC	PVC/CS
7.0	**Equalization Tank**	
i)	Numbers Required	1 no.
ii)	Flow (m3/hr)	As per process requirement
iii)	Detention Time	8 hours (min)
iv)	MOC of Tank	RCC
v)	Depth	As per system requirement
vi)	Type of Aeration	Coarse Bubble Diffused Aeration Type
vii)	Type of Diffusers	Coarse bubble diffusers with retrievable arrangement
viii)	No. of Diffusers	As per system requirement
ix)	No. of chain pulley block/electric hoist and capacity	One no., chain pulley bock or electrical hoist as per specification requirement, capacity as per specification requirement.
x)	Handrail	To be provided by bidder
8.0	**Common Air Blowers for Equalization Tank /Sludge Sump /Common Collection Sump**	
i)	Numbers Required	2 nos. (1W+1S)
ii)	Type of Blower	Twin lobe type
iii)	Flow	To cater Air requirement for Equalization tank & Sludge Sump & Common Collection Sump
iv)	Head	As per process requirement
v)	MOC	CI to IS 210 Gr. FG 260
vi)	Accessories	NRV, Pressure Gauge, Safety valves
vii)	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
viii)	Common Base plate/ mounting plate	MS as per IS 2062
9.0	**MBBR Feed Pumps**	
i)	Numbers Required	2 nos. (1W+1S)
ii)	Type	Vertical Submersible Grinder type Pumps
iii)	Flow	4.0 m3/hr (min)
iv)	Head	As per process requirement
v)	MOC	Casing – Cast Iron to IS 210 FG 260 Impeller & shaft - SS304
vi)	Particle Size	Up to 10 mm
vii)	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615

10.0	**MBBR Reactor**	
i)	Numbers Required	One(1) no.
ii)	Flow (m3/hr)	As per system requirement (or 4 m3/hr(min))
iii)	Food to Microorganism(F/M) Ratio	0.1-0.15 Kg BOD/ Kg MLSS/ day
iv)	MLSS (Mixed Liquor Suspended Solids)	3000-6000 mg/l
v)	MOC of Tank	RCC
vi)	Depth	Minimum 4-5 m
vii)	Type of Aeration	Fine Bubble Diffused Aeration Type
viii)	Type of Diffusers	Fine bubble diffusers with retrievable arrangement
ix)	No. of Diffusers	As per system requirement
x)	Media	PVC
xi)	Media Qty	As per system requirement
xii)	Free Board	500 mm
xiii)	Volume (in m3)	As per process requirement
11.0	**Air Blowers for MBBR Tank**	
i)	Numbers Required	2 nos. (1W+1S)
ii)	Type of Blower	Twin lobe type
iii)	Flow	To cater Air requirement of tank
iv)	Head	As per process requirement
v)	MOC	CI to IS 210 Gr. FG 260
vi)	Accessories	NRV, Pressure Gauge, Safety valves
vii)	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
viii)	Common Base plate/ mounting plate	MS as per IS 2062
12.0	**Tube settler (Secondary Settler)**	
i)	Numbers Required	One (1) no.
ii)	Flow (m3/hr)	As per system requirement (or 4 m3/hr(min))
iii)	Surface flow rate	5 m3/ m2/hr.
iv)	MOC of settler	RCC
iv)	Quantity of tube settler media	As per process requirement
v)	MOC of media	PVC
vi)	Free board	500 mm
13.0	**Hypo Contact Cum Filter Feed Tank**	
i)	Numbers Required	One (1) no.
ii)	Capacity	As per Process requirement
iii)	MOC	RCC
iv)	Handrail	To be provided by bidder
14.0	**Hypo Dosing System**	
14.1	**Hypo Dosing Tank**	
i)	Numbers Required	One (1) no.
ii)	Capacity	200 liters OR 24 hour storage requirement @ suitable dosing rate whichever is higher
iii)	MOC	PVC
14.2	**Hypo Dosing Pump**	
i)	Quantity	Three (3) no.
ii)	Capacity	0-6 LPH or 2 ppm continuous dosing rate requirement whichever is higher
iii)	Type	Metering Pump

iv)	MOC	PP
v)	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
15.0	**Filter Feed Pumps**	
i)	Quantity	Two (2X100%) nos. (1W+1S)
ii)	Type & Operation	Horizontal Centrifugal, Continuous
iii)	Suction condition	Flooded.
iv)	Capacity	4.0 m3/hr.
v)	Head	As per process requirement
vi)	Material of Construction	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Drive motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
	• Common base plate	Carbon steel IS:2062
vii)	Noise level	85 DBA
viii)	Vibration	As per HIS
ix)	RPM	1500 approx.
x)	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
xi)	Interconnecting Piping Material	Carbon Steel with Rubber lining.
16.0	**Dual Media Filter**	
i)	Quantity	1 no.
ii)	Capacity	4 m3/hr.
iii)	Surface flow rate	10 m3/hr./m2
iv)	Size	As per process requirement
v)	Design pressure	Shut off head of pump + 5% margin
vi)	MOC	FRP/MSRL
vii)	Media	Graded quartz sand free from carbonates and other foreign material and anthracite.
viii)	Rising Space(Free board)	100 %
17.0	**Activated Carbon Filter**	
i)	Quantity	1 no.
ii)	Capacity	4 m3/hr.
iii)	Surface flow rate	12 m3/hr./m2
iv)	Size	As per process requirement
v)	Design pressure	Shut off head of pump + 5% margin
vi)	MOC (Shell & Dish)	FRP/MSRL
vii)	Media	Activated Carbon
viii)	Supporting Media	Graded Gravel
ix)	Minimum Bed depth	1200 mm

x)	Rising Space(Free board)	100 %
18.0	**Treated Water Tank**	
i)	Number required	1 no.
ii)	Capacity (Effective)	28 m3/ As per system requirement
iii)	Flow	As per system requirement or 4 m3/hr (min)
iv)	Detention Time	8 Hrs.
v)	MOC of tank	RCC
vi)	Depth	2.5 m- 4 m
vii)	Handrail	To be provided by bidder
19.0	**Treated Water Disposal Pumps**	
i)	Quantity	Two (2X100%) nos. (1W+1S)
ii)	Type & Operation	Horizontal Centrifugal, Continuous
iii)	Suction condition	Flooded.
iv)	Capacity	4.0 m3/hr.
v)	Head	As per process requirement
vi)	Material of Construction	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
	• Common base plate	Carbon steel IS:2062
vii)	Noise level	85 DBA
viii)	Vibration	As per HIS
ix)	RPM	1500 Approx.
x)	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
xi)	Interconnecting Piping Material	Carbon Steel with Rubber lining.
20.0	**Sludge Sump (waste Pit)**	
i)	Number required	1 no.
ii)	MOC & type	RCC, Under Ground, Outdoor Location
iii)	Capacity (Effective)	As per Process requirement
iv)	Instrumentation	As per P&ID
v)	Inside Protection	5 mm thick coal tar epoxy screened lining
vi)	No. of chain pulley block/electric hoist and capacity	One no., chain pulley bock or electrical hoist as per specification requirement, capacity as per specification requirement.
vii)	Handrail	To be provided by bidder
21.0	**Sludge transfer Pumps**	
i)	Quantity	Two (2X100%) nos. (1W+1S)
ii)	Type	Vertical Screw Pumps
iii)	Location	Outdoor

iv)	Service	Intermittent
v)	Suction condition	Flooded.
vi)	Rated Flow	As per process requirement or 2 m3/hr whichever is higher.
vii)	Head	As per process requirement
viii)	Type of fluid handled	Sludge from system
ix)	Material of Construction	
	• Casing	2% Ni-CI to IS:210 Gr FG 260
	• Rotor	SS-316
	• Stator	Nitrile/EPDM
	• Shaft	SS-316
	• Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
x)	Noise level	85 DBA
xi)	Vibration	As per HIS
xii)	RPM	1500 Approx.
xiii)	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
22.0	**Centrifuge**	
i)	Quantity	Two (2) number (1W+ 1SB)
ii)	Type	Variable differential speed control type
iii)	Inlet concentration	2%
iv)	Outlet concentration	20% (min.)
v)	Capacity	As per process requirements
vi)	Liquid handled	Secondary sludge
vii)	Material of construction	Wetted parts: SS304 Other parts : MSEP/CI
viii)	Motor	IP-55 with outdoor installation,3 phase,415 V,TEFC type squirrel cage induction motor, Rating as per requirement, Energy Efficiency Class IE-3 as per IS : 12615; Hydraulic coupling to dampen the initial acceleration.
ix)	Base Frame	MS Fabricated
x)	Accessories	Screening at inlet, Suitable piping, valves, pressure gauge at delivery pulley, V-belt drive, foundation bolts etc.
xi)	No. of electric hoist and capacity	One no., Capacity as per specification requirement.
	Note: Suitable polyelectrolyte dosing tank (MOC-HDPE, Cap: 500ltr) along with two (2) no, (1W+1SB) dosing pumps, Capacity to suit process requirement, to be provided for dosing before centrifuge.	
23.0	**Sewage Sumps (Outside STP Area)**	
i)	Sewage sump S1, S2, S3, S4, S5, S6, S7, S8	Capacity as per P&ID
ii)	MOC	RCC
iii)	Type	Covered at top, below ground
iv)	Accessories	Coarse bar screen (MOC : SS-304) at each sump location
v)	Handrail	To be provided by bidder
vi)	No. of chain pulley block/electric hoist and capacity	One no. at each sump location , chain pulley bock or electrical hoist as per specification requirement, capacity as per specification requirement.

24.0	**Sewage Transfer Pumps(Outside STP Area)**	
i)	Type	Vertical submersible grinder type,
ii)	Quantity per sump	2 X 100 %
iii)	Capacity	As per P & ID of Sewage Treatment plant
iv)	MOC casing	Cast Iron to IS 210 FG 260
v)	MOC impeller	Stainless Steel AISI 304
vi)	MOC shaft	SS 410
vii)	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615

Further bidder to provide 1 no. Common chain pulley block (portable type) for handling of filter feed pump & treated water disposal pumps alongwith motor as per specification requirement, capacity shall be selected based on heaviest pump with motor weight from the above listed two drives & as per specification requirement.

For piping and valves specification bidder to refer specification of LP PIPING, VALVES & SPECIALITIES Included under section II-A mechanical of this technical specification.

PUMPS AND PIPE SELECTION CRITERIA

Pump and Pipeline carrying water and chemicals etc. shall generally be sized on the following velocities. However wherever minimum pipe sizes are defined in the drawing/datasheets, the selected size shall not be less than the specified size.

	VELOCITY IN m/sec.		
	BELOW 50 MM.	**50-150 MM**	**200 MM AND ABOVE**
Pump Suction for water	------	1.2-1.5	1.2-1.8
Pump discharge for water	1.2-1.8	1.8-2.4	2.1-2.5
Header for water	-------	1.5-2.4	2.1-2.4
Pump Suction for chemical solution	1.0-1.2	1.1-1.3	-------
Pump discharge for chemical solution	1.2-1.4	1.3-1.5	--------
Gravity flows	Pipe line under gravity flow shall be restricted to a flow velocity of 1 m/sec generally Channels under gravity flow shall be sized for a maximum flow velocity of 0.6 m/sec.		

Note 1- All piping system shall be capable of withstanding the maximum pressure in the corresponding line.

Note 2- TDH of all pumps shall be decided by the supplier assuming the following 'C values in Hazen & Williams equation for calculation of friction loss.

a) **Carbon steel pipes – 100**
b) **CI Pipes /Ductile Iron pipes –100**
c) **Rubber lined steel pipe – 120**
d) **PVC/HDPE pipes – 140**
e) **Stainless steel pipes -100**

For calculating the required pump head for pump selection, at least 10% margin shall be taken over the pipe friction losses and static head shall be calculated from the minimum water level of the tank/sump/reservoir from which the pumps draw water.

TECHNICAL DATASHEET-A FOR ELECTRIC HOIST:

Sl.no	DESCRIPTION	TECHNICAL PARTICULARS
1.0	Type	Steel wire electric hoist with electrically operated trolley
2.0	Scope (Qty., Capacity, Lift, Travel Length)	As per specification and layout requirement
3.0	Type of service	Indoor
4.0	Overload test	125% of SWL
5.0	Design Ambient temperature	50° C
6.0	General Design	As per IS: 3938 / 1983 or latest, Class-II duty
6.1	Design standards	IS: 3938, IS: 2266,IS: 4029, IS: 900,IS: 4237, IS: 694, IS: 3043, IS: 1822, IS: 2147. IS: 1554, IS: 325, IS: 15660, IS 9968 Part I etc as per latest revision
6.2	Duty class	Class II duty
7.0	Operating speed	
7.1	Hoisting speed	3 MPM
7.2	Trolley speed	6 MPM
8.0	Type of transmission	Through Electric motor and gear box.
9.0	Wire Rope	
9.1	Construction / core	6 x36 construction, steel core/Fibre core

9.2	Code	IS:2266
9.3	Number of falls	Min. 4
9.4	Factor of safety	Not less than 5
10.0	Load Hook and block	NORMALISED HOOK ONLY
10.1	Type of load hook	Plain shank trapezoidal section with safety latch.
10.2	Load hook Code	IS: 15560
10.3	Load hook Material	As per IS:15560
10.4	Hook suspension	Thrust bearing
10.5	Material of block suspension	Fabricated from steel plate, Material: IS: 2062
11.0	Gearing	
11.1	Type	Spur / Helical
11.2	Gear/ pinion material	as per IS 3938
11.3	Lubrication	Oil splash/ grease lubricated
11.4	Bearing type	Antifriction Ball / Roller
12.0	Trolley drive	
12.1	Wheel	Single flange taper thread
12.2	Wheel conform to (Std. / code)	IS: 3938
12.3	Wheel material	C55Mn75/ En-8/ En-9. (Max hardness 200 BHN)
12.4	Bearing type	Antifriction Ball / Roller
12.5	Trolley type	Rolled structural steel with side plates extended beyond wheel flanges to protect wheels.
12.6	Hardness	Max hardness 200 BHN
13.0	SHEAVE	
13.1	Material	Fabricated from steel plate. IS: 2062 Gr. A or Gr. B / as per IS: 3938
13.2	Bearing type	Antifriction Ball / Roller.
14.0	BRAKE (HOIST and TROLLEY)	
14.1	Type	DCEM brakes disc type (fail to safety).
14.2	Capacity	As per IS 3938.
14.3	Number	One number for each motor.
15.0	ROPE DRUM	
15.1	Material	Cast iron, cast steel or mild steel.

15.2	Flange / Flangeless	Flanged	
15.3	Type of groove	As per manufacturers standard to suit the layout requirement.(Shall be decided during detail engineering)	
17.0	TYPE OF DSL		
17.1	CT travel	PVC Shrouded bus bar conductor type DSL	
18.0	MOTORS		
18.1	Type	Sq. Cage induction, TEFC, S4 duty, 40% CDF.	
18.2	Number of start	300 starts / hr	
18.3	Voltage , Phase and Frequency	415V ±10%, 3 phase, 4 wire, 50 Hz	
18.4	Class of insulation	Class "F" and temperature rise limited to class B.	
18.5	Type of enclosure	TEFC	
18.6	Degree of protection provided for enclosure	IP-54/55 (indoor/outdoor)	
18.7	Margin	10% over maximum continuous load demand	
19.0	LIMIT SWITCHES	Hoisting	Trolley
19.1	Type	Snap action, self actuating type	Lever type
20.0	Control panel	* Fabricated from Cold rolled sheet steel not less than 2.5mm for front & rear & 2mm for side, top & bottom portion with gland plate of 3mm thick. * Degree of protection shall be IP 54. * Power on indicating lamps shall be provided * Panel illumination lamps operated by door switch. * 2 nos earthing terminals on panel. * 20 % spares terminals (clip on type) shall be provided. * Power and control terminals (clip on type) shall be on separate channels. * Gland plate shall be double brass compression type.	
20.1	Qty	1 No.	
21.0	Pendent Push buttons	Up /down / forward / Reverse push buttons. Indicative marking for easy operation shall be provided.	
22.0	Power cables	1.1 KV grade XLPE power cables shall have compacted aluminium conductor for cables including 10 sq. mm and above and copper conductor for cables below 10 sq.mm, XLPE insulated, PVC inner-sheathed (as applicable), armoured, FRLS PVC outer-sheathed conforming to IS: 7098. (Part-I).	
23.0	Control cable	Control cable shall be multi core, minimum 2.5 sq.mm cross section, stranded copper conductor, PVC insulated, inner PVC sheathed / galvanized steel wire armored and outer sheath made of FRLS PVC compound. In situation where accuracy of measurement or voltage drop in control circuit, warrant, higher cross sections as required	

		shall be used. 4 sq.mm copper conductors shall be used for CT circuits, all other specification remaining same. In 4 sq.mm conductor impose unacceptable high burden on CTs, higher cross section of conductor shall be used.
24.0	Flexible trailing cable	1.1 KV grade Trailing cables shall have tinned copper (class 5) conductor, insulated with heat resistant elastomeric compound based on Ethylene Propylene Rubber (EPR) suitable for withstanding 90°C continuous conductor temperature and 250 deg C during short circuit, inner-sheathed with heat resistant elastomeric compound, nylon cord reinforced, outer-sheathed with heat resistant, oil resistant and flame retardant heavy duty elastomeric compound conforming to IS 9968
25.0	Control Voltage	110 V

B) MANUAL HOIST (CHAIN PULLEY BLOCK):

DATA SHEET-A

1.00.00	Type	:	Hand operated chain pulley block
2.00.00	Area	:	As per scope sheet attached
3.00.00	Design	:	IS: 3832, IS: 2429, IS 15560, IS 210, IS 4367, IS 6216, IS: 4460. (All standards shall be of latest revision)
4.00.00	Duty Class as per IS:3832	:	Class –II
5.00.00	Hoisting Mechanism		
a)	Type	:	Hand operated gear transmission
b)	Type of gear	:	Spur / Helical
c)	Load Chain	:	
	i) Type	:	Link type
	ii)Material	:	Alloy steel grade 80 as per IS: 6216
	iii) Conforms to (Std./Code)	:	IS: 6216
d)	Hand Chain	:	
	i) Type	:	Link type
	ii) Material	:	Mild steel (grade 30) as per IS 2429 Part I
e)	Load Hook & Hook Block	:	
	i) Type of load hook	:	Plain shank- Trapezoidal section
	ii) Load hooks conform to / Material	:	IS: 15560
	iii)Type of hook suspension	:	Swivelling
	iv)Type of make of bearing of hook suspension	:	Thrust ball bearing

f)	Gears/pinion	:	
	i) Type	:	Spur
	ii) Material	:	Alloy steel / carbon steel (Material confirming to IS 3832)
	iii) Type of bearing used	:	Antifriction ball bearing / Roller
g)	Sprockets		
	i) Type of bearings used	:	Antifriction ball bearing / Roller
h)	Method of lubrications Used		
	i) Bearings	:	Grease
	ii)Gearing & Pinions	:	Grease
	iii)Sprockets	:	Grease
i)	Brakes		
	i) Type	:	Ratchet and pawl arrangement along with screw and friction disc type
6.00.0	Trolley & Bridge Drive		
a)	Trolley		
i)	Type	:	Geared (Manually operated)
ii)	Material of frame	:	Rolled structural steel (IS:2062 Grade A or B)
b)	Drive Chain		
i)	Type	:	Link type
ii)	Material	:	Steel Gr.30
c)	Trolley Wheel		
i)	Number of pairs of wheel in each trolley/bridge	:	Two/four
ii)	Flange	:	Single flanged
iii)	Wheel material	:	Heat Treated Carbon steel/low alloy steel/graded cast iron (Material confirming to IS 3832)
iv)	Type of bearings need	:	Antifriction
d)	Gears		
	i) Type	:	Spur / helical
	ii) Material	:	Alloy/ Carbon steel (Material confirming to IS 3832)
	iii) Type of bearings used	:	Antifriction
e)	Method of lubrication for		
	i) Bearings	:	Grease
	ii) Sprockets	:	Grease
f)	Load chain wheel		
	i) Material	:	SG iron/ Steel casting/IS 3832
g)	Hand chain wheel		
	i) Material	:	SG iron/ Steel casting/Grey iron Casting./IS 3832

SECTION-C2
(SPECIFIC TECHNICAL REQUIRMENT-ELECTRICAL)

TECHNICAL SPECIFICATION

FOR

DM PLANT/ CW TREATMENT/ PRE TREATMENT PLANT/EFFLUENT TREATMENT PLANT/ GAS CHLORINATION PLANT/SEWAGE TREAMENT PLANT

(ELECTRICAL PORTION)

1.0 **EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:**

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

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

Refer "Electrical Scope between BHEL and Vendor".

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

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

a) A copy of this sheet "Electrical equipment Specification for **DM PLANT/ CW TREATMENT/ PRE TREATMENT PLANT/EFFLUENT TREATMENT PLANT/ GAS CHLORINATION PLANT/SEWAGE TREAMENT PLANT**." and "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
b) Electrical load requirement

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

4.0 List of enclosures :

a) Electrical scope between BHEL & vendor (Annexure –I)
b) Technical specification for motors.
c) Datasheets & quality plan for motors.
d) Provenness & Technical specification for control cables
e) Datasheets & quality plan for control cables
f) Technical specification for Screened control cables
g) Datasheets & quality plan for Screened control cables
h) Electrical Load data format (Annexure –II)
i) BHEL cable listing format (Annexure –III)

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR(FOR EPC PROJECTS)

PACKAGES : VENTILATION / AC / MRS/ DM/ PTP/ CHLORINATION/ ETP/ CPU/ CWTP/STP
SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT
PROJECT:

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor. OR (DE to select the choice applicable for their project)) 415 V AC, 3 phase, 3 wire supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	 BHEL BHEL BHEL	 BHEL Vendor BHEL	1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Termination at BHEL equipment terminals by BHEL. 3. Termination at Vendor equipment terminals by Vendor.
4	Junction box for control & instrumentation cable	Vendor	Vendor	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, optical fibre etc.	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
6	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	BHEL Vendor	BHEL Vendor	Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs, as per approved layout drawing during contract stage.
7	Cable glands ,lugs and bimetallic strip for equipment supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and

Shweta Gaba 09/03/15

Pawan Dwi 09/3/15

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR(FOR EPC PROJECTS)

PACKAGES : VENTILATION / AC / MRS/ DM/ PTP/ CHLORINATION/ ETP/ CPU/ CWTP/STP

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

PROJECT:

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
				control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	BHEL	BHEL	
10	Equipment grounding (including electronic earthing) & lightning protection	BHEL	BHEL	Refer note no. 4 for electronic earthing
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer/ BHEL approval at contract stage.
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable and electronic earthing cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Electrical Equipment & cable tray layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish Electrical equipment layout & cable tray layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Cabling arrangement of the same (wherever overhead cable trays, trenches, cable ducts, conduits etc.) shall be decided during contract stage. Electrical equipment layout & cable tray layout drawing shall be subjected to BHEL/ customer approval without any commercial implications to BHEL.

Shweta Gaba 09/03/15

Pravoon Dak 09/3/2015

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR(FOR EPC PROJECTS)

PACKAGES : VENTILATION / AC / MRS/ DM/ PTP/ CHLORINATION/ ETP/ CPU/ CWTP/STP
SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT
PROJECT:

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.
4. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

Shweta Gabe
09/03/15

Pawan Dub
09/3/2015

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

ANNEXURE-II

NOTES:
1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER
2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V
: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

LOAD DATA (ELECTRICAL)	JOB NO.	434	ORIGINATING AGENCY		PEM (ELECTRICAL)	
	PROJECT TITLE	3x800MW PATRATU STPP	NAME		DATA FILLED UP ON	
	SYSTEM	STP	SIGN.		DATA ENTERED ON	
	DEPTT. / SECTION	MAUX	SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE	

SUB–SECTION – B-07

MOTORS

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2

CLAUSE NO.	TECHNICAL REQUIREMENTS
	MOTORS
1.00.00	**GENERAL REQUIREMENTS**
1.01.00	For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.
1.02.00	All equipment shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.
1.03.00	Contractor shall provide fully compatible electrical system, equipment, accessories and services.
1.04.00	All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.
1.05.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.
1.06.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances for contractors equipment and systems shall be under the contractor scope.
1.07.00	Degree of Protection Degree of protection for various enclosures as per IEC60034-05 shall be as follows:- i) Indoor motors - IP 54 ii) Outdoor motors - IP 55 iii) Cable box-indoor area - IP 54 iv) Cable box-Outdoor area - IP 55
2.00.00	**CODES AND STANDARDS** 1) Three phase induction motors : IS/IEC:60034 2) Single phase AC motors : IS/IEC:60034 3) Crane duty motors : IS:3177, IS/IEC:60034 4) DC motors/generators : IS/IEC:60034 5) Energy Efficient motors : IS 12615, IEC: 60034-30

CLAUSE NO.	TECHNICAL REQUIREMENTS
3.00.00	**TYPE**
3.01.00	**AC Motors:** a) Squirrel cage induction motor suitable for direct-on-line starting. b) Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30. c) Crane duty motors shall be squirrel cage Induction motor as per the requirement. d) Motor operating through variable frequency drives shall be suitable for inverter duty. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.
3.02.00	DC Motors Shunt wound
4.00.00	**RATING** (a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor. (b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations. (c) For BFP motors, starting MVA shall be restricted to meet requirements indicated in B-0. (d) The starting current for the DC motors shall be restricted to 3 times of the full load current.
5.00.00	**TEMPERATURE RISE** **Air cooled motors** 70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation. **Water cooled** 80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.

CLAUSE NO.	TECHNICAL REQUIREMENTS
	41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class 90 (Y) wet wound Boiler circulation pump motor.
6.00.00	**OPERATIONAL REQUIREMENTS**
6.01.00	**Starting Time**
6.01.01	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.
6.01.02	For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.
6.02.00	**Torque Requirements**
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.
6.02.02	Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.
6.03.00	**Starting voltage requirement**
	(a) Up to 85% of rated voltage for ratings below 110 KW
	(b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW
	(c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW
	(d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW
	(e) Up to 75 % of rated voltage for ratings above 4000KW
	Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.

CLAUSE NO.	TECHNICAL REQUIREMENTS
7.00.00	**DESIGN AND CONSTRUCTIONAL FEATURES**
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS: 2148 as detailed below (a) Fuel oil area : Group – IIB (b) Hydrogen generation : Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA / IEC60034)
7.03.00	Winding and Insulation (a) Type : Non-hygroscopic, oil resistant, flame resistant (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. (c) 11kV & 3.3 kV AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Pressure Impregnated i.e. resin poor method. The lightning Impulse & intertern insulation surge withstand level shall be as per IEC-60034 part-15. However winding insulation for wet wound Boiler circulation pump motor shall be thermal class 90 (Y) or better. (d) 240VAC, 415V AC & 220V DC motors : Thermal Class (B) or better
7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.

CLAUSE NO.	TECHNICAL REQUIREMENTS
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.
7.06.00	Noise level for all the motors shall be limited to 85dB (A) except for BFP motor for which the maximum limit shall be 90 dB(A). Vibration shall be limited within the limits prescribed in IS/IEC 60034-14. Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.
7.08.00	Motor body shall have two earthing points on opposite sides.
7.09.00	11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.
7.10.00	3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Suitable termination kit shall be provided for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material for single core cables) shall be provided.
7.11.00	The spacing between gland plate & center of terminal stud shall be as per Table-I.
7.12.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.

CLAUSE NO.	TECHNICAL REQUIREMENTS
8.00.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor. (a) Below 110KW : 11.0 (b) From 110 KW & upto 200 KW : 9.0 (c) Above 200 KW & upto 1000KW : 10.0 (d) From 1001KW & upto 4000KW : 9.0 (e) Above 4000KW : 6 to 6.5
9.00.00	CW motor shall be designed with minimum power factor of 0.8 at design duty point.
10.00.00	**TYPE TEST**
10.01.00	**HT MOTORS**
10.01.01	The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII-(BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.
10.01.02	The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set–up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.
10.01.03	In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the employer for waival of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.
10.01.04	Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED "and carried out within last ten years from the date of bid opening. These reports should be for

CLAUSE NO.	TECHNICAL REQUIREMENTS
	the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval.
10.01.05	**LIST OF TYPE TESTS TO BE CONDUCTED** **The following type tests shall be conducted on each type and rating of HT motor** (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary excess torque test (subject to test bed constraint). (d) Full load test (subject to test bed constraint) (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.
10.01.06	**LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED** **The following type test reports shall be submitted for each type and rating of HT motor** (a) Degree of protection test for the enclosure followed by IR, HV and no load run test. (b) Terminal box-fault level withstand test for each type of terminal box of HT motors only. (c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15 (d) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15

CLAUSE NO.	TECHNICAL REQUIREMENTS
10.02.00	**LT Motors**
10.02.01	LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for employer's approval the reports of all the type tests as listed in this specification and carried out within last *ten* years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
10.02.02	However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval.
10.02.03	**LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED** **The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only** 1. Measurement of resistance of windings of stator and wound rotor. 2. No load test at rated voltage to determine input current power and speed 3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) 4. Full load test to determine efficiency power factor and slip. 5. Temperature rise test. 6. Momentary excess torque test. 7. High voltage test. 8. Test for vibration severity of motor. 9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section) 10. Test for degree of protection and 11. Over speed test.

CLAUSE NO.	TECHNICAL REQUIREMENTS
	12. Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1
10.03.00	All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.
10.04.00	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.

TABLE - I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm
UP to 3 KW	**As per manufacturer's practice.**
Above 3 KW - upto 7 KW	85
Above 7 KW - upto 13 KW	115
Above 13 KW - upto 24 KW	167
Above 24 KW - upto 37 KW	196
Above 37 KW - upto 55 KW	249
Above 55 KW - upto 90 KW	277
Above 90 KW - upto 125 KW	331
Above 125 KW-upto 200 KW	203

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.

PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

CLAUSE NO.	TECHNICAL REQUIREMENTS

Motor MCR in KW	Clearance
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

MOTOR

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

Note:
1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW.
2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard
3. Makes of major bought out items for HT motors will be subject to NTPC approval.

Y1 = for HT Motor / Machines only.

MOTOR

TESTS/CHECKS / ITEMS/ COMPONENTS	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-325/IS-4722 /IS- 9283/IS 2148/IEC60034\IEC 60079-I	Vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion
Plates for stator frame, end shield, spider etc.										
Shaft										
Magnetic Material	Y		Y							
Rotor Copper/Aluminium										
Stator copper			Y							
SC Ring										
Insulating Material			Y							
Tubes for Cooler		Y								
Sleeve Bearing		Y								
Stator/Rotor, Exciter Coils										
Castings, stator frame, terminal box and bearing housing etc.										
Fabrication & machining of stator, rotor, terminal box										
Wound stator										
Wound Exciter										
Rotor complete				Y	Y					
Exciter, Stator, Rotor, Terminal Box assembly										
Accessories, RTD, BTD,CT, , Space heater, antifriction bearing, gaskets etc.										
Complete Motor						Y	Y	Y	Y1	Y

Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW.

2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard

3. Makes of major bought out items for HT motors will be subject to NTPC approval.

Y1 = for HT Motor / Machines only.

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

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

1.0 INTENT OF SPECIFIATION

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

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

2.0 CODES AND STANDARDS

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

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

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

3.0 DESIGN REQUIREMENTS

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

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

3.3 Starting Requirements

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

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

The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.

3.3.3 The following frequency of starts shall apply

i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.

ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)

iii) Motors for coal conveyor and coal crusher application shall be suitable fro three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be sutable fro mimimum 20,000 starts during the life time of the motor

3.4 **Running Requirements**

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

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

3.5 **Stress During bus Transfer**

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

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

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

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

4.0 **CONSTRUCTIONAL FEATURES**

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

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

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

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

4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.

4.5 Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.

4.6 In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation.
In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.

4.7 **Terminals and Terminal Boxes**

4.7.1 Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.

Unless otherwise statedin Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".

4.7.2 Unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.

4.7.3 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or V W & V respectively.

4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.

4.7.5 Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.

4.7.6 Degree of protection for terminal boxes shall be IP 55 as per IS 4691.

4.7.7 Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.

4.7.8. Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.

4.7.9 Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.

4.8 Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.

4.9 **General**

4.9.1 Motors provided for similar drives shall be interchangeable.

4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.

4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.

4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.

4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.

4.9.6 Name plate with all particulars as per IS: 325 shall be provided

4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

5.0 **INSPECTION AND TESTING**

5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.

5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.

5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.

5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.

6.0 **DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT**

a) OGA drawing showing the position of terminal boxes, earthing connections etc.
b) Arrangement drawing of terminal boxes.
c) Characteristic curves:
(*To be given for motor above 55 kW unless otherwise specified in Data Sheet*).

i) Current vs. time at rated voltage and minimum starting voltage.
ii) Speed vs. time at rated voltage and minimum starting voltage.
iii) Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.
iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.

1.0	Design ambient temperature	:	50 °C
2.0	Maximum acceptable kW rating of LV motor	:	≤200KW
3.0	Installation (Indoors/ Outdoors)	:	As required
4.0	Degree Of Protection (Indoor/Outdoor)	:	IP54/IP55
5.0	Type of Cooling	:	TEFC/CACA/TETV
6.0	Details of supply system		
	a) Rated voltage (with variation)	:	415V ± 10%
	b) Rated frequency (with variation)	:	50 Hz (Variation: +3% TO –5%)
	c) Combined voltage & freq. variation	:	10%
	d) System fault level at rated voltage	:	50 kA for 1 sec
	e) Short time rating for terminal boxes		
	○ 110kW & Above (Breaker controlled)	:	50 kA for 1 sec
	○ Below 110kW (SFU+ Contactor controlled)	:	50 KA for 0.20 sec.
	f) LV System grounding	:	Solidly
7.0	Class of insulation	:	Class 'F', with temp rise limited to class B. (Refer clause 5.00.00 of Motors)
8.0	Minimum voltage for starting (As percentage of rated voltage)	:	As per Customer Motor Spec (enclosed)
9.0	Power cables data	:	Shall be given during Detailed engg.
10.0	Earth Conductor Size & Material	:	Shall be given during Detailed engg.
11.0	Space heater supply	:	240 V, 1Φ , 50 Hz
12.0	Rating up to which Single phase motor	:	Acceptable below 0.20 kW
13.0	Tests	:	As per Customer motor spec. (enclosed)
14.0	Energy efficient/ Flame proof motor	:	As per Customer spec. requirement

- **Also detail Customer spec. for Motors to be referred as enclosed with spec.**
- **The requirements mentioned in Customer Motor Spec for Motors shall prevail in case of conflict between the same and the corresponding requirements mentioned in the Section C/ Section D/ Datasheet A**

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

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

NAME OF VENDOR					
			SEAL	REV.	
NAME	SIGNATURE	DATE			

			CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
		QUALITY PLAN	BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
		SHEET 1 OF 9	SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	RAW MATERIAL & BOUGHT OUT CONTROL											
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	FREE FROM BLINKS, CRACKS, WAVINESS ETC	LOG BOOK	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	-DO-	3	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	-DO-	-DO-	-DO-	INSPEC. REPORT	3	-	2	
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	MANFR'S DRG./SPEC BOOK	RELEVENT IS/SPEC.	SUPPLIERS TC & LOG	3	-	2	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3	-	2	
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	MANFR'S DRG./SPEC	RELEVENT IS/	SUPPLIER'S TC	3	-	2	HEAT NO. SHALL BE VERIFIED
		3.DIMENSIONS	MA	MEASUREMENT	100%	MANUFR'S DRG.	MANUFR'S DRG.	LOG BOOK	3	-	2	
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	LOG BOOK	3	-	2	

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

			CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
		QUALITY PLAN	BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
		SHEET 2 OF 9	SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	**W**	**V**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			**11**
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MFG. DRG. SPEC.	RELEVANT IS	SUPPLIER'S TC	3	-	2	
		3. DIMENSIONS	MA	MEASUREMENT	100%	-DO-	MANUFR'S DRG.	LOG BOOK	3	-	2	
		4.INTERNAL FLAWS	CR	UT	-DO-	ASTM-A388	MANUFR'S SPEC. BHEL SPEC.	-DO-	3	2	1	FOR DIA OF 55 MM & ABOVE
1.6	SPACE HEATERS, CONNEC-TORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	-DO-	MANUFR'S DRG. SPEC.	MANUFR'S DRG. SPEC.	-DO-	3	-	2	
		2. PHYSICAL COND.	MA	-DO-	-DO-	-	NO PHYS. DAMAGE, NO ELECTRICAL DISCONTINUITY	-DO-	3	-	2	
		3.DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG./ SPEC.	MANUFR'S DRG. / SPEC.	-DO-	3	-	2	
		4.PERFORMANCE/ CALIBRATION	MA	TEST	100%	-DO-	-DO-	INSP. REPORT	3	-	2	

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

			CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
		QUALITY PLAN	BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
		SHEET 3 OF 9	SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC.	MA	VISUAL	100%	-	NO VISUAL DEFECTS	INSPT. REPORT	3	-	2	
		2. OTHER CHARACTERISTICS	MA	TEST	SAMPLE	MANUF'S SPEC.	MANUF'S SPEC.	LOG BOOK AND OR SUPPLIER'S TC	3	-	2	
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND.	MA	VISUAL	100%	-	NO VISUAL DEFECTS (FREE FROM BURS)	LOG BOOK	3	-	-	
		2.DIMENSIONS INCLUDING BURS HEIGHT	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG. .	MANUFR'S DRG.	-DO-	3	-	2	FOR MV MOTOR INSULA-TION/VARNISH THICKNESS SHALL BE MORE THAN THE BURS HEIGHT
		3. ACCEPTANCE TESTS	MA	ELECT. & MECH TESTS	-DO-	MANUF'S SPEC./ RELEVANT IS	RELEVANT IS	SUPPLIER'S TC	3	-	2	
1.9	CONDUCTORS	1. SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	LOG BOOK	3*	-	2*	* MOTOR MANUFACTURER TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS (10% SAMPLE) AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY BHEL/CUSTOMER.
		2.ELECT. PROP, & MECH. PROP	MA	ELECT. & MECH.TEST	SAMPLES	RELEVANT IS/ BS OR OTHER STANDARDS	RELEVANT IS/ BS OR OTHER STANDARDS	SUPPLIERS TC & VENDOR'S INSPN. REPORTS	3	-	2	

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			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
		SHEET 4 OF 9	SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
		3.DIMENSIONS	MA	MEASUREMENT	-DO-	-DO-	-DO-	Log Book	3	-	2	
1.10	BEARINGS	1.MAKE & TYPE	MA	VISUAL	100%	MANFR'S DRG./ APPROVED DATASHEET	MANFR'S DRG./ APPROVED DATASHEET	-DO-	3	-	2	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	BHEL DATA SHEET	BHEL DATA SHEET BEARING MANUF'S CATALOGUES	-DO-	3	-	2	
		3.SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	2	
1.11	SLIP RING (WHEREVER APPLICABLE)	1.SURFACE COND.	MA	VISUAL	100%	-	-DO-	-DO-	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
		3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	-DO-	MANUF'S SPEC./ BHEL SPEC.	MANUF'S SPEC./ BHEL SPEC.	-DO-	3	-	2	
		4.HV/IR	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-	2	
1.12	OIL SEALS & GASKETS	1.MATERIAL OF GASKET	MA	VISUAL	100%	MANUF'S DRG/SPECS	MANUF'S DRG./ SPECS.	-DO-	3	-	-	
		2.SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	

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