ANNEXURE-I
LIST OF MAKES OF SUB-VENDOR ITEMS

SUB-VENDOR LIST - FUEL OIL UNLOADING AND STORAGE SYSTEM

SL. NO	ITEM	SUB-VENDORS	PLACE	TECHNICAL LIMIT
MECHANICAL				
1	GATE, GLOBE AND CHECK (CARBON STEEL VALVES)	A.V. VALVES LTD	AGRA	
		ATAM VALVES PVT. LTD.	JALANDHAR	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	
		M/S GM ENGINEERING	RAJKOT	
		INTERVALVE (INDIA) LTD.	PUNE	A) STEEL GATE VALVES: UPTO 50NB, #800 AND 65NB TO 150NB, #150 B) STEEL GLOBE VALVES: UPTO 50NB, #800 AND 65NB TO 100NB, #150 C)SUPPLIER NOT REGISTERED FOR NR VALVES
		LEADER VALVES LTD.	JALANDHAR	
		NITON VALVE INDUSTRIES PVT LTD	MUMBAI	
		NSSL LIMITED.	NAGPUR	
		STEEL STRONG VALVES (I) PVT.LTD.	MUMBAI	LIMIT AS PER VD FILE AS ATTACHED IN SHEET 2
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	CC/CSS-GATE-BBT-UPTO600NB CL UPTO300,GATE-PSBT UPTO250NB CL 1500,GLV-BBT-UPTO300NB CL UPTO600,SCNRV-BBT-UPTO600NB CL UPTO150,SCNRV-BBT-UPTO300NB CL 300,SCNRV-PSBT-UPTO150NB CL UPTO900
		VALTECH INDUSTRIES	MUMBAI	CAST CARBON & ALLOY STEEL - VALVE/RATING/SIZE- GV/150/900,GV/300/400, GV/600/300 , GV/GLV/NRV/900/250 , GLV/300/300,GLV/150/350/ , SCNRV/150/700, SCNRV/300/350, SCNRV/600/250.
		V.K. VALVES PVT. LTD.,	JALANDHAR	
		WEIR BDK VALVES	NEW DELHI	
		AUDCO -L&T	CHENNAI / COIMBATORE	
		OSWAL INDUSTRIES		
		HITECH	AHMEDABAD	
		KSB WATER PUMPS / VALVES	COIMBATORE	
		KBL	KONDHAPURI	
		HAWA ENGINEERS	AHMEDABAD	
		BHEL	GOINDWAL	
		FOURESS ENGG	MUMBAI	UPTO 600 NB, CL-300 & 300NB CL-600
		FOURESS ENGG	AURANGABAD	

2	CS BALL VALVES	A.V. VALVES LTD	AGRA	
		AKAY INDUSTRIES PVT.LTD.	DHARWAD	
		BELGAUM AQUA VALVES PVT. LTD.	-VOID-	
		-VOID-	-VOID-	
		ATAM VALVES PVT. LTD.	JALANDHAR	
		-VOID-	-VOID-	
		M/S GM ENGINEERING	RAJKOT	
		-VOID-	-VOID-	
		INTERVALVE (INDIA) LTD.	PUNE	
		LEADER VALVES LTD.	JALANDHAR	
		MICROFINISH VALVES PVT LTD.	HUBLI	
		-VOID-	-VOID-	
		-VOID-	-VOID-	
		-VOID-	-VOID-	
		VALTECH INDUSTRIES	MUMBAI	
		-VOID-	-VOID-	
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	DELHI	
		-VOID-	-VOID-	
		L&T VALVES	COIMBATORE	
		L&T VALVES (AUDCO)	CHHENNAI	
		-VOID-	-VOID-	
		CRESCENT		
3	**CS PLUG VALVES**	FLOWSERVE (AUDCO)	CHENNAI	
		IMET	HUBLI	
		DEZURIK		
		-VOID-	-VOID-	
		LEADER VALVES LTD.	JALANDHAR	
4	**SUMP PUMP (VERTICAL**	DARLING PUMPS PVT. LTD	INDORE	
		FLOWMORE LTD.	GURGAON	

	CENTRIFUGAL)	SU MOTORS PVT. LTD.	MUMBAI	
		VARAT PUMP AND MACHINERY PVT. LTD.	KOLKATA	
		WPIL LIMITED	KOLKATA	
		SAM TURBO INDUSTRY LTD	COIMBATORE	
		KISHORE	PUNE	
		-VOID-	-VOID-	
		FLOWMORE PUMP	GHAZIABAD	
		-VOID-	-VOID-	
		B & C ENGG(BECON WEIR)	CHENNAI	
5	**SCREW PUMPS**	ROTO PUMPS	NOIDA	
		TUSHACO	MUMBAI	
		UT PUMPS	FARIDABAD	
6	**API 5L ERW PIPE**	TISCO	JAMSHEDPUR	
		SURYA ROSHNI	BAHADURGARH	
		JINDAL	GHAZIABAD	
		MSL	RAIGAD	
		SAIL	ROURKELA	
		RATNAMANI	KUTCH	
7	**ASTM A 106, CS SEAMLESS PIPE**	ISMT	AHMED NAGAR	
		MSL	RAIGAD	
		RATNAMANI		
		SAIL		
		ISMT	BARAMATI	
8	**CS ERW PIPE (IS 1239 / 3589)**	SURYA ROSHNI	BAHADURGARH	
		JINDAL	GHAZIBAD/HISSAR	
		MSL	RAIGAD	
		SAIL	ROURKELA	
		HSL		
		INDUS TUBE	GAUTAM BUDDH NAGAR	
		RATNAMANI	KUTCH /AHMEDABAD / CHHATRAL	
		TATA TUBE	JAMSHEDPUR	
		BST		
		JAIN TUBES		
		AJANTA		

		ZENITH		
		INDUS TUBES	G B NAGAR	
		MANN IND	INDORE	
		ITC		
		-VOID-	-VOID-	
9	**SUCTION HEATER**	PARKAIRE	DELHI	
		MVS	DELHI	
		MELCON	DELHI	
		GASO ENERGY	PUNE	
		INDCON	DELHI	
		TEMASME	NOIDA	
10	**PRESSURE REDUCING VALVE & DESUPERHEATER**	MIL CONTROLS	INDIA	
		-VOID-	-VOID-	
		COPES VULCAN LTD.	U.K	
		-VOID-	-VOID-	
		CONTROL COMPONENT INDIA PVT. LTD.	NOIDA	
		YARWAY CORPORATION	USA	
		HOLTER REGELARMATUREN GMBH & CO.	GERMANY	
		INSTRUMENTATION LTD.	PALAKKAD	
11	**STRAINERS (DUPLEX / SIMPLEX BASKET TYPE)**	GENERAL MECHANICAL WORKS PVT LTD	VADODARA	
		GRAND PRIX	FARIDABAD	
		GUJARAT OTOFILT	VATVA , AHMEDABAD	
		FILTRATION ENGRS	MUMBAI	
		JAYPEE INDUSTRIES PVT. LTD.	NEW DELHI	
		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI	
		OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI	
		BHATIA ENGINEERING CO.	NEW DELHI	SIMPLEX ONLY
		FILTERATION ENGINEERS (I) PVT. LTD.	MUMBAI	SIMPLEX ONLY
		SUNGOV ENGINEERING PVT. LTD.	CHENNAI	

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

		-VOID-	-VOID-	
15	**STRUCTURAL STEEL / MS-PLATE**	SAIL		
		ESSAR STEEL		
		TISCO		
		RINL		
		JINDAL		
		M/S UTTAM VALUE STEEL (LLOYDS)		
		ISPAT		
		JSW		
		INDIAN IRON & STEEL CO. LTD		
16	**SAFETY RELIEF VALVE**	SPIRAX MARSHALL	PUNE	
		FISCHER SANMAR	CHENNAI	
		BHEL	TRICHY	
		L&T		
		LEADER	JULLANDHAR	
17	**PAINT**	SUB-VENDORS HAS BEEN SPECIFIED IN THE PAINTING SPECIFICATIONS		
18	**FITTINGS (MS/SS)**	PIPE FIT ENGINEERS	VADODARA	
		GUJRAT INFRA PIPES	VADODARA	
		MS FITTINGS	KOLKATA	
		TUBE PRODUCT	VADODARA	
		SIDDARTH & GAUTAM	FARIDABAD	
		EBY	MUMBAI	
		NL HAZRA	KOLKATA	
		EXCEL METAL		
		INTERTECH		
		FITTECH		
		METAL LLOYDS	MUMBAI	
		TRUE FORGE	FARIDABAD	
19	**OIL HOSE**	D WREN & CO	KOLKATA	
		SUDEEP INDUSTRIES	KOLKATA	
		HYDROKRIMP	MUMBAI	
		PRESIDENCY RUBBER	KOLKATA	

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

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

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

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

	LUGS, JB (FLAME PROOF)	BALIGA	CHENNAI	
		FLEXPRO	NAVSARI	
40	**BATTERY CHARGER FOR PLC**	CHLORIDE POWER	KOLKATA	
		CHABBI	JALGAON	
		AMAR RAJA	TIRUPATI	
		STATCON	NOIDA	
		HBL POWER SYSTEM	HYDERABAD	
		JEMA ENERGY	SPAIN	
		MASS-TECH CONTROLS PVT.LTD.	MUMBAI	
		DUBAS	BANGALORE	
		CALDYNE	KOLKATA	
41	**DC LEAD ACID / NI-CD BATTERIES**	AMCO SAFT INDIA LTD	BANGALORE	NI-CD BATTERIES ONLY
		EXIDE INDUSTRIES LTD	DELHI	LEAD ACID BATTERIES ONLY.
		HBL POWER SYSTEMS LTD	HYDERABAD	NI/CD AND TUBULAR TYPE FOR LEAD ACID
		HOPPECKE BATTERIEN GMBH & CO.KG,	GERMANY	
		AMAR RAJA	TIRUPATI	
		SAFT	FRANCE/SWEDEN	
42	**CONTROL / POWER CABLE**	CORDS CABLE	BHIWADI	
		RADIANT CABLES	HYDERABAD	
		POLYCAB	DAMAN	
		KEI	BHIWADI	
		NICCO	KOLKATA	
		RAVIN CABLES	PUNE	
		INCAB	PUNE	
		HVPL	FARIDABAD	
		TORRENT CABLE	NADIAD	
		HAVELLS	ALWAR	
		PARAMOUNT	KHUSHKHERA	
		SRI RAM CABLES	BHIWADI	
		THERMOCABLES	HYDERABAD	
		TORRENT CABLE	NADIAD	
		UNIVERSAL CABLES	SATNA	
		GEMSCAB	BHIWADI	
		DELTON	FARIDABAD	
43	**PLC BASED PANELS**	SIEMENS	NASIK	
		SCHNEIDER	NASIK	
		ROCKWELL	SAHIBABAD	
		GE INTELLIGENT PLATFORM	BANGALORE	
		HONEYWELL AUTOMATION INDIA LIMITED ,	PUNE	
		ABB	BANGALORE	
44	**OWS/PC**	HP/COMPAQ /DELL/HCL/IBM/LENOVO		

45	**PRINTER**	HP/CANNON/EPSON/XEROX/IBM/LEXMARK		
46	**INSTRUMENT FITTINGS**	AURA INCORPORATED	DELHI	
		ASTEC VALVES & FITTINGS PVT. LTD.,	MUMBAI	
		ARYA CRAFTS & ENGINEERING PVT. LTD.	MUMBAI	
		COMFIT & VALVE PVT. LTD.	NANDASAN	
		FLUIDFIT ENGINEERS PVT. LTD.	MUMBAI	REGISTERED AS PER 22ND ELECTRICAL AND C&I MISCC MEETING DTD. 15.01.2014
		FLUID CONTROLS PVT. LTD.	MUMBAI	NAME CHANGED FROM M/S HYD-AIR VALVES PVT. LTD. TO M/S FLUID CONTROLS PVT. LTD. AS PER 25TH MISCC-ELECTRICAL AND C&I DTD. 20.02.2014
		HP VALVES & FITTINGS INDIA PVT. LTD.	CHENNAI	
		PRECISION ENGINEERING INDUSTRIES	MUMBAI	
		PANAM ENGINEERS,	MUMBAI	
		PERFECT INSTRUMENTATION CONTROL (INDIA) PVT. LTD.	MUMBAI	
		VIKAS INDUSTRIAL PRODUCTS	NOIDA	FINANCIAL LIMIT REVIEWED ON 05.06.2014
47	**CABLE TRAY SUPPORT SYSTEM - BOLTABLE**	AM-TECH ENGG.SERVICES	PUNE	
		INDUSTRIAL PERFORATION (I) PVT.LTD.	KOLKATA	
		INDMARK FORMTECH PVT. LTD.	PUNE	
		PREMIER POWER PRODUCTS (CAL) PVT. LTD.	KOLKATA	GALVANISATION TO BE DONE AT ITS OWN PLANT OR FROM BHEL-PEM APPROVED GALVANIZERS.
		RATAN PROJECTS & ENGINEERING CO. PVT.LTD.	KOLKATA	
		STEELITE ENGINEERING LTD.	MUMBAI	
48	**CABLE TRAY SUPPORT SYSTEM-WELDED(GALV)**	ASSOCIATED POWER STRUCTURES PVT. LTD.	G. I. D. C., MAKARPURA, VADODARA-GUJARAT	WORKS ADDRESSES ARE APPLICABLE FOR MANUFACTURING AND GALVANISING.
		INDUSTRIAL PERFORATION (I) PVT.LTD.	DUM DUM KOLKATA-WEST BENGAL	
		INDMARK FORMTECH PVT. LTD.	MIDC BHOSARI PUNE-MAHARASHTRA	GALVANIZING UNIT LOCATED AT PHAS-3, E-11/1, MIDC, PUNE ,
		JAMNA METAL COMPANY	DSIDC, NARLA INDL. AREA DELHI	
		PREMIER POWER PRODUCTS (CAL) PVT. LTD.	KOLKATA,-WEST BENGAL	GALVANISATION TO BE DONE AT ITS OWN PLANT OR FROM BHEL-PEM APPROVED GALVANIZERS.
		PATNY SYSTEMS (P) LTD	SARDAR PATEL	

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

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

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

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

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

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

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

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

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

ANNEXURE-II

LIST OF MANDATORY SPARES

ANNEXURE-II
MANDATORY SPARE LIST

SI. NO.	PARTICULARS	QUANTITY
XI	Fuel Oil System	
1	**Tanks & Pumps**	
1.1	Suction Heater Gaskets	
1.1.1	For LDO/HFO Day Tanks	4 sets
1.2	Suction Heater Nuts and Bolts	
1.2.1	For LDO/HFO Day Tanks	Lot
1.3	Pump suction Strainer Basket	3 Nos. for each type
1.4	Pump suction Strainer Gasket	6 Nos. for each type
1.5	Pump O-Ring and Gasket	12 Nos. for each type
1.6	Various types of Gland packing for valves	Lot for each type
1.7	Pump Screw	3 Nos. for each type
1.8	Pump and Motor Bearing	
1.8.1	For HFO & LDO transfer pump	4 sets for each pump
1.8.2	For Drain Oil Pump	2 sets
1.9	Relief Valve Spring	1 No. each
1.9.1	For HFO & LDO transfer pump	3 nos.
1.9.2	For Drain Oil Pump	3 nos.
1.10	Suction Heater Heating Element	1 No.
1.11	Mat Coil Heater – Heating Element	2 sections
1.12	Thermodynamic traps	5 Nos.
1.13	Inverted Bucket type traps	2 Nos.
2	Electrical Items for 3.3KV, 415V System & DC	Items indicated below:
2.1.0	**415 Volt Motor (above 30KW Rating upto 160KW)**	
2.1.1	End Shield Cover Driving & Non-Driving End	1Set for each type and rating of Motor
2.1.2	Driving End & Non-Driving End Bearing	1Set for each type and rating of Motor
2.1.3	Cooling Fan	1No. for each type and rating of Motor
2.1.4	Motor Space Heater	1No. for each type and rating of Motor
2.1.5	Motor Terminal Block	1No. for each type and rating of Motor
2.1.6	Complete Set of Coupling	1Set for each Application
2.2.0	**415 Volt Motor (Upto 30KW Rating)**	
2.2.1	Driving End & Non-Driving End Bearing	3 Set for each type and rating of Motor
2.2.2	Cooling Fan	2 No. for each type and rating of Motor
2.2.3	Motor Terminal Block	5 No. for each type and rating of Motor
2.2.4	Complete Set of Coupling	1 Set for each Application

SI. NO.	PARTICULARS	QUANTITY
2.3.0	**ACDB (as applicable)**	
2.3.1	Contactor	
2.3.1.1	Power Contactor (AC)	
2.3.1.1.1	Power Contactor Complete Assembly	4 Nos.for each type and rating
2.3.1.1.2	Power Contactor spare kits	10Sets for each type and rating
2.3.1.1.3	Power Contactor AC Coils	10Nos. Coils for each type and rating
2.3.1.2	Auxiliary Control Contactor (AC)	
2.3.1.2.1	Auxiliary Control Contactor Complete Assembly	30 Nos.for each type and rating
2.3.1.2.2	Auxiliary Control Contactor spare kits	40 Sets for each type and rating
2.3.1.2.3	Auxiliary Control Contactor AC Coils	35 Nos.for each type and rating
2.3.2	MCCB (Power Circuit)	5 Nos. for each type and rating
2.3.3	MCB (Control Circuit)	25 Nos.for each type and rating
2.3.4	Switch	
2.3.4.1	Local / Remote Selector Switch	10Nos.
2.3.4.2	MCCB Status (On/off) Monitoring Switch/Contact	5Nos.
2.3.4.3	Trial / Normal /MCC Selector Switch	15Nos.
2.3.4.4	MCC module Service Position Limit Switch	5Nos.
2.3.5	Thermal Overload Relay	5Nos. for each type and rating
2.3.6	Sliding Contact (Fixed & Moving)	25Sets
2.3.7	BUS bar to MCC module Lira contact assembly (BUS end & MCC module end)	5 sets for each type and rating
2.3.8	Indicating Lamps complete assembly	
2.3.8.1	Red	30Sets
2.3.8.2	Amber	30Sets
2.3.8.3	Green	30Sets
2.3.9	Push Button (On/Off) Complete Assembly	20Sets
2.3.10	CT	1No.for each type and rating
2.3.11	Ammeter	1No. for each type and rating
2.3.12	Control transformer	1No. for each type and rating
2.3.13	Off Delay/ On Delay Timer	5Nos.for each type and rating
2.3.14	Switch Fuse Unit	5Nos.for each type and rating
2.3.15	Terminal Block	

SI. NO.	PARTICULARS	QUANTITY
2.3.15.1	Power Terminal Block	10% of total nos. for each type and rating used in the system or minimum one (1) no. whichever is more
2.3.15.2	Control Terminal Block	10% of total nos. for each type and rating used in the system or minimum one (1) no. whichever is more
2.3.15.3	End Plate for Power & Control Terminal Block	Each type 25Nos.
2.4	Energy Meter	1No. For each type &rating
3.0	**Control Panel/Desk Mounted Items**	
3.1	Push Button	
3.1.1	Complete assembly	5Nos for each colour
3.1.2	Contact Element (1NO + 1NC) Block	20Nos.
3.2	Selector Switch	10Nos. for each type and rating
3.3	Meter (Analog or Digital)	
3.3.1	Ammeter	10% for each type and range or minimum one (1) no. whichever is more
3.3.2	Voltmeter	10% for each type and range or minimum one (1) no. whichever is more
3.3.3	Frequency	10% for each type and range or minimum one (1) no. whichever is more
3.3.4	MW	10% for each type and range or minimum one (1) no. whichever is more
3.3.5	MVAR	10% for each type and range or minimum one (1) no. whichever is more
3.3.6	Power Factor	10% for each type and range or minimum one (1) no. whichever is more
3.3.7	Synchroscope	10% for each type and range or minimum one (1) no. whichever is more
3.4	Indicating Lamps complete assembly	10Nos. for each Colour and type
3.5	Mimic Lamps	10Nos. for each Colour and type
3.6	MCB	2Nos. for each type and rating
3.7	Door Limit Switch	2Nos.
3.8	Annunciation system	
3.8.1	Lamp Box with Facia & Lamps (LED type)	25Nos.
3.8.2	Hooter	1No
3.8.3	Each type of PCB (for non-PLC driven system)	1No
4.0	**Actuator**	
4.1	Complete set of Actuator	1No. for each type and rating

SI. NO.	PARTICULARS	QUANTITY
4.2	Limit Switch	2 Nos each type and rating
4.3	Torque Switch	2 Nos each type and rating
4.4	Auxiliary Contact	1 no each type and rating
4.5	Motor	1 no each type and rating
4.6	Complete Seal kit	1Set for each type and rating
4.7	Complete O-Ring Set	1Set
5.0	**Field Instruments (Transmitters/temperature elements (TC / RTD) / Gauges / Switches etc. along with relevant accessories)**	10 (ten) percent of total of each type or at least one (whichever is higher) of each type along with accessories.
6.0	**Valves, Actuators & Accessories**	
6.1	**Control Valves**	
6.1.1	2 (two) sets of spare control valve stem packing for each of the control valves, as offered.	
6.1.2	1 (one) set of spare valve trim (including cage, plug, stem, seat rings, guide bushings etc.) for both the units for each of the control valves, as offered.	
6.2	**Control valve Actuators**	
6.2.1	1 (one) set of spare actuators with drive of each type and rating.	
6.2.2	10 (ten) percent of valve positioners of each type.	
6.2.3	10 (ten) percent of position transmitters of each type.	
6.2.4	10 (ten) percent of limit switches/torque switches of each type.	

ANNEXURE-III

PAINTING & COLOUR SCHEME

1.0 GENERAL PAINTING REQUIREMENTS

1.1 Painting of equipment shall be carried out as per the specifications indicated below and attached annexures and shall conform to the relevant IS specification/ international standards for the material and workmanship.

1.2 The following latest Indian Standards may be referred to for carrying out the painting job:

IS:5	:	Colours for ready mixed paints and enamels
IS:1303	:	Glossary of terms relating to paints
IS:2379	:	Colour code for identification of pipelines
IS:1477	:	Code of practice for painting of ferrous metals in Buildings (Parts I & II)
IS:2524	:	Code of practice for painting of non-ferrous metals in buildings (Parts I & II)
IS:158	:	Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water and heat resisting
IS:2074	:	Ready mixed paint, air drying, red Oxide Zinc Chrome, priming
IS:104	:	Ready mixed paint, brushing, Zinc Chrome, priming
IS: 2932	:	Enamel, synthetic, exterior (a) undercoating (b) Finishing
IS :2933	:	Specification for enamel synthetic exterior type II
IS:2339	:	Specification for Aluminium paints for general purpose

1

1.3 **Preparation of Surfaces**

All surfaces to be painted shall be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes shall be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out sand scrapping may be permitted with steel wire brushes and /or abrasive paper. Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the OWNER/OWNER RESPRESENTATIVE.

The sheet steel of electrical and instrumentation panels shall be pre-treated through chemical cleaning (7 tank) process of rinsing, degreasing, rinsing, derusting, rinsing, phosphate and rinsing. However, in case mechanical cleaning is also required the Contractor shall carry out the same to get a smooth finish.

1.4 **Primer Paint**

After the surface is prepared one coat of Zinc Phosphate primer conforming to IS 2074 shall be applied.

1.5 Tie Paint

After the coat is dried up completely, second coat of Zinc Phosphate primer conforming to IS 2074 shall be applied by brushing, spray, roller as per manufacture recommendation to ensure a continuous film. The dry film thickness of each coat shall be as indicated in Ann-I & II enclosed. Insulated surfaces will have only primer coating and no finish painting.

1.6 **Finish Paint**

Synthetic enamel paint conforming to IS 2932 shall be used for finish coats. The colour /shade shall be as approved by the OWNER. After cleaning the dust on the dried up primer, first coat of synthetic enamel shall be applied. After this first coat dries up hard, the surface is wet scrubbed cutting down to a smooth finish and ensuring that at no place the first coat is completely removed. After allowing the water to get evaporated completely, the second finish coat of synthetic enamel paint shall be applied.

1

Note For structural painting, customer's specification V II/G2/8 Cl 3.03.11 shall be followed however DFT and coating system shall be followed in line with paint manufacturer's recommendation.

1.7 **Painting and Corrosion Protection for Pipes & Fittings**

1.7.1 All uninsulated piping systems, hangers and supports shall have two coats of Zinc Phosphate Primer (conforming to IS 2074) (One primer coat and one tie coat) and finish paint using synthetic enamel paint to give a finish coat. Shades shall be as per IS 5 or as indicated by PURCHASER/OWNER. Service of the pipeline designations shall be painted on all pipes at visible locations.

1.7.2 Before application of paint, Contractor shall clean the pipes of all mill scale, dirt dust, soot grease, rust etc.

1.7.3 All pipe lines, piping components shall be adequately protected against corrosion during manufacture, fabrication, shipment and storage by appropriate protective paint.

1.7.4 Shop fabricated equipment/items shall be dispatched with final paint. Necessary touch up shall be done at site. Site fabricated equipment/items shall be dispatched with primer painting only and final painting shall be applied at site.

1.8 **Painting and Corrosion Protection for Valves & Specialties**

1

Primer of thickness as indicated in Ann-II shall be applied to all steel and cast iron exposed surfaces as required to prevent corrosion before dispatch. The use of grease or oil, other than light grade mineral oil, for corrosion protection is prohibited. Bores of all vales shall be covered immediately after testing, draining and drying with suitable plastic end covers to avoid ingress of foreign materials.

1.9 **Suggested Colour Codes for Painting**

Suggested colour codes shall be furnished by the successful bidder after award of contract. Colour codes for piping shall be as per IS 2379 with necessary modifications. Where band colour is specified for piping, same shall be provided at 30 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.

2.0 **Approved Paint Makes**

i) Asian Paints (I) Ltd.
ii) Berger Paints India Ltd
iii) Goodlass Nerolac
iv) Jenson & Nicholson (I) Ltd
v) CDC carboline (I) Ltd.
vi) Shalimar Paints Ltd.
vii) Addison Paints Ltd
viii) Grand Polycoat
ix) Bombay Paints
x) Hemple Paints (Singapore)
xi) Jotun Paints
xii) Akzonobel coatings

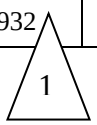
2.1 **PAINTING SCHEDULES**

2.1 Painting schedules for various systems/ items are furnished as per enclosed Annexures-I and II. Vendors of different packages/ items will furnish detailed painting schedule for customer approval during detail engineering as per this guide specification.

PAINTING SCHEDULE

1x800 MW WANAKBORI TPS

Annexure-I

Paint Reference Scheme	Surface Preparation Grade / Surface Profile	Primer Coat			Intermediate Coat			Finish Coat			Total DFT in microns
		Premier Paint	No. of Coats	DFT in Microns	Intermediate Paint	No. of Coats	DFT in Microns	Finish Paint (See Note)	No. of Coats	DFT in Microns	
Various type of equipment/valve, etc. (Temp. upto 90°C)	Degreasing and Mech. Cleaning with wire brushing/hand tool (Sa1/St2/St3 as applicable)	HB Zinc Phosphate (alkyd Medium) as per IS:2074	1	35-45 per coat	HB Zinc Phosphate (alkyd Medium) as per IS:2074	1	35-45 per coat	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110 - 140
Structural 	- do -	Epoxy resin based HB Zinc phosphate (alkyd medium)	1	50 – 75 per coat	Epoxy based HB MIO pigmented polyamide cured paint	1	110-125 per coat	Polyamide cured epoxy finish coating + Polyurethane coat	1+1	50 – 60 per coat + 25 – 35 per coat	235 - 295
LP Piping/ Vessels, etc. (Temp. upto 90°)	- do -	HB Zinc Phosphate as per IS:2074 (alkyd medium)	1	35 – 45 per coat	HB Zinc Phosphate (alkyd Medium) as per IS:2074	1	35-45 per coat	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110-140
Equipment with (Temp. upto 250°)	- do -	Heat resistant Al – paint	2	20 per coat	- NA	-	-	NA	Insulated	NA	40
Equipment in corrosive areas like CPU (regeneration) Dosing skid, etc.	Blast clean to Sa $2^1/2$	HB Epoxy resin based zinc phosphate primer	1	50 per coat	Epoxy based MIO pigmented paint	1	50 per coat	Polyamide cured Epoxy finish coat	2	25 – 35 per coat	150 - 170
Elect. / Control Panels, etc.	Seven tank process	HB Zinc phosphate (alkyd Medium) as per IS:2074	2	35 – 45 per coat	HB Zinc Phosphate (alkyd Medium) as per IS:2074	1	35-45 per coat	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110 – 140
Large dia pipes	As per customer specification for Large diameter piping CI. No. 9.00.00 of VII-I/S-5 										

Notes:

1. Surface preparation shown above is as per Swedish Standards SIS 05-5900. Degreasing will be as per Standard SSPC-SP1.

2. In case of insulated surfaces, only primer coats shall be applied.

3. GM/SS items with piping and G.I. pipes will not be painted. Further SS/GI piping shall be given necessary colour banding for identification as per colour scheme.

4. All instruments shall be painted as per manufacturer standard practice.

5. All structural steel items shall be painted at site. Piping shall go with primer coating & finish Paint shall be applied at site. Equipment shall be finish painted at shop.

6. Method of painting application shall be as per paint manufacturer's recommendation.

1

7. Based on above painting schedule, detailed painting schedule will be prepared by respective Package supplier and approved painting schedule shall be submitted to GSECL/DCPL under information category.

8. This painting schedule is applicable for bought out equipment/packages of PEM. Painting specification for various piping/ equipment in scope of various other BHEL units like Power cycle piping, CW piping, LP piping, R.E. joints, Butterfly valves, Power cycle valve etc., shall be furnished by unit separately.

ANNEXURE –II

LDO/HFO Storage Tank			
	Internal	**External**	**Underneath**
Surface preparation	Wire bushing	ST2 (Wire Brushing/ Hand tool cleaning)	Blast clean to SA 2.5
Primer	2 coats of double boiled linseed oil	2 coats of red oxide zinc chromate primer (IS 2074) of 30 - 35 microns DFT each	1 coat of high build coal tar epoxy suitably pigmented, DFT : 80 – 100 microns
Finish 2	1 coats of synthetic enamel (IS – 2932) paint of 20 – 25 microns (DFT) each	2 coats of synthetic enamel (IS – 2932) paint of 20 – 25 microns (DFT) each	N.A
Total DFT		100 – 120 microns	80 – 100 microns

ANNEXURE-III

SUGGESTED COLOUR CODES FOR PAINTING

SL. NO.	ITEM/SERVICE	COLOUR	IS-5	COLOUR (BAND)	IS-5
1.0	Structures, platforms, galleries, ladders and handrails	Dark Admirality Grey	632	-	-
2.0	Fans, pumps, motors, compressors, Blowers	Light Grey	631	-	-
3.0	Tanks (without insulation and cladding)				
3.1	Outdoor, Stand pipes, vent pipes	Aluminum	-	-	-
3.2	Indoor	Aluminum	-	-	-
4.0	Vessels & all other proprietary equip-ment (without insulation & cladding)	Light grey	631	-	-
5.0	Switchgear	Light grey	631	-	-
6.0	Control & relay panels	Light grey	631/7078 of IS 1650	-	-
7.0	Transformers	Dark Admiralty Grey	632	-	-
8.0	Machinery guards	Signal red	537	-	-
9.0	Piping (without insulation and cladding)				
9.1	Water System				
a)	Boiler feed	Sea green	217	-	-
b)	Condensate	Sea green	217	Light brown	410
c)	D M Water	Sea Green	217	Light orange	557
d)	Soft water	Sea green	217	French blue	166
e)	Bearing cooling water	Sea green	217	French blue	166
f)	Potable & filtered water	Sea green	217	French blue	166
g)	Service & clarified water	Sea green	217	French blue	166
h)	Raw water	Sea green	217	White	-
i)	Cooling water	Sea green	217	French blue	166
9.2	Compressed Air System				
a)	Service air	Sky Blue	101	-	-
b)	Instrument air	blue	101	White	-
9.3	Oil system				
a)	Fuel oil	Light brown	410	French Blue	166
b)	Light oil	Dark Brown	412	Brilliant green	221
c)	Lubricating oil	Light brown	410	Light grey	631

SL. NO.	ITEM/SERVICE	COLOUR	IS-5	COLOUR (BAND)	IS-5
d)	Control oil	Light brown	410	Light orange	557
e)	Transformer oil	Light brown	410	Light orange	557
9.4	Gas system				
a)	Carbon dioxide	Canary yellow	309	Light grey	631
9.5	Fire services	Fire red	536	-	-
9.6	Drainage	Black	-	-	-
9.7	Stand pipes and all Vent pipes	Aluminum	-	-	-

Notes:

1. This color code basically refers to IS:2379 for piping with necessary modifications.

2. Where band color is specified, same shall be provided at 10 meter intervals on long uninterrupted lines and also adjacent to valves and junctions.

ANNEXURE-IV

-INTENTIONALLY KEPT BLANK-

ANNEXURE-V, FUEL OIL ANALYSIS

HEAVY FUEL OIL (HFO) ANALYSIS

Sl no.	Characteristics	Heavy Furnace Oil
1.1	Total Sulphur by weight.	0.680%
1.2	Gross calorific value (Kcal/kg)	Of the order of 10,800
1.3	Flash point (Min.)	69^0C
1.4	Water content by volume	0.20%
1.5	Sediment by weight	0.10%
1.6	Density at 15^0 C(Approximate), Kg/m^3	954.8
1.7	Kinematic viscosity in centistokes at 50^0C summer	134
1.8	Ash content by weight	0.059%
1.9	Pour Point summer	18^0C

LIGHT DIESEL OIL (LDO) ANALYSIS

Sl no.	Characteristics	Light Diesel Oil (LDO)
1.1	Kinematic Viscosity in centistokes at 38^o C	6.80
1.2	Waste content percent by volume (Max.)	0.25
1.3	Sediment percent by mass	0.06
1.4	Total Sulphur percent by mass,	0.46
1.5	Ash percentage by mass	0.01
1.6	Water Content Max, % Volume	0.15
1.7	Density at 15^0C(approximate), gm/l	0.8682
1.8	a) Flash point, b) Pour point:	75^0C 9^0C

ANNEXURE-VI
DRAWINGS / DOCUMENTS SUBMISSION PROCEDURE

(COVERED UNDER SECTION C 2B)

ANNEXURE-VII

-INTENTIONALLY KEPT BLANK-

ANNEXURE-VIII

MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION

S. No.	DOCUMENT NO.	DOCUMENT TITLE	SCHEDULE OF SUBMISSION
1	PE-V0-410-166-A001	P&ID'S OF FOHS	28-Dec-15
2	PE-V0-410-166-A002	CONTROL PHILOSPHY OF FOHS	28-Dec-15
3	PE-V0-410-166-A003	DESIGN CALCULATION OF TANKS FOR FOHS	11-Jan-16
4	PE-V0-410-166-A004	SIZING CALCULATION OF UTILITIES OF FOHS	28-Dec-15
5	PE-V0-410-166-A005	DATASHEET & GAD OF SCREW PUMPS & MOTORS FOR FOHS	23-Feb-16
6	PE-V0-410-166-A006	NPSH AND PUMP HEAD CALULATION OF PUMPS FOR FOHS	11-Jan-16
7	PE-V0-410-166-A007	DESIGN CALCULATION AND GAD OF SUCTION HEATER FOR FOHS	09-Feb-16
8	PE-V0-410-166-A009	STRESS ANALYSIS OF LINES FOR FOHS	09-Feb-16
9	PE-V0-410-166-A010	DESIGN CALCULATION AND GAD OF OWS FOR FOHS	06-Mar-16
10	PE-V0-410-166-A012	PAINTING SCHEDULE OF FOHS	09-Feb-16
11	PE-V0-410-166-A013	DS AND GAD OF PRS, TCV, TRAP, INSULATION AND CLADDING FOR FOHS	06-Mar-16
12	PE-V0-410-166-A014	DATASHEET OF FOHS INSTRUMENTS	09-Feb-16
12A	PE-V0-410-166-A015	DATASHEET OF FOHS EHT SYSTEM	09-Feb-16
13	PE-V0-410-166-A016	PIPING LAYOUT IN TANK FARM AREA OF FOHS	25-Jan-16
14	PE-V0-410-166-A017	PIPING LAYOUT IN TRANSFER PUMP HOUSE OF FOHS	09-Feb-16
15	PE-V0-410-166-A018	GAD OF FOHS (COMPOSITE LAYOUT)	23-Feb-16
16	PE-V0-410-166-A019	SUGGESTIVE ELECTRICAL LAYOUT DRAWING OF FOHS	09-Feb-16
17	PE-V0-410-166-A021	GAD OF FOHS TANKS INCLUDING ROOF STRUCTURE & NOZZLE ORIENTATION	09-Feb-16
18	PE-V0-410-166-A023	FABRICATION DRAWING OF FOHS TANKS INCLUDING ACCESSORIES	02-Mar-15
19	PE-V0-410-166-A024	DESIGN CALCULATION & GAD OF MISCELLANEOUS TANKS FOR FOHS	09-Feb-16
20	PE-V0-410-166-A025	CIVIL INPUT DRAWING IN TANK FARM AREA FOR FOHS	20-Mar-16
21	PE-V0-410-166-A026	QAP OF SCREW PUMP & MOTORS FOR FOHS	06-Mar-16
22	PE-V0-410-166-A027	QAP OF PRS, TCV, TRAP, INSULATION AND CLADDING FOR FOHS	20-Mar-16
23	PE-V0-410-166-A028	QAP OF SUMP PUMP & MOTORS FOR FOHS	06-Mar-16
24	PE-V0-410-166-A029	QAP OF FOHS INSTRUMENTS	20-Mar-16
25	PE-V0-410-166-A030	QAP OF CONTROL PANEL	23-Feb-16
26	PE-V0-410-166-A031	EQUIPMENT SCHEDULES OF FOHS	30-Mar-16
27	PE-V0-410-166-A032	CABLE SCHEDULE OF FOHS	30-Mar-16
28	PE-V0-410-166-A033	ELECTRICAL LOAD DATA OF FOHS	20-Mar-16
29	PE-V0-410-166-A035	SUB-VENDOR LIST WITH INSPECTION CATEGORIZATION LIST FOR FOHS	30-Mar-16
30	PE-V0-410-166-A036	INSTRUMENT INSTALLATION DIAGRAM OF FOHS	30-Mar-16
31	PE-V0-410-166-A039	INSULATION I& CLADDING NSTALLATION PROCEDURE FOR FOHS EQUIPMENTS	30-Mar-16
32	PE-V0-410-166-A040	STEAM TRACING INSTALLATION PROCEDURE	18-Dec-15
33	PE-V0-410-166-A043	PG TEST PROCEDURE OF FOHS	20-Mar-16
34	PE-V0-410-166-A044	O&M MANUAL OF FOHS	30-Mar-16
35	PE-V0-410-166-A045	ANALOG & BINARY I/O LIST, BOM, HMI PICTURES/ PLANT SCHEMATICS FOR FOHS (DCS BASED)	20-Mar-16
36	PE-V0-410-166-A046	CONTROL SCHEME/ LOGIC DIAGRAM FOR FOHS (DCS BASED)	20-Mar-16
37	PE-V0-410-166-A047	PROCESS MANUSCRIPT FOR IMPLEMENTATION IN DCS FOR FOHS	20-Mar-16
38	PE-V0-410-166-A048	DATASHEET & GAD OF SUMP PUMPS & MOTORS IN FOHS	06-Mar-16
39	PE-V0-410-166-A049	DS AND GAD OF VALVES, HOSE AND STRAINER	09-Feb-16

40	PE-V0-410-166-A050	DS AND GAD PIPES, PLATES AND FITTINGS ETC FOR FOHS	25-Jan-16
41	PE-V0-410-166-A051	PIPING LAYOUT IN TANSFER PUMP HOUSE TO DYKE AREADYKE AREA OF FOHS	23-Feb-16
42	PE-V0-410-166-A052	PIPING LAYOUT IN IN AND AROUND DYKE AREA OF FOHS	30-Feb-16
43	PE-V0-410-166-A053	CIVIL INPUT DRAWING IN TRANSFER PUMP HOUSE OF FOHS	20-Mar-16
44	PE-V0-410-166-A054	CIVIL INPUT DRAWING IN TRANSFER PUMP HOUSE TO DYKE AREA OF FOHS	20-Mar-15
45	PE-V0-410-166-A055	CIVIL INPUT DRAWING IN IN AND AROUND DYKE AREA OF FOHS	20-Mar-15
46	PE-V0-410-166-A056	QAP OF VALVES, HOSE AND STRAINER FOR FOHS	23-Feb-16
47	PE-V0-410-166-A057	QAP OF PIPES, PLATES AND FITTINGS ETC FOR FOHS	25-Jan-16
48	PE-V0-410-166-A062	DS OF FLOWMETER FOR FOHS	06-Mar-16
49	PE-V0-410-166-A063	QAP OF FLOWMETER FOR FOHS	06-Mar-16
50	PE-V0-410-166-A064	ERECTION PROCEDURE OF ALL EQUIPMENT IN FOHS SCOPE	05-Apr-15

Submission schedule given considered LOI placed on vendor on 15th December 2015. Submission dates will be modified based on date of LOI.

Notes:

1. Drawing / Document shall be uploaded by the successful bidder on WRENCH /DMS. Procedure for the same will be informed after award of contract.
2. Submission and approval of all documents as mentioned above are linked with payment against engineering completion.
3. Any other drawings and documents as required by BHEL / Customer / Consultant shall be furnished by the successful bidder during detail engineering stage for which no commercial implication shall be entertained by BHEL.
4. Every re-submission will be done by vendor within 10 days of BHEL comments.

Other points to be considered while preparing drawings:

a) GA drawing covering all details shown in data sheets like design data, dimensions, material of construction, list of appurtenances, lists of specifications, details of paints, standards & codes, general notes including details of test to be conducted on tank in accordance with specification and brand-name of welding electrodes to be used etc.

b) Field quality plan / quality assurance plan / check list shall be prepared by the bidder for storage tanks / each instrument / item and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.

c) All possible efforts shall be made by the bidder to get the approval of drawings and documents from BHEL / customer / consultant at the earliest and the documents prepared / generated by them or their sub-vendors shall be checked by their competent authority before submission to BHEL.

d) Revision made by the bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by BHEL to review the drawings and documents.

e) Any other drawings and documents in addition to the list of drawings and documents indicated in the NIT specification as required by BHEL for the execution of the project shall be furnished by them during detailed engineering stage and no commercial implication shall be entertained by BHEL for the same.

f) Bidder to do 3D modelling of the package and review model in compatible format to be provided to BHEL on different stages as asked by BHEL. 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. Details of the software compatible with BHEL software is given elsewhere in the specification.

g) Bidder to extract 2-D drawings (AutoCAD) from the 3-D software and soft copy of the same to be provided for interfacing with other agency drawings.

h) Data sheets of various items shall be prepared by the bidder for fuel oil system and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.

i) Civil works will be done by BHEL based on civil inputs furnished by the bidder during detail engineering. In case of any changes in the civil input drawing after civil work is completed. Necessary prices on account of modification of the civil work shall be deducted from bidder's account.

j) Bidder to furnish the civil pedestal details drawing indicating.

- Scope of work by BHEL and bidder shall be indicated with different legend or in the form of note.

k) Recommended locations of insert plates / embedment plates.

l) All drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to BHEL during detailed engineering stage and shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc.:-

- All drawings and documents shall bear BHEL's title block and drawing / document number. However, BHEL's drawing / document numbering scheme shall be furnished to the successful bidder after the placement of L.O.I.
- All drawings and documents shall indicate the list of all reference drawings including general arrangement.
- All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view, all major self-manufactured and bought out items shall be labelled and included in BOQ / BOM in tabular form.
- Specification / schedule of painting shall be made as a part of general arrangement drawing of each item indicating at least 3 make.

- All text/ numeric in the document / drawings to be generated by the successful bidder will be in English language only.

ANNEXURE-IX

FORMAT FOR OPERATION AND MAINTENANCE MANUAL

Check List for Operation & Maintenance Manual

Project name :
Project number :
Package Name :
PO reference :
Document number :
Revision number :

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

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

6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.1	Guarantee and warranty clauses				
7	**Statutory and other specific requirements considerations.**				
8	**List of reference documents**				
9	**Binding as per requirement**				

ANNEXURE-X

SITE STORAGE AND PRESERVATION

SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHNANICAL BOPs

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

PROJECT ENGINEERING MANAGEMENT, POWER SECTOR

BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

1. SCOPE OF THE DOCUMENT

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

2. PURPOSE OF STORAGE & PRESERVATION

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

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

a) GENERAL STORAGE REQUIREMENTS

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

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

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

b) GENERAL PRESERVATION REQUIREMENTS

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

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

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

    a. Rust preventive fluid (RPF)

    b. Rust protective paints

    c. Tarpaulin covers, in case of outdoor storage

    d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –

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

2. Any damages to equipment / materials.

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

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

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

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

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

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

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

iii Open storage (O)

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

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

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