



BHARAT HEAVY ELECTRICALS LIMITED/PEM-NOIDA

Corrigendum-3

PROJECT: 4X270 MW BHADRADRI TPS

Date: 08.03.2018

PACKAGE: EFFLUENT TREATMENT PLANT

ENQUIRY NO: E-5846/2017 Dtd. 06.02.2018

Dear all,

Please note the following.

1. Technical amendment to technical specification is attached along with this CORRIGENDUM-3, all vendors are requested to read technical specification along with the attached amendment to technical specification.
2. Bidders (who had already submitted their offer) are requested to review their offer once again and should incorporate all the necessary amendments, revisions updated over website till date. It should be complete in all respect.
3. Please ensure submission of offer on or before due date 20/03/2018 and time 02:00 pm. P1 shall be opened on 20/03/2018 at 3:00 pm.

Kindly ensure submission of offer on or before due date and time.

GURU DAS
DY.MGR/BOP-Ordering



AMENDMENT ON TECHNICAL SPECIFICATION FOR WATER TREATMENT PACKAGES (PTP / ETP / STP / DM PLANT (R&M)) FOR 1X250 MW NSPCL ROURKELA STPP.

SPECIFICATION NO.: PE-TS-411-164-A001 R1

AMENDMENT NO # 1

REV. NO. 00

DATE: 07/03/2017

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The following modifications with respect to Technical Specification for **EFFLUENT TREATMENT PLANT PACKAGE FOR 4X270 MW BHADRADRI TPS**, technical specification no **PE-TS-411-164-A001** shall apply.

Bidder to note that existing clauses/details as appearing in the specification stands deleted and clauses/details as mentioned in "Modified to or Read as" column shall be applicable and complied by the bidder as listed below in **SCHEDULE A**.

SCHEDULE A

MODIFIED CLAUSES/PAGE NUMBERS.

Sl no.	Vol. No.	Section/ Description	Clause no	Page no	Existing clause/details	To be Read as
1.	IIB	SECTION I/ P&ID FOR EFFLUNET TREATMENT PLANT	P&ID FOR EFFLUNET TREATMENT PLANT	227 of 481	P&ID FOR EFFLUNET TREATMENT PLANT R8	P&ID FOR EFFLUNET TREATMENT PLANT R8 has been replaced with P&ID FOR EFFLUNET TREATMENT PLANT R9. R9 shall be referred wherever R8 of P&ID is mentioned in BHEL technical specification no PE-TS-411-164-A001, R1 wrt EFFLUENT TREATMENT PLANT.
2.	IIB	SECTION I/ SUB SECTION-IA/ SPECIFIC TECHNICAL REQUIREMENT (MECHANICAL)	SPECIFIC TECHNICAL REQUIREMENT (MECHANICAL)	5-17 of 481	SPECIFIC TECHNICAL REQUIREMENT (MECHANICAL) R1 dated 05.02.2018	SPECIFIC TECHNICAL REQUIREMENT (MECHANICAL) R1 dated 05.02.2018 has been replaced with SPECIFIC TECHNICAL REQUIREMENT (MECHANICAL) R2 dated 06.03.2018. R2 shall be referred wherever R1 of SPECIFIC TECHNICAL REQUIREMENT (MECHANICAL) is mentioned in BHEL technical specification no PE-TS-411-164-A001, R1 wrt EFFLUENT TREATMENT PLANT.
3.	IIB	SECTION I/ SUB SECTION-IA/ DATASHEET A	DATASHEET A	230-240 of 481	DATASHEET A R1 dated 05.02.2018	DATASHEET A R1 dated 05.02.2018 has been replaced with DATASHEET A R2 dated 06.03.2018. R2 shall be referred wherever R1 of DATASHEET is mentioned in BHEL technical specification no PE-TS-411-164-A001, R1 wrt EFFLUENT TREATMENT PLANT.



AMENDMENT ON TECHNICAL SPECIFICATION FOR WATER TREATMENT PACKAGES (PTP / ETP / STP / DM PLANT (R&M)) FOR 1X250 MW NSPCL ROURKELA STPP.

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4.	IIB	SECTION II/ SUB SECTION-IIA/ GENERAL TECHNICAL REQUIREMENT (MECHANICAL)	2a)	275 of 481	TG and SG Area Floor Wash waste Effluent waste generated from TG and SG area floor wash waste shall be collected in local sump. A common sump is envisaged for SG and TG area of unit 1 & 2 and another common sump is envisaged for SG and TG area of Unit 3 & 4. This waste contains suspended solids and oil. Further this waste shall be transferred Common Oily Waste Collection Sump located in ETP area for further treatment in lamella clarifier / tube settler. In lamella clarifier / tube settler provision of Alum and PE dosing is envisaged. Oil shall be collected in oil drums and clear water shall be transferred to Central Monitoring Basin (CMB), in addition sludge generated from lamella clarifier / tube settler shall be routed to Sludge collection pit, from there it shall be pumped to Ash Slurry Pump House.	TG and Boiler Area Floor Wash waste Effluent waste generated from TG and Boiler area floor wash waste shall be collected in local sump. A separate sump is envisaged for SG floor wash waste water for each unit. Similarly, a separate sump is envisaged for TG area wash waste water for each waste. This waste contains suspended solids and oil. Further this waste shall be transferred Common Oily Waste Collection Sump located in ETP area for further treatment in lamella clarifier / tube settler. In lamella clarifier / tube settler provision of Alum and PE dosing is envisaged. Oil shall be collected in oil drums and clear water shall be transferred to Central Monitoring Basin (CMB), in addition sludge generated from lamella clarifier / tube settler shall be routed to Sludge collection pit, from there it shall be pumped to Ash Slurry Pump House.
5.	IIB	SECTION I/ SUB SECTION-IC/ SPECIFIC TECHNICAL REQUIREMENT (CONTROL & INSTRUMENTATION)	8.	265 of 481	Two number RIO panels to be provided with Fiber Optics cable for connecting the RIO with the PLC. The network communication between RIO and PLC shall be redundant. All the necessary hardware and software is in ETP Vendor scope of supply. The Fiber optic cable of 2 KM is required.	Two number RIO panels to be provided with Fiber Optics cable for connecting the RIO with the PLC. The network communication between RIO and PLC shall be redundant. All the necessary hardware and software is in ETP Vendor scope of supply. The Fiber optic cable of 3 KM is required.



TITLE:
4 X 270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-164-A001

**TECHNICAL SPECIFICATION FOR
EFFLUENT TREATMENT PLANT**

REV. NO. 2

DATE : 06/03/2018

DATASHEET A

1.0	TRANSFORMER YARD OILY WASTE COLLECTION PIT	
1.1	Number	Four (4) numbers [One per unit] 1. TRANSFORMER YARD OILY WASTE COLLECTION PIT FOR UNIT-1 (E1) 2. TRANSFORMER YARD OILY WASTE COLLECTION PIT FOR UNIT-2 (E2) 3. TRANSFORMER YARD OILY WASTE COLLECTION PIT FOR UNIT-3 (E3) 4. TRANSFORMER YARD OILY WASTE COLLECTION PIT FOR UNIT-4 (E4)
1.2	Capacity (each)	To accumulate the oil leakage of largest transformer & fire water the same shall be provided by bidder during detailed engineering.
1.3	Material	RCC
2.0	FLOOR WASH COLLECTION PIT FROM BOILER AND TG AREA	
2.1	Number	Eight (8) nos [One no. pit for each TG & Boiler Area for each unit] 1. WASTE WATER COLLECTION PIT FROM BOILER AREA UNIT 1 (E5) 2. WASTE WATER COLLECTION PIT FROM BOILER AREA UNIT 2 (E6) 3. WASTE WATER COLLECTION PIT FROM BOILER AREA UNIT 3 (E18) 4. WASTE WATER COLLECTION PIT FROM BOILER AREA UNIT 4 (E19) 5. WASTE WATER COLLECTION PIT FROM TG AREA UNIT 1 (E20) 6. WASTE WATER COLLECTION PIT FROM TG AREA UNIT 2 (E21) 7. WASTE WATER COLLECTION PIT FROM TG AREA UNIT 3 (E22) 8. WASTE WATER COLLECTION PIT FROM TG AREA UNIT 4 (E23)
2.2	Effective Capacity (each)	10 CuM
2.3	Material	RCC
3.0	BOILER BLOW DOWN SUMP	
3.1	Number	Four (4) numbers [One per unit] 1. BOILER BLOW DOWN SUMP (FOR UNIT-1) (E7) 2. BOILER BLOW DOWN SUMP (FOR UNIT-2) (E8) 3. BOILER BLOW DOWN SUMP (FOR UNIT-3) (E9) 4. BOILER BLOW DOWN SUMP (FOR UNIT-4) (E10)
3.2	Effective Capacity (each)	25 CuM
3.3	Material	RCC
4.0	ESP AREA WASHING WASTE COLLECTION SUMP	
4.1	Number	Four (4) numbers [One per unit] 1. ESP WASH WATER SUMP (FOR UNIT-1) (E11) 2. ESP WASH WATER SUMP (FOR UNIT-2) (E12) 3. ESP WASH WATER SUMP (FOR UNIT-3) (E13) 4. ESP WASH WATER SUMP (FOR UNIT-4)



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4 X 270 MW BHADRADRI TPS

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		(E14)
4.2	Effective Capacity (each)	10 CuM
4.3	Material	RCC
5.0	COMMON OILY WASTE COLLECTION SUMP (E15)	
5.1	Number	One (1) number.
5.2	Effective Capacity	50 m3
5.3	Material	RCC
6.0	LAMELLA CLARIFIER / TUBE SETTLER	
6.1	Number	One (1) number.
6.2	Capacity	20 m3/hr.
6.3	Type	As per supplier recommendation.
6.4	Distance between successive plates/tubes	As per supplier recommendation.
6.5	Angle of inclination	As per supplier recommendation.
6.6	Tanks & internals	MSEP
6.7	Oil skimmer	MSEP
6.8	Slop oil drum	Two nos. 1000 lit each, MOC: MS with Epoxy painted
6.9	Sludge Trolley	Two nos. 1000 lit each, MOC: MS with Epoxy painted
6.10	Flash mixer tank & flocculator tank	
6.10.1	Number	1X100% flash mixer tank and 1X100% flocculation tank
6.10.2	Capacity	As per system/specification requirement
6.10.3	Tanks and internals	MSEP
6.10.4	Agitator	One number, gear operated SS 316
6.10.5	Flocculator	One number, gear operated SS 316
7.0	SLUDGE COLLECTION PIT (E16)	
7.1	Number	One (1) number
7.2	Effective Capacity	20 m3
7.3	Material	RCC
7.4	SLUDGE PIT BLOWERS	
i	Number	Two (2) Number [1W+1S]
ii	Type of Blower	Rotary, twin lobe
iii	Rated Capacity	Suitable to meet 100% of system requirements
iv	Head to be developed at rated capacity	Head shall be develop at rated capacity and shall be decided during detailed engineering.
v	Material of construction	
	• Casing	CI
	• Lobes	CS to BS 970, EN9 Forged
	• Shaft	CS to BS 970, EN9 Forged
8.0	CHEMICAL DOSING SYSTEM FOR LAMELLA CLARIFIER / TUBE SETTLER	
8.1	ALUM DOSING SYSTEM (@ 70 ppm)	
8.1.1	Tank	Number - One Number Capacity (effective) - 24 Hour storage capacity of 10% Alum solution +20% margin excluding freeboard to dose Alum to lamella clarifier / tube settler Type – vertical cylindrical with dished bottom. Material - MSRL (4.5 MM Thick RL), IS 2062, Gr. B. Motorized Stirrer (MOC-SS 316) - One (1) number (Top/Side mounted). Dissolving Basket-One no. (MOC: SS 316)
8.1.2	Pump	Number-Two (2) numbers (1W+1S). Type – Simplex hydraulically operated Diaphragm type. Capacity and Head- As per system requirement. MOC: Liquid end (Pump head Valve, valve spring Housing, etc.)- AISI 316, Diaphragm-PTFE, Packing-



TITLE:
4 X 270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-164-A001

**TECHNICAL SPECIFICATION FOR
EFFLUENT TREATMENT PLANT**

REV. NO. 2

DATE : 06/03/2018

		PTFE, Shaft-Hardened steel (EN8-BS-970)/ AISI-316 Pumps shall be provided by bidder with accessories such as Y-type suction strainers, pressure dampeners, Pressure Gauge, safety relief valves along with recirculation to tank etc.
8.2	POLYMER DOSING SYSTEM (@ 1 ppm)	
8.2.1	Tank	Number-One Number Capacity (effective) - 24 Hrs storage capacity of 0.5% PE solution +20% margin excluding freeboard to dose PE to lamella clarifier / tube settler Type – vertical cylindrical with dished bottom. Material- MSRL (4.5 MM Thick RL), IS 2062, Gr. B. Motorized Stirrer (MOC-SS 316)- One (1) number (Top mounted)
8.2.2	Pump	Number- Two (2) numbers (1W+1S). Type – Simplex hydraulically operated Diaphragm type. Capacity and Head- As per requirement. MOC: Liquid end (pump head valve, valve housing, etc.), valve spring- PP / FRP/CPVC/Rubber lined steel and Diaphragm-TEFLON. Pumps shall be provided by bidder with accessories such as Y-type suction strainers, pressure dampeners, Pressure Gauge, safety relief valves along with recirculation to tank etc
9.0	CENTRAL MONITORING BASIN (CMB) (E17)	
9.1	Number	One (1) number
9.2	Compartments	Two (2) numbers
9.3	Effective Capacity (each compartment)	500 m3
9.4	Material	RCC with A/R tiling
9.5	Type	Rectangular with flat bottom
9.6	Arrangement	Inlet and Outlet chamber with gate
10.0	NaOCl DOSING SYSTEM FOR CMB	
10.1	NaOCl PREPARATION TANK	
10.1.1	Number	One
10.1.2	MOC	MS (3 mm Thick) with 4.5 MM RL
10.1.3	Capacity	To store 24 hours solution (prepared) requirement.
10.2	NaOCl Dosing Pump	
10.2.1	Number	Two (2X100%)
10.2.2	Type	Simplex hydraulically operated Diaphragm type.
10.2.3	Displacer	Plunger/diaphragm
10.2.4	Capacity and pressure	As per system requirements
10.2.5	Capacity variation	0-100%
10.2.6	Materials of construction	SS 316
10.2.7	Accessories	Pumps shall be provided by bidder with accessories such as Y-type suction strainers, pressure dampeners, Pressure Gauge, safety relief valves along with recirculation to tank etc
11.0	ACID DOSING SYSTEM FOR CMB	
11.1	ACID DOSING TANK	
11.1.1	Number	One
11.1.2	MOC	MSRL (3 MM Thick with 4.5 MM inside RL)
11.1.3	Effective Capacity	To store 24 hours solution (prepared) requirement.
11.2	ACID DOSING PUMP	
11.2.1	Number	Two (2X100 %)
11.2.2	Capacity and Head	As per system requirement.
11.2.3	MOC of wetted parts	PP
11.2.4	Type	Positive displacement plunger type.



TITLE:
4 X 270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-164-A001

**TECHNICAL SPECIFICATION FOR
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11.2.5	Accessories	Pumps shall be provided by bidder with accessories such as Y-type suction strainers, pressure dampeners, Pressure Gauge, safety relief valves along with recirculation to tank etc
12.0	ALKALI DOSING SYSTEM FOR CMB	
12.1	ALKALI DOSING TANK	
12.1.1	Number	One
12.1.2	MOC	MSRL (3 MM Thick with 4.5 MM inside RL)
12.1.3	Effective Capacity	To store 24 hours solution (prepared) requirement.
12.2	ALKALI DOSING PUMP	
12.2.1	Number	Two (2X100 %)
12.2.2	Capacity and Head	As per system requirement.
12.2.3	MOC of wetted parts	SS316
12.2.4	Type	Positive displacement plunger type.
12.2.5	Accessories	Pumps shall be provided by bidder with accessories such as Y-type suction strainers, pressure dampeners, Pressure Gauge, safety relief valves along with recirculation to tank etc
13.0	CHEMICAL STORAGE SPACE (In shed)	
13.1	Storage area for chemicals	15 days
13.0	WEIGHING SCALE	
13.1	Type	Platform, dial type.
13.2	Number	One (1)
13.3	Capacity	0-1000 Kgs
14.0	HOIST	
14.1	Type	1. Electric in monorail in chemical dosing area 2. Electric in monorail for Effluent Transfer pumps of CMB
14.2	Number	Two (2).
14.3	Capacity	2 Ton.
15.0	SAFETY ARRANGEMENT	
15.1	Safety shower	One number safety shower shall be provided by bidder in chemical preparation area
15.2	Personal protection	Two sets of safety equipment each comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall also be provided.
16.0	PIPING	
		Pipe carrying instrument air or service air or air blower line shall be of ASTM A-53 type E Gr-B galvanized/IS 3589 Gr 410 galvanized/ IS 1239 heavy galvanized to IS 4736 or equivalent. All CS / MS pipes shall be of heavy grade as per IS1239 / IS 3589 Rest MOC of pipes as per P & ID PVC pipes shall be of minimum schedule 80 or as per system requirement whichever is higher. HDPE pipes shall be of minimum PE 80 or as per system requirement whichever is higher. Pipe MOC not mentioned in P & ID or in this datasheet shall be suitably selected as per system requirement and similar type of application. For All (PE/ Alum/ Sodium Hypochlorite/ acid/ alkali) dosing piping shall be of PVC/HDPE and for fitting/valves shall be of PP.
17.0	VALVES	



TITLE:
4 X 270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-164-A001

**TECHNICAL SPECIFICATION FOR
EFFLUENT TREATMENT PLANT**

REV. NO. 2

DATE : 06/03/2018

17.1

BUTTERFLY VALVE

Butterfly valves shall be of double flanged or lugged wafer type of low leakage rate confirming to AWWA-C-504 class 150 (min.) or BS:5155 PN 10 (min.)

Body: cast Iron IS:210 Gr. FG 260

Disc: SS 316.

Shaft: ASTM.A296 Gr. CF8M

Seat rings: Nitrile rubber, EPDM, Hypalon

All the butterfly valves shall be provided by bidder with Hand wheel or lever as per the requirements.

All the butterfly valves shall be provided by bidder with an indicator to show the position of the disc. Flanges shall conform to ANSI B 16.5 Cl.150 (min)

DIAPHRAGM VALVE

The Diaphragm shall conform to following requirement

i) Design standard: BS:5156 or equivalent of required rating/class. (minimum rating of valves shall be PN 10.

ii) Type: Flanged and lined body ends, sealed bonnet, weir pattern, tight shut off type

iii) Material of Construction

- a. Body , Bonnet: Cast iron IS 210 Gr. FG 260 or equivalent or Cast steel ASTM A-216 Gr. WCB
- b. Body lining : Soft natural rubber, ebonite, Polypropelene
- c. Hand wheel : Cast Iron
- d. Compressor : Stainless Steel
- e. Stem and Bush : Stainless Steel

GATE VALVE

Type :Outside screw and rising stem type

Stem,seat ring and wedge facing ring:SS,

Rating: PN 10 (min).

Other parts of the valve:As per IS:14846.

BALL VALVE/PLUG VALVE

Type :Full bore

Rating: PN 10 (min).

Body: cast Iron/carbon steel

Ball: stainless steel

Seat ring: PTFE

Stem: Stainless steel

Seat:Nitrile rubber,PTFE

GLOBE

Type: Double flanged or wafer type

Rating: PN 10 (min).

Body: Cast iron:IS 210 Gr FG260

Stem:stainless steel

Disc: Cast iron.

NON RETURN VALVE

These valves shall be swing check type or dual plate type Swing check type (non-corrosive application)

Body and disc: Cast iron.

Hinge pin and door/disc pin: Cast steel ASTM A216 Gr. WCB

Disc facing ring: stainless steel

Body Seat ring: Stainless steel

18.0	Pump Description	Quantity	1.00.00 UMP TYPE	2.00.00 apacity and Head	3.00.00 Mate rial of Construction
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TITLE:
4 X 270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-164-A001

**TECHNICAL SPECIFICATION FOR
EFFLUENT TREATMENT PLANT**

REV. NO. 2

DATE : 06/03/2018

i.	Transformer Yard Oily waste transfer pumps (Unit-1)	Two (2X100%)	Single screw, vertical	20 CuM/Hr. (each) and Head shall be as per requirement.	Casing – 2% NiCi as per IS 210 FG 260 Rotor: CF8M, Shaft: CF8M, Stator: Nitrile Black
ii.	Transformer Yard Oily waste transfer pumps (Unit-2)	Two (2X100%)	Single screw, vertical	20 CuM/Hr. (each) and Head shall be as per requirement.	Casing – 2% NiCi as per IS 210 FG 260 Rotor: CF8M, Shaft: CF8M, Stator: Nitrile Black
iii.	Transformer Yard Oily waste transfer pumps (Unit-3)	Two (2X100%)	Single screw, vertical	20 CuM/Hr. (each) and Head shall be as per requirement.	Casing – 2% NiCi as per IS 210 FG 260 Rotor: CF8M, Shaft: CF8M, Stator: Nitrile Black
iv.	Transformer Yard Oily waste transfer pumps (Unit-4)	Two (2X100%)	Single screw, vertical	20 CuM/Hr. (each) and Head shall be as per requirement.	Casing – 2% NiCi as per IS 210 FG 260 Rotor: CF8M, Shaft: CF8M, Stator: Nitrile Black
v.	Common Oily waste transfer pumps	Two (2X100%)	Single screw, vertical	20 CuM/Hr. (each) and Head shall be as per requirement.	Casing – 2% NiCi as per IS 210 FG 260 Rotor: CF8M, Shaft: CF8M, Stator: Nitrile Black
vi.	ESP Waster Water Transfer pumps for Unit-1	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
vii.	ESP Waster Water Transfer pumps for Unit-2	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
viii.	ESP Waster Water Transfer pumps for Unit-3	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
ix.	ESP Waster Water Transfer pumps for Unit-4	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
x.	Boiler Blow Down Transfer pumps for unit-1	Two (2X100%)	Vertical Centrifugal Impeller – open	50 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xi.	Boiler Blow Down Transfer pumps for unit-2	Two (2X100%)	Vertical Centrifugal Impeller –	50 CuM/Hr. (each) and Head shall be	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft



TITLE:
4 X 270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-164-A001

**TECHNICAL SPECIFICATION FOR
EFFLUENT TREATMENT PLANT**

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			open	as per requirement.	– SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xii.	Boiler Blow Down Transfer pumps for unit-3	Two (2X100%)	Vertical Centrifugal Impeller – open	50 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xiii.	Boiler Blow Down Transfer pumps for unit-4	Two (2X100%)	Vertical Centrifugal Impeller – open	50 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xiv.	Sludge Transfer pumps	Two (2X100%)	Vertical Centrifugal	20 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xv.	Effluent Transfer Pumps	Two (2X100%)	Vertical Centrifugal	60 CuM/Hr. (each) and Head shall be as per requirement.	Casing – SS 316L. Pump shaft/line shaft – SS 316L Impeller – SS 316L Seal – Mechanical
xvi.	Boiler Floor Wash Water Transfer pumps Unit-1	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xvii.	Boiler Floor Wash Water Transfer pumps Unit-2	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xviii.	Boiler Floor Wash Water Transfer pumps Unit-3	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xix.	Boiler Floor Wash Water Transfer pumps Unit-4	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xx.	TG Floor Wash Water Transfer pumps Unit-1	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xxi.	TG Floor Wash Water	Two (2X100%)	Vertical	15 CuM/Hr.	Casing – CI IS-210



TITLE:
4 X 270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-164-A001

**TECHNICAL SPECIFICATION FOR
EFFLUENT TREATMENT PLANT**

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DATE : 06/03/2018

	Transfer pumps Unit-2		Centrifugal Impeller – open	(each) and Head shall be as per requirement.	Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xxii.	TG Floor Wash Water Transfer pumps Unit-3	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.
xxiii.	TG Floor Wash Water Transfer pumps Unit-4	Two (2X100%)	Vertical Centrifugal Impeller – open	15 CuM/Hr. (each) and Head shall be as per requirement.	Casing – CI IS-210 Gr. FG 260. Pump shaft/line shaft – SS 410 / EN 8 TO BS 970. Impeller – SS 304.

Note: 1. Separate flange joint shall be provided by bidder for NRV of Pump.

2. All pipes, fittings, valves etc. shall be provided by bidder of minimum PN 10/150H class rating.

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
7.0	Operating speed	
7.1	Hoisting speed	3 MPM.
7.2	Trolley speed	15 MPM
8.0	Type of transmission	Through Electric motor and gear box.
9.0	Wire Rope	
9.1	Construction / core	6 x36/ 6X37 (Steel 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



TITLE: 4 X 270 MW BHADRADRI TPS		SPECIFICATION NO. PE-TS-411-164-A001	
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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	As per IS:3938
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	DC EM brakes disc type (fail to safe).
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	150 starts / hr
18.3	Voltage, Phase and Frequency	415V $\pm 10\%$, 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/IP-55 depending upon Indoor / Outdoor application



TITLE:
4 X 270 MW BHADRADRI TPS

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18.7	Margin	Motor rating will be calculated keeping margin of at least 15% over the maximum power requirement in the duty condition specified.	
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 by bidder * Panel illumination lamps operated by door switch. * 2 nos earthing terminals on panel. * 20 % spares terminals (clip on type) shall be provided by bidder. * 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 by bidder.	
22.0	Power cables	FRLS / EPR flexible Cu cable / Aluminum cable	
23.0	Control cable	FRLS / EPR flexible Cu cable	
24.0	Control Voltage	110 V	
25.0	Painting	A) <u>Structural</u> Surface preparation : De greasing and Mechanical cleaning with wire brush or hand tool. (SA 1/ ST 2 / ST 3 as applicable) Primer : Red oxide Zinc phosphate (Alkyd medium)- 2 coat , DFT 35 μ per coat. Finish Coat : Synthetic enamel (Alkyd medium) as per IS: 2932- 2 coats, DFT 35 μ per coat. Total DFT : 140μ B) <u>Electrical /Control Panel</u> Surface preparation: Seven tank process Primer : Red Oxide Zinc phosphate (Alkyd medium)- 2 coat , Minimum DFT 35 μ per coat. Finish Coat : Synthetic enamel (Alkyd medium) as per IS: 2932- 2 coats, Minimum DFT 35 μ per coat. Total DFT : 140 μ	
MANUAL HOIST (CHAIN PULLEY BLOCK)			
1	Type	Chain pulley block with/without travelling trolley	
2	General Design	IS: 3832	



TITLE:
4 X 270 MW BHADRADRI TPS

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3	Duty Class as per IS:3832	Class –II
4	Hoisting Mechanism	
a)	Type	Hand operated gear transmission
b)	Type of gear	Spur / Helical
c)	Load Chain	
i)	Type	Link type
ii)	Material	T (8) as per IS: 6216
iii)	Conforms to (Std./Code)	IS: 6216
d)	Hand Chain	
i)	Type	Link type
ii)	Material	Mild steel Grade 30
iii)	Conform to Std.	IS:2429 (Part I)
e)	Load Hook & Hook Block	
i)	Type of load hook	Plain shank- Trapezoidal section
ii)	Load hooks conforms to	IS: 15560
iii)	Type of hook suspension	Swivelling type with lock
iv)	Type of make of bearing	Thrust ball bearing of hook suspension
v)	Type & Material of hook	Carbon steel/forged steel As per IS 15560
f)	Gears/ Pinion	
i)	Type	Spur
ii)	Material	Alloy steel / carbon steel
iii)	Type of Bearing	Antifriction ball bearing / Roller
h)	Sprockets:	
	Type of bearings used	Antifriction ball bearing / Roller
i)	Method of lubrication	
	Bearings	Grease
	Gearing & Pinions	Grease
	Sprockets	Grease
j)	Brakes	
	Type	Screw and friction disc type
5	Trolley and Bridge drive	
a)	Trolley	
i)	Type	Geared (Manually operated)
ii)	Material of frame	Mild steel (IS:2062 Grade A or B)
b)	Drive Chain	
i)	Type	Link type
ii)	Material	Steel Gr.30 as per IS 2429 (part 1)
c)	Wheel	
i)	Number of pairs of wheel	Two in each trolley/bridge
ii)	Flange	Single flanged
iii)	Wheel material	Cast Iron Gr. FG 200 as per IS:210
iv)	Type of bearings need	Antifriction



TITLE:
4 X 270 MW BHADRADRI TPS

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d)	Gears	
i)	Type	Spur / helical
ii)	Material	EN8
iii)	Type of bearings used	Antifriction
e)	Method of lubrication for	
i)	Bearings	Grease
ii)	General	Grease
iii)	Sprockets	Grease
6	Painting	As per manufacturer standard



TITLE: 4 X 270 MW BHADRADRI TPS	SPECIFICATION NO. PE-TS-411-164-A001	
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SUB-SECTION IA

SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)



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1.0 GENERAL

This specification is intended to cover for SUPPLY PART , SERVICES PART & MANDATORY SPARES comprising of design (i.e. Preparation and submission of drawing/ documents including " As Built " drawings and O&M Manuals) , engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), filling of lubricants & consumables, chemicals as specified, mandatory spares along with spares for erection ,startup and commissioning as required, forwarding, proper packing, shipment and delivery at site, unloading, handling, transportation & storage at site, in site transportation, assembly, minor civil works, erection & commissioning, trial run at site, preparation of drawings in 3D (if applicable) and carry out performance guarantee /Functional / Demonstration tests at site (As applicable), training of customer/ client O&M staff (if applicable) & final handing over to end customer in flawless condition for project and **EFFLUENT TREATMENT PLANT** complete with all accessories for the total scope defined as per BHEL NIT & tender technical specification, amendment & agreements till placement of order for **4X270 MW BHADRADRI TPS**.

2.0 SCOPE OF SUPPLY (MECHANICAL)

Broad scope of supply for this package is detailed below and as indicated in relevant portion of this specification.

- 2.1 Two (2) nos. (1W+1S) effluent transfer pumps for transformer yard oily waste of unit 1 complete with all instrumentation, valves, piping, fittings, motor etc.
- 2.2 Two (2) Nos. (1W+1S) effluent transfer pumps for transformer yard oily waste of unit 2 complete with all instrumentation, valves, piping, fittings, motor etc.
- 2.3 Two (2) Nos. (1W+1S) effluent transfer pumps for transformer yard oily waste of unit 3 complete with all instrumentation, valves, piping, fittings, motor etc.
- 2.4 Two (2) Nos. (1W+1S) effluent transfer pumps for transformer yard oily waste of unit 4 complete with all instrumentation, valves, piping, fittings, motor etc.
- 2.5 Two (2) Nos. (1W+1S) Boiler Floor Wash Water Transfer pumps Unit-1 with all instrumentation, valves, piping, fittings, motor etc.
- 2.6 Two (2) Nos. (1W+1S) Boiler Floor Wash Water Transfer pumps Unit-2 with all instrumentation, valves, piping, fittings, motor etc.
- 2.7 Two (2) Nos. (1W+1S) Boiler Floor Wash Water Transfer pumps Unit-3 with all instrumentation, valves, piping, fittings, motor etc.
- 2.8 Two (2) Nos. (1W+1S) Boiler Floor Wash Water Transfer pumps Unit-4 with all instrumentation, valves, piping, fittings, motor etc.
- 2.9 Two (2) Nos. (1W+1S) TG Floor Wash Water Transfer pumps Unit-1 with all instrumentation, valves, piping, fittings, motor etc.
- 2.10 Two (2) Nos. (1W+1S) TG Floor Wash Water Transfer pumps Unit-2 with all instrumentation, valves, piping, fittings, motor etc.
- 2.11 Two (2) Nos. (1W+1S) TG Floor Wash Water Transfer pumps Unit-3 with all instrumentation, valves, piping, fittings, motor etc.
- 2.12 Two (2) Nos. (1W+1S) TG Floor Wash Water Transfer pumps Unit-4 with all instrumentation, valves, piping, fittings, motor etc.
- 2.13 Two (2) Nos. (1W+1S) Floor Wash Water Transfer pumps for ESP area unit-1 with all instrumentation, valves, piping, ventury mixer, fittings, motor etc.
- 2.14 Two (2) Nos. (1W+1S) Floor Wash Water Transfer pumps for ESP area unit-2 with all instrumentation, valves, piping, ventury mixer, fittings, motor etc.
- 2.15 Two (2) Nos. (1W+1S) Floor Wash Water Transfer pumps for ESP area unit-3 with all instrumentation, valves, piping, ventury mixer, fittings, motor etc.
- 2.16 Two (2) Nos. (1W+1S) Floor Wash Water Transfer pumps for ESP area unit-4 with all instrumentation, valves, piping, ventury mixer, fittings, motor etc.
- 2.17 Two (2) Nos. (1W+1S) Boiler Blow Down Transfer pumps for unit-1 with all instrumentation, valves, piping, fittings, motor etc.
- 2.18 Two (2) Nos. (1W+1S) Boiler Blow Down Transfer pumps for unit-2 with all instrumentation, valves, piping, fittings, motor etc.
- 2.19 Two (2) Nos. (1W+1S) Boiler Blow Down Transfer pumps for unit-3 with all instrumentation, valves, piping, fittings, motor etc.

**TITLE:****4 X 270 MW BHADRADRI TPS**

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- 2.20 Two (2) Nos. (1W+1S) Boiler Blow Down Transfer pumps for unit-4 with all instrumentation, valves, piping, fittings, motor etc.
- 2.21 Two (2) Nos. (1W+1S) Common Oily Waste Transfer pumps with all instrumentation, valves, piping, fittings, motor etc.
- 2.22 Two (2) Nos. (1W+1S) Sludge Transfer pumps with all instrumentation, valves, piping, fittings, motor etc.
- 2.23 Two (2) Nos. (1W+1S) Effluent Transfer pumps for Central Monitoring Basin (CMB) with all instrumentation, valves, piping, fittings, motor etc.
- 2.24 One (1) no. LAMELLA CLARIFIER/TUBE SETTLER along with flocculation tank, flash mixer, agitator, flocculator, fittings, oil skimmer, sludge trolley, media, plate packs, oil collection drum and all other accessories.
- 2.25 One no. Alum dosing tank for lamella clarifier / tube settler including slow speed gear operated agitator driven by motor complete with overflow seal, integral pipe works, dissolving basket, filling connection, valves, instrumentation and all other accessories required.
- 2.26 Two (2) (1W+1S) nos. pumps of positive displacement type suitable for dosing alum at design dosage rate specified and head as required. Pumps shall be provided with accessories such as Y-type suction strainers, pressure dampeners, safety relief valves, valves, instrumentation, fittings etc. as required for lamella clarifier / tube settler.
- 2.27 One no. PE dosing tank for lamella clarifier / tube settler including slow speed gear operated agitator driven by motor complete with overflow seal, integral pipe works, filling connection, valves, instrumentation and all other accessories required.
- 2.28 Two (2) (1W+1S) nos. pumps of positive displacement type suitable for dosing PE at design dosage rate specified and head as required. Pumps shall be provided with accessories such as Y-type suction strainers, pressure dampeners, safety relief valves, valves, instrumentation, fittings etc. as required for lamella clarifier / tube settler.
- 2.29 One no. NaOCl dosing tank for Central Monitoring Basin (CMB) including slow speed gear operated agitator driven by motor complete with overflow seal, integral pipe works, dissolving basket, filling connection, valves, instrumentation and all other accessories required.
- 2.30 Two (2) (1W+1S) of positive displacement type suitable for dosing NaOCl at design dosage rate specified and head as required in CMB. Pumps shall be provided with accessories such as Y-type suction strainers, pressure dampeners, safety relief valves, valves, instrumentation, fittings etc. as required.
- 2.31 Two nos. (2X100%) Air Blowers (Centrifugal /Twin Lobe Type) for Sludge Collection pit along with suction filter, silencer, motors, piping, valves, fittings, instrumentation, acoustic chamber and accessories associated with the same.
- 2.32 One no. acid dosing tank for CMB with fume absorber, overflow seal, integral pipe works, filling connection, valves, instrumentation and all other accessories required.
- 2.33 Two (2) (1W+1S) of positive displacement type suitable for dosing acid at design dosage rate specified and head as required in CMB. Pumps shall be provided with accessories such as Y-type suction strainers, pressure dampeners, safety relief valves valves, instrumentation, fittings etc. as required.
- 2.34 One no. alkali dosing tank for CMB including slow speed gear operated agitator driven by motor complete with overflow seal, integral pipe works, CO2 absorber, dissolving basket, filling connection, valves, instrumentation and all other accessories required.
- 2.35 Two (2) (1W+1S) of positive displacement type suitable for dosing alkali at design dosage rate specified and head as required in CMB. Pumps shall be provided with accessories such as Y-type suction strainers, pressure dampeners, safety relief valves valves, instrumentation, fittings etc. as required.
- 2.36 One no. PLC based control system along with accessories located inside ETP area.
- 2.37 Two nos. RIO panels are in bidder's scope for all effluent lifting sumps located outside boundary of ETP area.
- 2.38 3.0 km fiber optical cable are in bidder's scope for communication between RIO panels and PLC located in ETP area.
- 2.39 Bidder to take care the length of piping as included elsewhere in specification of Effluent Treatment plant. Pipe routing shall be decided during detailed engineering, however bidder will consider 13.5 m (or 12 m, as per availability of pipe racks) static head + 10% margin during pump selection for outside ETP area, Sludge transfer pumps, ESP waste water transfer pumps, Boiler Blow down transfer pumps and Effluent transfer pumps for CMB.



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- 2.40 Pipe racks shall be provided by BHEL wherever available. However, where pipe racks are not available the pipe shall run on pipe pedestals. All auxiliary steel structures (U-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles shall be in the scope of bidder. If buried piping is required, Wrapping, coating and protection of the entire buried pipe is also in bidder's scope & shall be as per IS 10221.
- 2.41 All steel inserts plates with lugs, rungs, ladder, puddle pipes, bolts, edge angle in desired shape, nuts, sleeves, and all other embedding components etc as required to grout in BHEL civil works and to support/hold the equipments to being supplied under this specification shall be in bidder's scope.
- 2.42 Any statutory clearance required for the system from MOEF or local pollution control board in bidder's scope.
- 2.43 Initial charge of all lubricants & grease in bidder's scope.
- 2.44 All motorized valves shall be provided with integral starter.
- 2.45 Instrument hook up material shall be in bidder's scope.
- 2.46 Edge angle required in a proper shape for edge protection in civil works will be provided by bidder.
- 2.47 The pipe sizes indicated in the tender specification/ P & I diagram are minimum. Wherever pipe sizes are not indicated, the same shall be selected based on the specification requirement and shall be subject to BHEL / customer approval during detailing engineering. All pipes shall be carbon steel unless exclusively mentioned.
- 2.48 All necessary drains, vents and sampling points with valves as specified and as required are in bidder's scope.
- 2.49 Monitoring gadgets, instruments and equipments required for maintenance (till demonstration test & plant handover).
- 2.50 Associated piping, instrumentation and valves required for the system.
- 2.51 All necessary instruments and controls required for easy and safe operation of the system.
- 2.52 Wherever terminal points between BHEL and bidder indicated, bidder shall provide pipes with counter flange.
- 2.53 All pipes, fittings etc. required for hand railing, platforms, and ladders shall be in the scope of bidder. All ladders shall be non-civil work. All insert plates, nuts and bolts, puddle pipes, counter flanges wherever applicable shall be in the scope of bidder. Supply and erection of Hand railing as desired for safety purpose will be in bidder's scope.
- 2.54 All the sumps, tanks, reservoirs and other water retaining structures shall be provided with access ladders/rungs from operating platforms/ground level as the case may be and de-watering pits one for each section (civil work by BHEL).
- 2.55 Two sets of safety equipment each comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall also be provided by the bidder. One nos. personnel water drench safety shower and eye bath shall be provided by the bidder near acid alkali handling area.
- 2.56 Instrumentation, valves etc. indicated in P & ID of effluent treatment plant are bare minimum requirement, however bidder has to provide complete system for trouble free operation meeting technical specification requirement.
- 2.57 **Effluent lifting sumps E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E18, E19, E20, E21, E22 and E23 shall be located outside ETP area however rest facilities indicated in P & ID of ETP shall be located inside ETP area provided in plot plan included in this specification.**
- 2.58 All blank flanges/counter flanges, isolations valves, tees etc. to interconnect the pipes at all terminal points.
- 2.59 Mandatory spares as per list attached in ANNEXURE VI.
- 2.60 Special tools and tackles as required for the system. Refer ANNEXURE VIII
- 2.61 All special tools necessary for proper maintenance or adjustment of the equipment packaged in permanent box. Finish paints for touch-up painting of equipment after erection at site in sealed container.
- 2.62 Start-up and commissioning spares as required.
- 2.63 All the first fill and one Year's topping requirements of consumable such as greases, oil, lubricants, servo fluids/control fluids, gases and etc. which will be required to put the equipment covered under the scope of specifications, into successful commissioning / initial operation and to establish completion of facilities shall be furnished by the bidder. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum.
- 2.64 Electric hoist and chain pulley block as per specification requirement.
- 2.65 Grouting of equipments and grouting material is in bidder's scope.
- 2.66 All pipes, fittings etc. required for hand railing, platforms, and ladders shall be in the scope of bidder.



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All ladders shall be non-civil work. Supply and erection of Hand railing as required for safety purpose will be in bidder's scope. All handrails shall be of 32 mm nominal bore MS pipes (medium class) as per ASTM A 500 or equivalent international standard galvanized using 750 gm. / sq. m of zinc. Hand railing shall be a two-rail system with the top rail 1000 mm above the walkway surface and the intermediate rail 450 mm below the top rail. Handrail post spacing shall be limited to 1500 mm as far as possible but can be proportioned to the length of the opening. In such a case spacing shall not exceed 1850 mm center to center of posts. Hand railing shall be shop fabricated for specific locations and field welded or bolted to the erected structural steel. Railings shall be provided with 100 mm wide and 8 mm thick MS strip at bottom as toe guard all along the length of railing in horizontal plane. For RCC stairs, hand railing with 20 mm square MS bar balustrade with suitable MS flat and Aluminum/ Teakwood handrail shall be provided, unless specifically mentioned otherwise.

2.67 PIPING

- 2.67.1 Complete piping indicated in P & ID (Refer ANNEXURE XII) of Effluent treatment plant is in bidder's scope of supply and erection. In addition, any additional piping required to make the system complete inside ETP area shall be in bidder's scope. Pipe length inside ETP area has to be considered by bidder in their scope suitably.
- 2.67.2 Pipe distances from sumps outside ETP area upto inside ETP area and inside ETP area to respective location have been indicated in P & ID. Bidder to note that no commercial settlement / adjustment shall be entertained for variation upto +/- 10% of pipe lengths during detailed engineering. Distances given are from one area to other area only, however inside piping in respective area shall be in bidder's scope which has to be suitably consider by bidder as additional.
- 2.68 Two (1W+1S) Flushing pumps along with all instrumentation, valves, piping, fittings, motor etc.
- 2.69 Isolation gates as per P & ID enclosed.
- 2.70 Bidder to adhere Format of operation and maintenance manual requirement as per Annexure IX during detailed engineering.
- 2.71 Bidder to adhere site storage and preservation requirement as per Annexure X during detailed engineering.
- 2.72 Bidder to adhere site General technical requirement as per Annexure XI during detailed engineering.
- 2.73 Bidder to refer Plot plan attached (Refer ANNEXURE XII) with this section. Location of effluent sumps is located in plot plan along with tentative routing for bidder's information.
- 2.74 Bidder to refer Annexure III for Functional / performance / demonstration guarantee requirements.
- 2.75 Bidder to refer Annexure XIII for water analysis.
- 2.76 Sumps E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16, E17, E18, E19, E20, E21, E22 and E23 (RCC work by BHEL) along with piping, valves, fittings, instrumentation and associated accessories.
- 2.77 Bidder to refer datasheet A for technical requirements.

3.0 SCOPE OF SUPPLY (ELECTRICAL)

Complete electrical as per specification / details indicated in Sub Section IB and IIB.

4.0 SCOPE OF SUPPLY (C&I)

Complete C&I as per specification / details indicated in Sub Section IC and IIC.

5.0 SCOPE OF SUPPLY (CIVIL)

Total Civil is in BHEL Scope of work, however Civil Input drawing shall be provided by bidder.

6.0 SCOPE OF SERVICE

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

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



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- b. Minor civil work like chipping of foundation, grouting below base plate for all structures, equipment, grouting of anchor bolts wherever these are not placed in the foundation during casting of foundation itself, excavation & filling of earth for buried pipes if and as required. To the extent possible, vendor shall ensure to supply all foundation bolts timely so as to facilitate placement of these bolts while casting the foundation. Wrapping, coating and protection of all the buried pipe shall be as per IS 10221.
- c. Pre- Commissioning work such as flushing, hydraulic testing etc. Necessary consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities shall be arranged by the successful bidder at their own cost.
- d. Erection and Commissioning of entire Effluent Treatment Plant.
- e. Arrangement of all lubricants, instruments, reagents for carrying out trial run, commissioning and demonstration test.
- f. Monitoring gadgets, instruments and equipment required for maintenance (till demonstration test & Plant Hand over).
- g. All personnel required during commissioning, trial run and demonstration Test.
- h. Trial run for requisite period.
- i. Performance testing.
- j. Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.
- k. All other facilities/ services as described in section on site services in specification and related to Effluent Treatment Plant scope of work.
- l. Relevant requirements as per GTR, GCC, ECC & SCC.
- m. Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system as well as to meet any statutory requirement relevant to the package, unless specifically excluded from scope of services.
- n. Painting as per enclosed painting schedule ANNEXURE V. However, any variation in the painting schedule as finally approved by customer / BHEL shall be taken care by bidder without any commercial and delivery implication. Colour-coding scheme shall be intimated to vendor during detailed engineering.

7.0 TERMINAL POINTS

- a. Service water line (50 NB) will be provided by BHEL at 5 m distance from ETP area. Further distribution inside ETP area will be in bidder's scope. Bidder to note that pressure available at terminal point for service water will be 2 kg/cm² approx (max.); hence bidder will take care for their pump lubrication / cooling accordingly.
- b. Instrument air pipe (25 NB) will be provided by BHEL at 5 m distance from ETP area. Further distribution inside ETP area will be in bidder's scope, if required.
- c. Service air pipe (25 NB) will be provided by BHEL at 5 m distance from ETP area. Further distribution inside ETP area will be in bidder's scope, if required.
- d. DM plant regeneration waste shall be terminated by DM plant vendor in CMB.
- e. Fuel oil waste shall be terminated by Fuel oil vendor in Common oily waste collection sump.

8.0 EXCLUSIONS

- 7.1 All civil works including foundation of equipment, excavation & back filling. However complete grouting for equipment, grouting material, fixing and any concreting inside vessels and lining shall be in the scope of the bidder.
- 7.2 Main pipe trestles.



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- 7.3 Air conditioning, ventilation & firefighting facilities.
- 7.4 Other exclusions are mentioned in the electrical & C&I parts of this specification.
- 7.5 Acid, alkali, PE, NaOCl, and alum Chemicals.

9.0 QP AND SUBVENDOR APPROVAL:

- 8.1 Minimum QP requirements are specified as Annexure I. However, any additional comments as given by BHEL/Customer shall be adhered by the bidder without any commercial & delivery implication to BHEL.
- 8.2 The sub vendor list (Annexure- II) enclosed is indicative only and is subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.
- 8.3 Bidder to propose sub vendor list with following back up documents within 4 weeks of placement of LOI/LOA. Thereafter no request for additional sub-vendor shall be entertained. The sub vendor list shall subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.
- 8.4 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.
- 8.5 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.

10.0 DESIGN /CONSTRUCTION

In addition to the requirements of Section I and II the following shall also be complied under scope of this specification.

The P&I diagram is enclosed herein in this section for bidder's compliance.

The material of construction specified in data Sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subject to BHEL / Customer approval during detail engineering without any commercial & delivery implication to BHEL.

11.0 INFLUENT QUALITY AND OUTLET GUARANTEE PARAMETERS:

10.1 INFLUENT QUALITY:

- a) FREE OIL & FLOATING OIL IN LAMELLA CLARIFIER / TUBE SETTLER: 50 PPM
- b) TSS IN LAMELLA CLARIFIER / TUBE SETTLER: 500 PPM
- c) TSS FROM DM PLANT REGENERATION WASTE: 200 PPM
- d) TDS FROM DM PLANT REGENERATION WASTE: 1400 TO 6000 PPM
- e) CLARIFIED WATER WILL BE USED FOR WASHING

10.2 OUTLET GUARANTEE PARAMETERS:

- a) OIL QUANTITY AT LAMELLA CLARIFIER / TUBE SETTLER OUTLET: As per Annexure III
- b) TSS AT LAMELLA CLARIFIER / TUBE SETTLER OUTLET: As per Annexure III

12.0 DRAWING/DOCUMENTS REQUIREMENT

- 11.1 For the Drawings/Documents distribution Procedure, please refer attached Annexure-IV. Bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. The numbers of soft copies & hard copies of drawing/documents to be submitted by the bidder shall be as per enclosed Annexure-IV.
- 11.2 After award of LOI/LOA, drawing/documents to be submitted by the bidder for BHEL/Customer approval has been indicated in Annexure VII. However, any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any



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commercial & delivery implication to BHEL.

- 11.3 Bidder to note that the successful bidder, during detail engineering, will submit the drg/doc through web based Document Management System in addition to hard copies to be submitted as per the Annexure IV of this specification. Bidder would be provided access to the DMS for drg/doc 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>

13.0 SPARES

The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares as indicated in the relevant sections of specifications. The general requirements pertaining to the supply of these spares is given below: -

12.1 MANDATORY SPARES

- a. The list of mandatory spares which is to be considered by bidder in their scope are indicated in Annexure VI.
- b. All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. However, spares shall not be dispatched before dispatch of corresponding main equipments.
- c. Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until and unless specified otherwise.
- d. Inspection of mandatory spares shall be in line with the approved quality plans for the respective items/equipments. The inspection categorization of mandatory spares shall also be in line with the approved Categorization plan for the respective items/equipment.

12.2 START-UP & COMMISSIONING SPARES

- a. Start-up and commissioning spares are those spares which are required during the start-up and commissioning of the equipment/system. All spares used till the plant is handed over to the BHEL/Customer shall come under this category. The Bidder shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipments are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All start up spares which remain unused at the time shall remain the property of the Bidder.
- b. The Bidder shall indicate the service expectancy period for the spares under normal operating conditions before replacement is necessary.



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- c. All spares supplied under this contract shall be strictly inter changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desecrator packs as necessary.
- d. All the spares (mandatory) shall be manufactured along with the main equipment components as a continuous operation as per same specification and quality plan.
- e. Each spares part shall be clearly marked or labelled on the outside of the packing with its description. When more than one spares part is packed in a single case, a general description of the content 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 purposes of identification.
- f. All cases, containers or other packages are to be opened for such examination as may be considered necessary by BHEL / Customer.
- g. The Bidder will provide the BHEL/Customer with all the addresses and particulars of his sub suppliers while placing the order on vendors for items/components/equipments covered under the contract and will further ensure with his vendors that the BHEL/Customer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.
- h. The Bidder shall warrant that all spares supplied will be new and in accordance with the contract Documents and will be free from defects in design, material and workmanship.
- i. The bidder to provide datasheets/assembly drawings of the manufacturer/ any other relevant document showing Bill of Material(s), Make, Model Number, Part Number etc. through which the mandatory spares to be supplied can be uniquely identified.

Any other documents submitted by bidder except as asked in the bid's specification shall not be evaluated & considered as null & void.

10.3 ADDITIONAL REQUIREMENT

- Lamella clarifier dosing system and dosing system for CMB shall be located in side industrial shed. Rest all equipment / facilities shall be located outside open to sky.
- Control room and MCC room shall be located inside single story RCC building. Chemical storage for alum, PE, NaOCl, acid & alkali shall be located in side industrial shed adjacent to control room for 15 days.
- Bidder to submit BBU during detailed engineering after approval of Basic documents. BBU shall be equal to BOQ for the package and there shall be no price and delivery implication is applicable to BHEL / customer for the same. None of the items supplied for the project as non-billable. Incomplete BBU shall not be review by BHEL. Further during detail engineering breakup of supply prices of Effluent treatment plant in the Billing break up schedule shall be prepared for billing purpose as per below mentioned details:

1.0	THE BREAK UP (%) OF SUPPLY PRICES OF EFFLUENT TREATMENT PLANT IN THE BBU SHALL BE IN LINE WITH THE BELOW PROVIDED DETAILS:	
1.1	Lump sum firm price for supply of Atmospheric tanks and pressure vessels (if applicable) along with accessories inclusive of all taxes, duties and other levies as applicable.	4% of Total Supply Price.
1.2	Lump sum firm price for supply of Valves inclusive of all taxes, duties and other levies as applicable.	10% of Total Supply Price.
1.3	Lump sum firm price for supply of Instruments & analysers inclusive of all taxes, duties and other levies as applicable.	24% of Total Supply Price.



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1.4	Lump sum firm price for supply of Pumps & Blowers with motor inclusive of all taxes, duties and other levies as applicable.	21% of Total Supply Price.
1.5	Lump sum firm price for supply of Piping & Fittings inclusive of all taxes, duties and other levies as applicable.	15% of Total Supply Price.
1.6	Lump sum firm price for supply of lamella clarifier / tube settler plates & media, agitators, strainers along with accessories inclusive of all taxes, duties and other levies as applicable.	3% of Total Supply Price.
1.7	Lump sum firm price for supply of PLC system ,UPS with battery & battery charger, ACDB & BHMS (as applicable) inclusive of all taxes, duties and other levies as applicable.	12% of Total Supply Price.
1.8	Lump sum firm price for supply of Balance Miscellaneous items inclusive of all taxes, duties and other levies as applicable.	11% of Total Supply Price.

- Any statutory requirement / clearance required for the package from government / local body shall be in bidder's scope.
- All interconnecting piping, valves, fittings including dosing piping, drain piping from tanks to nearby drain, flushing lines from nearest available water source, valves, fittings and accessories is also in bidder's scope.
- All the vertical pumps shall be self-lubricating type.
- Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval shall be taken from BHEL. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
- KKS numbering if required, as per BHEL/Customer requirement shall be provided by the Bidder during detailed engineering stage without any commercial/delivery implication to BHEL.
- Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the works for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.
- Buried piping shall be protected as under (as per IS-10221).
 - Surface cleaning by wire brush, power tool cleaning etc.
 - Apply one coat of coaltar/primer/enamel.
 - Apply one layer of tape comprising of coaltar. Application of tape shall conform to AWWA C-203/IS 10221 (Appendix-B) with Minimum thickness of tape as 4MM +10%
- All drawings/documents shall be approved by BHEL/Customer during detailed engineering stage. Successful Bidder shall comply with the comment of the customer/BHEL without price & delivery implication.
- 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.
- Final Electrical Load list will be submitted by the successful bidder as per agreed drawing/ doc submission schedule. Thereafter any change in the electrical load list shall be entertained only subject to its feasibility, and BHEL reserves the right to debit the vendor cost of any changes necessitated in the switch gear /MCC on account of changed loads.
- Wherever CIVIL works is excluded from the bidder's scope, successful bidder shall furnish civil assignment / scope drawings. The corresponding CIVIL drawing prepared by BHEL / CIVIL agency, based on civil assignment drawing of bidder will be furnished to the successful bidder for concurrence. In case any modification is required in the civil work already carried out based on final civil inputs given by bidder, BHEL reserves the right to debit cost of such rework to bidder.
- 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.



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- Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details w.r.t. existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reason for any shortcoming in the work by them. BHEL shall also not entertain any cost implication for any lack of input data with regard to site during detail engineering.

10.4 PAINTING

Painting shall be Annexure V of technical specification. Internal painting of the equipments shall be suitable for withstanding effect of effluent. Outer painting shall be as per technical specifications. Supporting documents shall be furnished in support of suitability of the lining offered for the duty conditions by bidder during detailed engineering.

10.5 PLANT OPERATION AND CONTROL

Effluent treatment plant shall be controlled from PLC.

The control philosophy of various systems is described below. However, for all the systems, following basic process related interlocks, alarms /pre-warning signals shall be implemented in the control system as per system requirement.

- a) Among the equipments, it shall be possible to select a specific pump or tank or sump for working/standby/ maintenance etc through control system.
- b) Permissive & Interlocks:
 - (i) Starting & tripping of pumps with respect to liquid level in the respective sump/tanks or liquid pressure in the suction lines.
 - (ii) Starting & tripping of agitators with respect to liquid level in the respective sump/tanks.
 - (iii) Starting & tripping of pumps (which are provided with forced water lubrication) with respect to lubricating water flow (through low pressure/ low flow signal as the case may be).
 - (iv) Tripping of pumps when the discharge pressure is very high to avoid operation of the pump under shutoff head.
 - (v) Stopping/ tripping of equipments due to abnormal parameters related to safety of equipments like high vibration, very high bearing lubrication water (and /or oil) temperature to the drive/pumps, very high bearing temperature of the of pump/drive etc as applicable based on the recommendations of Equipment Supplier.
 - (vi) Automatic opening of the re-circulation valve to pre-set percentage, in case of failure of opening of pump(s) discharge valve to ensure minimum flow through the pump, as per the recommendation of manufacturer.
 - (vii) Automatic starting of standby pumps upon failure of starting of selected pump or tripping of running pump as the case may be.
 - (viii) Capacity of the metering pump shall be controllable from 10-100% continuously by adjusting the stroke length manually by a micro meter dial calibrated for 0–100% of pump capacity integral with the pump.
 - (ix) Various annunciations related to low level of the chemical tanks & sumps shall be provided.
- c) Alarms /Signals
 - (i) Abnormal parameters such as low & high level in tanks/sumps, high pressure at pump discharge, low header pressure, low lubrication water flow to pumps (provided with forced water lubrication



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system) etc.

- (ii) Failure of starting of equipments such as pumps, blowers etc. upon start command.
- (iii) Tripping of equipments due to protection logic.

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

MATERIAL HANDLING EQUIPMENTS

1.0 ELECTRIC HOIST AND MANUAL HOIST (CHAIN PULLEY BLOCK)

Required number of electric hoist / manual hoist of adequate capacity, to meet the erection and maintenance requirements are to be provided for the various areas where handling weight is more than 500 kg.

Manual hoists (hand operated) shall be designed to duty class 2 as per IS 3832 and electric wire rope hoist shall be designed as per IS: 3938 (latest).

The stipulations of all statutory codes like Indian Electricity Act, Indian Electricity Rules, Factory Acts, Local Municipality act etc. shall however prevail over the specification requirements, in case any conflict arises between this specification and the statutory codes.

Maintenance tools and tackles shall be as per data sheet attached.

DESIGN CRITERIA

For the hoists with more than 2.0 tonne lifting capacity and/ or more than 10.0 M lift i.e. either capacity or lift is more than 2T or 10 m, Electrical hoist shall be provided. Less than or equal to 2T and lift < 10m hoist blocks shall be of hand operated type for both travel and lift.

However, all monorails coming out of the building shall be provided with electric hoist block, irrespective of load and lift.

Capacity of electric and manual (Chain pulley block) hoists shall be decided keeping 25% margin over heaviest equipment to be handled.

For hand operated hoists, the hoists shall be suitable for operation from floor level. Hand chain shall be provided for long travel of trolley and the Hoisting mechanism. For electric hoist, operator shall be able to control the movement of the electrical hoist with the help of floor operated pendant

Note;

- Travel and Lift are layout dependent and shall be finalized during detail engineering without any commercial implication
- Additional electric/manual hoist required during detail engineering shall be provided as per design criteria given above without any commercial implication.

2.0 SCOPE OF SUPPLIES

Equipment and services to be furnished by the bidder for the ELECTRIC HOIST/ MANUAL HOIST with accessories as per the details given in the technical specification and data sheet A. Any equipment / accessories not specified in the specification but required to make the ELECTRIC HOIST/ MANUAL HOIST complete and efficient operation shall also be under the bidder's scope of work.

Compliance with this specification shall not relieve the bidder of the responsibility of furnishing material and workmanship to meet the specified working/duty conditions.



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2.1 ELECTRIC HOIST

Electric hoist shall include but not be limited to the following: -

- a. Hoisting and CT drive arrangement
- b. All electrical equipment including cables (as per electrical scope matrix) and panels.
- c. PVC insulated shrouded bus bar DSL
- d. Earthing arrangement.
- e. Fill of lubricant till commissioning / handling over to customer.
- f. Painting of electric hoist and accessories.
- g. Maintenance tools & Tackles
- h. Erection & Commissioning spares
- i. Isolating switch in enclosure at operating floor for disconnecting supply to DSL while maintaining the electric hoist.
- j. Mandatory spares

2.2 MANUAL HOIST (CHAIN PULLEY BLOCK)

Manual hoist shall include but not be limited to the following:

- a. Chain pulley blocks with/without traveling trolleys
- b. Maintenance Tools and Tackles
- c. Mandatory spares

2.3 Erection and Commissioning spares (ELECTRIC HOIST)

The Bidder shall also supply erection & commissioning spares along with his main equipment as per his experience, for replacement of damaged or unserviceable parts during the execution of the project at site, to avoid delay in the project schedule. This shall form part of the main equipment supply. The Purchaser shall retain the unutilized commissioning spares. The initial fill of lubricants, oil etc. shall also be supplied by the bidder.

2.4 Services to be provided by the bidder

Packing, forwarding and transportation to site, storage and handling at site.

2.5 Erection and Commissioning

2.6 Functional test (Overload testing, load testing at rated speed, travel and hoisting motion checks as per relevant Indian standards)

2.7 Obtaining clearance and acceptance certificate from the concerned competent authority after site test as applicable. Necessary fees/expenditure as required shall be borne by the supplier.

3.0 Inspection and Testing

Inspection and testing shall be carried out as per enclosed standard quality plan approved QAP and as per IS 3938 (latest revision). Prime inspection agency shall be NBPPL/End Customer. Equipment supplied shall be strictly in accordance with nomenclature & technical specification. Any additional testing requirement/ CHP(Customer Hold Point) at any stage of inspection deemed necessary by Customer/NBPPL during detailed engineering shall be carried out without any commercial or technical implication.

4.0 Works Excluded

Supply of ISMB monorail.

5.0 PAINTING SPECIFICATION

As per painting details specified elsewhere in specification.

ELECTRIC HOIST COLOR SHADE:

Colour shade: Structure: Golden Yellow, RAL 1004

Panel: Opaline green for exterior and semi glossy white for interior

MANUAL HOIST COLOR SHADE:

Trolley: Lemon yellow (Shade 355 as per IS 5)

Hook: Light grey (Shade 631 as per IS 5)

6.0 PACKING

As per packing details specified elsewhere in specification.



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7.0 DEMONSTRATION TEST

Hoist along with its drives, controls and other accessories shall be demonstrated for the rated capacity against the rated speed of motions and for the service conditions specified as specified in QAP and as per IS 3938 for electric hoist and IS 3832 for manual hoist.

The bidder shall have the full responsibility for the safe and efficient operation of the hoist with associated accessories as a single unit.

If the shop/site performance tests indicate the failure of any of the components to achieve the guaranteed performance, the deficiency shall be made good at bidder's cost.

Demonstration tests shall be carried out each time after the rectification /modification is carried out.

8.0 MAKE OF SUB - VENDOR ITEMS

Makes of bought out items will be as per list specified in the specification. No other make will be acceptable, until and unless specifically got it approved by the purchaser/ end client.

9.0 TESTING AT SITE

A) ELECTRIC HOIST:

As required for statutory clearance for operating at site i.e., overload test, load test and other tests as per IS 3938.

Test for Operation -After the supply has been connected, tests shall be carried out to prove the following:

- a) The satisfactory operation of each controller, switch, contactor, relay and other control devices and in particular the correct operation of all limit switches under the most unfavorable conditions;
- b) The correctness of all circuits and interlocks and sequence of operation; and
- c) The satisfactory operation of all protective devices.

Overload Test -After test but before the hoist is put into service, it shall be tested with overload relays appropriately set, to lift and sustain a test load of 125 percent of the working load. During the overload test, the hoist shall sustain the load under full control. The specified speeds need not be attained but the hoist shall show itself capable of dealing with the overload without difficulty.

B) MANUAL HOIST:

As required for statutory clearance for operating at site with following minimum test i.e., overload and load test.

10.0 Maintenance Tools and Tackles

One (1) complete unused new set of special purpose tools, tackles and accessories along with detailed instructions and maintenance manual shall be supplied for each EH/CPB. Tools shall be of suitable sizes for maintenance of electric hoist of each type and capacity. Each tool shall be stamped so as to be identified easy for its use. The tools shall be supplied in steel toolbox. The items supplied shall be of the best quality, specially protected against rusting. The following shall be provided as minimum requirement:

S-No.	Description	Qty.
1	Complete set of ring spanners (Indicate the sizes offered)	1 Set
2	Complete set of screwdrivers (Indicate the sizes)	1 Set
3.	Adjustable Spanner	1 No.
4.	Insulated plier	1 No.
5.	Grease gun	1 No.



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6. Oil gun
7. Line tester

1 No.
1 No.

Note: - Bidder shall ensure that the tools & tackles mentioned in above list are sufficient to handle all sizes/capacities of hoists & in case any other /additional tool is required for handling/maintenance any size/capacity of hoist the same shall be included in this list.