
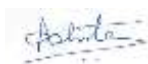




SPECIFICATION FOR COOLING SKID ASSEMBLY

Specification no: CEE/17003 Rev 02

	Name	Signature	
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Approved by	Ajay Dhote		Revision no:02
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1 APPLICATIONS

The cooling skid is required for cooling of DM water flowing through Diode cubicle of large current rectifier used in caustic soda industries. The cooling skid will be mounted in rectifier semi-enclosed room. Being a caustic soda industrial environment, vendor is requested to take necessary coating/protection on/off all items to be supplied. Vendor may visit GACL Vadodara to access the quantum of volume of work involved before quoting for the tender if necessary.

2 BID QUALIFICATION CRITERIA

Vendor shall have the manufacturing facility (steel cutting, welding, testing etc) required for the execution of the project. Vendor must have experience of executing similar project. The project completion certificate obtained from customer will be enclosed along with tender.

3 DELIVERY

One set of item is required by **3rd week of Nov'17 or 8 weeks from LOI whichever is early**. Offer will be **technically rejected** in case vendor is not agreeing for this delivery condition for first set of supply.

4 SCOPE OF SUPPLY

One set of cooling skid supply will consist the following:

4.1 FULLY ASSEMBLED COOLING SKID AS PER SPECIFICATION: 2SETS

Each of assembled Cooling skid shall consist of the following:

- **30mtrs:** 50 mm nominal bore seamless stainless steel pipe, thickness of pipe 1.2 to 1.5 mm, s.s grade 316L. The various pipe assemblies will be manufacturing as per drgs mentioned elsewhere in the specification.
- **20 Nos:** 50 mm dia, S.S. valves full bore S.S.grade 316L to be assembled as per assembly drawing mentioned elsewhere in the specification.
- **22 Nos :** 50 mm dia S.S. Elbow, S.S.Grade 316L to be assembled as per assembly drawing mentioned elsewhere in the specification.
- **16 Nos :** 50 mm dia S.S.Tee, S.S.Grade 316L to be assembled as per assembly drawing mentioned elsewhere in the specification.
- **8 Nos :** 50 mm dia S.S.Plug, S.S.Gr.316L to be assembled as per assembly drawing mentioned elsewhere in the specification
- **48Nos:** 50 mm size S.S. Flanges as per BS-10, table 'D' S.S. Grade 316L with Nitrile rubber gaskets 5 mm thick.



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- **20Kg:** Stainless steel SS316L hardware for above flanges along with plain & spring washer. Hardware length shall be suitable for assembly.
- 50 NB S.S.Pipes with two flanges welded on both ends S.S. Grade 316L to be assembled as per assembly drawing mentioned elsewhere in the specification.
- **2 Nos:** 400mm long (flange to flange) 50 NB PVC Pipes with two flanges both side to be assembled as per assembly drawing mentioned elsewhere in the specification.
- **4Nos:** 12.7mm (1/2") dia ball type SS-316L Valve full bore
- **2 Nos :** Strainer suitable for SS pipe
- **4Nos:** Temperature & pressure gauges to be installed at inlet and output of PHE
- **1Nos:** Deionization cartilidge for online treatment of DM water
- **1No:** Suitable MS box 500*500*600mm with single leaf fron door for mouting indication lamp, temperature indicator, meters etc.
- **2Nos:** SS PUMP make Alfa Laval to spec given any where in the specification
- **2Nos:** SS Plate type heat exchanger make Alfa Laval to spec given any where in the specification
- **1no :** Vortex type flow meters to be assembled as per assembly drawing mentioned elsewhere in the specification
- **1no :** Conductivity analyser anong with sensor to be assembled as per assembly drawing mentioned elsewhere in the specification
- **2nos:** Deinonising cartlidge of Ion exchange make
- **1no:** Control box (MS sheet to 400*400*600 tentative) for mounting of flow meter, conductivity meter, temperature indicator, terminals etc and necessary support for mounting of this box.
- **6nos:** SS316L flexible hose for connection of interconnecting pipe between cooling skid and rectifier cubicle
- Pipe Supports as per requirement

4.2 SEAMLESS CARBON STEEL PIPES ASSEMBLIES/LOOSE SUPPLY: 2Sets

Each set will consist of the following:

- 25 mtrs: 50 mm nominal bore seamless carbon steel pipe, thickness of pipe 2 to 2.5 mm
- 8 Nos: 50 mm dia, Ball type C.S. valves full bore C.S. Grade.
- 10 Nos: 50 mm dia C.S. Elbow, C.S.Grade.
- 8 Nos: 50 mm dia C.S.Tee, C.S.Grade 316
- 6 Nos: 50 mm size C.S. Flanges as per BS-10, table 'D' with Nitrile rubber gaskets 5 mm thick.
- 1 No: 3" size C.S. Flanges as per BS-10, table 'D' with Nitrile rubber gaskets 5 mm thick.
- 10 Kg : CS Hardware of suitable length for above flanges along with plain & spring washer.



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- 1 No: Flow Switch/indicator suitable for 50mm (2") NB pipe, 227 LPM flow of water with SS304 (preferable)/Gun Metal base, with suitable T-Mounting Series 4012 with 100mm dial and 2 microswitches (5A 240 VAC) as per Sukrut Udyog, Pune Cat.No.FSM-COND T-Mounting as per code M1-2, Table-I, Fig.7 on page-5 of Cat.No.FSM-COND.
 - First switch will operate at xxxLPM
 - Second switch will operate at xxxLPM
 - xxx data will be intimated after PO placement
- 1No: Flow switch/indicator suitable for 50mm (2") NB pipe, 67 LPM flow of water with SS304 (preferable)/Gun Metal base. With suitable T-Mounting Series 4012 with 100mm dial and 2 microswitches (5A 240 VAC) as per Sukrut Udyog, Pune Cat.No.FSM-COND T-Mounting as per code M1-2, Table-I, Fig.7 on page-5 of Cat.No.FSM-COND.
 - First switch will operate at 40LPM
 - Second switch will operate at 30LPM
- 2Nos: Cable Float switch of Waaree or Nivelco make with following specifications:
 - Micro-switch rating 5A, 240VAC
 - Cable length-3 meters
- 2Nos: Temperature gauge analog type suitable for pipe mounting to display the temperature of water.

5 CONSTRUCTION

It consists of piping work, measuring instruments, valves, heat exchangers, pump motor assembly, skid, etc. Cooling skid base frame shall be manufactured as per drg. No. 26500600018. Components of skid shall be assembled as per drawing no. 16500600006.

Pipe bending shall be followed strictly as per drawing.

Cooling skid dimensions shall be maintained strictly as per the final drawings released for manufacturing. Provision of modification of dimensions of components from that indicated in attached drawings shall be accommodated free of charge by the vendor. Any open end of piping shall be sealed by suitable gasket & blanking plate.

6 MAKE OF MAJOR ITEMS/INSTRUMENTS.

The major items/instruments shall be used only of make as per given in Annexure I. Any deviation to make is not acceptable.



7 DOCUMENTATION

All the related drawings, BOM & components specifications are enclosed list of which is given in Annexure II. Final drawings for manufacturing will be forwarded by BHEL to vendor after finalization of PO.

The following documents will be submitted along with the offer:

1. Makes of all bought out item considered.
2. Technical brochures of all bought out components.

The following documents will be submitted within one week of receipt of order/LOI:

1. Drawings of all bought out components for dimensional details and electrical termination details
2. Schedule of execution from receipt of PO/LOI to delivery showing all milestones activities.

8 TESTING/INSPECTION

Vendor will mandatorily place stage wise inspection calls as follows:

1. After assembly of cooling skid base frame prior to painting.
2. After receipt of all bought out components prior to assembly. Material certificates of all bought out items as called in the specifications shall be submitted at this stage.
3. Final inspection

However, BHEL reserves the right to visit vendor works any time during execution for monitoring progress.

Testing/inspection of final finished item will be carried out at vendor works in presence of BHEL/GACL based on test instructions to be forwarded by BHEL. The dispatched equipment shall be tested at BHEL & supplier shall associate during combined testing of subject equipment with other systems at BHEL works free of cost.

9 SPARES

Spares for cooling skid shall be quoted separately as per list given below:

9.1 List of Spares

Sl.No.	Items	Quantity	Unit
1	A Set of Valves 1no each type	1	Set
2	Conductivity measuring system along	1	Set



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	with sensor		
3	Temperature gauges	1	No
4	Pressure Gauge	1	No
5	Gasket 1no each type	2	Set
6	Level Switch	1	No
7	Mechanical seal & bearing for Pump motor assembly	1	Set
9	SS Pump alongwith motor	1	No
10	Flow switch 67LPM	1	No
11	Flow switch 227LPM	1	No
12	Flow meter vortex type	1	No

10 STAINLESS STEEL GRADE

Stainless steel items shall be manufactured to grade SS 316L. This supersedes any information given elsewhere.

11 COMMISSIONING OF COOLING SKID

The cooling shall be supplied to GACL Vadodara. Vendor has to participate at GACL site for commissioning of the cooling skid. Vendor has to arrange tools required for commissioning. Vendor has to rectify/modify cooling skid to suit site requirement if necessary. Vendor has to make own arrangement for lodging, boarding etc.

12 PAYMENT TERMS

Payment terms as per BHEL standard practice. 10% payment will be released after the satisfactory completion of site work. Certificate from customer (GACL/BHEL) is required.



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Annexure – I

Make of items shall be as follows:

Sl. No.	Item	Make
1	Heat exchanger	Alfa Laval
2	SS Piping/valve & accessories etc	Alfa Laval/Wukesha cherrybull/ APV
3	DM Water Pump	Alfa Laval
4	Flow meter	Yokogawa/Honeywell/Emerson
5	Flow / Level switches	Sukrut Udyog / Nivo Controls
6	Conductivity Meter	Yokogawa/Honeywell/Emerson
7	Digital / Analog Meters	AEL / Pyrotech / Rishabh
8	Push button & Indicating Lamps	Siemens / L&T / Technic / Schneider/ Essen
9	Switches	Siemens / L&T / Kaycee / Schneider
10	MCB/MPCB/Contactors & Accessories	Siemens / Schneider / Hager
11	Terminals	Wago / Phoenix Contact
12	Temperature gauges	Alfa Laval/Equivalent
13	Pressures gauges	Alfa Laval/Equivalent
14	Hardware (SS316L) & accessories	Alfa Laval/Wukesha cherrybull/ APV
15	DM water Cartilage	Ion-exchange

Note: If any item required to make the complete assembly and it's make is not mentioned above. Vendor is requested to make the same approval for same.



TECHNICAL SPECIFICATION FOR COOLING SKID ASSEMBLY

Annexure – II

LIST OF DOCUMENTS

1. DRAWINGS & BOMS

S.NO	DOCUMENT NO	DESCRIPTION
1.	26500600018	Cooling skid base frame
2.	1650600006	Cooling system assembly
3.	1650600006_BOM	Cooling system assembly - bom
4.	36734000118	Lifting arrangement
5.	36500600036	Common delivery pipe assembly
6.	36500600037	Common receiver & interconnecting pipe assy
7.	36500600038	Pipe assym interconnecting
8.	36500600034	Raw water outlet & interconnecting pipe assym
9.	3650600034	Pipe assym.
10.	36500600039	Inlet-outlet pipe assy from PHE
11.	36500600035	receiver pipe assym to PHE 1&2
12.	36500600034.	Pipe assym suction

2. SPECIFICATIONS OF COMPONENTS

2.1 Specification of flow meter

Vortex Flow meter makes: Yokogawa for the measurement of DM water flow.

Type	:	2" Pipe mounted 2-wire microprocessor based
Input Power Supply	:	240VAC or 16.4 to 42 VDC two wire
Display	:	2 line LCD for simultaneous display of flow rate
Output	:	4-20 mA dc analog output
Diagnostic	:	Required like high pipeline vibration, abnormal flow, clogging, bubbles etc
Temp. element	:	Pt100, Class A-equivalent
Protection	:	field mounting, IP 67
Accuracy	:	1.0% of reading for liquids
Repeatability	:	0.2% of reading
Process Temperature	:	0 to 100 Deg.C
Process pressure limit	:	(-) 1 kg/cm ² to flange rating
Ambient humidity	:	5 to 100% RH
Environment	:	Chlorinate-caustic soda plant



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Material

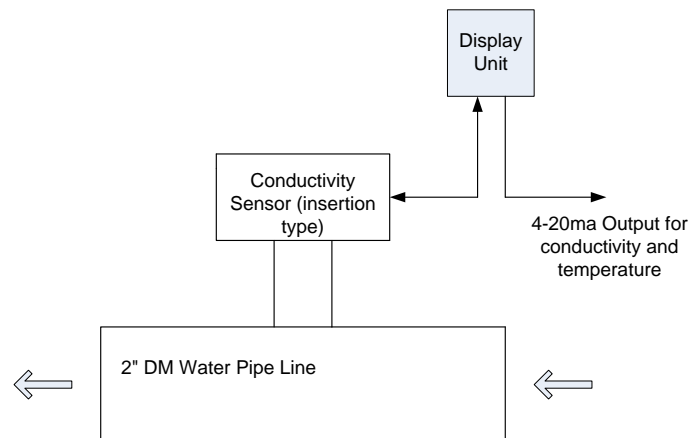
Body	:	SS316
Shedder bar	:	Duplex Stainless Steel
EMC Conformity Stds.	:	EN61326 , AS/NZS 2064

Flow indicator shall be installed in Control box.

2.2 Specification of conductivity analyser & sensor

Conductivity sensors with temperature sensor (PT1000) make: Yokogawa to the following specifications:

- Type: Flow thru or insertion
- Cell constant (K): 0.1
- Conductivity: 0-200 μ C/cm
- Mounting: insertion type mounting should be suitable for 3" main pipeline. Supplier has to provide complete assembly of sensor with suitable nipple to be welded on pipe line(3")
- Pressure: 8-10Bar
- Temperature: 0-70°C
- Cable Length: 5 meters (max)
- Material: SS316L



2.3 Field mounted Conductivity analyser make Yokogawa suitable for item-1 to the following specifications:

- Input supply: 240VAC, 50Hz
- Output: 4-20mA for both conductivity & temperature for SCADA/PLC, isolated
- Relays: 2 SPDT(min). 240VAC, 5A for conductivity high & very high
- Conductivity range: 0-200 μ C/cm
- Mounting: Field mounting IP66
- Temperature: 0-70°C
- This analyser should have local display for conductivity & temperature and built-in transmitter to transmit both 4-20ma output signal

Conductivity indicator shall be installed in Control box.



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Specification of Pump and heat exchanger

- 2.4 Stain less steel pumps as per specification given below :
- 1) Type – LKH mono-block/eq of Alfa Laval. The Alfa Laval stainless steel centrifugal pump model coupled to 3HP induction motor and mounted on a common base plate. The pump should be capable to discharge 17500 LPH of demineralized water at maximum head 25 MWC. The other technical details are as given below:
- a) **TECHNICAL SPECIFICATION FOR PUMPS**
- i) Capacity of demineralised water to be discharged by pump 17500 LPH
- ii) Temperature 70 deg.C
- iii) Specific gravity 1.0
- iv) Viscosity Negligible
- v) Suction 12.ft.flooded
- vi) Pressure Atmospheric
- vii) Differential head 14M flooded
- viii) Seal Mechanical seal, to ensure 'No' water leakage (carbon VS.SS)
- b) **PUMP SPECIFICATIONS**
- Model LKH/Eq
- Pump RPM 2840
- Rated BHP with water 3 HP
- Version Version IV (coupled)
- Impeller SS316
- Pump casing SS316
- Shaft SS316
- c) **IMPELLER DIAMETER**
- i) Rated 135 mm Shaft steel
- ii) Maximum 135 mm Sealing ring
- iii) Sealing ring Mech. seal carbon
- iv) Base plate Cast iron
- v) In let diameter 51 mm
- vi) Prime mover (offer FF drilled to BS10 table 'D')
- Make Bharat Bijlee/ Crompton make preferred
- Type TEFC
- Rating
- Motor supplied should be of totally enclosed type and suitable for 415/440 volts 3 phase 50 Hz AC, Class "E" insulation.
- 2.5 Plate heat exchangers type M6-MFM of Alfa level designed for a capacity of 150 KW and with following specification.
- Application Cooling of Demineralised water
- Design The heat exchanger consists of section. The heat transfer surfaces of pressed corrugated plates are inserted in a high pressure frame of mild steel.
- Plate thickness and material AISI 316, 0.6 mm thick
- Gasket material Nitrile rubber
- | Duty details | Primary side | Secondary side |
|----------------------------------|---------------------|-----------------------|
| Fluid | DM water | Raw water |
| Flow rate | 40 GPM | 20 GPM |
| Inlet temperature | 53 deg.C | 10 deg.C |
| Outlet temperature not more than | 45 deg.C | 20 deg.C |



TECHNICAL SPECIFICATION FOR COOLING SKID ASSEMBLY

Pressure drop	Vendor to mention
Connection material	SS Flanged SS Flanged (BS10 (BS –10 Table D) Table D) 51 mm dia 51 mm dia
Size	51 mm dia
No. of passes	Single pass on both sides
No. of plates	Suitable number of plates to be provided to dissipate 150 KW losses as above. No. of plates to be specified in offer. There should be around 50% design margin.
Total heat transfer area	To be specified in offer
Design/Test pressure	6/8 kg cm ²
Design /Test Temperature	130 deg. C Max.
Accessories	1 No. Spanner for Tightening bolts. 1 set of foundation bolts. 1 no seal