प्लाज़्मा अनुसंधान संस्थान
INSTITUTE FOR PLASMA RESEARCH
परमाणु ऊर्जा विभाग, भारत सरकार का एक सहायता प्राप्त संस्थान
An Aided Institute of Department of Atomic Energy, Government of India

इन्दिरा पुल के पास, भाट, गांधीनगर – 382 428 भारत
दूरभाष: (079) 2396 2020/2021/2028
फैक्स: 91-079-23962277
वेब: www.ipr.res.in

NEAR INDIRA BRIDGE, BHAT
DIST. GANDHINAGAR - 382 428 (INDIA)
Phone: (079) 2396 2020/2021/2028
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ENQUIRY

ENQUIRY NO : IPR/EQL/18-19/382
Date : 25-01-2019

Due on : 28-02-2019 by 1:00 PM IST

Please send your offer in sealed envelope specifying Enquiry No, Date & Due Date, ALONG WITH your credentials for the following items:

Important Note:

Please note that e-mail quotations are not acceptable however you may send your queries (if any) to localpurchase@ipr.res.in

Please ensure your sealed quotation reaches this office not later than above mentioned due date and time.

Kindly go through the following documents properly before quoting which are available on the IPR web portal i.e., http://www.ipr.res.in/documents/tender_terms.html / attached herewith.

1) Instructions to the bidders & Terms and conditions (refer Form No: **IPR-LP-01.V4**)
2) Bidding format

GST for Goods and Services (IGST/CGST/SGST TAX BENEFITS): Please refer **clause no: 8** of Form No: **IPR-LP-01.V4**

QUOTATION SHOULD BE ADDRESSED TO PURCHASE OFFICER ONLY

Sr No	Description	Quantity
1	Manufacture, supply, installation, testing and commissioning of 5 TR (Twin Circuit of 3 TR + 2TR) air cooled cabinet type Scientific Water Chiller unit (Multi Temperature) with in-built pumps, SS-316 storage tanks, isolation valves, rotameter, temperature controller, electric heater, electric control panel, safety controls etc. conforming to technical specifications as per attached sheet.	1.0 Nos.

Note: TDS as per CGST Act: As per provisions of section No. 51 of the CGST Act 2017,
TDS @2% (IGST 2% or CGST 1% and SGST 1%) will be deducted while making
payment to the suppliers where total value of orders/contracts/work orders
exceeds Rs. 2.5 lakhs, in the event of order in Indian Rupees. Necessary TDS
Certificate will be issued to the supplier after TDS deduction.

Encl: As per attachment.

Sd/-

Mr. D. Ramesh
Purchase Officer-II

Information to Vendors: We are working towards a single platform for our future requirement. Hence, please refer IPR website i.e, http://www.ipr.res.in/documents/tenderseng.html for our future requirement.

TENDER DOCUMENT

FOR

Manufacture, Supply, Installation, Testing and Commissioning of 5 TR Air-cooled Cabinet type Scientific Water Chiller (Multi Temperature) for SYMPLE System at IPR.

1. **SCOPE:**

The scope of work is supply, installation, testing and commissioning of **1 no. 5 TR (3 TR +2 TR, Twin circuit)** air cooled cabinet type Scientific Water Chiller (Multi Temperature) with in-built pump and tanks confirming to technical specifications mentioned in tender for cooling of SYMPLE (System for Microwave Plasma Experiments) System. SYMPLE is an experimental system, which need DM water at constant temperature to remove dissipated heat during experiments. This SYMPLE system need water at two different temperature and pressure, hence Scientific Water Chiller shall provide water at two different temperature & pressure from two separate inbuilt SS-316 tanks (Tank-1 & Tank-2) for two different cooling loops. A schematic diagram attached here for reference.

Required parameters of Process Water for SYMPLE System are:

1. **60 lpm at 25 °C @ 3.5 barG Pressure, Heat Load- 8 kW (Actual)**
2. **30 lpm at 40 °C @ 2.5 barG Pressure, Heat Load- 1.5 kW (Actual)**

Vendor should design and manufacture the Scientific Water Chiller to fulfil these requirements of system parameters.

Information to vendor

- The vendor should submit the relevant technical catalogues.
- Enclose the list of system components with all technical details.
- IPR shall provide the main incoming power cable at the chiller panel.
- The charging of refrigerant till the final commissioning is in the contractor's scope.
- Vendor has to demonstrate the performance of chiller unit at site during final testing and commissioning.

Scientific Water Chiller

The chiller should be air cooled with scroll/ rotary/ reciprocating compressor, low noise fan and pump. Water chiller should be a compact skid mounted cabinet type fitted with caster wheels, single with built in water tank and pumps. The unit shall have two independent refrigerant circuits as specified in technical specs. This chiller units shall be used for DM (De-mineralized) water circulation, **hence all wetted parts of the DM water path should be SS-316/ Copper**. The unit shall have removable panels, which will allow access to major inside components and controls. The unit shall be powder coated galvanized iron casing, finished with weather resistant enamel paint and fitted with SS-304 wire mesh of sufficient gauge from bottom side to protect from rodent. Tanks shall be provided with water level indicator, inlet, outlet, make-up, overflow and drain connections. By-pass lines with isolation valves shall be provided in inlet-outlet connection for flow & pressure setting. A rotameter shall be provided after by-pass lines in outlet lines from chillers to measure & control the DM water flow and SS 316 Y-type strainers of 40 to 60 wire mesh shall be provided at outlets from chiller unit for filter DM water supplied to experimental systems. Drain point shall be at bottom face with special design to drain out all water from tanks. Electric Panel shall be enclosed with transparent acrylic sheet of suitable thickness. Acrylic sheet should be framed, hinged door type, lockable and soft seating with chiller body for proper sealing and weather

protection. Required vibration pads to be provided. The total nominal cooling capacity is 5 TR.

2. APPLICABLE DRAWING AND DOCUMENTS

List of applicable drawings & documents

a)	PROPOSED SCHEMATIC DRAWING FOR 5 TR CABINET TYPE SCIENTIFIC WATER CHILLER	ANNEXURE-I

Above drawing is a proposed schematic diagram of cabinet type scientific chiller. Party needs to submit a Schematic Diagram of Cabinet type Scientific Chiller with quotation to fulfill the requirement as per technical specifications.

3. MATERIALS:

Materials & standard parts which are not specifically described herein & are under the scope of supply of the fabricator shall be of genuine quality & in accordance with good practice pertinent to the manufacture of mild steel mechanical structure.

Unless otherwise specified in the drawings, the material of construction for all the parts of mechanical structure covered by this tender shall conform to the relevant standards.

Procurement of materials:
All material used for fabrication shall confirm to correct size, quality. Material shall be first grade, free from scratches, dents, twists, broken edges and free from rust.

All materials should be treated for anticorrosion before putting them to assy.

3.1 Fasteners & Hardware: All fasteners should be confirming to BIS.

3.2 Lifting Arrangement: Vendor shall make provision for lifting holes/eye bolts etc. to lift subassemblies & considering C.G (center of gravity) for stable lifting.

4. FABRICATION REQUIREMENT:

4.1 General:

Vendor shall prepare the shop drawings, bill of materials and component layouts, and shall fabricate, inspect, test, package and deliver the structure to IPR as per details given in this specification. Vendor's scope of work includes complete Scientific Chiller System delivered to IPR in good condition, without any damage installed and demonstrated.

Stage wise detailed manufacturing plan schedule and sequence of assembly to be adopted for fabrication of Chiller Unit.

4.2 Cleanliness & Surface Finish:

All scales, dents, burrs, weld spatter, oxide, oil and other foreign materials shall be completely removed, from the material surface. Items that will not permit their cleaning after complete fabrication shall be cleaned prior to assembly. Hammering on completed weld is not permitted.

4.3 Handling:

Care shall be taken in handling of the sub-assemblies at all stages of manufacture, testing, inspection and shipping. All necessary precautions shall be taken to protect the surfaces from damage. Permanent/non repairable deformation as a result of faulty handling during manufacturing stage or during transportation shall be a cause for rejection of the total assembly.

5. TECHNICAL SPECIFICATION OF CHILLER UNIT:

Description	IPR Parameter	
Design Requirement		
Nominal Cooling Capacity	5 TR (3 TR +2 TR, Twin Circuit) with two different temperature storage tanks.	
Process Water Parameters:	**For Other loads (Tank-1)**	**For Magnetron and Magnet (Tank-2)**
Water Flow Rate (lpm)	60 lpm	30 lpm
Desired Temp. (°C)	25 ±2 °C	40 ±2 °C
Temperature Set Range (°C)	15 to 30 °C	30 to 45 °C
Temperature resolution	0.1 °C preferably, max.: 0.5 °C	0.1 °C preferably, max.: 0.5 °C
Temperature Controller	Single controller for both compressors.	Single controller for 2-way Modulating or on/off solenoid valve.
Pressure at chiller outlet (barG)	3.5 barG	2.5 barG
Heat Load (kW)	8 kW	1.5 kW
Chiller inlet/ outlet connection size	25 NB (1 inch)	20 NB (3/4 inch)
Ambient Temperature	10 to 48 ^{0}C	
1) Compressor		
Capacity	3 TR+ 2 TR (Twin circuit)	
Number of compressors	Two	
Type	Scroll / Rotary/ Reciprocating	
Refrigerant	R-22/ R 134 a / R 407 C	
Number of independent compressor circuit	Two	
Operating Noise level	< 85 dB	
2) Evaporator/ Heat Exchanger		
Type	PHE/ Coil in Tank/Shell & tube	
Number of Evaporator	2 (two) for PHE & Coil in tank 1 (one) for Shell & tube (Dual Circuit)	
Material of Construction	**SS 316 for PHE** **SS 316 or copper for shell & tube or coil in tank**	
Number of refrigerant circuit insulated (preferably nitrile foam)	Two	

3) Heat Exchanger Coil for Tank-2	
Type	Coil in Tank
Number of Coil	1 nos. of "Coil in tank" type to maintain the water temperature **40 ±2 °C** in tank-2 with auto control 2-way Modulating valve or on/off solenoid valve controlled by temperature controller.
Material of Construction	**SS 316**
4) Condenser	
Type	Air Cooled, Fin & Tube
Number of condenser	Two/ As required
Number of fan	Two/ As required
Condenser fans drive & safety guard	Direct Drive, Protected by Wire type Safety guard
Motor insulation class	Class F Insulation
5) Storage tanks for DM Water	
Tank-1	~250 litres for **25 ±2°C DM (De-mineralized) water**
Tank-2	~75 litres for 40 ±2**°C DM (De-mineralized) water with heater.**
Heater capacity for Tank-2	4kW (4 kW x 1 nos. or in suitable combination of 3 Phase)
Material of construction	SS 316
Insulation	Elastomeric Nitrile foam/ EPDM foam of sufficient thickness.

Note:

a) **Thickness of the tanks should be properly selected and stiffener shall be provided to avoid sagging.**
b) **TIG welded joints**
c) **Necessary strengthening stiffeners to be provided**
d) **Inlet, outlet, drain and overflow & By-pass connections. There shall be water level sensors for dry run protection of pumps. The tanks should have water level indicator. Drain point shall be at bottom face with special design to drain out all water from tanks.**
e) **SS-316 Y-type strainers of 40 to 60 wire mesh shall be provided at outlets from chiller unit for filtering DM water supplied to the experimental systems.**
f) **Immersion type Heater of sufficient capacity fitted on side face of tank to maintain the water temperature at 40 ±2°C of tank-2.**

6) Pump:	
Process Pumps-1 (From tank-1):	For circulation of DM water through system from Tank-1 (Temperature: **25** ±2**°C)** of following specification: • Pump Head: 3.5 barG • Qty. - 1 nos. • Flow rates: 60 LPM • Motor capacity: 1 HP or suitable • Insulation class: Class F • MOC of Pump component: **All water contact part shall be SS 316/ equivalent.**
Process Pumps-2 (From tank-	For circulation of DM water through system from Tank-2 (Temperature: 40±2**°C)** of following specification: • Pump Head: 2.5 barG.

2):	• Qty.- 1 nos. • Flow rates: 30 LPM • Motor capacity: 0.75 HP or suitable • Insulation class: Class F • MOC of Pump component: **All water contact part shall be SS 316/ equivalent.**
Primary Pump:	For internal circulation of DM water within chiller of following specification: • Pump Head: 2.0 barG or suitable. • Qty.- 1 nos. • Flow rates: As per chiller requirement • Motor capacity: 1 HP or suitable • Insulation class: Class F • MOC of Pump component: **All water contact part shall be SS 316/ equivalent.**

Note:

- Provide the performance curve of pumps and selection data sheet.
- Water pressure Gauge should be provided at outlet of process pumps.
- Bypass arrangement with bypass valve shall be made for supply pressure setting.
- A rotameter shall be provided after by-pass lines in outlet lines from chillers to measure and control the DM water flow.

7) Control / Safeties:

The Chiller should be with all necessary safety controls like Low Pressure / High Pressure switches, compressor overload trip, Low water level switch cum pump dry run protection, Water flow switch, Anti-freeze thermostat, safety relief valves etc.

8) Chiller unit should be fitted with SS-304 wire mesh of sufficient gauge from bottom side to protect from rodent.

9) Chiller Kit:

The chiller kit shall contain Expansion Valve, Filter drier, Solenoid valve, sight glass, Accumulator, service valves, Pressure gauge, Temperature sensor etc.

10) Electrical Panel

AC input Supply	3 Phase 415 V, 50 Hz
Automatic Panel indicating	Running, tripping, SPP (Single Phase Preventer), RPP (Reverse Phase Preventer), overload relays, contactors, transformers etc. for compress or pump and fan with overload protector. Also trip indication for HP/LP/ anti-freeze/ no water flow/ high temperature of water/low water level etc. **Machine will stop in any of the above faulty conditions and will have to be restarted after rectifying the fault.**
Display type	LCD/LED for Temperature controller.
Data to be displayed	Water temp (deg-C), Temperature Set point (deg-C)
Flexibility of set point changes	Should be Provided
Electric panel enclosure	Electric Panel shall be enclosed with transparent acrylic sheet of suitable thickness. Acrylic sheet should be framed, hinged door type, lockable and soft seating with chiller body for proper sealing and weather protection.

11) Approved make	
Compressor	Danfoss/ Copeland/ Tecumseh
Pump	CG/Beacon/KBL/CRI/ Grundfoss/ CNP/ LEO
Condenser fan	Hi Cool / EPC / Dynamic /*Equivalent
2-way/3-Way Modulating valve/ solenoid valves	Siemens/Honeywell/Belimo/Emerald/*Equivalent

Technical Compliance Report

Sr. No	Particulars	IPR Requirement	Vendor's Specification
	Design Requirement		
	Nominal Chilling capacity	5 TR (3TR+2TR, twin circuit)	
	Ambient Temperature	10 to 48 ^{0}C	
	-Process Water Parameters for Other loads (Tank-1)		
	Water Flow Rate (lpm)	60 lpm	
	Desired Temp. (°C)	25 ±2 °C	
	Temp. Set Range (°C)	15 to 30 °C	
	Temperature resolution	0.1 °C preferably, max.: 0.5 °C	
	Temperature Controller	Single controller for both compressors.	
	Pressure at chiller outlet (barG)	3.5 barG	
	Heat Load (kW)	8 kW	
	Chiller inlet/ outlet connection size	25 NB (1 inch)	
	-Process Water Parameters for Magnetron and Magnet (Tank-2)		
	Water Flow Rate (lpm)	30 lpm	
	Desired Temp. (°C)	40 ±2 °C	
	Temp. Set Range (°C)	30 to 45 °C	
	Temperature resolution	0.1 °C preferably, max.: 0.5 °C	

	Temperature Controller	Single controller for 2-way Modulating or on/off solenoid valve and Heater.	
	Pressure at chiller outlet (barG)	2.5 barG	
	Heat Load (kW)	1.5 kW	
	Chiller inlet/ outlet connection size	20 NB (3/4 inch)	
1)	**Compressor**		
	Capacity	3 TR+ 2 TR (Twin circuit)	
	Number of compressor	Two	
	Type	Scroll / Rotary/ Reciprocating	
	Refrigerant	R-22/ R 134 a / R 407 C/ Equivalent	
	Number of independent compressor circuit	Two	
	Operating Noise level	< 85 dB	
2)	**Evaporator**		
	Type	PHE/ Coil in Tank/Shell & tube	
	Number of Evaporator	2 (two) for PHE & Coil in tank 1 (one) for Shell & tube (Dual Circuit)	
	Material of Construction	**SS 316 for PHE** **SS 316 or copper for shell & tube or coil in tank**	
	Number of refrigerant circuit insulated (preferably nitrile foam)	Two	
3)	**Heat Exchanger Coil for Tank-2**		
	Type	Coil in Tank	
	Number of Coil	1 nos. of "Coil in tank" type to maintain the water temperature **40** ±2 **°C** in tank-2 with auto control 2-way Modulating valve or on/off solenoid valve controlled by temperature controller.	

	Material of Construction	**SS 316**	
4)	**Condenser**		
	Type	Air Cooled, Fin & Tube	
	Number of condenser	Two/ As required	
	Number of fan	Two/ As required	
	Condenser fans drive & safety guard	Direct Drive, Protected by Wire type Safety guard	
	Motor insulation Class	Class F Insulation	
5)	**Storage Water tanks**		
	Tank-1	~250 litres for 25 ±2°C DM (De-mineralized) water	
	Tank-2	~75 litres for 40 ±2°C DM (De-mineralized) water with heater.	
	Heater capacity for Tank-2	4kW (4 kW x 1 nos. or in suitable combination of 3 Phase)	
	MOC of Tank	SS 316	
	Thickness of tank sheet	-	
	Tank welding joints	TIG welding	
	Provision of SS 316, Y-Strainers of 40 to 60 wire mesh at Chiller outlets	Yes	
	Level indicator for tanks	Yes	
	Provision of inlet, outlet, overflow, drain with isolation valves.	Yes	
	Provision of stiffener to avoid sagging of tank wall.	Yes	
6)	**Pumps**		
	a. Process Pumps-1 (From tank-1):	**1 nos. for process as per IPR specification.**	
	Head	3.5 barG	
	Flow Rate	60 LPM	

	Motor Capacity	1 HP or Suitable	
	Insulation	Class F Insulation	
	MOC of pumps components	**All water contact part shall be SS 316/ equivalent.**	
	Performance curve of pumps submission.	-	
	Provision of Water pressure Gauge at pump outlet	Yes	
	Provision of Water rotameter at outlet	Yes	
	Provision of By-pass line with valves	Yes	
	b. Process Pumps-1 (From tank-2):	**1 nos. for process as per IPR specification.**	
	Head	2.5 barG	
	Flow Rate	30 LPM	
	Motor Capacity	0.75 HP or Suitable	
	Insulation	Class F Insulation	
	MOC of pumps components	**All water contact part shall be SS 316/ equivalent.**	
	Performance curve of pumps submission.	-	
	Provision of Water pressure Gauge at pump outlet	Yes	
	Provision of Water rotameter at outlet	Yes	
	Provision of By-pass line with valves	Yes	
	Note: Process pumps should be installed with isolation valves		
	c. Primary Pump:	**Primary Pump for internal circulation within Chiller**	
	Head	2.0 barG or suitable	
	Flow Rates	As per chiller requirement	
	Motor Capacity	1 HP or Suitable	
	Insulation	Class F Insulation	
	MOC of pumps components	**All water contact part shall be SS 316/ equivalent.**	

7)	**Control/ Safeties:**	**In each refrigerant and primary water circuits**	
		Low Pressure / High Pressure switches	
		compressor overload trip	
		Low water level switch	
		Water flow switch in each PHE/ Evaporator lines.	
		Anti freeze thermostat	
		safety relive valve	
		High Water Temp.	
8)	**Chiller Kit**		
		Expansion Valve	
		Filter drier	
		Solenoid valve	
		sight glass	
		Accumulator	
		Service valves	
		Pressure gauge	
		Temperature sensor	
9)	**Electrical Panel**		
	Supply	3 Phase 415 V, 50 Hz	
	Automatic Panel indicating	Running, tripping, single phase preventions, overload relays, contactors, transformers etc. for compressor or pump and fan with overload protector.	
	Display type	LCD/LED	
	Temperature resolution	0.1 °C preferably, max.: 0.5 °C	
	Data to be displayed	Water temperature (deg-C), Temperature Set point (deg-C)	
	Flexibility of set point changes (water temperature)	Should be Provided within specified temperature range.	
	Electric panel enclosure	Electric Panel shall be enclosed with transparent acrylic sheet of suitable thickness. Acrylic sheet	

		should be framed, hinged door type, lockable and soft seating with chiller body for proper sealing and weather protection.	
10)	**Approved Make**		
	Compressor	Danfoss/ Copeland/ Tecumseh	
	Pump	CG/ Beacon/ KBL/ CRI/ Grundfoss/ CNP/ LEO	
	Condenser fan	Hi Cool / EPC / Dynamic /*Equivalent	
	2-way/3-Way Modulating valve/ solenoid valves.	Siemens/Honeywell/Belimo/Emerald/ *Equivalent	
11)	**Submission of Schematic Diagram of Scientific Chiller along with quotation.**	Yes	
12)	**Size**	Compact	
13)	**Rodent Protection wire mesh/ sheet at bottom**	Yes, Wire mesh of SS 304	
14)	**Delivery period**	3 months	

6. **INSPECTION, TESTING & ACCEPTANCE:**

   a. All the temperature, flow, pressure and electronic tests are to be carried out at supplier's manufacturing facility as per relevant standards by manufacturer and report to be submitted to IPR before dispatch of the machine. IPR will depute their Engineers to witness these tests. The Chiller unit shall be tested as mentioned in "INSPECTION AND ACCEPTANCE PROCEDURE".

   b. Supplier has to demonstrate all the tests again after commissioning of the unit at IPR. The final acceptance of the chiller will be subjected to the satisfactory performance/installation/commissioning at IPR.

General Requirement:
The vendor shall be responsible for performing all the inspection and testing required as per this specification. The vendor shall have all instruments, heater etc. to perform testing.

Discrepancies & Field Changes:
Any discrepancies or omission from drawings, specifications or other documents or any doubts arising as to the meaning or intent of any part thereof shall be referred to the Purchaser for which written clarification will be issued by the Purchaser, Verbal communications should be avoided.

INSPECTION AND ACCEPTANCE PROCEDURE:

a. The vendor has to demonstrate a constant temperature output with a variation of ± 2° C around the set temperature (25 °C and 40 °C for Tank-1 and Tank-2

respectively) when 8 kW and 1.5 kW power is dissipated by external source (Electric Heater) in Tank-1 and Tank-2 respectively.

b. The vendor has to demonstrate a constant temperature output with a variation of ± 2° C around the set temperature set by user at two different points within temperature set ranges (15 to 30 °C for Tank-1 and 30 to 45 °C for Tank-2) with partial or no load conditions.

c. In case of the ambient temperature well above the set temperature (say 48 °C) and well below the set temperature (say 6 °C) the vendor has to demonstrate a constant set temperature output of water circulation both with 7 kilowatt of power dissipated and no load.

d. The vendor has to demonstrate the tripping of the fault relay when any parameter goes above a threshold. Also a buzzer should turn on.

7. **INSTALLATION AND COMMISSIONING**

The unit is required to be first installed at IPR, Gandhinagar, Gujarat. Vendor needs to depute their engineer for installation and commissioning.

8. **DOCUMENTATION:**

Operational & maintenance manuals (mechanical & electrical) of the chiller unit to be supplied along with the machine. O&M manual also contains Catalogues/technical brochures for the chiller unit & all standard items used in chiller unit.

9. **DELIVERY CUM COMMISSIONING PERIOD:** 3 months from the date of P.O.

SCHEDULE OF QUANTITIES (QUOTATION FORMAT)

(To be filled in completely by bidder and returned to IPR)

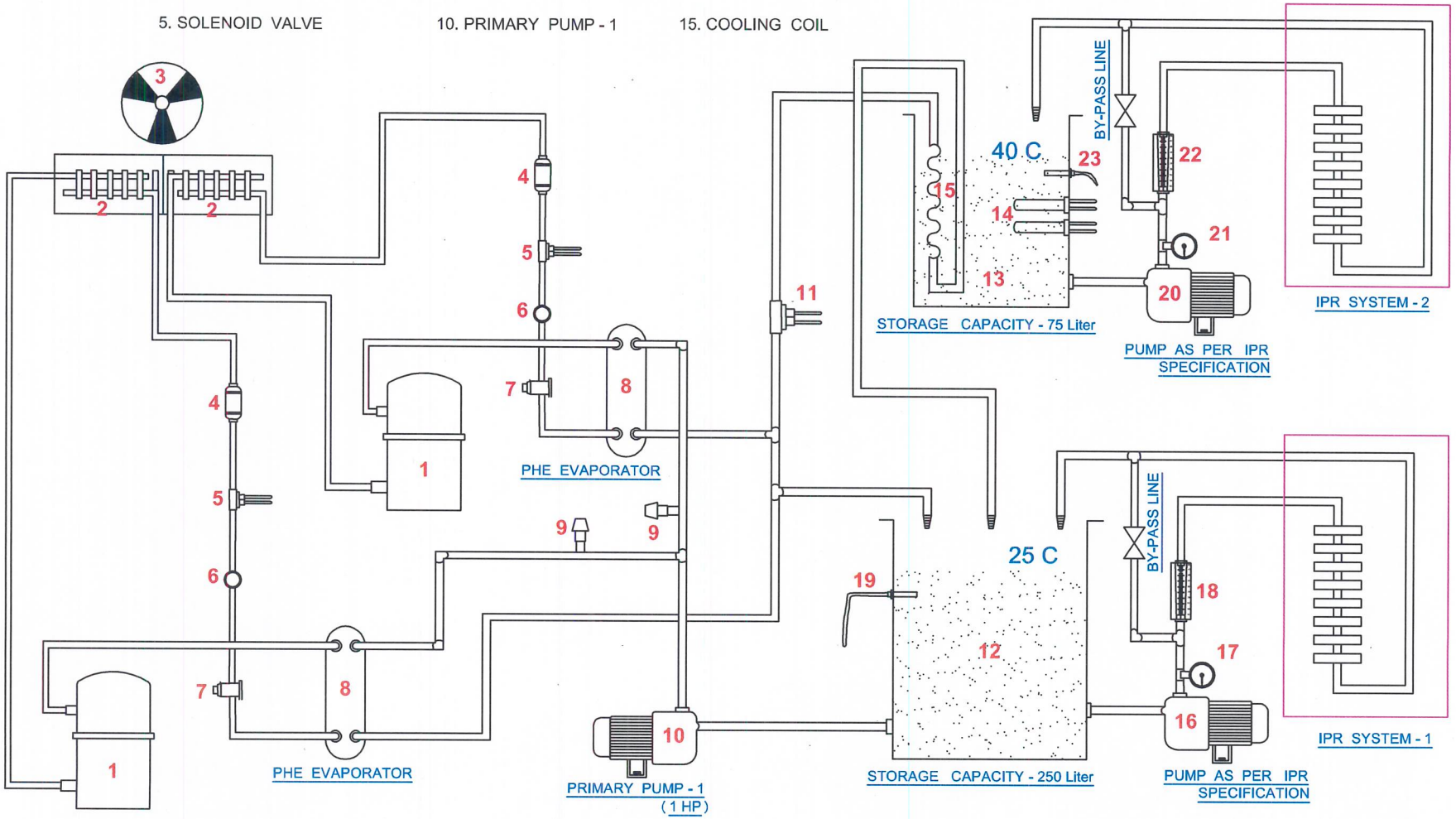
Sr. No	Item Description	Qty.	Unit	Rate (Rs.)	GST (%)	Total amount (Rs.)
		A		B		C=AxB
1.	Manufacture and supply of 5 TR (Twin Circuit of 3 TR + 2TR) air cooled cabinet type Scientific Water Chiller unit (Multi Temperature) with in-built pumps, SS-316 storage tanks, isolation valves, rotameter, temperature controller, electric heater, electric control panel, safety controls etc. conforming to technical specifications as per attached sheet.	01	Nos.			
2.	Installation, testing and commissioning of above 5 TR (Twin Circuit of 3 TR + 2TR) air cooled cabinet type Scientific Water Chiller unit (Multi Temperature) at IPR site.	01	Job.			
Total Price without GST, in Rs. (In Figures)						

Place:

Date: **(Office Seal)**

SCHEMATIC DIAGRAM

1. COMPRESSOR
2. AIR COOLED CONDENSER
3. FAN
4. FILTER DRIER
5. SOLENOID VALVE
6. SIGHT GLASS
7. EXPANSION VALVE
8. EVAPORATOR (PHE)
9. WATER FLOW SWITCH
10. PRIMARY PUMP - 1
11. SOLENOID VALVE
12. WATER TANK - 1
13. WATER TANK - 2
14. HEATER
15. COOLING COIL
16. PUMP -1
17. WATER PRESSUR GAUGE -1
18. ROTAMETER -1
19. WATER LEVEL SENSOR -1
20. PUMP -2
21. WATER PRESS. GAUGE -2
22. ROTAMETER -2
23. WATER LEVEL SENSOR -2



Note:

1. Above Proposed Schematic diagram is for reference only. Vendor has to design the system to fulfil the requirement.
2. Isolation valves to be installed in supply, return, drain, by-pass etc. (in refrigerant and DM water lines) for proper function of system.
3. Isolation/ Balancing valve to be installed for controlling water flow through cooling coil (Item no.-15). Proper pipes size selected.

INSTITUTE FOR PLASMA RESEARCH
DRAWING NO.