



**ANNEXURE-I**

**EQUIPMENT SPECIFICATION AND SCOPE OF SUPPLY FOR MARINE AIR CONDITIONING PLANT FOR  
INDIAN NAVY SURVEY VESSEL, YARD # 257-262.**

No.	Description	Requirements			Confirmation / Declaration by A.C. Plant Supplier			
1	Air side equipment	1.1	Air handling unit consist of:-	Qty.: 1 No./Ship	1.1	..... Make: ..... Model: .....	Qty.: ..... No./Ship	
		a)	Mixing section MS ZRP coated: 1 No.		a)	.....	..... No.	
		b)	Filter section MS ZRP coated: 1 No.		b)	.....	..... No.	
		c)	Fan section: 1 No.		c)	.....	..... No.	
		<b>Note:</b> No. of air changes and fresh air requirement to be considered as per D.G. Shipping guidelines			.....			
		d)	Cooling coil section with R-134a DX cooling coil of copper tubes & aluminium fins meeting following parameters – 1 No. i) Air quantity: Supplier to declare ii) Refrigerant: R-134a iii) Evaporating temp.: 5 <sup>o</sup> C * To be declared by supplier		d)	..... ..... ..... No.		
			Condition	Primary	Secondary	Condition	Primary	Secondary
			Air entering	* <sup>o</sup> C *% RH	* <sup>o</sup> C *% RH	Air entering	... <sup>o</sup> C ...% RH	... <sup>o</sup> C ...% RH
			Air leaving	* <sup>o</sup> C *% RH	* <sup>o</sup> C *% RH	Air leaving	... <sup>o</sup> C ...% RH	... <sup>o</sup> C ...% RH
		<b>Note:</b> Higher size coil given by either of primary or secondary condition may be selected			.....			
		e)	Foundation frame MS ZRP coated: 1 No.		e)	.....	..... No.	
		f)	Vibration suppressors: 1 Set		f)	.....	..... Set	
		g)	V belt drive: 1 Set		g)	.....	..... Set	
		h)	Slide rail: 1 Set		h)	.....	..... Set	
i)	4 pole TEFC sq. cage induction, marine electric motor of suitable power rating, B3 construction, IP44 enclosure, class B insulated and suitable for operation on 415 V, 3 Ph, 50 Hz AC power supply – 1 No.		i)	..... pole ..... ..... KW ..... Make ..... Model, IP ..... ..... Class ..... V, ... Ph, ... Hz AC: ..... No.				
j)	Supply air devices [grille/diffusers] based on the no. of spaces to be air conditioned. Sizes and no. of devices to be specified by the supplier in relation with the attached G.A. Plan – 1 Lot/Ship		j)	<u>Spaces</u> <u>Size</u> <u>Qty.</u> ..... ..... .....				

Stamp & sign of the Bidder



No.	Description	Requirements	Confirmation / Declaration by A.C. Plant Supplier
		k) Return air grilles based on the no. of spaces to be air conditioned and the location / space through which the air requires to return. The balancing of the system to be given due consideration and accordingly location, sizes and no. of grilles to be specified by the supplier in relation with the attached G.A. Plan – 1 Lot/Ship	k) <u>Space/Location</u> <u>Size</u> <u>Qty.</u> ..... ..... .....
		l) Fresh air intake louver grille with watertight cover, size, quantity and location based on system requirement and in relation with the attached G.A. Plan supplier to specify – 1 No. /Ship	l) <u>Space/Location</u> <u>Size</u> <u>Qty.</u> ..... ..... .....
		m) Return air thermostat range 0 to 50 <sup>o</sup> C – 1 No. /Ship	m) .....No./Ship Make: ..... Model: .....
		n) Condensate water drain arrangement – 1 Set/Ship	n) ..... Set/Ship
2	Cooling machinery [condensing unit]	<p>2.1 Condensing unit as a complete module each comprising one screw compressor, condenser, oil separator etc. ready to mount on ship [two condensing unit 50% capacity each working &amp; one condensing unit of 50% capacity standby]: Qty.: 3 Nos./Ship</p> <p><b>Note:</b> All the condensing units to have provision of inter connections to facilitate simultaneous operation during initial pulling down or under peak load condition as may be required. And to isolate any one as standby.</p> <p><u>Each condensing unit consisting of:</u></p> <p>a) R-134a screw type compressor with unloaded start arrangement and with automatic capacity control meeting following parameters: 1 No.  i) Capacity: Supplier to declare  ii) Condensing temp.: 43<sup>o</sup> C  iii) Suction temp.: 5<sup>o</sup> C  iv) Drive: V belt/directly coupled through flexible coupling</p> <p><b>Note:</b>  (1) Compressor to be complete with HP, LP, OP pressure gauges and cutouts, capacity control solenoid valves, suction and discharge service valves, oil &amp; suction strainer, flywheel / flexible coupling and crankcase heater.</p>	<p>2.1 .....  .....  Qty.: ..... Nos./Ship</p> <p>.....  .....  .....</p> <p><u>Each consisting of:</u></p> <p>a) .....type .....  .....  Make: ..... Model: ..... No.  i) Capacity: ..... TR  ii) Condensing temp.: .....<sup>o</sup> C  iii) Suction temp.: .....<sup>o</sup> C  iv) Drive: .....</p> <p>(1) .....  .....  .....</p>

Stamp & sign of the Bidder



No.	Description	Requirements	Confirmation / Declaration by A.C. Plant Supplier
		<p>(2) DME specification 405 (R2), 411, 412, 413 and 424 of Indian Navy are to be used as guidance specifications for selection, supply and installation of instrumentation / alarm / trips. Deviations if any, are to be clearly stated by the vendor in their technical offer with case to case adequate justification.</p> <p>(3) Compressor / condensing unit to be selected from the list of makes as specified below.            (i) York Marine Systems            (ii) KPC Ltd.            (iii) IEC/ACCEL            (iv) Frick</p> <p>b) 4 pole TEFC sq. cage induction, marine electric motor of suitable power rating to meet compressor capacity. B3 construction, IP44 enclosure, class F insulated and suitable for operation on 415 V, 3 Ph, 50 Hz AC power supply – 1 No.</p> <p>c) Base frame: 1 No.</p> <p>d) set of anti vibration mountings for installation of condensing unit module base frame foundation to the ship's structure – 1 set</p> <p>e) Shell and tube type condenser meeting following parameters: 1 No.            i) Nominal capacity: Supplier to declare            ii) Refrigerant: R-134a            iii) Heat extraction capacity: Supplier to declare            iv) Condensing temp.: 42<sup>o</sup> C            v) Suction temp.: 5<sup>o</sup> C            vi) Cooling medium: S.W. at 1<sup>o</sup> C to 35<sup>o</sup> C            vii) Water flow rate: Supplier to declare            viii) Fouling factor: 0.00005 M<sup>2</sup> °C/Kcal            ix) Water velocity: Not less than 0.5 M/S &amp; Not more than 2.5 M/S [Supplier to declare]</p>	<p>(2) .....</p> <p>(3) .....            Make: .....            Model: .....</p> <p>b) ..... pole .....            ..... KW ..... Make ..... Model .....            IP ..... Class ..... V, ... Ph, ... Hz            AC: ..... No.</p> <p>c) ..... No.</p> <p>d) ..... set</p> <p>e) .....            Make: ..... Model: ..... No.            i) Nominal capacity: ..... TR            ii) Refrigerant: .....            iii) Heat extraction capacity: ..... Kcal/h            iv) Condensing temp.: ..... ° C            v) Suction temp.: ..... ° C            vi) Cooling medium: ..... at ..... ° C            vii) Water flow rate: ..... LPM            viii) Fouling factor: ..... M<sup>2</sup> °C/Kcal            ix) Water velocity: ..... Mtr./Sec</p>

Stamp & sign of the Bidder



No.	Description	Requirements	Confirmation / Declaration by A.C. Plant Supplier
		<p>x) Material of construction: Shell: M.S. Seamless Tubes: 70/30 cupronickel integrally finned. 19 fins/inch with 1" plain ends Tube sheet: 70/30 cupronickel/naval brass or equivalent End covers: Nickel Aluminium Bronze Accessories: Sacrificing anodes, safety relief valve, purge valve, vent cock, drain cock, root cocks, Pr. /temp. gauges, sight glass etc.</p> <p>f) Inter connection refrigerant piping, condenser cooling piping, valves and controls duly installed in the condensing unit module connecting respective equipments: 1 Set</p> <p>g) Initial charge of refrigerant and refrigeration oil for as installed complete system: 1 Lot each/Ship</p> <p>h) Electrical control panel for complete A.C. system comprising all switches, controls, step down voltage transformers for requirements of lower voltage from 415 V power supply, indications and alarms etc.: 1 No. /Ship <u>Note:</u> The functions of complete A.C. system to be fully automatic with automatic control of temperature, humidity etc. inside the air conditioned spaces.</p>	<p>x) Material of construction: Shell: ..... Tubes: .....  Tube sheet: ..... End covers: ..... Accessories: ..... ..... .....</p> <p>f) ..... ..... ..... Set</p> <p>g) ..... ..... Lot each/Ship</p> <p>h) ..... ..... ..... No. /Ship ..... .....</p>
3	Condenser cooling pump, piping and valves	<p>3.1 Condenser cooling S.W. pump [one working &amp; one standby]: Qty.: 2 Nos. /Ship</p> <p>a) Pump to be centrifugal self priming type with 100% redundancy and meeting following parameters i) Capacity: Supplier to declare ii) Head: Supplier to declare iii) Material of construction</p> <ul style="list-style-type: none"> <li>• Pump casing: Gunmetal to CC492K of BS EN 1982-1999</li> <li>• Impeller: Al. Bronze to CC333G of BS EN 1982-1999</li> <li>• Shaft: Stainless steel to AISI 316</li> <li>• Bearing: Ball bearings</li> <li>• Seal: Mechanical type.</li> </ul>	<p>3.1 ..... Make: ....., Model: ..... Nos./Ship</p> <p>a) ..... ..... i) Capacity: ..... LPM each ii) Head: ..... MWC each iii) Material of construction</p> <ul style="list-style-type: none"> <li>• Pump casing: .....</li> <li>• Impeller: .....</li> <li>• Shaft: .....</li> <li>• Bearing: .....</li> <li>• Seal: .....</li> </ul>

Stamp & sign of the Bidder



No.	Description	Requirements	Confirmation / Declaration by A.C. Plant Supplier
		<p>b) TEFC sq. cage induction, marine electric motor of suitable power rating to meet pump capacity. B3 construction, IP54 enclosure, class B insulated and suitable for operation on 415 V, 3 Ph, 50 Hz AC power supply – 2 Nos.</p> <p>c) Condenser cooling sea water piping to be of 70/30 Cupro Nickel material. All valves of Nickel Aluminium Bronze material to be provided for condenser cooling S.W. system. Nickel Aluminium Bronze components / fittings to be as per following specification.            (i) Material as per NES 747 [Part 2]            (ii) End to end dimensions as per NES 360            (iii) Flange dimensions as per BS4504</p> <p><b>Note:</b>            (1) Pump and electric motor to be aligned and mounted on a common base frame and to be coupled through flexible coupling.            (2) Pump to be supplied from approved make of Indian Navy i.e. BE Pumps, Kolkatta OR Beacon Weir OR Johnson Pumps (India) Ltd. Based upon pump capacity worked out and declared by the vendor, the ratings for pumps will be selected by the yard from the standard range in naval service and Indian Navy will nominate one of the vendor from specified above for supply of the pump. Pump to be supplied accordingly.</p>	<p>b) .....            KW ..... Make ..... Model .....            IP ..... Class .....            ..... V, ... Ph, ... Hz AC: .... Nos./Ship</p> <p>.....            .....            .....            .....</p> <p>(3) .....            .....</p> <p>(4) .....            .....            .....            .....            .....</p>
4	A/C for galley and machinery control room	Galley and machinery control room also to be provided with A/C. The type and arrangement for the system proposed to be submitted in detail by the vendor. The requirements of SOLAS are to be given due consideration and to be complied with.	<p>.....            .....            .....</p>

Stamp & sign of the Bidder



No.	Description	Requirements	Confirmation / Declaration by A.C. Plant Supplier
5	Any component not specified here above, however found necessary for the efficient working of the A.C. System, needs to be included in standard scope of supply.	To be confirmed by the supplier and details of the same to be submitted along with technical offer.	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
6	Operating criteria and other requirements	<p>(A) Air conditioning and ventilation system and associated systems should be capable of efficient operation under the following conditions of vessel during operation.</p> <p>a) <u>Heel</u>: 20<sup>0</sup> continuous either side</p> <p>b) <u>Roll</u>: 20<sup>0</sup></p> <p>c) <u>Trim</u>: 5<sup>0</sup> continuous</p> <p>d) <u>Pitch</u>: 6<sup>0</sup></p> <p>(B) Machinery and equipments should have reliability and maintainability for a minimum mission period of four weeks.</p> <p>(C) The Air conditioning and ventilation system offered should confirm and comply to the Indian Navy RFP requirements in totality</p>	<p>(A) .....</p> <p>.....</p> <p>a) .....</p> <p>b) .....</p> <p>c) .....</p> <p>d) .....</p> <p>(B) .....</p> <p>.....</p> <p>(C) .....</p> <p>.....</p>
7	Manual / Catalogue	<p>Installation / Operating instruction and repair manual for A.C. plant and it's equipment / machinery: 6 Set each/Ship</p> <p>Part catalogue for all the A.C. equipment/machinery: 6 Set each/ship.</p> <p><b>Note:</b> All above documents to be provided inline with D-787 of Indian Navy.</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>Each / ship .....</p> <p>.....</p>
8	Testing/Performance and compliance of requirements	Complete A.C. plant and it's equipment / machinery to be tested and certified for the performance as per the Indian Register of Shipping (IRS) or LRS on behalf of IRS as per their latest rules and regulations applicable for the Indian Navy Survey Vessel, with class notation of +100A1 SSC SURVEY VESSEL G-3 +LMC UMS or equivalent.	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

Stamp & sign of the Bidder





No.	Description	Requirements	Confirmation / Declaration by A.C. Plant Supplier
		c) Dimensional G.A. and installation drawing for S.W. pump with motor Pump size: L x W x H Pump weight: in kg., Suc. & Disch sizes	c) ..... Pump size: ..... mm L x ..... mm W x ..... mm H Pump wt.: ..... kg., Suc. .... mm, Disch .... mm
		d) Heat load calculations (to be submitted)	d) .....
		e) Compartment wise air quantity calculations (to be submitted)	e) .....
		f) Size / cross sectional area for main and branch air duct for various spaces in duct layout drawing (to be submitted).	f) .....
		g) manufacturer's system drawings for electric power circuits and piping diagrams for refrigerant and condenser cooling system etc. (to be submitted)	g) .....
		<b>Note:</b>	
		1) Submit brochures / leaflets comprising technical details separately for all the equipment / machinery / components covered under your scope of supply and offered by you.	1) .....
		2) working drawing for complete system to be prepared and supplied to the yard with supply of plant/machinery/system	2) .....
		h) DME 452 is to be the guiding document for preparation and distribution of all technical / information	.....
		i) Introduction of organization including details of turnover, sales figures and reference list	.....
		j) Construction / performance details of equipment / machinery offered	.....
		k) Product support strategy including minimum stock level, lead time for supply, rupee payment facility for imported items if any	.....
		l) Details of service network	.....
		m) Details of import content as applicable and indigenisation plans for the same	.....
		n) Life cycle casting taking in to consideration, operating, watch keeping, maintenance, spares and other associated costs	.....

Stamp & sign of the Bidder





No.	Description	Requirements	Confirmation / Declaration by A.C. Plant Supplier
13	Training	The ship's crew, shore maintenance staff and staff of training school to be trained at the OEM's factory premises for each of the ship on the operation maintenance and of repair methodology of machinery / system installed onboard. Training aids comprising of cut section models, audio visual / CBT packages on operation, maintenance and repair activities are to be provided by vendor. The training schedule will be prepared in consultation with IHQ – MOD well in advance. Entire cost for the training to be borne by the vendor.	..... ..... ..... ..... ..... ..... .....

Stamp & sign of the Bidder