Section 7. Technical Specification

A. CUTTER SUCTION DREDGER, 500 mm (20") discharge diameter

This specification describes a Cutter Suction Dredger of the dismountable type. The dredger is of a simple and sturdy construction, suitable for heavy duty and durable operations. The sizes and weights of the various dismountable modules permit transportation by road or by ship.

The complete dredger consists of one main pontoon and two side pontoons. These side pontoons will be connected to the main pontoon using heavy steel claws and pins or any suitable option or better ways & means at bottom level and heavy steel plates with bolts at deck level.

During the assembly of the dredger, crane assistance is required.

The dredger can be operated by one man only from the control cabin.

The dredger is to be used in the tropical climate of Bangladesh, with an average rainfall of 2000 mm, air temperature of 5ºC to 50ºC and a relative humidity of 60% to 100%. All the equipment to be designed to comply the above climate conditions.

The tenderer has to submit detailed Specification of each and every item with its description, drawing, data etc. as required.

A-1. General particulars of Dredgers

	Description of Item	Dimensions/Instructions
1.01	**Principal Dimension**	
	Length over all (pontoons) (about)	32.00 m
	Breadth (about)	7.80 m
	Depth (about)	2.40 m
	Draught loaded (maximum)	1.50 m
1.02	**Dredging installation**	
	Inner diameter of suction pipe	550 mm
	Inner diameter of discharge pipe	500mm
	Discharge distance	2000 m
	Dredging depth up to	14.00 m (ladder angle 45º)
	Dredging Width with 35º swinging angle each side	
	at minimum dredging depth	36.00 m (approx.)
	at maximum dredging depth	30.00 m (approx.)
	Production capacity/output	Output of dredge pump of 650 m3/hour (approx.) at a discharge distance of 2000m at 14.0m dredging depth calculated at a volumetric concentration of 20% and deceive solid grain size of 235-440μm. The performance curve/production curve shall be submitted in the tender to support the output.`
1.03	**Tank capacities**	
	Fuel oil	25,000-35,000 litres (approx.)
	Ballast/Void	24,000 litres (approx.)
1.04	**Dredger pump**	Double wall dredge pump.
	Country of Origin	EU Countries/USA/ Australia/ Canada/Japan.

1.05	**Engine for sand pump drive**	
	Make	Marine Diesel Engine of reputed make
	Power	Appropriate Power to give output of 650 m3/hr (approx.) at a discharge distance of 2000 m.
	Maximum RPM	1800
	Country of Origin	EU Countries/USA/ Australia/ Canada/Japan/India
1.06	**Engine for Auxiliaries**	
	Make	Marine Diesel Engine of reputed make
	Power	Appropriate Power for operation of all hydraulic, electric and other auxiliaries.
	maximum RPM	1800
	Country of Origin	EU Countries/USA/ Australia/ Canada/Japan/India
1.07	**Cutter**	
	Type	Crown or equivalent
	Wearing parts on cutting edges	Knives replaceable
	RPM	0-35
1.08	**Spuds**	
	Outside Diameter (approx.)	550 mm
	Length (min.)	19m
	Spud tilting facility	Spud tilting facility to be provided
1.09	**Deck Crane**	One Deck Crane is to be provided for lifting and maintenance of dredge pump and other components with minimum capacity 3 tons.
1.10	**Class**	The Hull of the Dredger including its Main Engines, Auxiliary Engines, Generator, electro hydraulic installations etc. shall be built and classed for coastal water under the rules and regulations of the international classification society being a member of the International Association of Classification Societies (IACS) having registered office in Bangladesh. The following rules and regulations (if applicable) are to be complied with: Maritime Regulations of Bangladesh; SOLAS 1974 with latest amendments International Convention for the Prevention of Collision at Sea 1972 International Convention for Load Lines, 1966 IMO stability guideline including weather criteria Other rules and regulations applicable ***Registration & Survey (with Directorate of Shipping /Mercantile Marine Department of Bangladesh) must be completed by supplier's own cost***
1.11	**Operating Cabin**	The Operating Cabin is to be properly insulated with air coolers fitted, Considering high temperature of Bangladesh. The Cabin should be Spacious enough for working 3-4 persons (for training etc). To be provided with an adjustable chair for operator/dredge Master. All Controls, instrumentation etc, are to be positioned in the operating desk. Suction depth indicator, dredge pump vacuum and discharge pressure meter are also to be fitted in the operating desk. Any other facility required for operation are to be provided.
1.12	**Hydraulic system**	Hydraulic system of proven design & reputed make to be used for operation of winches, cutter, spuds etc. All components are to be of proven design for trouble free operation.
	Country of Origin	EU Countries/USA/ Australia/ Canada/Japan.

1.13	**Anchors and wire ropes**	Anchors: 4 Nos. @ 500kg each, 8 Nos. @ 300 kg each. Side winch wire (fitting): Minimum 150 m on each side. Necessary wires, gantry wires, spud slings, spud hoisting wires, mooring ropes etc. to be supplied and fitted with dredger.
1.14	**Painting**	As per standard. Colors are to be approved by the Employer.
1.15	**Cathodic Protection**	Sufficient amount of anodes to be placed on under water hull and ladder for a period of 2 years in salt water.
1.16	**Other Installations and accessories**	
	Swivel joint	To be provided with the discharge pipeline at the aft of the dredger.
	Automatic Vacuum relief valve	A by pass suction valve to be mounted underwater in the suction line to avoid too high vacuum. The valve is automatically driven through a vacuum signal, but can also be manually controlled from main control desk. .
	Non return Valve	Near the end of the discharge pipe an automatic non-return valve will be fitted to prevent the water from the discharge pipe to run back into the dredge pump. The valve can be disassembled for internal inspection.
	Fuel & running hour meter	Fuel & running hour meter to be supplied
	Dredging depth meter	Dredging depth meter to be supplied
	Depth Indicator	Depth indicator to be supplied
	Generator with engine	30 KVA, 220/440Vac, 50 Hz to be used for emergency lifting of ladder, spud
	Harbour Generating set	Diesel generating set with 20KVA power to arrange battery charging, fuel transfer pump operation, emergency lighting, operation of one welding set, cabin air cooler, emergency bilge pump etc.
	SSB Communication set/Cell Phone	SSB Communication/Cell phone set to be provided for each dredger for communication.
	Lights	In addition to normal lights for operation of the dredger, for night time operation sufficient flood lights are to be provided in suitable locations.
	Portable bilge pump (diesel engine or electric motor driven)	To be operated when dredger is not in operation.
	Electric welding set	300 Amps output with all accessories- 1 set for each dredger.
	Fuel Oil Transfer Pump	Electric motor driven pump to be Provided.
	Mechanical ventilation for the Engine room.	Air Blowers and Exhaust fans are to be provided of adequate capacity and number for proper ventilation considering high temperature and humidity in Bangladesh.
	Tanks	Fuel oil tanks, dirty oil tank, water ballast tanks, fresh water tank, dry tanks and store are to be provided.
	Signal Mast	To be Provided with requisite signal lamps, search lights etc. Complete for navigation.
	Bollard	6 Nos. double bollard shall be provided on the side pontoon of dredger for towing the dredger.
1.17	**Other Supplies**	**To be supplied:** a) Lifesaving appliances, i.e., Life jackets, life buoys etc. in adequate number, b) Boatswain's inventory c) Fire fighting appliances as per rule, d) First Aid box. e) Tools for general maintenance and special tools for sand pump, cutter, hydraulic system, electric system,

		engine and other works to be provided. f) 1 No. Laptop computer (Sony, Z-series) for each dredger to be supplied.
1.18	**FS Wire Rope**	For Side Winch: 4 Coils per dredger For Ladder: 2 Coils per dredger For dredger Towing: 2 Coils per dredger **Specification:** Construction of the Rope: 6x19(12+6+1) FC Normal Tensile Strength: 165 kg/sq.mm Lay of Wire: Right Hand Regular Lay Breaking Load: 17000-18000kg Length per coil: 300 meter Grade: A (Galvanized)

1.19 Tools for general maintenance and special tools for all engines, sand pump, cutter, hydraulic system, electric system and other works to be provided.

1.19.1 Engine Room Outfit and General Tools:

1 - Micrometer, 25 - 50 mm
1 - Surface gauge, 290 mm height.
1 - Straight edge, 600 mm
2 - Inside calipers, 300 & 200 mm
2 - Outside calipers, 300 and 200 mm
2 - Compass 300 & 200 mm
2 - Thermometers 100 C, with casing
2 - Straight shank drills 3 & 5 mm
1 - set Taps W3/8 - W1
1 - Plier, 200 mm
6 - Files 250 mm, Coarse and medium, flat, round and half round.
3 - Files 200mm, Fine, flat round and half round.
1 - set Files, fine
3 - File shanks
2 - File brushes
2 - Hammers, 2 lbs and 1 lb.
1 - Wooden hammer
1 - Hammer 10 lbs
2 - Scrapers, flat and cent
1 - Punching centre
4 - Punches, 11, 14, 18 & 21 mm
4 - Cold chisels 200 & 150 mm, flat & cross-cut
2 - Oil groove chisels, 150 x 22 x 5 mm x 130 x 19 x 3 mm
1 - Packing knife
1 - set Hacksaw frame with 12 blades
1 - Vice, 150 mm
1 - Oil stone, 150 x 50 x 25 mm
4 - Electric torches
1 - Chain block, 1 ton
1 - Rubber hose for air, complete with coupling,6mm diax 10m
1 - Copper hammer, 1.35 kg
1 - Lead hammer, 1.8 kg
1 - Tool box, steel
1 - Clock, 2-hand
1 - Turning bar for main engine
16 (from 3/8 to $1^{1/2}$)-Double end open spanner
16 (from 3/8 to $1^{1/2}$)-Double end ring spanner
24-Socket box wrench
2 (300 lb & 500 lb)-Torque wrench ¾ drive

A-2. AUXILIARIES AND SERVICES FOR DREDGER

	Description of Item	Dimensions/Instructions
1.01	**Production measuring system**	Complete set of production measuring system with integrated electro- magnetic velocity/density measuring instrument and production indicator for measuring solid output of dredged material in cubic meters per hour. Cumulative production is also to be recorded. All instruments, computers etc. needed for the system are to be supplied in complete set. If required, prior permission & clearance from Atomic Energy Commission of Bangladesh will be obtained by the supplier.
1.02	**Anchor Boom Installations.**	Two anchor booms driven by separate hydraulic motor and winches to be supplied for shifting anchors.
1.03	**Drawing**	• Instruction catalogue for dredgers, dredge pump, cutter, hydraulic & electric system, engines, generator, crane and all other accessories to be supplied in English language-3 sets. • Spare parts books for all components to be supplied in English language-3 sets. • G.A and other relevant drawings to be supplied-3 sets.
1.04	**Training**	
a.	**Training abroad**	Special training is to be arranged for 2 (two) Mechanical/Electrical &Electronic background Engineers for trouble shooting of dredger. Air ticket, accommodation, food, transport and all allowances to be arranged by the supplier for the trainees. The training period should be at least 1 (one) month excluding traveling.
b.	**Training in Bangladesh**	On job training is to be arranged for 15 (fifteen) days for each dredger in Bangladesh for Engineers, technicians & operators (dredger operation crew, engine room crew and repair & maintenance crew). Detailed programme is to be submitted before delivery of the dredger.
c.	**Training in Bangladesh**	15 (fifteen) weeks theoretical and practical training and demonstration of dredging, dredging equipments etc. for 6 (six) technical persons in Bangladesh.
1.05	**Cost of operation for test and trial**	All Cost of operation will be arranged by the supplier.
1.06	**Operation contract for dredgers**	**<u>Requirement:</u>** Very high skilled operation crew for operation of the dredgers. **<u>Operation period:</u>** 8(eight) months in a year (October to May). Working period-10 hours x 6 days per week.

		Skill Level: 1) Dredger Master/Operator of very high skill level is to be engaged. The average production output of dredger achieved should be at least 90% of the rated capacity. This may be calculated on weekly basis. Should be capable of planning the dredging operator independently as per project requirement in consultation with the project engineers. Should be able to communicate in English. 2) Engineer of very high skill level experienced in supplied model of dredger is to be engaged. Should be able to Communicate in English. To be fully capable of operating all instruments fitted in the dredger. **Cost of travel and accommodation etc:** The Cost of travel to & from Bangladesh will be included in the price offer. Transport and hotel accommodation in Bangladesh will be borne by the supplier. Accommodation at working site in the house boat with the dredgers will be free of charges. If additional facility is required it will be arranged by the supplier at their cost. Food is to be arranged by the supplier at their cost. **Supporting Crew:** Other Supporting Crew for dredger will be provided by the BIWTA **Cost of operation:** All Cost of operation will be arranged by the BIWTA. .

A-3. List of Spare Parts for 20″ (500 mm) 2 nos. Cutter Suction Dredgers.

MAIN ENGINE (DREDGE PUMP ENGINE)

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Cylinder liner with rubber seal	4 sets (1 set=1 No.x No. of Cylinder)		
2	Piston ring	4 sets (1 set=1ring group x No. of Cylinder)		
3	Exhaust valve	4 sets (1 set=2 Nos. x No. of Cylinder)		
4	Inlet valve	4 sets (1 set=2 Nos. x No. of Cylinder)		
5	Insert (valve seat) Exhaust	4 sets (1 set=2 Nos. x No. of Cylinder)		
6	Insert (valve seat) inlet	4 sets (1 set=2 Nos. x No. of Cylinder)		
7	Valve guide Exhaust	4 sets (1 set=2 Nos. x No. of		

		Cylinder)		
8	Valve guide Inlet	4 sets (1 set=2 Nos. x No. of Cylinder)		
9	Valve Spring	4 sets (1 set=4 Nos. x No. of Cylinder)		
10	Crank Shaft bearing (Main bearing)	4 sets (1 set=1 pair x No. of Cylinder)		
11	Cont. rod bearing (Big-end-bearing)	4 sets (1 set=1 pair x No. of Cylinder)		
12	Piston	4 sets (1 set=1 No.x No. of Cylinder)		
13	Injector nozzle	4 sets (1 set=1 No.x No. of Cylinder)		
14	Bolt (Cont. rod)	40 nos.		
15	Gasket (Cylinder head)	4 sets (1 set=1 No.x No. of Cylinder)		
16	Plate thrust (Thrust bearing)	4 sets (1 set=1 pair)		
17	Piston Pin (Gudgeon Pin)	40 nos.		
18	Plunger and barrel for fuel pump	4 sets (1 set=1 No.x No. of Cylinder)		
19	Complete engine overhauling gasket Kit	4 sets (1set=2 Nos. for complete engine)		
20	Fresh and sea water pump rebuilt kit	4 sets (1set=2 Nos. for each complete pump)		
21	Lub oil filter	80 nos.		
22	Fuel filter	80 nos.		

HYDRAULIC ENGINE

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Cylinder liner with rubber seal	4 sets (1 set=1 No.x No. of Cylinder)		
2	Crank shaft bearing (main bearing)	4 sets (1 set=1 pair x No. of Cylinder)		
3	Cont. rod bearing (Big-end-bearing)	4 sets (1 set=1 pair x No. of Cylinder)		
4	Piston ring	4 sets (1 set=1ring group x No. of Cylinder)		
5	Head gasket	4 sets (1 set=1 No.x No. of Cylinder)		
6	Piston	4 sets (1 set=1 No.x No. of Cylinder)		
7	Piston Pin (Gudgeon pin)	4 sets (1 set=1 No.x No. of Cylinder)		

Sl. No.	Description	Required Quantity	Unit Price	Total Price
8	Thrust bearing	4 sets (1 set=1 pair)		
9	Exhaust valve	4 sets (1 set=2 Nos. x No. of Cylinder)		
10	Inlet valve	4 sets (1 set=2 Nos. x No. of Cylinder)		
11	Insert (valve seat) Exhaust	4 sets (1 set=2 Nos. x No. of Cylinder)		
12	Insert (valve seat) Inlet	4 sets (1 set=2 Nos. x No. of Cylinder)		
13	Rocker arm/Cam flower	16 nos.		
14	Valve guide Exhaust	4 sets (1 set=2 Nos. x No. of Cylinder)		
15	Valve guide Inlet	4 sets (1 set=2 Nos. x No. of Cylinder)		
16	Injector nozzle	4 sets (1 set=1 No.x No. of Cylinder)		
17	Plunger and barrel for fuel pump	4 sets (1 set=1 No.x No. of Cylinder)		
19	Complete engine overhauling gasket Kit	4 sets (1set=2 Nos. for complete engine)		
20	Cooling water pump rebuilt kit	4 sets (1 set=2 Nos. for each complete pump)		
21	Lub oil filter	40 nos.		
22	Diesel filter (fuel filter)	40 nos.		
23	Connecting rod bearing bolt	16 nos.		

GENERATOR ENGINE

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Cylinder liner with rubber seal	4 sets (1 set=1 No.x No. of Cylinder)		
2	Piston ring	4 sets (1 set=1ring group x No. of Cylinder)		
3	Piston	4 sets (1 set=1 No.x No. of Cylinder)		
4	Piston Pin (Gudgeon pin)	4 sets (1 set=1 No.x No. of Cylinder)		
5	Exhaust valve	4 sets (1 set=2 Nos. x No. of Cylinder)		

6	Inlet valve	4 sets (1 set=2 Nos. x No. of Cylinder)		
7	Insert (for exhaust valve)	4 sets (1 set=2 Nos. x No. of Cylinder)		
8	Insert (for Inlet valve)	4 sets (1 set=2 Nos. x No. of Cylinder)		
9	Valve spring	16 nos.		
10	Main bearing	4 sets (1 set=1 pair x No. of Cylinder)		
11	Big-end-bearing	4 sets (1 set=1 pair x No. of Cylinder)		
12	Injector nozzle	4 sets (1 set=1 No.x No. of Cylinder)		
13	Plunger and barrel for fuel pump	4 sets (1 set=1 No.x No. of Cylinder)		

DREDGE PUMP ASSY. & OTHER ACCESSORIES

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Pump case	4 nos.		
2	Impeller	4 nos.		
3	Pressure plate suction side	4 nos.		
4	Pressure plate engine side	4 nos.		
5	Impeller sleeve	8 nos.		
6	Sand pump impeller driving shaft	2 nos.		
7	Cutter	2 nos.		
8	Cutter blades/cutter teeth	4 sets (1 set means total number of blades/teeth for one complete cutter)		
9	Cutter Shaft	2 Nos.		
10	Cutter Shaft cutless bush	2 Nos.		

HYDRAULIC SYSTEM AND LADDER ASSLY.

Sl. No.	Description	Required Quantity	Unit Price
1	Suction hose	4 nos.	
2	Hydraulic pump/hydraulic driving unit	4 nos.	
3	Cartridge Kit	20 Nos.	

B. CUTTER SUCTION DREDGER, 450 mm (18") discharge diameter

This specification describes a Cutter Suction Dredger of the dismountable type. The dredger is of a simple and sturdy construction, suitable for heavy duty and durable operations. The sizes and weights of the various dismountable modules permit transportation by road or by ship.

The complete dredger consists of one main pontoon and two side pontoons. These side pontoons will be connected to the main pontoon using heavy steel claws and pins or any suitable option or better ways & means at bottom level and heavy steel plates with bolts at deck level.

During the assembly of the dredger, crane assistance is required.

The dredger can be operated by one man only from the control cabin.

The dredger is to be used in the tropical climate of Bangladesh, with an average rainfall of 2000 mm, air temperature of 5ºC to 50ºC and a relative humidity of 60% to 100%. All the equipment to be designed to comply the above climate conditions.

The tenderer has to submit detailed Specification of each and every item with its description, drawing, data etc. as required.

B-1. General Particulars of Dredgers

	Description of Item	Dimensions/Instructions
1.01	**Principal Dimension**	
	Length over all (pontoons) (about)	24.00 m
	Breadth (about)	7.50 m
	Depth (about)	2.00 m
	Draught loaded (maximum)	1.25 m
1.02	**Dredging installation**	
	Inner diameter of suction pipe	450mm/500 mm
	Inner diameter of discharge pipe	450mm
	Discharge distance	1500 m
	Dredging depth up to	14.00 m (ladder angle 45º)
	Dredging Width with 35º swinging angle each side	
	at minimum dredging depth	35.00 m (approx.)
	at maximum dredging depth	30.00 m (approx.)
	Production capacity/output	Output of dredge pump of 450 m3/hr (minimum) at a discharge distance of 1500m at 14.0m dredging depth calculated at a volumetric concentration of 20% and decisive solid grain size of 235-440µm. The performance curve /production curve shall be submitted in the tender to support the output.
1.03	**Tank capacities**	
	Fuel oil	25,000-35,000 litres (approx.)
	Ballast/Void	24,000 litres (approx.)
1.04	**Dredger pump**	Double wall dredge pump.
	Country of Origin	EU Countries/USA/ Australia/ Canada/Japan.
1.05	**Engine for sand pump drive**	
	Make	Marine Diesel Engine of reputed make
	Power	Appropriate Power to give output of 450 m3/hr (approx.) at a discharge distance of 1500 m.
	Maximum RPM	1800
	Country of Origin	EU Countries/USA/ Australia/ Canada/Japan/India.

1.06	**Engine for Auxiliaries**	
	Make	Marine Diesel Engine of reputed make
	Power	Appropriate Power for operation of all hydraulic, electric and other auxiliaries.
	Maximum RPM	1800
	Country of Origin	EU Countries/USA/ Australia/ Canada/Japan/India.
1.07	**Cutter**	
	Type	Crown or equivalent
	Wearing parts on cutting edges	Knives replaceable
	RPM	0-35
1.08	**Spuds**	
	Outside Diameter (approx.)	500 mm
	Length (min.)	18m
	Spud tilting facility	Spud tilting facility to be provided
1.09	**Deck Crane**	One Deck Crane is to be provided for lifting and maintenance of dredge pump and other components with minimum capacity of 3 tons.
1.10	**Class**	The Hull of the Dredger including its Main Engines, Auxiliary Engines, Generator, electro hydraulic installations etc. shall be built and classed for coastal water under the rules and regulations of the international classification society being a member of the International Association of Classification Societies (IACS) having registered office in Bangladesh. The following rules and regulations (if applicable) are to be complied with: Maritime Regulations of Bangladesh; SOLAS 1974 with latest amendments International Convention for the Prevention of Collision at Sea 1972 International Convention for Load Lines, 1966 IMO stability guideline including weather criteria Other rules and regulations applicable ***Registration & Survey (with Directorate of Shipping /Mercantile Marine Department of Bangladesh) must be completed by supplier's own cost`***
1.11	**Operating Cabin**	The Operating Cabin is to be properly insulated with air coolers fitted, Considering high temperature of Bangladesh. The Cabin should be Spacious enough for working 3-4 persons (for training etc). To be provided with an adjustable chair for operator/dredge Master. All Controls, instrumentation etc, are to be positioned in the operating desk. Suction depth indicator, dredge pump vacuum and discharge pressure meter are also to be fitted in the operating desk. Any other facilities required for operation are to be provided.
1.12	**Hydraulic system**	Hydraulic system of proven design & reputed make to be used for operation of winches, cutter, spuds etc. All components are to be of proven design for trouble free operation.
	Country of Origin	EU Countries/USA/ Australia/ Canada/Japan.

1.13	**Anchors and wire ropes**	Anchors: 4 Nos. @ 500kg for dredger, 8 Nos. @ 300 kg for dredger. Side winch wire (fitting): Minimum 150 m on each side. Necessary wires, gantry wires, spud slings, spud hoisting wires, mooring ropes etc. to be supplied and fitted with dredger.
1.14	**Painting**	As per standard. Colors are to be approved by the Employer.
1.15	**Cathodic Protection**	Sufficient amount of anodes to be placed on under water hull and ladder for a period of 2 years in salt water.
1.16	**Other Installations and accessories**	
	Swivel joint	To be provided with the discharge pipeline at the aft of the dredger.
	Automatic Vacuum relief valve	A by pass suction valve to be mounted underwater in the suction line to avoid too high vacuum. The valve is automatically driven through a vacuum signal, but can also be manually controlled from main control desk. .
	Non return Valve	Near the end of the discharge pipe an automatic non-return valve will be fitted to prevent the water from the discharge pipe to run back into the dredge pump. The valve can be disassembled for internal inspection.
	Fuel & running hour meter	Fuel & running hour meter to be supplied
	Dredging depth meter	Dredging depth meter to be supplied
	Depth Indicator	Depth indicator to be supplied
	Generator with engine	30 KVA, 220/440Vac, 50 Hz to be used for emergency lifting of ladder, spud
	Harbour Generating set	Diesel generating set with 20KVA power to arrange battery charging, fuel transfer pump operation, emergency lighting, operation of one welding set, cabin air cooler, emergency bilge pump etc.
	SSB Communication set/Cell Phone	SSB Communication/Cell phone set to be provided for each dredger for communication.
	Lights	In addition to normal lights for operation of the dredger, for night time operation sufficient flood lights are to be provided in suitable locations.
	Portable bilge pump (diesel engine or electric motor driven)	To be operated when dredger is not in operation. In built bilge pump to be provided
	Electric welding set	300 Amps output with all accessories- 1 set for each dredger.
	Fuel Oil Transfer Pump	Electric motor driven pump to be Provided.
	Mechanical ventilation for the Engine room.	Air Blowers and Exhaust fans are to be provided of adequate capacity and number for proper ventilation considering high temperature and humidity in Bangladesh.
	Tanks	Fuel oil tanks, dirty oil tank, water ballast tanks, fresh water tank, dry tanks and store are to be provided.
	Signal Mast	To be Provided with requisite signal lamps, search lights etc. Complete for navigation.
1.17	**Other Supplies**	**To be supplied:** a. Lifesaving appliances, i.e., Life jackets, life buoys etc. in adequate number, b. Boatswain's inventory, c. Fire fighting appliances as per rule, d. First Aid box. e. Tools for general maintenance and special tools for sand pump, cutter, hydraulic system, electric system, engine and other works to be provided.

1.18	**FS Wire Rope**	For Side Winch: 4 Coils for dredger For Ladder: 2 Coils for dredger For dredger Towing: 2 Coils for dredger **Specification:** Construction of the Rope: 6x19(12+6+1) FC Normal Tensile Strength: 165 kg/sq.mm Lay of Wire: Right Hand Regular Lay Breaking Load: 17000-18000kg Length per coil: 300 meter Grade: A (Galvanized)

1.19 Tools for general maintenance and special tools for all engines, sand pump, cutter, hydraulic system, electric system and other works to be provided.

1.19.1 Engine Room Outfit and General Tools:

1 - Micrometer, 25 - 50 mm
1 - Surface gauge, 290 mm height.
1 - Straight edge, 600 mm
2 - Inside calipers, 300 & 200 mm
2 - Outside calipers, 300 and 200 mm
2 - Compass 300 & 200 mm
2 - Thermometers 100 C, with casing
2 - Straight shank drills 3 & 5 mm
1 - set Taps W3/8 - W1
1 - Plier, 200 mm
6 - Files 250 mm, Coarse and medium, flat, round and half round.
3 - Files 200mm, Fine, flat round and half round.
1 - set Files, fine
3 - File shanks
2 - File brushes
2 - Hammers, 2 lbs and 1 lb.
1 - Wooden hammer
1 - Hammer 10 lbs
2 - Scrapers, flat and cent
1 - Punching centre
4 - Punches, 11, 14, 18 & 21 mm
4 - Cold chisels 200 & 150 mm, flat & cross-cut
2 - Oil groove chisels, 150 x 22 x 5 mm x 130 x 19 x 3 mm
1 - Packing knife
1 - set Hacksaw frame with 12 blades
1 - Vice, 150 mm
1 - Oil stone, 150 x 50 x 25 mm
4 - Electric torches
1 - Chain block, 1 ton
1 - Rubber hose for air, complete with coupling,6mm diax 10m
1 - Copper hammer, 1.35 kg
1 - Lead hammer, 1.8 kg
1 - Tool box, steel
1 - Clock, 2-hand
1 - Turning bar for main engine
16 (from 3/8 to $1^{1/2}$)-Double end open spanner

16 (from 3/8 to $1^{1/2}$)-Double end ring spanner
24-Socket box wrench
2 (300 lb & 500 lb)-Torque wrench ¾ drive

B-2. AUXILIARIES AND SERVICES FOR DREDGER

	Description of Item	Dimensions/Instructions
1.01	**Production measuring system**	Complete set of production measuring system with integrated electro- magnetic velocity/density measuring instrument and production indicator for measuring solid output of dredged material in cubic meters per hour. Cumulative production is also to be recorded. All instruments, computers etc. needed for the system are to be supplied in complete set. If required, prior permission & clearance from Atomic Energy Commission of Bangladesh will be obtained by the supplier.
1.02	**Anchor Boom Installations.**	Two anchor booms driven by separate hydraulic motor and winches to be supplied for shifting anchors.
1.03	**Drawing**	• Instruction catalogue for dredgers, dredge pump, cutter, hydraulic & electric system, engines, generator, crane and all other accessories to be supplied in English language-3 sets. • Spare parts books for all components to be supplied in English language-3 sets. • G.A and other relevant drawings to be supplied-3 sets.
1.04	**Training**	
a.	**Training abroad**	Special training is to be arranged for 2 (two) Mechanical/Electrical &Electronic background Engineers and 5 crews of different categories for trouble shooting of dredger. Air ticket, accommodation, food, transport and all allowances to be arranged by the supplier for the trainees. The training period should be at least 1 (one) month excluding traveling.
b.	**Training in Bangladesh**	On job training is to be arranged for 15 (fifteen) days for each dredger in Bangladesh for Engineers, technicians & operators (dredger operation crew, engine room crew and repair & maintenance crew). Detailed programme is to be submitted before delivery of the dredger.
c.	**Training in Bangladesh**	15 (fifteen) weeks theoretical and practical training and demonstration of dredging, dredging equipments etc. for 6 (six) technical persons in Bangladesh.
1.05	**Cost of operation**	All Cost of operation will be arranged by the supplier .
1.06	**Operation contract for dredgers**	**<u>Requirement:</u>** Very high skilled operation crew for operation of the dredgers. **<u>Operation period:</u>** 8(eight) months in a year (October to May). Working period-10 hours x 6 days per week.

		Skill Level: 1) Dredger Master/Operator of very high skill level is to be engaged. The average production output of dredger achieved should be at least 90% of the rated capacity. This may be calculated on weekly basis. Should be capable of planning the dredging operator independently as per project requirement in consultation with the project engineers. Should be able to communicate in English. 2) Engineer of very high skill level experienced in supplied model of dredger is to be engaged. Should be able to Communicate in English. To be fully capable of operating all instruments fitted in the dredger. **Cost of travel and accommodation etc:** The Cost of travel to & from Bangladesh will be included in the price offer. Transport and hotel accommodation in Bangladesh will be borne by the supplier. Accommodation at working site in the house boat with the dredgers will be free of charges. If additional facility is required it will be arranged by the supplier at their cost. Food is to be arranged by the supplier at their cost. **Supporting Crew:** Other Supporting Crew for dredger will be provided by the BIWTA **Cost of operation:** All Cost of operation will be arranged by the BIWTA. .

B-3. List of Spare Parts for 18″ (450 mm) 1 No. Cutter Suction Dredger.

MAIN ENGINE (DREDGE PUMP ENGINE)

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Cylinder liner with rubber packing	02 sets (1set=1 No.x No. of Cylinder)		
2	Piston ring	02 compt. set (1 set=1ring group x No. of Cylinder)		
3	Exhaust valve	02 sets (1 set=2 Nos. x No. of Cylinder)		
4	Inlet valve	02 set (1 set=2 Nos. x No. of Cylinder)		
5	Insert (valve seat) Exhaust	02 sets (1 set=2 Nos. x No. of Cylinder)		
6	Insert (valve seat) inlet	02 sets (1 set=2 Nos. x No. of Cylinder)		
7	Valve guide Exhaust	02 sets (1 set=2 Nos. x No. of Cylinder)		
8	Valve guide Inlet	02 sets (1 set=2 Nos. x No. of Cylinder)		
9	Valve Spring	02 sets (1 set=4 Nos. x No. of Cylinder)		
10	Crank Shaft bearing (Main	02 sets		

	bearing)	(1 set=1 pair x No. of Cylinder)		
11	Cont. rod bearing (Big-end-bearing)	02 sets (1 set=1 pair x No. of Cylinder)		
12	Piston	02 sets (1 set=1 No.x No. of Cylinder)		
13	Injector nozzle	02 sets (1 set=1 No.x No. of Cylinder)		
14	Bolt (Cont. rod)	40 nos.		
15	Gasket (Cylinder head)	02 sets (1 set=1 No.x No. of Cylinder)		
16	Plate thrust (Thrust bearing)	02 sets (1 set=1 pair)		
17	Piston Pin (Gudgeon Pin)	40 nos.		
18	Plunger with barrel for fuel pump	02 sets (1 set=1 No.x No. of Cylinder)		
19	Complete engine overhauling gasket Kit	02 sets (1 set=2 Nos. for complete engine)		
20	Fresh and sea water pump rebuilt kit	02 sets (1 set=2 Nos. for each complete pump)		
21	Lub oil filter	40 nos.		
22	Fuel filter	40 nos.		
23	Connecting Rod	02 sets (1 Set=1 No.x No. of Cylinder)		

HYDRAULIC ENGINE

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Cylinder liner with rubber packing	02 sets (1 set=1 No.x No. of Cylinder)		
2	Crank shaft bearing (main bearing)	02 sets (1 set=1 pair x No. of Cylinder)		
3	Cont. rod bearing (Big-end-bearing)	02 sets (1 set=1 pair x No. of Cylinder)		
4	Piston ring	02 sets (1 set=1ring group x No. of Cylinder)		
5	Head gasket	02 sets (1 set=1 No.x No. of Cylinder)		
6	Piston	02 sets (1 set=1 No.x No. of Cylinder)		
7	Piston Pin (Gudgeon pin)	02 sets (1 set=1 No.x No. of Cylinder)		
8	Thrust bearing	02 sets (1 set=1 pair)		
9	Exhaust valve	02 sets (1 set=2 Nos. x No. of Cylinder)		
10	Inlet valve	02 sets (1 set=2 Nos. x No. of Cylinder)		
11	Insert (valve seat) Exhaust	02 sets (1 set=2 Nos. x No. of Cylinder)		
12	Insert (valve seat) Inlet	02 sets (1 set=2 Nos. x No. of Cylinder)		
13	Rocker arm/Cam Shaft	20 nos.		
14	Valve guide Exht. & Inlet	02 sets (1 set=2 Nos. x No. of Cylinder)		
15	Injector nozzle	02 sets (1 set=1 No.x No. of Cylinder)		
16	Plunger with barrel for fuel pump	02 sets (1 set=1 No.x No. of Cylinder)		

Sl. No.	Description	Required Quantity	Unit Price	Total Price
17	Complete engine overhauling gasket Kit	02 sets (1 set=2 Nos. for complete engine)		
18	Cooling water pump rebuilt kit	02 sets (1 set=2 Nos. for each complete pump)		
19	Lub oil filter	40 nos.		
20	Diesel filter	40 nos.		
21	Connecting rod bearing bolt	24 nos.		
22	Connecting rod	02 sets (1 Set=1 No.x No. of Cylinder)		

GENERATOR ENGINE

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Cylinder liner with packing	02 sets (1 set=1 No.x No. of Cylinder)		
2	Piston ring	02 compt. sets (1 set=1ring group x No. of Cylinder)		
3	Piston with Pin (Gudgeon)	02 sets (1 set=1 No.x No. of Cylinder)		
4	Exhaust valve	02 sets (1 set=2 Nos. x No. of Cylinder)		
5	Inlet valve	02 sets (1 set=2 Nos. x No. of Cylinder)		
6	Insert (for exhaust valve)	02 sets (1 set=2 Nos. x No. of Cylinder)		
7	Insert (for Inlet valve)	02 sets (1 set=2 Nos. x No. of Cylinder)		
8	Valve spring	24 nos.		
9	Main bearing	02 sets (1 set=1 pair x No. of Cylinder)		
10	Big-end-bearing	02 sets (1 set=1 pair x No. of Cylinder)		
11	Injector nozzle	02 sets (1 set=1 No.x No. of Cylinder)		
12	Plunger and barrel for fuel pump	02 sets (1 set=1 No.x No. of Cylinder)		

DREDGE PUMP ASSY. & OTHER ACCESSORIES

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Pump case	1 no.		
2	Impeller	2 nos.		
3	Presser plate suction side	4 Nos.		
4	Presser plate engine side	4 Nos.		
5	Impeller sleeve	4 nos.		
6	Sand pump impeller driving shaft	4 Nos.		
7	Cutter Frame	01 no.		
8	Cutter Blade/Cutter teeth	06 Sets ((1 set means total number of blades/teeth for one complete cutter)		

Sl. No.	Description	Required Quantity	Unit Price	Total Price
9	Cutter Shaft	01 No.		
10	Cutter Shaft Cutless bush	02 Nos.		

LADDER ASSY.

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Suction hose	02 Nos.		
2	Hydraulic pump/hydraulic driving unit	02 Nos.		
3	Cartridge Kit	10 Nos.		

C. CRANE BOATS

C-1. GENERAL PARTICULARS

1.0 Main characteristics

The vessel shall be provided with heavy steel fendering all around, Flush type Engine Room removal hatch, heavy deck crane support foundation, towing bitt, Propeller Nozzle (to create extra thrust), etc.

The Hull of the vessel including its machinery shall be built and classed under the rules and regulations of the International Classification Society like Lloyds Register of Shipping (LRS)/ American Bureau of Shipping (ABS)/ Nippon Kaiji Kyo kai (NK) /Bureau Veritas (BV). The Appropriate class notations to be mentioned in the offer. The other rules and regulations applicable for construction of this vessel including IMO stability guideline covering weather criteria shall be followed.

1.01 Principal dimension

Length O.A (about)	:	10.00-12.00 m
Breadth (about)	:	6.00 m
Depth (moulded)	:	1.80 m
Draught loaded (maximum)	:	1.20 m

1.02 Propelling Machinery

Number of engines	:	1 No. (Single screw)
Make	:	Diesel marine engine of reputed make
Country of origin	:	EU Countries/USA/ Australia/ Canada/Japan/India.
Power	:	Required to achieve the speed of 6.50 knots
RPM	:	Not exceeding 2000
Speed (Full loaded condition)		6.50 Knots

1.03 Performance

Deck Crane capacity	:	Minimum 2 ton at 8 m out reach
Slewing angle	:	360°
Fuel oil tanks 100% full	:	about 7-10 cubic meters

1.04 General Arrangement

The vessel will be a single screw diesel propelled, steel, crane boat of flush-deck type having a transom stern and a complete continuous deck below which the space will be subdivided by three transverse watertight bulkheads into four compartments.

(1) Fore peak;
(2) Boatswain's Store;
(3) Engine room.
(4) Aft peak & steering gear compartment

1.05 Materials & Workmanship

The Builder will supply all materials, equipment and machinery required for completion of the vessel. All these materials and equipment supplied will be new and of latest design and intended for marine use and also in accordance with the rules and regulations mentioned above and also other requirements of the governing bodies concerned.

Steel materials used for the vessel will be open-hearth or electric furnace processed mild steel of a good and uniform quality certified by the Classification Society for compliance with its rules.

All workmanship inspect of the construction of the vessel will be in accordance with the normal shipbuilding practice for this kind of vessels.

1.06 Plans and Instruction Books

Prior to the execution of the work concerned, 2 (two) copies of each of the following plans and booklets shall be submitted to the Purchaser for their approval. Such approval of the Purchaser shall not relieve the supplier of his obligations under this contract.

i) Specifications
ii) General arrangement
iii) Lines & offsets
iv) Hydrostatic curves
v) Capacity plan (preliminary)
vi) Stability booklet
vii) Midship section
viii) Construction profile & deck plan
ix) Shell expansion
x) Rudder & rudder carrier
xi) Hull construction plans
xii) Steering gear arrangement
xiii) Scheme of painting
xiv) Engine room arrangement
xv) Main engine specification & assembly
xvi) Auxiliary engine specification & assembly
xvii) Hydraulic crane specification and assembly plan
xviii) Load diagram of hydraulic crane
xix) Range diagram of hydraulic crane
xx) Load and Range diagram of crane
xxi) Hydraulic pumps, specification and assembly plan
xxii) Diagram of standard slewing arc
xxiii) Diagram of cooling water pipe systems in engine room
xxiv) Diagram of bilge, ballast and water service pipe systems in engine room
xxv) Diagram of lubricating oil pipe system in engine room
xxvi) Diagram of fuel oil pipe system in engine room
xxvii) Diagram of main electric feeder circuits
xxviii) Diagram of electric lighting, navigation aids etc., feeder circuits
xxix) Main switchboard assembly plan & connecting diagram

2 (two) copies of each of the following plans and booklets shall be submitted to the Purchaser for their approval upon completion of vessel and before test& trial.

i) List of deck inventory
ii) List of spares, tools and outfit of machinery part
iii) List of spares and accessories of electric part
iv) Schedule of inclining test
v) Schedule of official sea trials
vi) Schedule of various test and trials to be attested by Purchaser.

Upon the delivery of the vessel, the following finished plans shall be prepared and delivered to the purchaser.

The number of copies shall be three (3) for plans and two (2) for booklets.

All relevant as fitted and as built drawings and booklets from the above list will also be supplied.

Capacity plan with tanks & deadweight scales
Final calculation for weight, trim and stability
Stability curves
Results of inclining test
Results of official sea trials
Results of various tests and trials for machinery part
Results of various tests & trials for electric part
Docking plan

One set of the following finished plans shall be mounted on frames and displayed onboard:

General arrangement
Arrangement of safety equipment

Three (3) copies of suitable instruction books written in English shall associate the following machinery and equipment:

Steering gear
Main engine
Generators
Navigation equipment
Crane

1.07 Tests & Trials

Crane, Main Engine, Generators, switch board, electric motors and control gears and other machinery, equipment and systems shall be tested under the working conditions.

Insulation tests shall be made for all electric equipment and systems after installation onboard.

Results of these tests and trials shall be submitted to the Purchaser immediately after completion.

1.08 Registration & Survey must be completed by suppliers' own cost

C-2. HULL

2.01 Steel Work in General

The hull including superstructures will be constructed of steel throughout on the longitudinal system of framing. Good continuity of structural members in the basic hull structure will be maintained, and where members are discontinuous, continuity will be provided with by means of suitable tapers, overlaps, doubler plates and/or brackets.

The workmanship will be such as to ensure reasonable fair lines and smooth surfaces, attention will be given to the neatness of structural connections. Cuts in structures for engineering systems such as ventilating ducts, piping systems and electrical cables will be made according to standard shipbuilding practice, and portions unduly weakened by cutting such holes will be suitably compensated.

2.02 Hull Scantlings:

The hull hunting scantlings shall be as per the rules of classification society. A guidelines (not restrictive) scantlings may be as follows:

-	Sides, ends, bottom and deck plating	10 mm
-	Bulkheads	6 mm
-	Longitudinal frames angles (spacing 500 mm)	75 x75 x 9mm
-	Web frames sections (spacing 1000mm & 1500mm)	200 x125 x 8mm
-	Stiffeners on bulkheads (angles)	65 x 65 x 6mm
-	Steel fender all round at deck level consisting of a welded flatbar	500 mm x 28mm

2.03 Welding

Electric arc welding will be applied to all connections of structural members. Portions of members where welding is to be applied will be well prepared prior to welding work in order to obtain good results. Qualified welders with coated electrodes, and automatic welding by "Union melt" or equivalent process will execute manual welding. The materials and the procedure of welding will comply with the requirements of the Classification Society.

2.04 Keel

The Keel will be of flat plate type and properly shaped and secured.

2.05 Steel Skeg

The end of propeller shafts will be supported by a skeg of steel construction. The boss will be of cast steel. The rubber bearing lined bronze or equivalent materials bush will be used in the boss.

2.06 Rudder

The vessel will have one rudder of single plate semi-balanced type, connected to the rudderstock by a flange coupling.

2.07 Bottom Construction

The bottom will be of single bottom type constructed.

Under the main engines, strong continuous engine girders with strong top plates will be provided. The engine room webs will be 500mm apart following the class rules and will terminate on the engine girder. Inside of the engine, brackets will support girder. In the forward region, the bottom will be reinforced as required by the rules.

2.08 Web Frames and Side Stringers

Web frames will be fitted at a space of 1000 mm and 1500 mm apart following the class rules and welded to the shell plating. A side stringer will be provided on each side in way of the forward hull and the engine room.

2.09 Bulkheads

Main watertight transverse bulkheads will be arranged as shown on the general arrangement plan and extended up to the main deck. These bulkheads will be of welded flat type reinforced with vertical stiffeners bracketed at top and bottom as far as practicable. All bulkheads will be tested as required by the rules.

2.10 Shell Plating

All butts and seams of the shell plating will be welded. The shell plating in way of large openings will be properly compensated with doubler plates or by increasing plate thickness.

2.11 Main Deck

The main deck will be constructed with steel plates. Thicker plates or doubler plates will be laid at corners of large openings where considered necessary.

The deck stringer plates will be directly welded to the sheer strakes. Beams will be fitted transversely at every web frame & welded to the deck plating. Under-deck girders will be provided to support and stiffen the deck.

The deck will be well reinforced in way of deck machinery, deck crane & other heavy articles.

2.12 Machinery Foundation

Foundations under machinery will be of welded construction well connected to the bottom structure, and strong enough to stand up to the loads and vibrating forces of the machinery installed thereon. The top plates, webs and brackets will be of sufficient thickness. The main engine foundation will consist of continuous engine girders with strong top plates, constructed as an integral part of the bottom structure. Care will be taken to keep efficient continuity of strength at their ends. Foundations of the generating units, engine room auxiliaries, deck machinery, crane, etc., will be constructed on structures, which are to be suitably reinforced.

2.13 Wheelhouse

Wheelhouse will be constructed of steel plate. Sidewalls will be reinforced with vertical stiffeners and the roof will have transverse beams as necessary. Girders will be provided as necessary.

2.14 Tanks

Tanks will be arranged as shown on the general arrangement plan and constructed integral with the hull structure. Necessary pipelines, i.e. filling, suction, sounding and air escape pipes and also access manholes will be provided for these tanks.

2.15 Hull Fittings

2.15.1 Mast

A steel mast will be erected on the wheelhouse top to carry mast lamp brackets and a halyard for hoisting flags and spreading antennas. The mast will be collapsible.
On the wheelhouse top two steel board light boxes will be placed for the P.S. and S.B. lights.

2.15.2 Mooring & Anchoring

Double bollards of size 168 mm dia x 8 mm thick following the class rules will be arranged on the fore and aft, at port side and starboard side on the main deck.

2.15.3 Hoisting eyes (for Purchaser's use)

For hoisting, the vessel will be provided with 4 (four) hoisting eyes through the deck to the web frame construction.

2.15.4 Steering Gear

One set of manual hydraulic steering gear, suitable for single-rudder arrangement will be installed at ship's aft. The steering gear will be energized by manual hydraulic cylinder connected to the steering wheel in the wheelhouse. The steering gear will be capable of moving the rudder from 35 degrees on one side to 35 degrees on another side within about 15 seconds. Emergency steering arrangement will be provided.

2.15.5 Fender

Steel fender consisting of a welded flat bar of 500mm x 28mm will be provided all around at deck level of the vessel.

2.15.6 Stairways, Ladders and Steps

All stairways will be of steel. These stairways will have non-skid treads and galvanized tubular steel handrails. Steel vertical ladders will be fitted for access to the wheelhouse top, etc.

2.15.7 Hatches and Manholes

On the main deck and above the engine room, one large watertight hatch will be fitted for engine removal. The engine room entrance to be situated against the wheelhouse and will be provided with a watertight hatch on a raised coaming. For the store and the forepeak, watertight hatch will be provided. Oval manholes will be provided for access to tanks. Bolted flush steel covers will close these manholes.

2.15.8 Doors

The wheelhouse will have hinged aluminum alloy water tight door.

2.15.9 Natural lighting and Ventilation

One ventilation cowl will be provided for adequate natural ventilation of the engine room. Light alloy framed windows of fixed and hinged up type will be fitted on walls of the wheelhouse. Extruded aluminum glassed with 6mm thick glass fitted with long bolts and phenol resin washer will be provided.

A 250-mm dia clear view screen will be provided.

2.15.10 Sound Signal

On the wheelhouse top an air whistle will be fitted, fed by an air compressor fitted in the steering wheel casing.

2.15.11 Life Saving Appliances

The following life saving and signal appliances will be supplied and to be in accordance with rules and regulations applicable:

Buoyant apparatus	1 No.

Life buoy, solid	2 Nos.
Life jacket	2 Nos.
Self-activating water light	1 No.
Self-activating smoke signal	1 Nos.

2.15.12 Fire Fighting Systems and Appliances

A deck wash connection and fire main pipeline will be installed along one side of the main deck. This line will be fed with river water by the general service pump and the bilge and ballast pump. Hydrants will be suitably arranged on the fire main line so that any part of the vessel can be reached by a powerful water-jet. Canvas fire hoses of 1.5" bore and 18 meters in length, complete with nozzle, will be supplied and stowed in red paint cases. Portable fire extinguishers will be supplied as specified elsewhere as per the requirement of the rules and regulations.

2.15.13 Cathodic Protection

The vessel will be equipped with a cathodic hull protection system for the under water parts of the hull with sufficient zinc anodes of 3 kg. and 1.50 kg.

2.15.14 Markings

The ship's name in both English and Bengali letters and the draft marks in Arabic numerical in metric scale will be cut from steel plate and welded on the shell, and painted as directed by the purchaser. Draft marks will be fitted at the bow, stern and amidships in metric scale.

2.16 Wheelhouse Furnishing Schedule

2.16.1 Wheelhouse

1 - Fan
1 - Compass table
1 - Steering pedestal
1 - Foot grating
1 - Flag rack
1 - Magnetic compass
1 - Binocular
1 - Nav. lamp indicator
1 - Voice tube
1 - Thermometer
1 - Clear view screen,
1 - Engine remote control console
1 - High chair

All the windows except middle windows in the wheel house must be easily open able Arrangement shall be provided to permit rapid shut down and effective closer in case of weather and sea condition. In wheel house, fuel & running hour meter to be provided.

2.16.2 Boatswain's Store

The space under the main deck between the forepeak and engine room shall be used as a boatswain's store.
The shell sides shall be sparred with wooden battens up to a suitable height and the floor laid with wooden gratings. Wooden shelves shall be fitted along the shell sides.

2.17 Deck Piping

2.17.1 Piping in General

Pipes, valves, cocks, flange, etc., will be of such qualities and dimensions as to comply with rules of the Classification Society. Pipes will be efficiently supported or embraced to stand up to vibrations. Care will be taken where pipes are concealed by room furniture so that reasonable access may be provided for overhauling. Where pipes pass through watertight bulkheads or decks, bulkhead or deck pieces will be fitted. Where the danger of mechanical damage is expected, pipes will be well protected by means of wooden or steel covering or guards.

2.17.2 Pipe Materials

Pipes will generally be steel pipes of such qualities and dimensions as to comply with rules of the Classification Society. Galvanized pipes and flanges will be used for piping not coming into contact with oil.

2.17.3 Wash deck and Fire Main Piping

The wash deck and fire main pipeline will be installed along one side on the main deck. The pipeline will be supplied with river water by the general service pump and the bilge and ballast pump in the engine room.

2.18 Coating Protection

2.18.1 Surface Preparation

Prior to any sand/grit/wet blasting, all sea chests strainer plates will be removed and all hull openings, transducers, anodes, waster pieces, bearings, stern tube openings, fiber glass covers (over shafts and domes) and propellers will be plugged, covered, and otherwise protected from damage or contamination during surface preparation and coating application.

All steel surfaces will be prepared to near white, blasted to SA 2½ standard.

After sand/grit/wet blasting, surfaces will be brushed with clean brushes, blown off with compressed air, or cleaned by vacuum to remove all traces of blast products and dust.

The surfaces to be painted will have the specified surface preparation at the time of application of the paint. If the surface is degraded or contaminated subsequent to surface preparation and prior to painting, the surface will be restored before paint application.

In order to prevent degradation or contamination of the prepared surfaces, the first coat of paint will be applied as soon as possible after the surfaces have been prepared. The first coat will always be applied the same day as surface preparation is completed. Succeeding coats will be applied before contamination of the under surface occurs.

After surface preparation, surfaces will be brushed with clean brushes, blown off with compressed air, or cleaned by vacuum to remove all traces of blast products and dust.
Whenever sand/grit/wet blasting or spray painting is specified for surface preparation of exterior steel surfaces in places where applicable regulations and laws prohibit release of blast materials and paint into the atmosphere, the surfaces shall be enclosed in a cover adequate to contain the blast materials and paint.

Cleaning and painting will be so scheduled that detrimental amounts of dust or other contaminants do not fall on wet, newly painted surfaces.

2.18.2 Painting Schedule

1. BOTTOM & BOOT TOP AREA (COALTAR EPOXY SYSTEM)

   a) Anti Corrosive System
      i) Epoxy Primer 1x50 Microns
      ii) Coaltar Epoxy 1x100 Microns
      iii) Modified Coaltar Epoxy (Sealer Coat) 1x100 Micron

   b) Antifouling System
      i) Self Polishing Antifouling Paint (for 24 months protection) 2x50 Microns

2. TOP SIDES (RECOATABLE EPOXY SYSTEM)

   a) Epoxy Primer 1x50 Microns
   b) Recoatable Epoxy Undercoat 1x100 Microns
   c) Recoatable Epoxy Finish 1x100 Microns

3. DECK (RECOATABLE EPOXY SYSTEM)

a)	Epoxy Primer	1x50 Microns
b)	Recoatable Epoxy Undercoat	1x100 Microns
c)	Recoatable Polyurethane/ Epoxy Finish	1x100 Microns

4. BILGES/BALLAST/TANKS
(COALTAR EPOXY SYSTEM)

a)	Epoxy Primer	1x50 Microns
b)	Coaltar Epoxy (two different shades)	2x100 Microns

5. SUPERSTRUCTURE-EXTERIOR
(RECOATABLE EPOXY SYSTEM)

a)	Epoxy Primer	1x50 Microns
b)	Recoatable Epoxy Undercoat	1x75 Microns
c)	Recoatable Epoxy Finish	1x35 Microns

6. SUPERSTRUCTURE-INTERIOR
(RECOATABLE EPOXY SYSTEM)

a)	Epoxy Primer	1x50 Microns
b)	Recoatable Epoxy Undercoat	1x75 Microns
c)	Recoatable Epoxy Finish	1x35 Microns

7. DECK FITTINGS
(RECOATABLE EPOXY SYSTEM)

a)	Epoxy Primer	1x50 Microns
b)	Recoatable Epoxy Undercoat	1x75 Microns
c)	Recoatable Epoxy Finish	1x35 Microns

8. MACHINERY SPACE (EPOXY SYSTEM)

a)	Below Floor Plates		
	i)	Epoxy Primer	1x35 Microns
	ii)	Recoatable Epoxy Coating	1x75 Microns
b)	Above Floor Plates		
	i)	Epoxy Primer	1x50 Microns
	ii)	Recoatable Epoxy Undercoat	1x75 Microns
	iii)	Recoatable Epoxy Finish	1x35 Microns

9. CHAIN LOCKER, ANCHORS, CHAINS & VOID SPACES

High Build Bituminous Paint	1x250Microns

2.18.3 Pipe work Coloring

All exposed piping systems will be identified with colour bands in accordance with the following colour schemes:

1)	Bilge and Ballast	:	Black
2)	Firemain	:	Bright red
3)	Fuel oil	:	Brown
4)	Lub oil	:	Yellow
5)	Hydraulic oil	:	Purple
6)	Sea suctions	:	Green
7)	Seawater cooling	:	Light green
8)	Compressed air	:	White

2.19 Deck Inventory

2.19.1 Anchors, Chain Cables and Ropes

- 2 - Anchor, 200 kg. each
- 2 - Chain cable, high strength, welded, 8 mm dia 45 m line
- 1 - Stream wire, F.S. WR. 6 x 24, 16mm dia, 90 m in lenght
- 1 - Spare anchor shackle
- 2 - Spare joining shackles
- 1 - Chain hook
- 1 - Shackle punch

2.19.2 Compass & Nautical Equipment

- 1 - Bell, 150 mm in diameter
- 1 - Compass, table mounted, 150 mm card diameter

2.19.3 Navigation Lights and other Lamps.

- 1 - Starboard side lamp, electric
- 1 - Port, side lamp, electric
- 3 - Mast head lamp, electric
- 1 - Stern lamp, electric
- 1 - Anchor lamp, electric
- 1 - Search light (200 mm dia 500 watts)

2.19.4 Signal Equipment

- 1 - Foghorn
- 3 - Black balls
- 2 - Rocket signals
- 4 - Parachute signals

2.19.5 Flags, etc.

- 1 - Bangladesh ensign
- 1 - Set-hand signal flags
- 1 - Set-International Signal flags
- 1 - International code of signal

2.19.6 Canvas Covers

- 1 - each-Rigging screw cover
- 2 - Chain pipe covers
- 1 - Compass cover
- 2 - Searchlight covers

2.19.7 Fire Fighting Appliances

- 1 - Co_2 extinguisher - 6 kgs
- 1 - Powder extinguisher - 7 kgs.
- 1 - Deck-wash connection consisting of a deck valve with 1½" hose coupling and hose.
- 2 - Nozzles of required size
- 1 - Breathing apparatus
- 1 - Fire axe
- 1 - Flame safety lamp

2.19.8 Boatswain's & Carpenter's Stores

- 2 - Sounding rods
- 1 - Wooden spike
- 1 - Steel spike
- 2 - Chipping hammers
- 1 - Hand hammer
- 1 - Claw hammer
- 1 - Chisel
- 1 - Plane
- 1 - Axe
- 1 - Tinman's scissors
- 2 - Oil stones
- 1 - Tape measure
- 1 - Crow bar
- 1 - Serving board

10 - Padlocks
2 - Hawsers gratings
2 - Rat guards
1 - Serving mallet
2 - Paint scrapers
2 - Paint scrapers with long shafts
4 - Paint brushes
2 - Wire brushes
1 - Oil can
1 - Oil funnel
1 - Oil feeder
1 - Portable oil lamp
1 - Portable hand bilge pump
1 - Shifting spanner
1 - Bottom plug spanner
1 - Filling pipe spanners
2 - Spanners
2 - Tar brushes
1 - Pincer
2 - Sounding pipe spanners
1 - Key box
1 - Key hanger board

C-3. MACHINERY

3.1 General Description

All machinery including main and auxiliary engines, crane, pumps, equipment etc. will be of approved type and supplied with certificates as required by the classification society. All such machinery will be of reputed make, popular and well known in Bangladesh and have proven satisfactory after sales service and spare parts facilities. We shall submit a proposal to the Purchaser on the make and model of equipment. No machinery will be procured/supplied or installed without the prior written approval of the purchaser.

3.2 Main Engine

The propulsion machinery will be brand new, popular and well known in Bangladesh, which has proven after sale service facilities and readily available spare parts.

The power for propulsion will consist of one unit of marine diesel engine complete with all accessories, pumps, etc. as follows:

Make	: Reputed make
MCR	: 250 BHP
RPM	: Not exceeding 1800 at MCR
Cooling System	: Fresh water heat exchanger cooled.

3.3 Propeller

The propeller will be of standard 3/4 - blade type made of manganese bronze.

3.4 Propeller Protection

At the outside of propeller, a propeller protection thrust increasing fixed nozzle will be fitted.

3.5 Propeller Shaft

The propeller shaft will be of high quality steel and covered with stainless steel in way of after bearing. The bearing will be of rubber cutlass.

3.6 Stern Tube

The mild steel stern tube will be of heavy construction with a sturdy connection to the hull at the fore end and will contained forward and aft bearing bushes and stuffing gland to meet the rules of Class.

3.7 Auxiliary Sets

The electric power plant will consist of one main diesel driven generator set and one harbor use diesel generator set, installed in the engine room complete with the driving unit. Capacity of the main generator will be such that it can meet the full requirement under normal navigation etc. The harbor generator set will be sufficient for necessary pump, light etc. when the vessel lies at anchor.

3.7.1 Main Generator

Make - reputed make
Prime mover Make – reputed make
Alternator Make - reputed make
25 KVA at 1500 rpm
220 V AC, 50Hz, 1 Ph, 0.8Pf

3.7.2 Harbour Generator

Make – reputed make
5kW at 1500 rpm
220 V AC, 50Hz, 1 Ph, 0.8Pf

3.8 Steering Gear

One manual hydraulic system, as described in section 2.15.4, will be provided with steering stand in wheelhouse. In case of failure of the system, alternative (Manual steering) arrangement will be provided.

3.9 Bilge/Ballast Pump

One bilge pump driven by the main engines will be supplied. Two double acting hand bilge pumps will be supplied and fitted, one in the engine room and one in the forepeak for forepeak and store.

Make - reputed make
Motor - 0.75 kW

3.10 General Service Pump

One (1) horizontal self-priming centrifugal pump will be supplied.

Make - reputed make
Motor - 0.75 kW

3.11 Engine Room Ventilation

For adequate natural ventilation of the engine room one ventilation cowl will be provided.

3.12 Engine Exhaust

Insulated exhaust pipes with silencers will be provided as required for end exhaust.

3.13 Control and Alarms

The main engine revolutions and gearbox operation will be mechanically remote controlled from the wheelhouse. An instrument panel will be fitted in the wheelhouse dashboard, complete with stopping button and starting key, optical and acoustical alarms, meters etc.

The alarm system will consist of a separate control light for each alarm and combined electrical horn will be provided for the engine:

- Temperature of cooling water
- Main engine oil pressure
- Gear oil pressure (only control lamp)

A push button will be fitted to reset the alarm horn.

Following gauges will be provided for main and auxiliary engines:

- Oil pressure
- RPM
- Cooling water temperature.

3.14 Cooling System

The main engine will be cooled by it's own closed fresh water-cooling circuit.

3.15 Deck Machinery

One hydraulically operated crane of 2.0 ton hoisting capacity at 8 meters radius will be provided/fitted.

C-4. ELECTRICAL INSTALLATION

4.1 General

Only good quality marine fittings shall be supplied and fitted.

Complete electrical system is to be designed and installed in accordance with classification society and other rules and regulations concerned.

Everything necessary for the working of the electrical system whether specially mentioned or not, is to be supplied and fitted to the satisfaction of the Classification Society.

4.2 Installation Standard

These are to the rules and regulations of the Classification Society for the class and type of vessel specified.

4.3 Cables:

All cables employed for the vessel shall comply with the requirements of the classification society rules. In general, all cables are to be ERP insulated, PVC sheathed and steel wire braided marine cables.

In general, cables are to be arranged and laid in a neat manner adequately supported on cable trays supported by galvanized steel hanger and fitted with supporting clips.

Where cables are exposed to weather, they are to be protected by steel pipe (SGP).

4.4 Power Sources:

a) AC Power

Two in number as detailed in machinery specification.

b) DC Power for starting, lighting and emergency

Two (2) batteries with 12 V, 200 Ah. each, shall be installed in lead plate lined steel box. The battery shall be secured and placed on a wooden platform. On the engine a 40 Amp. 24 V alternator shall be mounted to charge the battery. The batteries to be used for electrical starting of the engine and supplying for lighting and other electrical equipment.

4.5 Switchboard

The switchboard shall be placed in the wheel house, with double pole, moulded case type circuit breakers or fuse with switch for the following group:

- Navigation lights
- Second top light
- Search light
- Whistle

- Wipers
- Clear view screen
- Main engine and instruments

A time switch shall be fitted in the switchboard for the engine room lighting. Meters shall be provided for voltage and charging/discharging of the battery.

4.6 Shore connection 440 V:

A wall plug with 20m cables, connected to a fuse box with 440V plug socket.

4.7 Lighting

a) Engine room

5 bullseyes 20W each with time switch in wheel house on switchboard.

b) Wheelhouse

One ceiling light 20W with diffuser for variable illumination. One 8 W light to facilitate further lighting for all time operation.

c) Main deck

Waterproof deck lights of 60W at the aft and fore side of the wheelhouse or near the steering position as is required.

d) Navigation Lights

1 No. Starboard lamp
1 No. Port lamp
1 No. Stern lamp
1 No. Anchor lamp
1 No. Masthead lamp

Make - reputed make

e) Deck flood Lights

Flood lights will be of 300 W capacity each. Two will be fitted onboard.

Make - reputed make

4.9 Nautical Equipment

a) Signaling Lamp
A morse lamp will be fitted on main mast trunk and operating key on steering console.

b) Search light

A 20 cm 500 watt. searchlight will be fitted on top of wheelhouse with provision for movement up and down as well as all-round with control arrangement located conveniently on the right of the wheel. One set of spare bulbs will be supplied.

Make - reputed make

c) Whistle/Horns

On the wheelhouse top a horn will be fitted fed from A/C power system, control in the steering wheel as described in sec 2.15.11.

5. Clear view Screen

One standard clear view screen will be fitted in one of the front windows of the wheelhouse.

C-5. TOOLS

With the vessel complete with engine, equipment, tools, accessories and tools and on board spare parts will be provided & supplied. List is provided hereunder.

5.1 TOOLS

Description	Qty.
Deck	
Wire brush	6
Cable punch	2
Cold chiesel 150mm	1
Cold chiesel 220 mm	1
Grease Gun	1
12" Hacksaw c/w 12 spare blades	1
Chipping hammer with shaft	6
1 lb Claw hammer with shaft	1
2 lbs hand hammer with shaft	1
7 lbs sledge hammer with shaft	1
Screw driver 300 mm	3
- 200 mm	3
- 150 mm	3
Galvanized shackles	
- 1 ton S.W.L. (harp)	2
- 2 ton S.W.L. (harp)	2
- 1/4 ton S.W.L. (harp)	2
- 1 ton S.W.L. (harp)	2
Spanner- 300 adjustable	1
Sounding tape	1
Engine Room	
"Allen" key	
Chain Block - 1 ton S.W.L	1 roll
Double sheaves - 1/2 ton S.W.L.	1
Wire brush	6
Electric drill - portable	1
Electric grinder - heavy duty	1
Grease gun	1
Feelers	1 set
Files 6 assorted with handles	1 set
Hacksaw 12" c/w 12 blades	2
Hammer - Chipping with shaft	3
- 2 lbs hand with shaft	2
- 7 lbs hand with shaft	1
Slide calipers - 200 mm	1
Punches (11, 14, 18, 21 mm)	4 each
Plier - inculate type	1 pair
- ordinary	1 pair
Punches – assorted	1 set
Scissors - 8"	1 pair
Scrapers - 3 assorted bearing	1 set
- 3 paint	1 set
Screw driver - three assorted	1 set
Sounding tape	2 nos.
Thermometer	2 nos.

Description	Qty.
Deck	
Vice - 150 mm	4
Work bench – steel	1
Clock	1
Tool box, steel	1
Socket box wrench	24 pcs
Double end open spanner	16 Nos. (from 3/8 to $1^{1/2}$)
Double end ring spanner	16 Nos. (from 3/8 to $1^{1/2}$)

C-6. ELECTRIC NAVIGATION AIDS & HYDROGRAPHIC EQUIPMENT

6.1 Echo Sounder (Digital Depth Indicator):

The equipment shall be new, unused, high quality and current commercial design & technique. It shall be made of components that will be supported by vendors at least ten years. The equipment and materials shall be suitable for operation under the environmental condition of Bangladesh. The equipment shall be maintainable in the field to the lowest replaceable unit by local personnel. The equipment must be light weight, robust, accurate and in waterproof enclosure and corrosive resistance. All parts and accessories of the equipment shall be free from manufacturing and/or material defect such as breaks, cracks, dents, deformation etc. when delivered at the place of destination. The equipment shall be fitted with the vessels. The transducer shall be hull mounted & provided in a watertight compartment in the bottom.

Labeling:

For equipment and all major components nameplates from original component manufacturer shall be attached and nameplates shall bear mode, serial numbers, year and place of manufacture, safety warnings and any other information critical to the component.

Codes and Regulations:

The equipment to be supplied under the specification shall be designed, built and equipped in conformity with the international standards, codes and regulations.

Spares:

The equipment shall be supplied with spare parts, component and assemblies adequate for three years consumption. The spare parts must be listed & priced individually and the spare parts price must be included with the quoted price.

Tests and Acceptance:

The supplier shall arrange transportation of the equipment/Goods inspection and tests. Tests will be taken in the field (river) around Narayangonj/Chandpur/Aricha. Supplier will, at his cost, assemble/install the equipment and demonstrate their operation. On successful completion of the tests, the Purchaser will issue acceptance certificate.

Maintenance Manuals:

One complete set of maintenance, installation and operation manuals shall be provided for each of equipment. The manuals should have detail and comprehensive circuit diagrams as are required to diagnose and rectify faults. Photographs block schematic circuits and other diagrams shall adequately illustrate the text of each manual. The manuals must be in English language. The maintenance manuals should be adequate for skilled technicians to fully test and repair the equipment by replacing any parts therein.

The Goods and related services shall comply with following Technical Specification as minimum-

Name of Item/Related services	Technical Specification
Type	Single Frequency Hydrographic Survey Echo-Sounder
Unit	Feet or Meter (User selectable)
Depth Range	0.5-150 Meter
Frequency	200/210 KHz
Required Power	11-30 VDC with polarity protection
Accuracy	1cm±0.1%depth
Depth Resolution	1cm
Depth range selection	Auto and Manual (User selectable)
Printer	Should be high resolution thin film thermal printer capable of printing depth, time, fix number, position, scale and other parameters of the chart.
Scale Line	Should be noted automatically at least one set of beginning and ending values which shall be visible in the chart window at all times.
Display	LC Display for digitized depth
Digitizer	Capability of digital signal processing. Digital depth data output through RS/USB/PS ports
Draft Adjustment	0-5 meter adjustable at 1cm steps
Ports & interfacing	BI-directional RS/USB ports should be available for interfacing with DGPS/GPS & PC. The Echo-sounder should accept Data Acquisition Software.
Operator Control	It should have the controls of On/Off, sensitivity, transmit power, chart speed, paper advance, digitized depth, tide/draft adjustment, time and date, manual/remote fix mark command, sound velocity input etc. on the front panel.
Environmental Condition	Operating temperature 0 to 50^0C Storage temperature-5^0 to 55^0 C Relative humidity 95% non-condensing
Paper Speed	Should have variable chart speed (at least 3 steps) Varied from 1cm/min. to 20cm/min.
Transducer	Inboard/Keel fittings type 200/210 KHz Transducer with all necessary fittings & fixture.
Spare Parts	Spare parts, components and assemblies for three years consumption must be listed separately with unit Price. But the price shall be included with the total quoted price. Spare parts for Echo sounder for 3 years consumption shall be as following: i. Power supply unit (PCB with components) ii. Printer assembly.
Accessories	i) Remote hand/foot fix marker, power cable, interfacing cable etc. ii) 25 Nos. Recording Chart Paper roll for each equipment iii) Operational and Technical Manuals iv) Special types tools if any required for servicing
Country of Origin	EU Countries/USA/ Australia/ Canada/Japan/India.

6.2 DGPS receiver:

All equipment shall be latest design & technique, high quality, new and unused. All the components (spate parts) must be supported by vendors for at least 10 (ten) years.

Item No.	Name of item or Related Service	Technical Specification and Standards
1	2	3
Receiver GPS:		
	Type	L1 freq. C/A Code, 12 Channel continuous tracking
	Update rate	At least once per second
	Accuracy	1-5m 2DRMS Position with DGPS ± 0.05m/s Velocity with DGPS.
	Dynamics	Velocity: 460 m/s
	Time to first fix	Less than 1 minute with almanac 15 minutes from cold start.
	Reacquisition	5-15 seconds.
	DGPS Input	RTCM SC-104 format, from internal beacon receiver and from external source connected to data port
Beacon:		
	Type	Automatic or Manual tuning.
	Frequency	283.5-325 KHz in 500Hz steps
	Bit rate	200 (auto-syne)
	RTCM Messages Supported	1, 2, 3, 5, 7, 9, 16
Display:		
	LCD	At least 5 inch Diagonal screen, B/W, backlight LCD display.
	Key board Consists of:	i) **Function keys:** Navigate, Route, Go to, Waypoint, Mark or Event, Plot, Man over Board, Tide, Auxiliary, Position, GPS, DGPS, Configuration, Edit, Clear, Power on/off, Mark position, Day/night view. ii) Cursor key iii) Soft keys.
Antennas:		
	Type	Combined (GPS and Beacon)
	Freq	GPS L1, 1575 MHz Beacon 283.5-325KHz
	Cable length	30 meters (100ft)
Environmental:		
	Operating temperature (CDU)	0 to 50^0 C
	Operating temperature (Antenna) Storage Temperature	0 to 60^0 C 0 to 60^0 C
Power:		
	Type	DC
	Consumption	Less than 10 W
	Supply Voltage	11-30 VDC with polarity protection
	Fuse	Internal over current/over temperature fuse.
	DGPS Status Display	i) Tracking station frequency, ID, and Distance ii) Baud rate, noise and signal strength. iii) Satellite Number (PRN), respective correction and correction are.
	DGPS Station selection	Both Auto and Manual.
	Alarms	Message 16 Alarm, No DGPS data, DGPS Health Changed, Antenna Alarm, HDOP Alarm, No update Alarm, No log data.

	Configuration	Alarm, Datum, Depth, DGPS, Dual control, GPS, Initial position, Lighting, Log, Navigation, NEMA, Operation, Position, Time.
	Language	English.
	Position reference system	Lat/Lon and Grid.
	Datum configuration	Including Bangladesh.
	Display Lighting condition	Quickly switch able between two predetermined display (day time/night time).
Inspection		
	The inspection shall be conducted after installation on Tugboat at Narayangonj/Aricha. A five member committee of BIWTA will inspect the goods. All inspection cost will be borne by the supplier.	
Manuals:		
	Operational manual and installation & Service manual will be supplied for each set. Brochure, technical specification of manufacturer and user's manual will be supplied with the tender.	
Country of Origin	EU Countries/USA/ Australia/ Canada/Japan/India.	

C-7. SPARE PARTS FOR CRANE BOAT

With the vessel complete with engine, equipment, tools, accessories and tools and on board spare parts will be provided & supplied. List is provided hereunder.

7.1 **List of SPARE PARTS for 3 Nos. Crane Boat.**

Main engine:

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Cylinder Liner with rubber seal	6 sets (1 set=1 No.x No. of Cylinder)		
2	Piston	6 sets (1 set=1 No.x No. of Cylinder)		
3	Piston pin	6 sets (1 set=1 No.x No. of Cylinder)		
4	Piston rings	6 sets (1 set=1ring group x No. of Cylinder)		
5	Main Bearing	6 sets (1 set=1 pair x No. of Cylinder)		
6	Big-end-bearing	6 sets (1 set=1 pair x No. of Cylinder)		
7	Thrust bearing	6 sets (1 set=1 pair)		
8	Cylinder head gasket	6 sets (1 set=1 No.x No. of Cylinder)		
9	Exhaust valve	6 sets (1 set=2 Nos. x No. of Cylinder)		
10	Inlet valve	6 sets (1 set=2 Nos. x No. of Cylinder)		
11	Insert exhaust	6 sets (1 set=2 Nos. x No. of Cylinder)		
12	Insert inlet	6 sets (1 set=2 Nos. x No. of Cylinder)		
13	Valve spring	30 Nos		
14	Valve guide exhaust	6 sets		

		(1 set=2 Nos. x No. of Cylinder)		
15	Valve guide inlet	6 sets (1 set=2 Nos. x No. of Cylinder)		
16	Injector nozzle	6 sets (1 set=1 No.x No. of Cylinder)		
17	Plunger barrel for fuel pump	6 sets (1 set=1 No.x No. of Cylinder)		
18	Cooling water pump rebuilt kit	6 sets (2 Nos. for each complete pump)		
19	Complete engine overhauling gasket Kit	6 sets (2 Nos. for complete engine)		
20	Lub. oil filter	30 Nos		
21	Fuel oil filter	30 Nos		
22	Bolt for connecting rod	20 Nos		

Hydraulic System

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	High pr. Pipes	60 nos.		
2	Seal for Ram/Boom (different sizes)	40 nos.		

Registration & Survey of Crane Boats (with Directorate of Shipping /Mercantile Marine Department of Bangladesh) must be completed by supplier's own cost.

D. TUG BOAT

D-1. General particulars of Tug Boats

1.1	**Principal Particulars**		
	Length O.A (about)	:	26.00 m
	Breadth (about)	:	8.00 m
	Depth (about)	:	3.0 m
	Draught loaded (maximum)	:	1.85 m
1.2	Propelling Machinery		
	Number of engines	:	2 nos. (Twin Screw)
	Make	:	Diesel marine engine of reputed make
	Country of origin	:	EU Countries/USA/ Australia/ Canada/Japan/India.
	Power	:	Necessary to render the services intended
1.3	**Performance**		
	Trial Speed at MCR	:	10.50 Knots at 1.85 m draft under fully loaded condition in the river water.
	Bollard Pull (min)	:	Not less than 10.00MT at MCR
	Maneuverability	:	Two and a half ship's length
	Cruising Range	:	750 nautical miles
1.4	**Capacities**		
	Fuel oil tanks 100% full	:	about 10 cubic meters
	Fresh water tanks, 100% full	:	about 5 cubic meters

Tug boat equipped with 1 no. backside capstan & which will be operated by automatically and manually. There should be derrick which will be operated by motor and manually. A dotter boat should be provided.

1.5 Classification/Regulations/Certificates/Registry

The following rules and regulations are to be complied with:
Maritime regulations of Bangladesh;
SOLAS 1974 with latest amendments
International convention for the prevention of collision at sea 1972
International convention for load lines, 1966
IMO stability guideline including weather criteria
Other rules and regulations applicable
The vessel including its hull, equipment and machinery shall be designed, manufactured, built and classed under the special survey and to classification requirements of reputed international classification society being a member of IACS having an office in Bangladesh. The appropriate class notations for hull and machinery to be mentioned in the offer.

Registration & Survey (with Directorate of Shipping /Mercantile Marine Department of Bangladesh) must be completed by supplier's own cost.

1.6 Complement

Officer	2
Master-1	1
Driver-1	1
Quarter Master	2
Greaser	3
Lasker	4
SSB Operator	1
Officer Cook	1
Topash	1
Bhandari	1
Total	17

1.7 Vibration and Noise

Special attention will be paid to the detailed design, construction and fitting of the vessel to minimize vibration and noise. Every effort will be made to eliminate rattles emanating from joiner work, furniture etc. Materials for sound damping will be of the approved type.

The Shipyard will mount machinery on vibration dampers where required. Any unsatisfactory condition found during trials, resulting from the excitation of resonant frequency in any equipment, not otherwise attributable to a major hull or machinery vibration problem will be corrected by the shipyard by approved effective means.

Sound levels

The sound levels measured will not exceed the following:

Officers accommodation-not more than 85 dBA.
Crew accommodations and messes-not more than 85 dBA.

1.8 On Board Spare Gears and Tools

The vessel will be equipped with onboard spares and tools (including common and special type, headsets, tools boxes etc.).

Boatswains' inventory

The Shipyard will supply adequate number of tools etc. to complete the Boatswain's inventory and the list will be requested by the Shipyard from the owner during the construction period.

Galley Inventory

The shipyard will supply galley inventory as required by the Purchaser for this type of vessel.

1.9 Speed & Endurance

The trial speed under the fully loaded condition at the maximum permissible draft 1.85 meter with clean bottom and in calm river, at the maximum continuous power rating of the main engines (M.C.R.) will not be less than 10.50 knots.

1.10 Materials and Workmanship

The Shipyard will supply all materials, equipment and machinery required for the completion of the vessel. All these materials and equipment supplied by the Shipyard will be new and of latest designs and intended for marine use and in accordance with the rules and regulations mentioned above and also other requirements of the statutory bodies concerned.

All workmanship entering into the construction of the vessel will be in accordance with good normal practice for this kind of ship.

Steel materials used for the structure of the hull will be open hearth or electric furnace processed mild steel of a good, uniform and shipbuilding quality certified by the Classification Society for compliance with its rules.

All timber will be free from rots, saps and shakes and reasonably free from knots, and also well seasoned. All plywood will be of marine quality.

1.11 Drawings Instruction Books etc. and Approval

Before work commenced, the builder will submit to the owner for approval of the following drawing and the owner must return these with promptness. All the drawing will be approved by the classification Society.

i) General Arrangement plan
ii) Lines Plan
iii) Hydrostatic curves and tables
iv) Cross curves
v) Stability and calculations stability Booklet
vi) Capacity plan
vii) Docking plan
viii) Sounding tables
ix) Mid ship section
x) Profile and dock plans
xi) Shell plating.
xii) Aft ship construction
xiii) Fore ship construction
xiv) Rudders and rudder stocks
xv) Main engine seating.
xvi) Deck arrangement plan
xvii) Double bottom plan
xviii) Mast and rigging
xix) Hatches
xx) Air and filling pipes
xxi) Deck house
xxii) Ventilation arrangement
xxiii) Bulkheads
xxiv) Shaft arrangement.
xxv) Engine room arrangement
xxvi) Accommodation plan
xxvii) Pipe diagrams of all systems
xxviii) Electrical diagrams
xxix) Fire plan
xxx) A complete ships' instruction book will be delivered and the owner giving details of all machinery and equipment's

D-2. HULL

2.1 Hull Structure

2.1.1 Steel Work in General

The hull including superstructures will be constructed of steel throughout on the transverse system of framing. Good continuity of structural members in the basic hull structure will be maintained, and, where members are discontinuous, continuity will be provided with by means of suitable tapers, overlaps, doubler plates and/or brackets.

The workmanship will be such as to ensure reasonable fair lines and smooth surfaces, attention being given to the neatness of structural connections especially where exposed to view in living quarters. Cuts in structures for engineering systems such as ventilating ducts, piping systems and electrical cables will be made according to good practice, and portions unduly weakened by cutting such holes will be suitably compensated.

2.1.2 Welding

Electric arc welding will be applied to all connections of structural members. Portions of members where welding is to be applied will be well prepared prior to welding work in order to obtain good results. Qualified welders with coated electrodes will execute manual welding. The materials and the procedure of welding will comply with the requirements of the Classification Society regarding welding.

2.1.3 Keel & Stem

The keel will be of flat plate type and properly shaped into & secured to the stem. All butts and seams will be welded. The stem will be built of welded steel plate stiffened by breast hooks, and the front face well rounded toward the top.

2.1.4 Shaft Brackets

The end of each propeller shaft will be supported by streamlined 'A' type shaft bracket of cast or fabricated steel construction with arms well rooted into and fixed to the bottom structure. Suitable local stiffening will be arranged in the hull in way of shaft brackets.

The boss will be of cast steel and the arms of fabricated steel plate or cast steel. A white metal lined bronze bush will be fixed in the boss.

2.1.5 Rudder

The vessel will have two rudders of double-plated, stream-lined balanced, suspended type of welded construction. The rudder stock will be of forged steel and connected with the rudder body by a pair of horizontal couplings or rooted into the rudder body. The stock will have a bronze sleeve in way of the neck bearing of bronze. The weight of the rudder will be carried by a rudder carrier made in halves.

2.1.6 Bottom Construction

The bottom will be of cellular double system in way of crew accommodation, forepeak etc. and of single bottom system elsewhere, and constructed on the transverse system of framing.

Solid floors will be provided at every frame station. These floors will be generally kept continuous from the centerline keelson to ship's sides.

The centre keelson will generally be continuous and side keelsons generally inter coastal. Under the main engines, strong continuous engine girders with strong top plates will be installed, and floors will be cut where they interest with these engine girders. In the forward region, the bottom will be reinforced as required by the rules.

2.1.7 Side Framing

Side transverse frames will be fitted at a space of 500 mm. apart and made of inverted steel angle bar welded to the shell plating.

Necessary web frames will be fitted. These web frames will be arranged in line with strong beams and pillars as far as practicable.

A side stringer will be provided on each side in way of the forward hull and the engine room.

2.1.8 Bulkheads

Main watertight transverse bulkheads will be arranged extended up to the main deck. These bulkheads will be of welded flat type reinforced with vertical stiffeners bracketed at top and bottom as far as practicable all bulkheads will be tested as required by the rules.

2.1.9 Shell Plating

All butts and seams of the shell plating will be welded. The shell plating in way of large openings will be properly compensated with doubler plates or by increasing thickness. Bilge keels will be fitted in way of about one third the ship's length amidships.

2.1.10 Main Deck

The main deck will be plated over with steel plates in all butts and seams. Thicker plates or doubler plates will be laid at corners of large openings where considered necessary. The deck stringer plates will be directly welded to the sheer strakes.

Beams will be fitted transversely at every frame station & formed of inverted steel angle bar welded to the deck plating. Under-deck girders will be provided to support and stiffen the deck in association with pillars and strong beams.

The deck will be well reinforced in way of deck machinery and other heavy articles.

2.1.11 Machinery Foundations

Foundations under machinery will be of welded construction well connected to the bottom or deck structure, and strong enough to stand up to the loads and vibrating forces of the machinery installed thereon. The top plates, webs and brackets will be of sufficient thickness.

Each main engine foundation will consist of continuous engine girders with strong top plates, constructed as an integral part of the bottom structure. Care will be taken to keep efficient continuity of strength at their ends.

Foundations of the generating units, engine room auxiliaries, deck machinery, etc., will be constructed on the bottom or deck structures which will be suitably reinforced in way.

2.1.12 Deckhouse

Deckhouses will be constructed of steel plate. Bulkheads will be reinforced by vertical stiffeners, and decks over these structures will have transverse beams in the same manner as the main deck. Under-deck girder will be provided as necessary.

2.1.13 Tanks

Tanks for fuel oil, fresh water and water ballast will be arranged as integral with the hull structure.

Necessary pipe lines, i.e. filling, suction, sounding and air escape pipes and also access manholes will be provided for these tanks.

2.1.14 Accommodations

Single cabin (A.C) shall be provided for 2 (two) Officers with attached bath room, toilet & shower and one cabin for Master and Driver on the main deck. One cabins shall be provided in the under deck accommodations space for 13 crews. A store room shall also be provided in the under deck space.

Cabins shall contain bunk (s) with mattress pillow, lockable cupboards, lights and ventilations fans.

On the main deck galley, 2 (two) toilets, bath room, with shower and mess room shall be provided.

2.2 Hull Fittings and Deck Machinery:

2.2.1 Mast

A steel mast will be erected on the wheelhouse top to carry mast lamp brackets and a halyard for hoisting flags and spreading antennas. The upper portion of the mast in excess of 7.93m in height above the water level will be collapsible.
A galvanized tubular steel antenna post/flag staff will be provided at the rear end of the bridge deck.

2.2.2 Mooring & Anchoring Gear

One set of electric windlass of European origin with two gypsy wheel and two warping ends, capable of a total pull of 1.00 tons at a speed of 8 meters per minute, will be installed on the main deck

forward. Hawse pipes will be made of welded steel pipe having bell mouths & deck pieces of steel half-round bar welded to the shell and the deck plating.

Chain cable compressors will be provided between haose pipes and the windlass.

2.2.3 Steering Gear

Both electro-hydraulic system and mechanical system shall be provided for operating steering wheel from the wheel house.

One set of Electro-hydraulic steering gear of suitable torque and capacity for twin rudder arrangement will be installed in the steering gear room. The steering gear will be energized by hydraulic pressure generated by a hydraulic pump, and the whole gear will be controlled by the steering wheel pedestal in the wheelhouse through a hydraulic telemotor system.

The steering gear will be capable of moving the rudders from 35 degrees on any one side to 30 degrees on another side within 15 seconds.

The hydraulic transmitter of the telemotor incorporated in the steering wheel pedestal will automatically be connected directly to the cylinders of the steering gear through a change-over valve in case of emergency steering and, in this case, the gear will be capable of turning the rudder from 15 degrees on any one-side to 5 degrees on the other side in 60 seconds, when the ship is running at a speed of 7 knots.

The steering gear motor will be arranged for starting by a switch in the wheelhouse, and in addition, no-voltage and overload alarms will be provided in the wheelhouse and the engine room.

One rudder help indicator will be fitted in the wheelhouse. A hand pumping system will be provided for emergency use.

2.2.4 Towing Gear

A towing hook with buffer spring of a capacity of 10.5 tons will be provided on the rear end wall of the engine casing, arranged to sweep on half-circular steel rail.

A tubular steel bit will be provided at the bow end, rooted down through the deck and fixed to the bulwark. One set of double cross bit will be provided on the main deck just abaft the towing hook. The tubular steel bit will be provided on each side, fixed to the deck and the bulwark. The steel towing beams with hardwood railing will be provided over the main deck aft.

2.2.5 Bulwarks

Steel plate bulwarks of adequate strength to be 1.0m height with wood top rail. Stays of requisite thickness and flange width to be arranged as required.

2.2.6 Fender

A hollow half-round steel fender with longitudinal stiffening inside will be provided around the main deck. Large rope fenders will be provided at the bow and stern.

2.2.7 Rails, Stanchions etc.

Open handrails will be fitted around the bridge deck. These handrails will consist of tubular steel top rails, stanchions of steel flat bar and solid steel intermediate rails. The height of the handrails will be about 1.00 m on the bridge deck on the wheelhouse top. The materials of handrails will be galvanized. Storm rails of galvanized steel pipe will be fitted on the exposed walls of the deck house where considered necessary.

2.2.8 Stairways, Ladders and Steps:

All stairways will be of steel. These stairways will have non-skid treads and galvanized tubular steel handrails.

The minimum width of stairways on the exposed decks will be 50 cm. and those inside deckhouses will be at least 60 cm. in width.

Steel vertical ladders will be fitted for access to the wheelhouse top, store forward, steering gear room, store space aft. etc. as necessary. Steel steps of steel round bar, in tanks, etc. as necessary.

2.2.9 Hatches and Manholes

The hatchways to spaces under the main deck will have steel coamings and will be closed by hinged watertight steel covers. In addition, a large flush hatch with bolted steel plate cover will be provided for the steering gear room. Oval manholes will be provided for access to tanks. These manholes will be closed by bolted flush steel covers.

2.2.10 Doors

Watertight steel doors will be provided at the entrances on the exposed steel walls on the main deck fullfilling the requirement of class.

The wheelhouse will have hinged solid hardwood door with glass panes. Inside doors to living rooms, officers' mess room, sanitary spaces and galley will be plywood paneled flush doors.

2.2.11 Natural Lighting & Ventilation

Natural lighting and ventilation system will be arranged as per standard shipbuilding practice.

2.2.12 Inboard Communication System

Voice tubes with whistles will be provided as listed below:
Wheelhouse - Engine room
Wheelhouse - Steering gear room

Voice tubes will be of seamless thin steel pipe except in the vicinity of magnetic compass where copper tube will be used.

2.2.13 Life Saving Appliances

The following life saving and signal appliances will be supplied:

Life buoy, solid	4
Life Jacket	8
Self-activating water light	4

2.2.14 Fire Fighting Systems & Appliances

A wash-deck and fire main pipeline will be installed along one side of the main deck. This line will be supplied with seawater by the general service pump and the bilge and ballast pump. Hydrants will be suitably arranged on the fire main line so that any part of the vessel can be reached by a powerful water jet.

Canvas fire hoses, 1.5" bore and 15 meters in length, complete with nozzle, will be supplied and stowed in red-painted cases located at necessary positions. Portable fire extinguishers will be supplied.

2.2.15 Zinc Protectors

Zinc protectors of required nos. & size will be fitted near sea valves, propeller, etc. to counteract electrolytic action.

2.2.16 Markings

The ship's name in both English and Bengali letters and the draught marks in metric scale will be cut from steel plate and welded on the shell, and painted as directed by the Purchaser.

Draught marks will be fitted at the bow, the stern and amidships.

Names of rooms in English language will be engraved on plastic plates and displayed over the entrance doors to these rooms.

2.3 ACCOMMODATION & SUNDRY SPACES:

2.3.1 Hardware:

All doors will be fitted with hinges, locks, hooks, handles, etc. as necessary. Doors of the toilets will have indicator bolts, and lockers and wardrobe will be fitted with suitable locks. Hardware will be of light alloy, chromium plated brass or equivalent. Keys of each lock will be supplied in duplicate. AC unit will be provided at officer's cabin and dining.

2.3.2 Multimedia system:

1 (one) video camera will be provided.

2.3.3 Furniture:

Necessary furniture, fitting, fixing & bedding accessories will be provided as per the standard shipbuilding practice. Furniture will generally be made of Burma teak and marine plywood. 1 (one) Television at the Cabin & 1 (one) Fridge at the dining room will be provided.

2.4 DECK PIPING

2.4.1 Piping in General:

Pipes, valves, cocks, flange, etc. will be of such qualities and dimensions as to comply with the requirements of the Classification Society. Pipes will be efficiently supported or embraced to stand up to probable vibrations. Care will be so taken where pipes are concealed by room furniture that reasonable access may be provided for overhauling. Where pipes pass through watertight bulkheads or decks, bulkhead or deck pieces will be fitted. Where the danger of mechanical damage is expected, pipes will be well protected by means of wooden or steel covering or guards.

Sufficient number of sectional shut-off valves will be provided for all systems so that any section can be shut-off for repair and maintenance.

2.4.2 Pipe Materials:

Pipes will generally be steel pipes of such qualities and dimensions as to comply with the requirements of the Classification Society. Galvanized pipes and flanges will be used for piping not coming into contact with oil.

2.4.3 Valves and Connection Pieces:

Valves of nominal bores, of 40 mm and less will be of bronze, while those of 50 mm and more will be of cast iron bodies.

Shipside valves, including storm valves, will be of bronze or cast steel bodies dependent on their nominal bores. Connections of pipes will be done by means of welded flanges generally, while screw sockets may be used at connection of water service pipes of small bores.

2.4.4 Fresh Water Service System:

A gravity tank for supply and distribution of fresh water tank complete with necessary pipes and fittings will be installed on the bridge deck and from this tank distribution lines will laid to the galley and sanitary fixtures as necessary. An additional fresh water suction line will be led from the fresh water tanks to the hand pump in the galley.

2.4.5 Daily Use Salt Water System

A gravity tank for supply and distribution of salt water for daily use will be installed.

The gravity tank will be replenished with seawater by the general service pump. An additional suction line will be led from the bottom to the hand pump in the galley.

2.4.6 Wash-Deck & Fire Main Piping:

The wash-deck and fire main pipeline will be installed along one side on the main deck. The pipeline will be supplied with sea water by the general service pump and the bilge and ballast pump in the engine room.

Hydrants will be suitably arranged on these main line so that any part of the vessel can be reached by a powerful water jet. Branch lines will be led also into the hawse pipes for washing down chain cables.

2.4.7 Bilge Pipe System:

Bilge water in the dry compartments under the main deck will be discharged by the general service pump and the bilge and ballast pump in the engine room. Each of these bilge service pumps will have a suction manifold and an independent overboard discharge. As for the bilge suction system in the engine room, the description in the Machinery Specification may be referred to.

Bilge water in the chain locker and the forward store will be discharged by a portable and pump through suction pipes led from bilge hats in these spaces to the weather deck above.
All bilge suction connected to power driven bilge suction systems will have non-return valves for the prevention of flooding into compartments for which they are installed.

An oily bilge water separator will be provided in the engine room.

Ballast System:

Ballast pipes will be led from all water ballast tanks and heeling tanks to the general service pump and the bilge and ballast pump in the engine room. The ballast pipe from the forward peak tank will have a stop valve at the collision bulkhead, which can be controlled through a spindle-gear system from the deck above.

Pipes will be so arranged that water in one heeling tank can be shifted to the other heeling tank by the bilge and ballast pump and the general service pump.

2.4.9 Drainage System:

Necessary number of scupper pipes will be fitted to the decks, tops of deckhouses, enclosed spaces, etc. and led overboard or to the next lower deck. Storm valves or non-return valves will be fitted as required by the rules. Scuppers will have necessary rose plates and arranged accessible.

Plumbing drain pipes will be carried down with proper slope near the water line and opened to sea through non-return valves or storm valves in accordance with the rules. The soil scupper pipes will be led directly overboard independent of other scuppers.

2.4.10 Filling Pipes and Overboard Discharge Pipes:

The fresh water tanks will have a common intake with branch pipes led into individual tanks.

A fuel oil filling port will be provided on each side of the main deck and connected to the fuel oil system in the engine room, from which oil will be distributed to fuel oil storage tanks.

A lubricating oil filling port will be provided on the main deck and led into the lubricating oil storage tank.

An overboard discharge pipe will be led from the fuel oil transfer pump in the engine room to a hose connection on the exposed portion of the main deck.

A similar overhead discharge pipe for fresh water will be led from the fresh water pump to the main deck, where a hose connection will be provided.

2.4.11 Air Pipes

Air pipes will be fitted to all storage and water ballast tanks. All these pipes will be led to weather decks and will terminate with gooseneck heads at height specified by the Classification Society.

Fire-protecting gauge screens will be fitted to air pipes from fuel oil tanks.

2.4.12 Sounding Pipes:

Sounding pipes will be fitted to tanks and bilge wells as necessary and led as straight and vertically as possible. At the tops of these pipes, bronze covers with names of compartments engraved clearly, will be fitted. Striking plates will be fitted under the lower ends of sounding pipes to protect the bottom plating.

2.5 Coating & Tiling:

2.5.1 Cementing & Tiling:

In the galley, the steel floor will be covered with grooved tile laid on cement bed of at least 35 mm in thickness.

In lavatories, the steel floor will be covered with ceramic mosaic tile laid on cement bed of at least 35mm in thickness. Tiling in these spaces will be carried up the sidewalls to a height of about 1500 mm.

2.5.2 Painting Schedule.

1. Bottom & Boot Top Area (Epoxy System)

   a) Anti Corrosive System
      i) Epoxy Primer 1x50 Microns
      ii) Epoxy 1x100 Microns
      iii) Sealer Coat Epoxy 1x100 Microns

   b) Antifouling System
      i) Self Polishing
      Antifouling Paint (for 24 months protection) 2x100Microns

2. Top Sides (Recoatable Epoxy System)

a) Epoxy Primer 1x50 microns
b) Recoatable Epoxy Undercoat 1x100 Microns
c) Recoatable Epoxy Finish 1x100 Microns

3. Deck (Recoatable Epoxy System)

a) Epoxy Primer 1x50 Microns
b) Recoatable Epoxy undercoat 1x100 Microns
c) Recoatable Polyurethene/Epoxy Finish 1x100 Microns

4. Ballast/Freshwater Tanks (Coaltar Epoxy System)

a) Epoxy Primer 1x50 Microns
b) Epoxy (two different shades) 2x100 Microns

5. Superstructure-Exterior (Recoatable Epoxy System)

a) Epoxy Primer 1x50 Microns
b) Recoatable Epoxy Undercoat 1x75 Microns
c) Recoatable Epoxy Finish 1x35 Microns

6. Superstructure-Interior (Recoatable Epoxy System)

a) Epoxy Primer 1x50 Microns
b) Recoatable Epoxy Undercoat 1x75 Microns
c) Recoatable Epoxy Finish 1x35 Microns

7. Deck Fittings (Recoatable Epoxy System)

a) Epoxy Primer 1x50 Microns
b) Recoatble Epoxy Undercoat 1x75 Microns
c) Recoatable Epoxy Finish 1x35 Microns

8. MACHINERY SPACE (EPOXY SYSTEM)

a) Below Floor Plates
i) Epoxy Primer 1x35 Microns
ii) Recoatable Epoxy Coating 1x75 Microns

b) Above Floor Plates
i) Epoxy Primer 1x50 Microns
ii) Recoatable Epoxy Undercoat 1x75 Microns
iii) Recoatable Epoxy Finish 1x35 Microns

9. Chain Locker, Cofferdam, Anchors, Chains & Void Spaces
High Build Bituminous Paint 1x250 Microns

D-3. MACHINERY

3.1 General

3.1.1 General Description:

Design conditions of machinery will be as follows:

Sea water temperature : 32^0C
Ambient temperature : 45^0C
Humidity : up to 100%

Atmospheric pressure : 760 mm Hg

The whole machinery, installations and supply of spare parts will comply with the requirements of the Classification Society and other rules and regulations concerned. Machinery, equipment and their accessories will be suitable for marine use and the purposes intended.

The propulsion machinery will consist of two sets of supercharged marine diesel engine with reverse/reduction gearbox having a total power sufficient to attain the speed and the bollard pull herein specified.

All machinery and equipment will be new of reputed make popular and well known in Bangladesh which have proven satisfactory after sale service and spare parts facilities.

Electric power required for the operation of the vessel will be supplied by two diesel driven main generator sets installed in the engine room.

All necessary auxiliary machinery, heat exchangers, tanks and other miscellaneous equipment will be installed for satisfactory operation of the vessel according to the requirements of the Classification Society and other governing bodies concerned.

3.1.2 Particulars of Machinery in Engine Room:

Main engine 2 sets.

Make – Reputed make
Power – required to achieve the speed and bollard pull intended

Airless injection, trunk piston, uni-directional, supercharged,
marine diesel engine with reverse/reduction gearbox.

Diesel generator 2 sets.

Make : Reputed make
Marine A.C. generator, driven by independent diesel engine
Generator 40 KVA x 405 V x 3 phase x 50 Hz

Fuel oil transfer pump 1 set

Make - Reputed make

Electric motor driven, rotary gear pump
8 m3/h x 20 m x 1.5 KW

General Service Pump 1 set

Make - Reputed make

Electric motor driven, self-priming,
Centrifugal pump 20 m3/h x 20 m x 3.7 KW.

Bilge and ballast pump 1 set

Make - Reputed make

Electric motor driven, self-priming,
Centrifugal pump 20 m3/h x 20m x 3.7 KW.

Fresh water pump 1 set.

Make - Reputed make

Electric motor driven, centrifugal
Pump automatically controlled, combined with
Pressure tank 5m3/h x 25m x 1.5 KW

Seawater pump 1 set.

Make - Reputed make

Capacity same as F.W. Pump

Bilge pump, manual control 1m3/h x 0.4 KW. 1 set

Engine room ventilating fan 2 sets.

Electric motor driven, vertical, axial-flow,
Reversible fan 60m3/min x 25mm aq x 0.75 KW

3.1.4 Particulars of Heat Exchangers in Engine Room:

Fresh water cooler (engine) 2 sets.

Horizontal, surface type, cooling surface
to meet engine requirement
Lubricating oil cooler (engine) 2 sets.

Horizontal, surface type, cooling surface
to meet engine requirement.

Lubricating oil cooler (gearbox) 2 sets.

Horizontal, surface type, cooling surface
to meet engine requirement

3.2 Main Engine:

The propulsion machinery/prime movers will be brand new and well known in Bangladesh, which have proven after sale service facilities and readily available spare parts.

The power plant for propulsion will consist of two sets of marine diesel engine having economy in fuel consumption of the following particulars, installed in the engine room:

Make	-	Reputed make
Type	-	Airless injection, trunk piston, uni-directional, supercharged, marine diesel engine with reverse/reduction gearbox.
Maximum continuous output	-	required to achieve the speed and bollard pull intended
RPM	-	Not exceeding 1800 at MCR
Cooling system	-	Fresh water cooling
Country of Origin	-	EU Countries/USA/ Australia/ Canada/Japan/India.

3.2.1 Control:

The engines will be controlled normally from the wheelhouse by a combined control console. Starting and stopping of the engine will be affected from the engine room only.

3.2.2 Alarms:

An alarm panel will be installed at a suitable position in the engine room easily visible from the engine control stations.

The panel will comprise:

2 - Main engine cooling fresh water high temperature alarm lamps
2 - Main engine lubricating oil low pressure alarm lamps
2 - Gearbox lubricating oil low pressure alarm lamps
2 - Main generator engine cooling fresh water high temperature alarm lamps.
2 - Main generator engine lubricating oil low pressure alarm lamps
1 - Alarm reset button
1 - Alarm bell
1 - Alarm bell off push button

Wheelhouse control console will comprise following:
2 - Main engine cooling fresh water high temperature alarm lamps
2 - Main engine lubricating oil low pressure alarm lamps
2 - Gearbox lubricating oil low pressure alarm lamps

3.2.3 **TUG WHEELHOUSE PROVISIONS**

Following equipment, instruments, gauges and controls will be provided and fitted in the wheel house of the tug.

a) Wheel steerage control
b) Compass (178mm dia.)
c) Barometer
d) Anemometer
e) External Loud hailer megaphone (15 Watts (peak) at 300 yards)
f) Binocular
g) Main propulsion engines control console
h) Trumpet type for/mist warning horn (25 Watts (peak) at 1,000 yards)

All the windows except middle windows in the wheel house must be easily open able Arrangement shall be provided to permit rapid shut down and effective closer in case of weather and sea condition.

In wheel house, fuel & running hour meter to be provided.

3.3 **Shafting & Propeller**

3.3.1 General:

The vessel will have two line shafting, comprising a propeller shaft, a stern tube and a screw propeller suitably positioned.

3.3.2 Propeller Shaft:

The propeller shaft will be of forged steel and will have a loose coupling flange at the forward end. The diameter will be as required by the rules, and slightly increased where supported by bearings. The after end of the shaft will be tapered to fit to the tapered inner surface of the boss of the propeller, which will be fixed to the shaft by a forged steel nut. A key way will be cut in the tapered part of the shaft. Propeller shall be protected with net guard.

3.3.3 Stern Tube:

The stern tube will be of cast iron or of fabricated steel. The inboard end will be fixed to the stern bulkhead or a special deep floor by stud bolts and the outboard end to a special fixing piece well rooted into floor by means of strong nut with a locking device. Bronze bushes lined with white metal inside will be fitted inside the stern tube at its forward and after ends. The forward end will be fitted

with a stuffing box with soft packing inside and a packing gland in halves, fixed in position by stud bolts.

The stern tube will have water cooling system for rubbing parts.

3.3.4 Propeller:

The propeller will be of solid type made of manganese bronze, having four or five blades of aerofoil cross-section. The blades will be finished bright on both surfaces, and the trailing edges properly finished to avoid singing. The inner surface of the boss will be finished in tapered shape having a key way to fit to the tapered end of the propeller shaft. A conical bronze bonnet will be fixed to the propeller by stud bolts to cover the fixing nut.

3.4 Electric Generator Sets:

The electric power plant will consist of two sets of diesel driven generator sets installed in the engine room. Each set will consist of a diesel engine prime mover and an electric generator, aligned and directly coupled with each other on a substantial fabricated steel bedplate, which will be fixed on a strong foundation constructed on the ship's structure.

The generator sets will be of the same type and particulars, and the capacity will be such that any one set can meet the total power requirement including working deck machinery, leaving the remaining set as stand-by.

Each of the diesel engine prime movers of the generator sets will be of the following same particulars:

Make – Reputed make

Type- Vertical, four stroke cycle diesel engine.

The cylinder jackets and covers will be cooled by fresh water circulated by the engine mounted cooling water pump.

The engine will be forced lubricated on wet sump system and started by battery.

Alarms to indicate disorder in the cooling water and lubricating oil systems will be mounted on the engine room alarm panel.

Each of the above specified diesel engine prime mover will be coupled with an electric generator of the following particulars:

Type	Marine A.C. Generator.
Phase	Three Phase
Frequency	50 Hz
Voltage	405 V.
Rated output	40 KVA Primary
Power factor	0.8
No. of revolution	1500 RPM
Rating	Continuous
Insulation	Class H.

3.5 **Cooling Water System:**

3.5.1 General:

All diesel engines will be cooled by fresh water.

3.5.2 Cooling Water System for Main Engine:

Cooling sea water will be drawn by the cooling sea water pump from the cooling sea water interconnection main line and forced circulated through the lubricating oil cooler, the air cooler and the fresh water cooler. After cooled these coolers, water will be discharged overboard. A branch line will be led from the circuit for cooling the plumber blocks and the oil cooler of the reverse/reduction gearbox.

The general service pump will be arranged to serve for this sea water circulation in the event of damage to the cooling sea water pump.

Cooling fresh water will be forced circulated by the cooling fresh water pump through the fresh water cooler, the cooling spaces of cylinders and the supercharger. A branch line will be led from this circuit to the fresh water expansion tank.

The bilge and ballast pump will be arranged to serve for this fresh water circulation in the event of damage to the cooling fresh water pump.

3.5.3 Cooling Water System for Auxiliary Engine Driving Generator:

The auxiliary diesel engines will have their own cooling water systems served by pumps driven by them. Cooling sea water pumps will draw water from the sea
chest through strainers, and, after cooling their own lubricating oil coolers and fresh water coolers, discharged overboard through independent discharge pipes.

Cooling fresh water pumps will circulate water through there own fresh water coolers and cylinder jackets. Branch lines will be led from these circuits to the fresh water expansion tank.

3.5.4 Pumps and Heat Exchangers:

Pumps and heat exchangers supplied as parts of engines will be of their makers' standard designs and materials. Insides of cast iron casings of centrifugal pumps used for sea water service will be coated with epoxy resin for prevention of corrosion.

3.5.5 Sea Chests:

The vessel will have a large sea suction chest on each side, extending up to the main deck and provided with an air escape pipe. The sea chest will have a baffle plate extending from the bottom up to a mid-height in water so as to be divided into two sub-compartment, one of which is to have a large sea inlet opening with grill & the other having suction connections from and/to pumps.

Water coming through the grill will flow from the first compartment to the second one over the baffle plate and then drawn into pipe connections.

Two sea chests will be interconnected by a pipeline with a group of a kingston valve, a simplex suction strainer and a stop valve arranged in series at each end, and the cooling raw water will be drawn from mid-length of this interconnection pipe.

Pumps other than cooling water pumps will take suction from the sea chests directly.

Each sea chest will have a compressed blowing connection.

3.6 Lubricating Oil System

3.6.1 General:

The lubrication of the engines will be normally performed by lubricating oil pumps mounted on these machinery and oil coolers. Emergency system will be provided for the main engines.

3.6.2 Lubricating Oil System for Main Engine:

The engine will have its own, engine mounted lubricating oil pump, which will draw oil from the lubricating oil pump through a primary oil filter and deliver to the lubricating oil cooler through a secondary oil filter.

Cooled oil from the cooler will be led to main bearings, cylinder lubricators, etc. and then gathered into the engine bottom sump. An auxiliary lubricating pump will be used to circulate oil for the main engine, in the event the lubricating oil pump mounted on the engine is not functional.

The reverse/reduction gearbox will have its own oil pump, which will draw oil from the gearbox bottom sump and deliver oil under pressure to the gears and clutches. An oil cooler will be incorporated in this circuit. After lubrication, oil will be returned into the bottom sump.

.3.6.3 Lubricating Oil System for Auxiliary Engines:

Each of the auxiliary engines will have its own lubricating oil system independent of their machinery, incorporating a lubricating oil pump and an oil cooler.
Oil in the engine bottom sump will be forced circulated by the engine mounted pump through the oil cooler and the engine parts requiring lubrication, and finally gathered into the same sump.

3.7 Fuel Oil System

3.7.1 General

The fuel oil system will consist of a fuel oil shifting system, engine feeding system and a fuel oil filling system.

3.7.2 Fuel Oil Shifting System:

The fuel oil transfer pump will be used for shifting fuel oil from the fuel oil storage tank to the service tank.

3.7.3 Engine Feeding System:

Fuel oil in the service tank will be led by gravity through an interchangeable duplex oil filter to the fuel oil injection pumps of the main engines. The feeding of the auxiliary engines driving generators will be performed in a similar manner as the main engine.

3.7.4 Fuel Oil Filling and Overhead Discharge Systems:

Filling of the fuel oil storage tanks will be done through two filling pipes led from the main deck, one on each side.

An overboard discharge pipe will be led from the transfer
pump to a hose connection on the exposed portion forward of the main deck.

3.7.5 Pumps:

The fuel oil transfer pump will be of rotary gear type, made of the following materials:

Casing	Cast iron
Rotor	Carbon steel or forged steel
Shaft	Carbon steel or forged

The pump will have a relief valve.

3.10 EXHAUST GAS SYSTEMS:

3.10.1 General:

All exhaust gas pipes from engines shall be led to the funnel. These pipes shall be arranged to allow free expansion, and well supported against vibrations. All these pipes shall be well lagged with suitable lagging materials, which are to be covered with wire nets as necessary.

3.10.2 Exhaust Gas Pipes from Main Engines:

Exhaust gas from cylinders of each engine shall be gathered to an exhaust manifold, which is to be connected to the exhaust turbo-supercharger. Gas from the turbo-supercharger shall be led to the funnel and puffed to air. A silencer shall be provided on the exhaust gas system of each main engine.

3.10.3 Exhaust Gas Pipes from Auxiliary Engines:

Exhaust Gas from auxiliary diesel engine in the engine room shall be directly led to the funnel independent of one another and puffed to air. These exhaust gas pipes from the auxiliary engines shall have silencers.

3.11 PIPING GENERAL

3.11.1 Pipes:

The dimensions and qualities of pipes shall be suitable for the purpose intended. The thickness of pipes and the dimensions of flanges shall be in accordance with the requirements of the Classification Society. Pipes shall be effectively supported or embraced to stand up to vibrations in the engine room and also well protected where liable to mechanical damages.

Special care/attention shall be paid to rain and air, which shall gather in pipes.

All pipes shall be cleaned before installation abroad and tested under the working conditions after installation. Pipe lines shall be generally of steel pipe for low pressure piping except those required by the Classification Society to be of heavier dimensions. Galvanized pipes and flanges shall be used for water pipes and air and sounding pipes not coming into contact with oil.

Connections of pipes shall be generally by means of welded flange couplings.

3.11.2 Valves and Cocks on Inboard Piping:

Valves and cocks shall be in accordance with the requirements of the Classification Society. In low pressure system, valves of 40 mm or smaller nominal bores shall be of bronze, while those of 50 mm or larger nominal bores shall be of cast iron bodies.

3.11.3 Sea Suction Valves:

Sea suction valves shall be of cast steel or cast bronze bodies with bronze mountings, and shall be secured to thick doubling plates on the sea chests by stud bolts or to flanges of distance pieces by through bolts.

3.11.4 Ship-Side Valves:

Ship-side valves shall be of cast steel or cast bronze bodies with bronze mountings, and shall be secured to flanges of distance pieces welded to the shell plating by means of through bolts or to reinforcing rings by stud bolts.

3.12 MISCELLANEOUS

3.12.1 Lagging:

The exhaust gas pipes shall be lagged with suitable materials not harmful to human being.

Insulating layers shall be covered by suitable materials not harmful to human being for protection against wear and damage.

3.12.2 Funnel:

A stream-lined funnel shall be erected on the top of the engine casing.
The funnel shall be constructed of steel plates, and shall be arranged to house all exhaust gas pipes from diesel engines. Funnel marks shall be fitted on the funnel as directed by the Purchaser.

Paint application in funnel shall be of heat resistant type.

3.12.3 Ventilation:

Two electrically driven ventilating fans shall supply or exhaust air through ducts of thin steel sheet. In addition, the funnel shall be used or natural exhausting. Skylights with openable flaps shall be provided for natural ventilation and lighting.

3.12.4 Lifting Gear:

Over each main engine, a steel lifting beam of I section, with a chain block of 1-ton capacity shall be installed for use when overhauling. Over the auxiliary engines and other heavy machinery, eye plates shall be suitably arranged for use when overhauling such machinery.

3.12.5 Electric Horn:

An electric Horn of sufficient capacity shall be installed in the wheel house.

3.12.6 Communication Appliances:

Two electrically operated, dial type engine telegraph receivers shall be provided to receive orders from the wheelhouse, where a double-dial type transmitter for twin-engine use shall be installed.

3.12.7 Floors, Gratings, Platforms, Leaders & Railings:

Platforms of non-skid steel plate and steel bar gratings laid on brackets or bearers shall be provided for easy access for watching and handling of machinery, valves, cocks, tanks, etc.

The floor in the engine room shall be of 4 mm checkered or positive non-skid steel plate laid on angle or flat bar bearers, which are to be strong enough to carry the weight of parts of machinery, when they are overhauled.
Handrails and stanchions shall be arranged where necessary. Dangerous moving parts of machinery shall be provided with plate cover or protecting rails.

3.12.8 Store

A small store space bounded by wire-net enclosures shall be provided in the engine room. Suitable steel shelves & tool hanger board shall be provided inside.

3.12.9 Measuring and Alarming Devices:

All machinery, tanks, pipe lines, etc. shall be equipped with thermometers, pressure gauges, tachometers and other necessary measuring instruments according to the makers' standards and normal marine practice.

An alarm panel with visual and audible alarms as specified elsewhere herein shall be provided in the engine room at a suitable position easily visible from the main engine control station.

3.12.10 Fire Extinguishing Appliances & Emergency Devices:

Two hydrants with hoses and nozzles shall be provided at suitable position in the engine room, one on each side.

Two portable froth fire extinguishers of 9 litres shall be provided in the engine room.

Emergency shut-off valves for remote control for fuel oil service tank and emergency stop buttons for the fuel oil transfer pump shall be so arranged as to be operated from out side of the engine room.

A fire monitor of required capacity will also be provided.

Make & Model: To be mentioned

3.12.11 Painting & Marking:

Machinery, pipes, tanks, etc. shall be painted with suitable colour paint. Pipes shall be distinguished by colour strips according to their services.

Name plates noted in English language shall be fitted to machinery, valves, cocks, etc. Arrow marks indicating the direction of rotation or flow shall be put where necessary.

3.13 TOOLS & OUTFIT

3.13.1 Tools:

Special tools for overhauling, control, adjustment and maintenance of engine, shafting, pumps, etc. shall be supplied in accordance with the normal standards.

In addition one portable ultrasonic hull thickness measuring instrument (Digital) and one Ultrasonic film thickness measuring instrument (Digital) will be supplied.

3.13.2 Engine Room Outfit and General Tools:

1 - Micrometer, 25 - 50 mm
1 - Surface gauge, 290 mm height.
1 - Straight edge, 600 mm
2 - Inside calipers, 300 & 200 mm
2 - Outside calipers, 300 and 200 mm
2 - Compass 300 & 200 mm
2 - Thermometers 100 C, with casing
2 - Straight shank drills 3 & 5 mm
1 - set Taps W3/8 - W1
1 - Plier, 200 mm
6 - Files 250 mm, Coarse and medium, flat, round and half round.
3 - Files 200mm, Fine, flat round and half round.
1 - set Files, fine
3 - File shanks
2 - File brushes
2 - Hammers, 2 lbs and 1 lb.
1 - Wooden hammer
1 - Hammer 10 lbs
2 - Scrapers, flat and cent
1 - Punching centre
4 - Punches, 11, 14, 18 & 21 mm
4 - Cold chisels 200 & 150 mm, flat & cross-cut
2 - Oil groove chisels, 150 x 22 x 5 mm x 130 x 19 x 3 mm
1 - Packing knife
1 - set Hacksaw frame with 12 blades
1 - Vice, 150 mm
1 - Oil stone, 150 x 50 x 25 mm
4 - Electric torches
1 - Chain block, 1 ton
1 - Rubber hose for air, complete with coupling,6mm diax 10m

1 - Copper hammer, 1.35 kg
1 - Lead hammer, 1.8 kg
1 - Tool box, steel
1 - Clock, 2-hand
1 - Turning bar for main engine
16 (from 3/8 to $1^{1/2}$)-Double end open spanner
16 (from 3/8 to $1^{1/2}$)-Double end ring spanner
24-Socket box wrench
2 (300 lb & 500 lb)-Torque wrench ¾ drive

D-4. ELECTRICAL INSTALLATIONS

4.1 GENERAL:

4.1.1 General Description:

The whole electrical installations shall comply with the requirements of the Classification Society and other rules and regulations concerned. Machinery, equipment and their accessories shall be of good designs and substantial makes, assuring long life and easy handling and maintenance.

4.1.2 Tests & Trials:

Generators, switch board, transformers, electric motors and control gears shall be tested at their makers' shops as required by the Classification Society. Lighting & communication appliances, navigation aids, etc. shall be tested at their makers' shops as necessary before installation onboard.

After installation onboard, these machinery, equipment and systems shall be tested under the working conditions.

Insulation tests shall be made for all electric equipment and systems after installation onboard.

Results of these tests and trials shall be submitted to the Purchaser immediately after completion.

4.1.3 Distribution Systems:

The nominal voltages, currencies, frequencies and types of wiring of power supply and feeding systems shall be as follows:

Generator circuits on A.C., 405V, 3-phase, 50 Hz, 3-wire systems;

Power circuits on A.C. 405V, 3-phase, 50 Hz, 3-wire systems;

Power circuits on A.C. 400 V, 3-phase, 50 Hz, 3-wire system;

Lighting circuits on A.C.230V, single or 3-phase, 50 Hz, 2-or 3-wire systems.

Inboard communication circuits on A.C. 230V, single phase, 50 Hz, 2-wire system, or D.C. 24V, 2-wire system.

Navigation aids circuits on A.C. 230V, single phase, 50 Hz, 2-wire system or D.C., 24V, 2-wire system;
Radio equipment circuits on D.C. 24V, 2-wire systems;

Emergency lighting circuits on D.C. 24V, 2-wire system.

In general, machinery and equipment consuming large power shall be fed from the main switchboard directly and those consuming smaller power, lamps, communication appliances, etc. shall be fed through branch circuits led from section board, distribution boards and branch boxes.

4.2 CABLES & CABLE INSTALLATION:

4.2.1 Electric Cable:

All cables shall be of such qualities that comply with the requirements of the Classification Society.

All cables used for alternating current circuits shall be multiple conductor cables.

All electric cables shall have conductors of current carrying capacities sufficient for loads connected to them.

Anti-corrosive vinyl sheathed cables shall be used for wiring fixed to the masts and on exposed decks.

4.2.2 Electric Cable Installation:

Cables shall be in single continuous lengths without joints, from their terminals to terminals.

Where cables run in groups, they shall be supported in metal hangers so arranged as far as practicable as to permit painting of the surrounding structures without causing undue disturbances to the cables.

Cables shall be installed in accessible positions, as far as practicable, so that no cable may be exposed to drip or accumulation of water or oil, steam or oily vapor, high temperature, etc.

Where cables penetrate watertight decks or bulkheads, watertight cable glands shall be fitted. Where cables penetrate beams or non-watertight decks or bulkheads, bushings or coamings with round edges shall be used as necessary for protection of cables. Due caution shall be given for rat-proofing of such openings.

Cables led in spaces, where danger of mechanical damage is expected, shall be protected by sheet steel plating or by steel conduit pipes, which shall be well earthed to the hull.

4.3 ELECTRIC POWER SOURCES:

4.3.1 Generators:

The main primary electric power plant shall consist of two alternators, each of which to be directly coupled to an independent diesel engine prime mover. The generators shall be of the following same type and particulars, and the capacity shall be so determined that any one set if capable of meeting all power requirements, leaving the remaining set as stand-by:

Make	Reputed make
Type	Semi-enclosed, drip-proof, Self-ventilated, compound wound, marine generator.
Current	Alternating current
Exciting	Self-excited.
No.of poles 4	
Phase	Three-phase
Wiring	3-wire.
Frequency	50 HZ
No. of revolution	1500 RPM.
Voltage	405V
Rated output	40 KVA Primary
Power Factor	0.8
Rating	Continuous
Insulation	Class-H

These generators shall have stationery exciters mounted on or incorporated in the generators themselves, and shall have space heaters to keep inside dry. These generators shall be installed in the engine room, and shall be arranged for parallel operation.

4.3.2 Shore Connection Boxes:

A waterproof shore connection box shall be mounted on a steel wall on the deck to receive power from shore. The shore connection box shall be capable of receiving 30 amperes of 400V, 3-phase, 50Hz current on 3-wire system, and complete with moulded case circuit breakers, phase sequence indicator lamps, etc. and connected to the main switchboard.

4.3.3 Storage Batteries:

As the power source for several inboard communication appliances, navigation aids and emergency lighting, two sets of the following storage battery shall be installed in the engine room:

Type	Lead-acid, marine storage battery
Voltage	24V
Capacity	200 AH/10 H

4.4 SWITCHBOARDS AND DISTRIBUTION BOARDS:

4.4.1 Main Switchboard:

One set of main switchboard shall be installed in the engine room for control and protection of the main generators and distribution of 400V and 230V power. The main switchboard shall be of independent, self-supported cubicle type, made of finely enameled steel plate panelled on strong steel frame, and equipped with insulated handrails in front side. The main switchboard shall be of dead-front type, having hinged front panels and shall consist of a generator panel and a 400V and 230V feeder panel.

The generator panel shall be equipped with appliances for control, protection and parallel running of the generators, such as air circuit breakers, disconnecting switches, voltage regulators, synchroscope, reverse current relays, A.C. voltmeters, A.C. ammeters, watt-meters, frequency metres, pilot lamps, indicating lamps, etc.

The 400V and 230V feeder panel shall have its own bus bars and circuits outgoing from the panel shall generally be protected by moulded case type circuit breakers (M.C.B.)

A charging and discharging board for the storage battery shall be included in the main switchboard, arranged to charge the storage batteries through a selenium rectifier of the following particulars:

Input	A.C., 400V, 3-phase, 50 Hz
Output	D.C. 35V, 20 A.

4.4.2 Distribution Boards & Section Boards:

Distribution boards and section board shall be enclosed by protecting drip-proof metal cases with hinged front covers and shall generally be of wall mounting type.

These boards shall be equipped with moulded case type circuit breakers (M.C.B.)

4.5 POWER MOTORS

4.5.1 Motors:

All motors shall have characteristics suitable for the machinery they are to drive, and shall generally be of squirrel cage, induction type except those required to produce large starting torque, which shall be of wound rotor type.

Motors installed in the engine room and other spaces where protected from weather shall be of semi-enclosed, drip-proof type, while those installed on decks exposed to weather or those exposed to weather or moisture because of their duties or the manners of installation shall be of totally enclosed, water-proof construction.

Insulation of power motors shall generally be of class E. Motors shall generally be operated on A.C. 400V, 3-phase, 50 Hz, 3-wire system, while those of minor power shall be operated on A.C. 230V, single phase, 50 Hz, 2-wire system.

4.5.2 Motor Starters:

Across-the-line type starters shall be employed for motors except those causing excessively large surge current, for which star-delta type or reduced voltage type starters shall be employed. The motors of the windlass shall have a starter equipped with speed control device. States shall generally be of wall mounting, drip-proof construction.

All starts shall be complete with magnetic contractors overload relays, low voltage protection devices, pilot lamps & push button switches, except those for motors of smaller than 0.4 KW, which may equipped with knife switches, fuses & pilot lamps.

Starters for motors larger than 7.5 KW output shall be equipped with ammeters.

4.5.3 Wiring:

Starters shall be wired directly from the main switchboard or through suitable distribution or section boards depending on the sizes and dispositions of the installations.

The Steering gear motor shall be wired from the main switchboard by two separate circuits, and a change-over switch for selecting the working circuit shall be provided in the steering gear room. This motor shall be arranged for starting also by a switch in the wheelhouse, and no-voltage and overload alarms shall be provided in the wheelhouse and the engine room.

4.5.4 Emergency Stop Devices:

Motors driving the engine room ventilating fans and the fuel oil transfer pump shall be arranged for simultaneous shut-down from outside of the engine room in case of emergency.

4.6 ELECTRIC LIGHTING:

4.6.1 General:

The general lighting circuits shall be of A.C. 230 V, single phase, 50 Hz, two-wire system fed by the transformers, and the emergency lighting circuits of D.C., 24V, two-wire system fed by the storage batteries. The emergency circuits shall be so arranged as to be automatically switched-on when the voltage in the general lighting circuits is lost, and automatically switched-off by the restoration of the normal power supply. Holders of incandescent lamp bulbs shall be of bayonet type.

4.6.2 Ceiling & Bracket Lamps:

Flourescent lamps without globes shall generally be arranged in the crew's living rooms and inboard passages.

Fluorescent lamps with non-weather-proof globes shall be arranged in the wheelhouse, mess rooms and officers cabins.

Flourescent lamps with weather proof globes shall be arranged in the engine room, galley and lavatories.

For illumination of the weathered decks, watertight incandescent lamp fittings with globes and basket guards shall be suitably arranged.

Similar watertight fittings shall be fitted in store spaces, the steering gear room, etc.

4.6.3 Bed Lamps:

All beds in cabins shall have non-weather-proof incandescent bed lamps, operated by toggle switches located on the lamp fittings.

4.6.4 Deck Lamps:

Incandescent desk lamps shall be fitted on all desks in the Officers' cabins.

4.6.5 Mirror Lamps:

Non-weather-proof incandescent mirror lamps with gloves shall be fitted over mirrors in lavatories.

4.6.6 Chart Table Lamp:

An incandescent chart table lamp with extensible arm and dimmer switch shall be provided over the chart table in the wheelhouse.

4.6.7 Instrument Lamps:

For some instruments and equipment, such as magnetic compass, engine telegraph, etc. suitable incandescent illumination lamps shall be provided. Dimmer switches shall be provided as necessary.

4.6.8 Portable Lamps:

Six weather-proof incandescent portable lamps of 60 W shall be supplied. Those portable lamps shall be fitted with basket guards and flexible cabtire sheathed cables of 20 metres in length.

4.6.9 Searchlight:

One set of directional searchlight of 2 KW shall be installed on the wheelhouse top, arranged for control from underneath.

4.6.10 Emergency Lamps:

Incandescent emergency lamps fed by the storage batteries of 24 Volts shall be provided in the engine room, wheelhouse, steering gear room, main passages, officers' and crew's mess room, inboard stairways and toilets.

4.6.11 Navigation Lamps:

The following navigation lamps of Aqua Signal Navigation and Signaling Lights, type 70D+70 shall be provided in accordance with the International Convention for the Prevention of Collision at Sea:

3	-	Masthead lamps of duplex type
1	-	Port side lamp with red lens, of duplex type
1	-	Starboard side lamp with green lens, of duplex type
1	-	Stern lamp of duplex type
1	-	Anchor lamp of duplex type
2	-	Not-under-command lamps of single type

Duplex lamps shall be fed from A.C 230V and D.C 24V power sources. The navigation lamps shall be wired from and controlled by a navigation lamp indicator installed in the wheelhouse. The indicator shall have necessary switches and pilot lamps indicating the presence of voltage in the lamp circuits and an alarm buzzer.

4.7 INBOARD COMMUNICATION SYSTEM

4.7.1 Engine Order Telegraph:

An engine order telegraph transmitter of double-dial type for twin-engine use with reply shall be installed in the wheelhouse and two receivers in the engine room. This system shall be operated on A.C., 230V, single phase power.

4.7.2 Helm Angle Indicator System:

One set of electrically operated, self-synchronizing helm angle indicator system, powered from the A.C. 230V, single phase circuit, shall be installed. The transmitter shall be provided in the steering gear room and an indicator in the wheelhouse.

4.7.3 Signal Bell Systems:

The following signal bell systems with reply, operated on D.C., 24V, shall be provided for intercommunication between the following positions:

Wheelhouse	-	Engine Room
Wheelhouse	-	Steering gear room

4.7.4 Steering Gear Motor Alarm System:

A no-voltage and overload alarm system operated on D.C., 24V shall be installed for the motor of the steering gear. An alarm bell and lamp shall be fitted in the engine room and an alarm buzzer and lamp in the wheelhouse.

4.7.5 Engineer's Alarm Panel in Engine Room:

An alarm panel with a buzzer and indicating lamps, operated on D.C. 24V, shall be installed near the maneuvering station in the engine room.

4.8 ELECTRIC NAVIGATION AIDS & HYDROGRAPHIC EQUIPMENT

4.8.1 **Echo Sounder (Digital Depth Indicator):**

The equipment shall be new, unused, high quality and current commercial design & technique. It shall be made of components that will be supported by vendors at least ten years. The equipment and materials shall be suitable for operation under the environmental condition of Bangladesh. The equipment shall be maintainable in the field to the lowest replaceable unit by local personnel. The equipment must be light weight, robust, accurate and in waterproof enclosure and corrosive resistance. All parts and accessories of the equipment shall be free from manufacturing and/or material defect such as breaks, cracks, dents, deformation etc. when delivered at the place of destination. The equipment shall be fitted with the vessels. The transducer shall be hull mounted & provided in a watertight compartment in the bottom.

Labeling:

For equipment and all major components nameplates from original component manufacturer shall be attached and nameplates shall bear mode, serial numbers, year and place of manufacture, safety warnings and any other information critical to the component.

Codes and Regulations:

The equipment to be supplied under the specification shall be designed, built and equipped in conformity with the international standards, codes and regulations.

Spares:

The equipment shall be supplied with spare parts, component and assemblies adequate for three years consumption. The spare parts must be listed & priced individually and the spare parts price must be included with the quoted price.

Tests and Acceptance:

The supplier shall arrange transportation of the equipment/Goods inspection and tests. Tests will be taken in the field (river) around Narayangonj/Chandpur/Aricha. Supplier will, at his cost, assemble/install the equipment and demonstrate their operation. On successful completion of the tests, the Purchaser will issue acceptance certificate.

Maintenance Manuals:

One complete set of maintenance, installation and operation manuals shall be provided for each of equipment. The manuals should have detail and comprehensive circuit diagrams as are required to diagnose and rectify faults. Photographs block schematic circuits and other diagrams shall adequately illustrate the text of each manual. The manuals must be in English language. The maintenance manuals should be adequate for skilled technicians to fully test and repair the equipment by replacing any parts therein.

The Goods and related services shall comply with following Technical Specification as minimum-

Name of Item/Related services	Technical Specification
Type	Single Frequency Hydrographic Survey Echo-Sounder
Unit	Feet or Meter (User selectable)
Depth Range	0.5-150 Meter
Frequency	200/210 KHz
Required Power	11-30 VDC with polarity protection
Accuracy	1cm±0.1%depth
Depth Resolution	1cm
Depth range selection	Auto and Manual (User selectable)
Printer	Should be high resolution thin film thermal printer capable of printing depth, time, fix number, position, scale and other parameters of the chart.
Scale Line	Should be noted automatically at least one set of beginning and ending values which shall be visible in the chart window at all times.
Display	LC Display for digitized depth
Digitizer	Capability of digital signal processing. Digital depth data output through RS/USB/PS ports
Draft Adjustment	0-5 meter adjustable at 1cm steps
Ports & interfacing	BI-directional RS/USB ports should be available for interfacing with DGPS/GPS & PC. The Echo-sounder should accept Data Acquisition Software.
Operator Control	It should have the controls of On/Off, sensitivity, transmit power, chart speed, paper advance, digitized depth, tide/draft adjustment, time and date, manual/remote fix mark command, sound velocity input etc. on the front panel.
Environmental Condition	Operating temperature 0 to 50^0C Storage temperature-5^0 to 55^0 C Relative humidity 95% non-condensing
Paper Speed	Should have variable chart speed (at least 3 steps) Varied from 1cm/min. to 20cm/min.
Transducer	Inboard/Keel fittings type 200/210 KHz Transducer with all necessary fittings & fixture.
Spare Parts	Spare parts, components and assemblies for three years consumption must be listed separately with unit Price. But the price shall be included with the total quoted price. Spare parts for Echo sounder for 3 years consumption shall be as following: i. Power supply unit (PCB with components) ii. Printer assembly.
Accessories	i) Remote hand/foot fix marker, power cable, interfacing cable ete.

	ii) 25 Nos. Recording Chart Paper roll for each equipment iii) Operational and Technical Manuals iv) Special types tools if any required for servicing
Country of Origin	EU Countries/USA/ Australia/ Canada/Japan/India.

4.8.3 DGPS receiver:

All equipment shall be latest design & technique, high quality, new and unused. All the components (spate parts) must be supported by vendors for at least 10 (ten) years.

Item No.	Name of item or Related Service	Technical Specification and Standards
1	2	3
Receiver GPS:		
	Type	L1 freq. C/A Code, 12 Channel continuous tracking
	Update rate	At least once per second
	Accuracy	1-5m 2DRMS Position with DGPS ± 0.05m/s Velocity with DGPS.
	Dynamics	Velocity: 460 m/s
	Time to first fix	Less than 1 minute with almanac 15 minutes from cold start.
	Reacquisition	5-15 seconds.
	DGPS Input	RTCM SC-104 format, from internal beacon receiver and from external source connected to data port
Beacon:		
	Type	Automatic or Manual tuning.
	Frequency	283.5-325 KHz in 500Hz steps
	Bit rate	200 (auto-syne)
	RTCM Messages Supported	1, 2, 3, 5, 7, 9, 16
Display:		
	LCD	At least 5 inch Diagonal screen, B/W, backlight LCD display.
	Key board Consists of:	i) **Function keys:** Navigate, Route, Go to, Waypoint, Mark or Event, Plot, Man over Board, Tide, Auxiliary, Position, GPS, DGPS, Configuration, Edit, Clear, Power on/off, Mark position, Day/night view. ii) Cursor key iii) Soft keys.
Antennas:		
	Type	Combined (GPS and Beacon)
	Freq	GPS L1, 1575 MHz Beacon 283.5-325KHz
	Cable length	30 meters (100ft)
Environmental:		
	Operating temperature (CDU)	0 to 50^0C
	Operating temperature (Antenna) Storage Temperature	0 to 60^0 C 0 to 60^0 C
Power:		
	Type	DC
	Consumption	Less than 10 W
	Supply Voltage	11-30 VDC with polarity protection
	Fuse	Internal over current/over temperature fuse.
	DGPS Status Display	i) Tracking station frequency, ID, and Distance ii) Baud rate, noise and signal strength. iii) Satellite Number (PRN), respective correction and correction are.

	DGPS Station selection	Both Auto and Manual.
	Alarms	Message 16 Alarm, No DGPS data, DGPS Health Changed, Antenna Alarm, HDOP Alarm, No update Alarm, No log data.
	Configuration	Alarm, Datum, Depth, DGPS, Dual control, GPS, Initial position, Lighting, Log, Navigation, NEMA, Operation, Position, Time.
	Language	English.
	Position reference system	Lat/Lon and Grid.
	Datum configuration	Including Bangladesh.
	Display Lighting condition	Quickly switch able between two predetermined display (day time/night time).
Inspection		
	The inspection shall be conducted after installation on Tugboat at Narayangonj/Aricha. A five member committee of BIWTA will inspect the goods. All inspection cost will be borne by the supplier.	
Manuals:		
	Operational manual and installation & Service manual will be supplied for each set. Brochure, technical specification of manufacturer and user's manual will be supplied with the tender.	
Country of Origin	EU Countries/USA/ Australia/ Canada/Japan/India.	

4.8.3 Electric Clear-view Screen:

Two electric clear-view screen of a nominal diameter of 300mm, operated on A.C., 230V, single phase system, shall be fitted on front windows of the wheelhouse.

4.9 **RADIO COMMUNICATION EQUIPMENT:**

4.9.1 Radio Telephone Transceiver:

One set of SSB radio telephone transceiver, operated on D.C., 24V system, shall be installed in the wheelhouse.

4.9.2 Aerial:

The aerial of the transceiver shall be spread between a yard of the mast and a yard of the flag staff.

5.1 List of Spare Parts for 2 Nos. Tug

Main engine:

Sl. No.	Description	Required Quantity	Unit Price	Total Price
1	Cylinder Liner with rubber seal	2 sets (1 set=1 No.x No. of Cylinder)		
2	Piston	2 sets (1 set=1 No.x No. of Cylinder)		
3	Piston pin	2 sets (1 set=1 No.x No. of Cylinder)		
4	Piston rings	2 sets (1 set=1ring group x No. of Cylinder)		
5	Main Bearing	2 sets (1 set=1 pair x No. of Cylinder)		
6	Big-end-bearing	2 sets		

Sl. No.	Description	Required Quantity	Unit Price	Total Price
		(1 set=1 pair x No. of Cylinder)		
7	Exhaust valve	2 sets (1 set=2 Nos. x No. of Cylinder)		
8	Inlet valve	2 sets (1 set=2 Nos. x No. of Cylinder)		
9	Valve guide exhaust	2 sets (1 set=2 Nos. x No. of Cylinder)		
10	Valve guide inlet	2 sets (1 set=2 Nos. x No. of Cylinder)		
11	Valve spring	20 nos.		
12	Insert for exhaust valve	2 sets (1 set=2 Nos. x No. of Cylinder)		
13	Insert for inlet valve	2 sets (1 set=2 Nos. x No. of Cylinder)		
14	Rocker arm/Cam flower assembly	20 Nos.		
15	Injector nozzle	2 sets (1 set=1 No.x No. of Cylinder)		
16	Plunger barrel for fuel pump	2 sets (1 set=1 No.x No. of Cylinder)		
17	Cooling water pump rebuilt kit	2 sets (2 Nos. for each complete pump)		
18	Complete engine overhauling gasket Kit	2 sets (2 Nos. for complete engine)		
19	Lub. oil filter	30 Nos		
20	Diesel filter	30 Nos		
21	Bolt for connecting rod	40 Nos		

E. CREW HOUSE BOATS

1.0 General

The house boat described herein non-self-propelled boat, outfitted to be utilized as an accommodation vessel. Each house boat shall be of welded steel construction, with diesel generator, enclosed cabins, dinning rooms, galleys, 2 toilets for crew under main deck 1 bath room on the upper deck roof for officers with tiles fitting & fixing etc.

The house boat shall have a complete continuous main deck, below which space shall be sub-divided by five nos. transverse and one no. longitudinal centre line bulkheads.

Deckhouses with provision for accommodation and other facilities shall be on the main deck and upper deck.

Each house boat shall be provided with living accommodations for two officers and twenty six crew members, store room, galley for crew, diesel Marine Generators of about 30 KVA, color TV, DVD Player & required freeze, necessary furniture, fitting & fixing and bedding accessories along with other usual navigational aids and facilities shall be supplied.

1.1 Principal Particulars

Length O.A (approx)	:	17-20 m
Breadth (approx)	:	6-7 m
Draft (approx)	:	1.22 m
Draught loaded (maximum)	:	1.85 m
Main deck to upper deck	:	2.20 m
Upper deck to roof	:	2.20 m

1.2 Capacity

Fresh water x 2 tank (10 M Ton x 2)	:	20 M Ton

1.3 Accommodation

2X1	-	Berth Cabin	:	2 Officer (On the upper deck roof)
1X2	-	Berth Cabins	:	2 (Master-2 & Driver-1 On the upper deck roof)
2x2	-	Berth Cabins	:	4 Crews on the under deck
5X4	-	Berth Cabins	:	20 Crews on the under deck

Simple cabins shall be provided for 26 persons. Single cabin shall be provided for 2 (two) Officer and one double cabin shall be provided for Master-2 & Driver-1 on the upper deck roof. Seven cabins for crews shall be provided in the under deck accommodations space.

1.4 Standard and Workmanship

Scantlings of deck and shell plates and all structural members of the hull and superstructure will comply with this specification. All materials, fittings, equipment etc. will be new, of good quality and free from all defects and be suitable for marine use and standard applicable for vessels of this type.

Workmanship involved will be of good quality conforming to standard shipbuilding practices and construction to be executed and carried out by skilled workers under the supervision of qualified/experienced Naval Architect(s)/Shipbuilding Engineer(s).

1.5 Drawings, Instruction Books

Before work commenced, the supplier will submit to the purchaser of the following drawing. All the drawing will be approved by the classification Society.

xxxi) General Arrangement plant
xxxii) Lines Plan
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xxxv) Docking plan
xxxvi) Mid ship section
xxxvii) Profile and deck plans
xxxviii) Shell plating.
xxxix) Aft ship construction
xl) Fore ship construction
xli) Deck arrangement plan
xlii) Hatches
xliii) Air and filling pipes
xliv) Deck house
xlv) Ventilation arrangement
xlvi) Bulkheads
xlvii) Accommodation plan
xlviii) Pipe diagrams all systems
xlix) Electrical diagrams

1.6 Materials

1.6.1 Mild Steel

All steel plates for the Houseboats will be open hearth or electric furnace processed shipbuilding quality Lloyds Grade-A or equivalent mild steel of uniform surface. Necessary documents including Class Certificates will be submitted.

Best quality steel angles approved by the Purchaser will be used for secondary members such as longitudinal, stiffeners etc.

1.7 Welding

All welding will be of excellent quality. Electric arc welding will be applied to all connections of structural members. Welding of any structural members will only be made after preparing the edges properly as per shipbuilding practice.

1.8 Plating

Deck and shell plating will be welded as per standard shipbuilding practice. Deck, bottom, shell and bulkhead plating will be of 6mm thickness plates. The first roof will be of 5mm and top roof will be 3mm thickness plate. Deck plates will be fitted only after completion of the shell plating except in cases where prefabricated sections are being made for erection.

1.9 Frames and Bulkheads

1.9.1 Frames

All web frames and deck and bottom longitudinal girders will preferably be prefabricated prior to erection. Spacing of web frames will be 1.5m. In between web frames and transverse bulkheads 65x65x6 mm angles will be fitted as side shell stiffeners with a spacing of 500mm.

1.9.2 Bulkheads

Transverse and Longitudinal centerline bulkhead will be fitted. All bulkheads will be of watertight type and preferably be prefabricated. Bulkhead stiffening will be made by 65x65x6mm M.S. angle. Spacing of the transverse bulkhead stiffeners will correspond to the spacing of longitudinal.

1.10 Hatches

Required watertight hatches will be provided in way of the watertight compartments. The construction of hatch covers will be as per standard shipbuilding practice.

1.11 Deckhouse

1.11.1 Crew Cabin

Nine cabins will be made of 4mm M.S. plate to accommodate 26 persons. Two cabins shall be provided for 2 officers each and one double cabin shall be provided for Master-2 & driver-1 on under deck and seven crews cabins will be made to accommodate 24 crews on the under deck of the house boat. The arrangement and the partition wall stiffening and the transverse beams at the deck over these structures will be provided adequately.

The cabins will be paneled by marine plywood all round and ceiling by 6mm. All exposed deck will be insulated with styro foam (50mm thick). Adequate wooden framing (50x15mm) to be made for paneling works. A total of 28 Nos. of wooden bunks will be provided. Coir mattress of minimum 150mm thickness covered with good quality resin will be provided for each bunk.

1.11.2 SSB/Communication Room

The SSB/Communication room of 1800x2000mm of 4mm M.S. plate will be constructed on the top of upper deck.

1.11.3 Crew Mess Room

The mess room of 2050x2000mm of 4mm M.S. plates will be constructed. Other construction and paneling works etc. will be similar to the specification of crew cabin stated above. The position, size and arrangement of the mess room will be as shown in the GA drawing. The mess room is equipped with TV, DVD player, Fridge, Binocular & other necessary furniture and others.

1.11.4 Galley

1 (One) no. galley will be constructed attached to the mess room by 4mm M.S. plates following the construction procedure as stated above.

Provision for sufficient ventilation will be made including one number electric motor driven exhaust fan of adequate capacity.

1.11.5 Store

Two- (2) nos. store of 4000x2000mm & 1325x2000mm of 4mm M.S. plate will be constructed.

1.11.6 Generator and Pump Room

1 (One) no. Generator room 2200x2000 of 4mm M.S. Plate adjacent to the suitable place under main deck.

1.12 Furnishing Schedule

Furniture will be installed as per standard for such ship and as needed for the living personnel. Purchaser's requirements, if there is any will be accommodated.

1.13 Hull fittings, Deck auxiliary and Fittings

1.13.1 Rails and Stanchions

Handrails will be fitted around the weathered portions of the main deck and the upper deck. These handrails will consist of tubular steel top rails, stanchions of steel pipe. The height of the handrails will be about 1.00 meter above deck.

1.13.2 Ladders

Steel Ladders will be provided for access as per standard shipbuilding practice with checkered, footplate.

1.13.3 Doors

All doors on main deck for entering from outside of the deckhouse will be watertight and be made of 4.75mm M.S. plates as per standard requirement. All others doors, such as doors on the upper deck and internal doors will be of flash plywood door.

1.13.4 Fenders

Fenders will be of 200mm diameter of half-circled pipe of thickness of 6mm. Necessary inside gusset and stiffening will be provided.

1.13.5 Chain lockers

Steel floors of shown perforated M.S. plates for storing chain, will be provided with provision of wash and discharge and cleaning of mud. Necessary fixing arrangement for chains will be made. Necessary steel framing by 50x50x6mm M.S. angles will be made.

1.13.6 Windows

Gratings of square size 75mmx75mm made with 6mm dia M.S. rod will be provided as necessary for safety. All window shutters will be made of aluminium framed glass of 4mm thickness.

1.13.7 Capstans

2 (two) nos. sturdy manually operated capstans will be provided as shown in the GA plans. Capstan barrel at the waist, will whelps casted on for efficient warping operation. The mild steel capstan shaft will be of 40mm diameter and stoppers with ratchet mechanism will be fitted at the base for safe operation. Deck plate will be strengthened in way of the capstans.

1.13.8 Bollards and Fairleads

6 (six) double Bollards and 4 (four) Fairleads will be made and fitted as per standard practice of shipbuilding and as shown in the General Arrangement plan.

1.13.9 Deck Strengthening

Deck underside in way of deck auxiliaries and fittings will be sufficiently strengthened for the intended service and to reduce vibration.

1.13.10 Anchor

2 (two) nos. (one for 200 kg. and one for 300 kg.) steel anchors will be supplied.

1.13.11 Chain

2 (two) shackles (27.5m each shackle) of 24mm dia stud link chain will be supplied along with d-type joining Shackle at each end. The chains will have a minimum breaking load of 20400 Kg_f.

1.13.12 Air Pipes

All the watertight holds will be provided with two air vent of pipes of 100mm dia and will have height of 250mm and will be fitted.

1.13.13 Hawse and Chain Pipe

The dimensions of the hawse and chain pipe will be not less than NB 150mm x 10mm thick and NB 175mm x 6mm thick respectively.

1.13.14 Mast

A steel mast will be erected on the upper deck roof to carry necessary lamp, brackets and a halyard for hoisting flags and spreading antennas.

A galvanized tubular steel antenna post/flag staff will be provided at the rear end of the upper deck roof.

1.14 Painting Schedule

Hull below Waterline		**Total DFT (micron)**
1 Coat shop primer (compatible to the epoxy)		25
1 Coat coal tar epoxy	Black	75
1 Coat coal tar epoxy	Chocolate	75
1 Coat epoxy enamel	Red	50
Hull till Main Deck		
1 Coat shop primer (compatible to the epoxy)		25
1 Coat high build epoxy	Silk Grey	75
1 Coat epoxy enamel	Light Grey	50
1 Coat epoxy enamel	Light Grey	50
Deck		
1 Coat shop primer (compatible to the epoxy)		25
1 Coat high build epoxy (all area)	Silk Grey	75
1 Coat epoxy enamel (non-slip) (outside accommodation area)	Deep Grey	50
1 Coat epoxy enamel (non-slip) (outside accommodation area)	Deep Grey	50
Superstructure Outside		
1 Coat red oxide primer	Red	25
1 Coat synthetic undercoat	White	30
3 coat enamel	White	60
Superstructure Inside		
1 Coat red oxide primer	Red	25
1 Coat synthetic undercoat	White	30
3 coat enamel	White	60
Hull Compartments		
1 Coat red oxide primer	Red	25
1 Coat bituminous paint	Black	40
Anchor, Chain Capstan, Bollard		
2 Coat bituminous paint	Black	40

1.15 Machinery

1.15.1 Diesel Generator Set

A marine diesel generator set will be provided with a continuous rating of not less than 30 KVA at 0.8 power factor, 220 volt, 50Hz., single phase at 1500 rpm. Actual generator rating will satisfy full 220-volt demand load without generator overload. The unit will be of current standard manufacture with spare parts readily available.

1.15.2 Control Panel

Bulkhead mounted control panel will be provided in the generator room having the components as required.

1.15.3 Distribution Panel Board

One A.C and one D.C. power and lighting distribution panel board, located adjacent to the main control panel will be provided. The panel boards will have circuit breakers with ratings and numbers to satisfy system requirements.
The A.C panel board will be rated for 220 volts, single phase, 50 Hz. The panel board will be equipped with feeder circuit breakers to satisfy the A.C. electrical power requirement of the Houseboat.

1.15.4 Pump

1.15.5 Bilge / Wash-deck

One 220V single phase AC electric motor driven self-priming pump will be provided for bilge / ballast/ deck wash. The capacity of the pump will be of not less than 15m3/hr. at a head of abt. 6.0m.

1.15.6 Fresh Water

One (1) no. 220V single phase AC electric motor driven pump of 4.0 m3 capacity against a head suitable for pumping water from fresh water tank in hold to service tank of capacity 2m3 positioned on upper deck roof will be provided.

1.16 Electrical System

1.16.1 Cables and Cable Installation

Ethylene propylene rubber insulated PVC sheathed, cables will generally be used and all cables will have conductors of sufficient load current carrying capacity.

Cables used for AC circuit will be multiple conductor cables.

Cables will be in single continuous length without joins from terminals to terminals.
Cables running in -groups will be supported in metal hangers with provision for watertight glands or stuffing box where penetration through decks or bulkheads takes place.

1.16.2 Lighting and Fans

A complete adequate lighting system will be provided to include fluorescent, ceiling mounted fixtures for interior lighting and incandescent watertight fixtures for exterior lighting. Fixtures for lights will be as per the direction of the Purchaser. Lighting switches will be of marine type and will be mounted for convenient operation. The interior and exterior lighting will be of sufficient number and candlepower capacity as suitable for vessels of this type will be ensured.

Electric wall mounted fans of requisite capacity for each individual person will be provided. Each of the mess rooms will be provided with two bulkhead fans of sufficient capacity and the galley with one ventilator fan.

1.17 Fresh Water, Sea Water and Bilge / Wash deck system.

1.17.1 Piping in General

Pipes, valves, cocks, flanges, etc. will be of such materials, qualities and dimensions as to comply with marine practice and intended purpose. Provision for suitable arrangement will be made in respect of vibration, mechanical damage and passage through bulkheads and decks as well as sufficient number of sectional shut-off valves.

1.17.2 Fresh Water

One gravity tank of $2m^3$ capacity for supply and distribution of fresh water complete with necessary pipes and fittings will be installed on the upper deck roof and from this tank distribution lines will be led to bath rooms, galley etc. where so necessary.

1.17.3 Sea Water

One gravity tank of 2m^3 capacity for supply and distribution of Sea water complete with necessary pipes and fittings will be installed on the upper deck roof and from this tank distribution lines will be led to W/C's, bath rooms, galley etc. where so necessary.

1.17.4 Bilge/ Wash deck / Fire Fighting

A complete piping system including all necessary manifolds, valves and fittings will be provided to allow the pump to function as a bilge pump to drain the bilges of all compartments as well as to function for wash and fire fighting services. Necessary fire hydrants will be placed at suitable positions on every deck to reach every point.

1.18 Navigation Equipment

1.18.1 Navigation Lights

A set of 220V AC navigation lights with control panel, including bow, side, stern and anchor light will be provided in the size and type as required for such vessel to satisfy the requirement of statutory bodies.

1.19 Fire Fighting and Life Saving Appliances.

1.19.1 Fire Fighting Appliances

Fire extinguishers of requisite capacity will be installed outside the galley, generator room, inside accommodation spaces etc. as required by the competent Authority

Fire buckets, fire axe, sand box etc also will provided as required.

1.19.2 Life Saving Appliances

Life buoys and life jackets will be supplied as per requirement of the competent authority.

F. **OFFICER'S HOUSE BOAT**

1.0 General

The house boat described herein non-self-propelled boat, outfitted to be utilized as an accommodation vessel. Each house boat shall be of welded steel construction, with diesel generator, enclosed cabins, dinning rooms, saloon, galleys, toilets and bath rooms.

The house boat shall have a complete continuous main deck, below which space shall be sub-divided by five nos. transverse and one no. longitudinal centre line bulkheads.

Deckhouses with provision for accommodation and other facilities shall be on the main deck and upper deck.

Each house boat shall be provided with living accommodations for 15 (fifteen) officers, saloon, store room, galley, diesel Marine Generators of about 30 KVA, air conditioner, refrigerator, color TV, DVD Player, Mobile sets, note book computer, powered wind glass, necessary furniture, fitting & fixing and bedding accessories along with other usual navigational aids and facilities shall be supplied.

1.1 Principal Particulars

Length O.A (approx.)	:	19 m
Length hull		18.00 m
Breadth MLD (approx)	:	6-7 m
Depth MLD	:	1.50
Draught loaded (maximum)	:	0.75 m
Beam Chamber	:	0.15 m
Height from main deck to upper deck	:	2.20 m
Height from upper deck to roof		2.20 m

1.2 Capacity

Fresh water x 2 tank (10 M Ton x 2)	:	20 M Ton

1.3 Accommodation

1X1	-	Cabin	:	1 Officer
2X2	-	Cabins	:	4 Officers
2x4	-	Cabins	:	8 Crews
1x2	-	Cabin	:	2 Crews

1.4 Classification/Regulation/Registry

Classification

The barge shall not be classed but machinery, equipment, fitting and materials scantlings and quality as well as workmanship shall at least conform to the requirements of internationally reputed Classification Society Rules and Regulations. Certificates from Classification Society, however, shall have to be provided in respect of materials, machinery and equipments etc. where so specified.

Regulation

The barge shall comply with the following rules and regulations:

(a) Statutory regulations of Bangladesh applicable for inland waters.

(b) IMO Stability Guideline including weather criteria.

Registry

The barge is to be registered in Bangladesh by the supplier.

1.5 Vibration and Noise

The enclosed areas shall be as quiet as practical in order for the technicians and crew to conduct their assigned missions and to obtain proper rest and relaxation. Noise levels in the enclosed crew spaces shall not exceed 65 DBA. Measures, Including but not limited to the following, shall be taken if required to reduce the noise levels to within the above specified limits:

(a) The diesel generator compartment and all other spaces containing operating machinery shall be sound-insulated and all engines and driven auxiliaries and solid connections thereto shall be isolated from foundations and other elements of the vessel's structure to minimize the transmission of sound and vibration. Discrete isolation mounts shall be applied rather than securing machinery on surfaces faced with resilient sheet materials; and

(b) Sound transmission form noise producing machinery shall be minimized by interposing rubber sleeves, spacers, gaskets or flexible connections between any piping, bracing, supports, etc., connecting machinery to hull, decks, bulkheads, structural members and piping.

1.6 Protection during Construction & Outfitting

1.6.1 The barge's structure, appendages and all installations, made thereon or therein, shall be properly protected by the Shipyard throughout the entire period of construction and outfitting and also prior to official acceptance by the Purchaser. Appropriate measures and precautions shall be taken to prevent corrosion or deterioration, especially to unpainted, bare, polished and moving parts.

1.6.2 Rigid control of welding and earthing shall be maintained for protection of the barge. The Shipyard shall ensure that the correct welding polarity and earth connections of the welding machinery used on the barge, or any other vessels in the immediate vicinity and on the wharf to which the vessel in moored during the fitting out period, shall be such as not to damage any part of the barge.

1.7 Equipment Guards and Insulation

All equipment with moving parts exposed to contact by personnel or which otherwise crate a hazard shall be guarded. All hot surfaces of equipment, including exhaust pipes or other lines which may be subject to high temperatures, exposed to contact by persons or which create a fire hazard shall be suitably guarded or insulated.

1.8 Delivery

1.8.1 After completion of successful trials and acceptance, the shipyard shall immediately deliver the barge, in accordance with the terms and conditions of the Contract and Specification, in fully clean condition, ready for immediate use and with the equipment and store stowed and installed and installed onboard. All parts of the vessel shall be thoroughly cleaned of extraneous material and dirt. All tanks and spaces onboard shall be in a condition to receive their designated contents and ready to be put to immediate use.

1.8.2 In this regard, it is recognized that the Shipyard shall immediately deliver the vessel free from all known defects and deficiencies and should avoid any interference with the schedule acceptance or immediate use of the vessel. A final survey of the vessel shall be made by the Purchaser's Acceptance Committee prior to the acceptance date, before the barge is officially accepted by the Purchaser.

2. **DRAWING AND INSTRUCTION BOOKS**

2.1 Before work commenced

The supplier will submit to the purchaser of the following drawing. All the drawing will be approved by the classification Society.

l) General Arrangement plant
li) Lines Plan

lii) Hydrostatic curves and tables
liii) Stability and trim sheets
liv) Docking plan
lv) Mid ship section
lvi) Profile and deck plans
lvii) Shell plating.
lviii) Aft ship construction
lix) Fore ship construction
lx) Deck arrangement plan
lxi) Hatches
lxii) Air and filling pipes
lxiii) Deck house
lxiv) Ventilation arrangement
lxv) Bulkheads
lxvi) Accommodation plan
lxvii) Pipe diagrams all systems
lxviii) Electrical diagrams

2.2 During Delivery

To facilitate the further outfitting of the barge and to provide documentation of the configuration for maintenance purposes, documentation in the form of Size E drawings (30 in. x 42 in. or 76 cm x 107 cm) and technical specifications shall be provided to the Purchaser upon delivery of each barge and shall depict the barge systems as fitted.

As a minimum, three (3) copies of the following Size E drawings, reflecting the as-built condition of the barge shall be provided to the Purchaser upon delivery of each barge:

(a)	General Arrangement and profiles;
(b)	Structural Arrangement and Sections;
(c)	Machinery and Exhaust Arrangement;
(d)	Piping Diagrammatic;
(e)	Electrical Diagrammatic;
(f)	Principal Foundations;
(g)	Tank Details; and
(h)	Hatch and Door Details.

2.3 Manuals and Parts Lists

Three (3) copies of the manufacturer's instructions and parts lists for the equipment listed below shall be furnished with each barge. Each of the sets shall be bound in one or more loose-leaf with separators:

(a)	Diesel Engine/Generator and Attachments;
(b)	Instrument Panel Components;
(c)	Bilge Pumps;
(d)	Control Components;
(e)	Fuel Pumps and Fuel Meters;
(f)	Ventilation Fan (s);
(g)	Air Conditioner;
(h)	Fire Extinguisher (s);
(i)	Communication Equipments;
(j)	Electric Motors;
(k)	Circuit Breakers;
(l)	Anchor Windlass; and
(m)	Other components for which manufacturer's information is provided.

2.4 Calculations

The following calculations for each barge shall be submitted upon delivery

(a)	Weight and Centre of Gravity; and
(b)	Trim and Stability.

3. Standard and Workmanship

The shipyard/Dockyard shall supply all materials, equipment required for the completion of the house boat. All these material and equipment supplied by the shipyard/Dockyard shall be new and of latest designs and intended for marine use and shall fulfill rules regulations and standards applicable for vessels for this type.

All materials, fittings and equipments must be of good quality and free from all defects.

Workmanship involved will be of good quality conforming to standard shipbuilding practices and construction will be executed and carried out by skilled workers under the supervision of qualified Naval Architect (s)/Shipbuilding Engineer (s).

4. Materials

4.1 Mild Steel

Steel materials for the barge shall be open hearth or electric furnace processed shipbuilding quality Lloyds Grade; A or equivalent mild steel of uniform surface certified by a classification Society for compliance with the rules. Necessary documents including Class Certificates are to be submitted.

Non Class-certified best quality steel angles approved by the Purchaser may be used for secondary members such as longitudinal, stiffeners etc.

4.2 Timber

All timber shall be free from rots, saps and shakes and reasonably free from knots, well seasoned garzon or shilkorai or shawal timber shall be used as specified for the purpose. Approval of the Purchaser regarding timber quality has to be obtained before commencing actual work.

5. Welding

All welding will be of excellent quality. Electric arc welding shall be applied to all connections of structural members. The make, type and quality of electrodes are to be approved by the Purchaser. Welding technique must be approved by the Purchaser prior to construction. Welding of any structural members shall only be made after preparing the edges properly as per shipbuilding practice.

Manual welding shall be executed by qualified welders with coated electrodes and automatic welding by “union melt” or equivalent process.

6. KEEL AND BOTTOM PLATING

6.1 The keel shall be flat plate type. All butts and seams shall be welded.
6.2 The bottom shall be of single bottom system and constructed on the longitudinal system of framing. Two side keelsons will be fitted.

7. DEEK AND SHELL PLATING

7.1 Deck

All deck plating are to be welded as per standard shipbuilding practice. Under deck girders shall be provided to support and stiffen the deck in association with pillars. Deck plates shall be fitted only after completion of the shell plating. Main deck and upper deck shall be sufficiently strengthened to carry load of superstructure.

7.2 **Shell Plating**

All shell plating are to be welded as per standard shipbuilding practice. All butts and seams of the shell plating shall be welded. Side shell longitudinal girder will be fitted 750 mm above bottom.

8. WEB FRAMES AND BULKHEADS

8.1 Web Frames

All web frames and deck, side and bottom longitudinal girders shall preferably be prefabricated prior to erection. Spacing of web frames shall be 2.0m. In between web frames and transverse bulkheads 65x65x6 mm angles shall be fitted as side shell stiffeners with a spacing of 0.5m. The centerline bulkhead shall also be strengthened in a similar manner. Deck, side and bottom longitudinal girders and pillars shall be positioned and constructed.

8.2 Bulkheads

All bulkheads shall be watertight and be extended up to the main deck. Thus the vessel will be subdivided into twelve (12) compartments. These bulkheads shall be of welded flat type reinforced with vertical stiffeners bracketed at top and bottom as far as practicable. Transverse bulkhead stiffening is to be made by 65x65x6mm M.S. angle. Spacing will be same as that of the longitudinal. Longitudinal bulkhead stiffener scantling will be the same as for transverse bulkhead but the stiffener spacing shall be 500mm.

9. SUPERSTRUCTURES

Superstructures shall be constructed of steel plate. Bulkheads shall be reinforced by vertical stiffeners and deck over these structures shall have transverse beams. Under deck girders shall be provided. Inside walls surrounding the galley, pantry, lavatories ete. may be made of corrugated steel plate.

10. SUPERSTRUCTURE LAYOUT

10.1 Superstructure on Main Deck

10.1.1 Crew Cabin

2 Nos. crew cabin of 4 bunks each are to be provided. 2 Nos. lockers & 2 nos. table is to be provided.

One no. crew cabin of 2 bunks is to be provided. 2 nos. lockers and one table is to be provided.

10.1.2 Crew mess

One no. dining room is to be provided. 6 nos. chairs and one no. table is to be supplied.

10.1.3 Generator and Pump room

One no. generator and pump room adjacent to dining room is to be provided.

10.1.4 Galley

One no. galley as shown in drawing is to be made.

10.1.5 Store

One no. store is to be made.

10.1.6 Water Closet

2 nos. water closets are to be made. The floor is to be cemented up to the height of the pan. Side walls of toilet are to have extra paint coatings of 100 microns (DFT) thickness beyond normal scheme.

10.1.7 Bath Rooms

2 nos. bath rooms are to be provided.

All windows & doors for crew cabin, crew mess, generator room & pump room, galley, store are to be provided as per shipbuilding practice.

10. 2 superstructure on Upper Deck

10.2.1 **Officers Cabin**

2 nos. officers cabin of 2 bunks each are to be made. 2 nos. lockers are to be provided in each cabin. 1 no. door, 5 nos. windows are to be made.

1 no. officer cabin of 1 bunk are to be made. 1 no. locker are to be provided in cabin. 1 no. door, 2 nos. windows are to be made.

10.2.2 Water Closet

2 nos. water closets are to be constructed. The floor is to be cemented up to a height of 100 mm, side walls of toilets are to have extra paint coatings of 100 microns (DFT) thickness beyond normal scheme. 1 no. 300 mm dia skylight is to be provided in each water closet.

10.2.3 Bath Rooms

2 nos. bath rooms are to be made. 1 no. 300mm dia skylight is to be provided in each bath room.

10.2.4 Officers Saloon cum Office Room

One no. officers saloon cum office room is to be made. 2 nos. door and 9 nos. windows are to be made.

10.2.5 Galley

1 no. galley is to be made.

11. ACCOMMODATION AND SUNDRY SPACES

11.1 Joiner works and Deck Covering in Accommodation Spaces

Steel walls surrounding living rooms and mess rooms shall be lined with water proof marine plywood of 9mm in thickness with plastic resin overlay.

Steel deck heads of these rooms shall be ceiled with waterproof marine plywood of 6mm in thickness with plastic resin overlay.

Walls and deck heads directly exposed to weather shall be insulated with glass wool or equivalent insulating materials of 50mm in thickness. All floors in the living rooms, in board passages shall be paved with latex deck composition of 6mm in thickness.

Elsewhere Styrofoam insulation of 50 mm thickness is to be provided at the ceiling.

11.2 **Hardware**

All doors shall be made of marine plywood of 25 mm thickness with plastic resin overlay on both sides and be fitted with hinges, locks, hooks, handles, etc. as necessary. Doors of the toilets shall have indicator bolts, and lockers and wardrobes shall be fitted with suitable locks. Hardware shall be of light alloy, chromium plated brass or equivalent. Keys of each lock shall be supplied in duplicate.

11.3 **Furniture**

Furniture shall be provided as listed in the Furnishing Schedule included herein. The inside size of beds shall be as follows:

Officers	1,950mm x 800mm
Crew	1,900mm x 700mm

The bunks shall be made of wood (Shilkorai), Top surface to be covered by 40mm thick good quality wood (Jarul/Garjan). Necessary coir mattress of minimum 150mm thickness covered by good quality rexin in to be provided.

11.4 **Upholstery**

Vinyl leather shall generally be used as cover of chair seats, chair backs, sofas etc. stuffing materials of these furniture shall be of polyurethanes foam. Cushion covers curtain etc. shall generally of synthetic fibre materials.

11.5 **Furnishing Schedule**

Furniture shall be installed as listed in the following tables:

Officer's cabin (one single berthed cabin)

1	-	Bed with 2 drawers
1	-	Sofa
1	-	Table
1	-	Locker
1	-	Coat hook
1	-	Revolving arm chair
1	-	Desk with single pedestal
1	-	Ash tray
1	-	Book rack
1	-	Bed sheet
1	-	Bed cover
1	-	Pillow with cover
1	-	Blanket
1	-	Door curtain
1	-	window curtains
1	-	Marine battery clock
1	-	Mirror
1	-	Calling Bell
1	-	Windows type air conditioner 1.5 ton capacity
1	-	Note book computer (Sony-Z series) with laser printer

Officer's cabin (each of 2 berthed cabins).

2	-	Bed with 2 drawers
2	-	Lockers
1	-	Table
2	-	Chairs
2	-	Coat hooks
1	-	Ash tray
2	-	Bed sheets
2	-	Bed covers
2	-	Pillow with covers
2	-	Blankets
1	-	Door curtain
5	-	window curtains
1	-	Marine battery clock
1	-	Mirror
1	-	Calling Bell

Officer's Saloon cum Office Room

1	-	Dinning table for 6 persons
1	-	Sofa for 4 persons and a table
6	-	Chairs
3	-	Coat hooks
1	-	Mirror
1	-	Ash tray
1	-	Marine battery clock
9	-	Window curtains
2	-	Door curtains
1	-	Book rack
1	-	Calling Bell
1	-	Working table
1	-	Chair
1	-	24″ Colour T.V.
1	-	DVD Player
1	-	Window type Air conditioner 1.5 ton capacity.

Crew cabin (one 2 berthed cabin)

2	-	Single bed with drawers
2	-	Chairs
2	-	Lockers
1	-	Mirror
2	-	Coat hooks
1	-	Ash tray
2	-	Bed sheets
2	-	Bed covers
2	-	Pillows with covers
1	-	Door curtain
2	-	Window curtains
2	-	Blankets

Crew cabin (two 4 berthed cabins)

4	-	Single beds with drawers
1	-	Mirror
4	-	Coat hooks
2	-	Ash trays
4	-	Bed sheets
4	-	Bed covers

4 - Pillows with covers
2 - Door curtains
5 - Window curtains
4 - Blankets

Crew mess room

1 - Dining Table for 6 persons
10 - Chairs
2 - Ash trays
1 - Mirror
1 - Marine Battery Clock
1 - 20″ Colour T.V
1 - DVD Player
2 - Door curtains
5 - Window curtains

11.6 Sanitary spaces

Officer's W/C (for each)

1 - European commode
1 - Urinal with Flushing device
1 - Toilet paper holder
1 - Tap
1 - Water pot with a spout
1 - Coat hook

Officer's Bath Room (for each)

1 - Shower head
1 - Wash Basin
1 - Soap holder
1 - Towel Rail
1 - Mirror

Crew's W/C (for each)

1 - Asian type commode
1 - Urinal with flushing device
1 - Tap
1 - Water pot with a spout

Crew's Bath Room (for each)

1 - Shower head
1 - Wash Basin
1 - Soap holder
1 - Towel Rail
1 - Mirror

11.7 Commissary spaces

Officer's Galley

1 - Oil burning cooking range with 1 oven and 2 top plates
1 - Stainless steel sink with draining board
1 - Electric A.C. motor driven ventilator fan

1 - Cupboard
3 - Shelves
1 - Pan rack
1 - Fresh water hand pump
1 - Sea water hand pump
1 - Electric refrigerator cum deep fridge approximately 8.5 cft capacity

Crew's Galley

1 - Oil burning cooking range with 1 oven and 2 top plates
1 - Stainless steel sink with draining board
1 - Electric A.C. motor driven ventilator fan
1 - Cupboard
3 - Shelves
1 - Pan rack
1 - Fresh water hand pump
1 - Sea water hand pump

12. HULL FITTINGS

12.1 Mast

A steel mast shall be erected on the upper deck roof to carry mast lamp brackets and a halyard for hoisting flags and spreading antennas.

A galvanized tubular steel antenna post/flag staff shall be provided at the rear end of the upper deck roof.

12.2 Rails, Stanchions, etc

Open handrails shall be fitted around the weathered portions of the main deck; and the upper deck. These handrails shall consist of tubular steel top rails, stanchions of steel pipe and solid steel intermediate rails. The height of the handrails shall be about 1.00m above deck.

12.3 Hatches

Twelve (12) hatches are to be provided in way of the water tight compartments.

12.4 Ladders

Twelve (12) nos. steel ladder's are to be provided for access to the holds.

12.5 Markings

The barge's name in both English and Bengali letters and the draft marks in Arabic letters in metric scale shall be cut out from steel plate and welded on the shell, and painted as directed by the Purchaser.

Draft marks shall be in metric scale and indicated on the port and starboard sides at the bow, the stern and amidships.

12.6 Fenders

Fender shall be provided.

12.7 Chain Lockers

Chain lockers bottom shall be of 6mm perforated M. S. plate for storing the chain. Necessary steel framing by 65x65x6mm M. S. angles are to be made. Sufficient capacity for storage of chains to be provided as per direction of the purchaser.

12.8 Windows

Gratings of square size (75xmmx75mm) by 6mm dia M. S. rod are to be provided. At the inner side glass of 4 mm thickness will be fitted.

12.9 Stairs

All stairways shall be of steel. These stairways shall have non-skid treads and galvanized tubular steel handrails.

The minimum width of stairways shall be 75 cm.

12.10 Natural Lighting & Ventilation

Provision for natural lighting shall be made.

Goose-neck or mushroom ventilators shall be provided for natural ventilation of the galley, sanitary spaces etc. on the main and upper deck superstructure.

12.11 Davits

Four (4) Nos. davits are to be fitted. Three (3) of the davits shall be of 400 kg capacity and the remaining (Port side, forward position) shall be of 800 kg capacity. The operation radius shall be sufficient to permit easy handling and lifting of the anchors as well as heavy equipment onboard.

13. DECK AUXILIARY AND FITTINGS

13.1 Windlass

Two sets of electric windlass each complete with two gypsy wheel and two warping ends, capable of a total pull of 1.50 tons at a speed of 8 meters per minute, shall be installed at the fore and after end of the main deck.

13.2 Bollard and Fairleads

Bollards and Fairleads are to be made and fitted.

13.3 Deck Strengthening

Deck in way of equipments and fittings shall be additionally strengthened as necessary.

14. ANCHOR AND CHAIN

14.1 Anchor

Four (4) nos. 300 kg cast steel anchors, are to be supplied. Each finished anchor is to undergo percussion test. Such test certificate along with a guarantee certificate from the manufacturer are to be submitted at the time of supply.

14.2 Chain

Two (2) shackles of 26mm dia stud link chain are to be supplied with each anchor along with D-type joining shackle at each end.

15. AIR PIPES

All the watertight holds are to be provided with at least 1 (one) air vent each made of pipes of 100mm dia and to have 250mm height and shall be fitted.

16. HAWSE AND CHAIN PIPE

The dimensions of the hawse and chain pipe shall be not less than NB 250mmx10mm thick and NB 175mmx6mm thick respectively.

17. PINTING AND PRESERVING WORK

17.1 The painting and preserving of the steel construction, the requirement and the wood and outfit shall be highest standards. Paint shall be of high grade epoxy resin based (two component) in the underwater part. Elsewhere good quality marine paint shall be applied. Both types of paint to be approved by the Purchaser's representative. The choice and application of materials and the execution of the paint work shall be performed in consultation with the Purchaser and the manufacturer of the materials. The dockyard/shipyard shall ensure that the paints shall be applied according to the International standard.

17.2 All steel surfaces are to be sand/shot/grit blasted. Shot or grit blasted surfaces shall be immediately coated with an approved red oxide shop primer. Before and after application of each coat of the paint system, the surfaces shall be inspected and approved by the Purchaser's representative Intervals between coats in the schemes shall be strictly in accordance with paint manufacturer's instruction. Each coat of paint shall be of appropriate dry film thickness DFT as mentioned in section 17.4. It is the dry film thickness which shall be strictly complied with. The paints shall be applied to roller or spray as recommended by the manufacturer.

17.3 All steel plates and sections shall be cleaned properly to remove all weld spatters, rust grease. Prior to application of paints the dockyard/shipyard must ensure clean, smooth steel surfaces absolutely free from any mill scale. For the purpose of surface cleaning and preparation, the dockyard shall use sand blasting/wet blasting. All steel surfaces shall be prepared by sand blasting/wet blasting to a "near white" surface. Disk grinding scrapping may be used for corners, patch workers only. NO paints shall be applied on any part of the barge without approval of the Purchaser's representative on the surface preparation. Manufacturer's quality certificate is to be submitted.

17.4 Principal part of the barge shall be painted according to the following standards. Paints shall be of reputed make. Proven records of the use shall be produced, if required by the Purchaser.

Paint Scheme

Hull below Waterline		**Total DFT (microns)**
1 Coat coal tar epoxy	Black	125
1 Coat coal tar epoxy	Chocolate	125
1 Coat antifouling	Red	75
Hull till Main Deck		
1 Coat high build epoxy	Silk Grey	125
1 Coat epoxy	Light Grey	50
1 Coat epoxy	Light Grey	50
Deck		
1 Coat high build epoxy	Silk Grey	125
1 Coat epoxy (non-slip)	Deep Grey	50

1 Coat epoxy (non-slip)	Deep Grey	50
Superstructure Outside		
1 Coat red oxide primer	Red	50
1 Coat synthetic undercoat	White	30
3 coat enamel	White	60
Superstructure Inside		
2 Coat red oxide primer	Red	50
1 Coat synthetic undercoat	White	30
3 coat enamel	White	60
(inside of panelled space 1 coat enamel)	White	20
Hull Compartments		
1 Coat red oxide primer	Red	25
2 Coat bituminous paint	Black	40
Anchor, Chain Capstan, Bollard		
2 Coat bituminous paint	Black	40

Note: 95% of DFT readings shall be at the specified thickness and no reading shall be less than 80% of the specified thickness.

18. MACHINERY

18.1 Diesel Generator Set

A marine diesel generator set with engine shall be provided with a continuous rating of not less than 30 KVA at 0.8 power factor, 220 volt, 50Hz., single phase at 1500 rpm. Actual generator rating shall satisfy full 220-volt demand load without generator overload, and the unit shall be capable of delivering 110% of rated load for not less than two (2) hours in any twenty-four (24) hour period.

Electric Starting and Accessories-A 24 volt DC system shall be provided which shall include series-connected batteries, starter motor, alarms and controls. Batteries shall be heavy duty sealed type, suitable for marine service, and with a minimum capacity of 100 amp-hours. Battery charging shall be accomplished by a float type solid state charger fed from the 220 volt AC bus. The charger shall be equipped with an integrally-mounted charging Ammeter and a Voltmeter.

18.2 Pumps

18.3.1 Bilge/Washdeck

One 220V single phase AC electric motor driven self-priming bilge/washdeck pump shall be provided. The capacity of the pump shall be of not less than $15m^3$/hr. at a head of abt. 3.50m.

18.3.2 Fresh Water

One (1) no. 220V single phase AC electric motor driven pump of $4m^3$/hour capacity against a head suitable for pumping water from fresh water tank in hold to service tank of capacity $2m^3$ positioned on upper deck roof.

18.3.3 Fuel Oil

1 No. 220V A. C. single phase electric motor driven self priming positive displacement pump of capacity $2m^3$ per hour at 10m head shall be provided.

18.3 Ventilator/Exhaust Fans

3 Nos. 220V. A. C. single phase electric motor driven axial flow fans of $2m^3$ per minute capacity shall be provided.

19. OPERATION SYSTEMS

19.1 Electrical Systems

The vessel shall be provided with a complete dual-voltage, 220 V AC, 24 V DC electrical system consisting of a diesel generator set, 220 V AC shore power receptacles, main battery bank, 220 V AC/24 V DC float-type battery charger/power supply, main control panel, and AC and DC distribution system.

19.1.1 Main Control Panel

A Main Control Panel shall be provided and bulkhead-mounted in the generator room. This panel shall be provided with, but is not limited to, the following components as required:

a) generator circuit breaker;
b) shore power circuit breaker;
c) AC distribution panel feeder breaker;
d) generator voltage regulator with voltage adjusting rheostat;
e) frequency meter;
f) ammeter;
g) voltmeter; and
h) instrument transformers.

Provisions shall be incorporated to interlock the generator and the shore power circuit breakers to prevent paralleling of non-synchronous sources.

19.1.2 Distribution Panel boards

The supplier shall provide one (1) each AC, one (1) each DC power and lighting distribution panel board, located adjacent to the main control panel. The panel boards shall be dead front circuit breaker type equipped with molded case circuit breakers with ratings and the number of poles to satisfy system requirements.

The enclosure of the distribution panel boards shall be drip proof and the front of each enclosure shall include a door with latches and spring-loaded door pulls. Directories of nameplates shall be provided and shall identify circuit designation and the service of each circuit breaker.

(i) AC Distribution Panel board

The AC panel board shall be rated for 220 volts, single phase, two (2) wire, 50 Hz service. The panel board shall be equipped with feeder circuit breakers to satisfy the AC electrical power requirements of the barge, which as a minimum, shall include the following electrical loads:

a) battery charger for the 24 V DC battery banks;
b) generator room exhaust blowers;
c) lighting and receptacles;
d) navigation lights;
e) air conditioner;
f) anchor windlass;
g) galley exhaust blowers;
h) refrigerator; and
i) radio.

(ii) DC Distribution Panel board

The DC panel board shall be rated for 24 V DC and shall be connected to the output of the battery bank for the generator engine. The panel board shall be equipped with the number of feeder breakers to satisfy the 24 V DC electrical power requirements of the vessel, which, as a minimum, shall include the following electrical loads:

a) engine/generator controls, instruments and alarms;
b) miscellaneous controls, instruments and alarms;
c) radio;
d) navigation lights;
e) searchlight; and
f) emergency lights.

19.1.3 Main DC Battery Charger/Power Supply

A float type battery charger shall be provided to charger the battery bank and simultaneously to provide full rated power for all of the 24 V DC loads. The battery charger unit shall be a solid state device, shall be convection cooled in a ventilated steel enclosure, shall maintain rated DC output voltage with AC input variation of ±10% and shall be provided with, but is not limited to, the following basic components and features:

a) automatic AC line compensation;
b) automatic overload protection (current limit);
c) sealed silicone diode full-wave rectifiers;
d) automatic surge suppressors;
e) automatic load regulation;
f) DC output ammeter;
g) fused AC input and DC output; and
h) automatic DC voltage regulation.

19.1.4 Shore Power System

The shore power system shall be capable of accepting 220 volt, single phase, 50 Hz, 100 amp service which shall be fed through a circuit breaker mounted in the main control panel. One (1) watertight receptacle, rated for 100 amp service shall be provided and shall be mounted on the house aft bulkhead, near the centerline, just below the level of windows, and provided with an isolation device to prevent cathodic corrosion. In addition, two (2) twenty (20) meter shore power cables shall be provided. Each cable shall have one end compatible with the receptacle on the barge. On the shore side, one (1) cable shall have a standard 50 amp marine type fitting while the other shall have a larger 100 amp fitting.

19.1.5 Lighting

A complete lighting system shall be provided to include fluorescent, ceiling-mounted fixtures for interior lighting and incandescent watertight fixtures for exterior lighting. Fixtures shall be made of corrosion resistant materials and shall be spaced evenly to provide proper distribution of light. Fixture installation shall be such that the low point on all fixtures is not below the lowest structural members or the line of overhead sheathing, where sheathing is installed. Lighting switches shall be marine type, watertight where required by operation and shall be mounted for convenient operation. Duplex convenience receptacles shall be provided throughout the vessel to adequately satisfy all of the electrical requirements. The receptacles shall be of the ground fault interrupting type, weather proof and shall be fed from the distribution panel boards located at the generator control station.

(a) Interior Lighting

Fluorescent lighting fixtures shall be provided for the below listed areas specified at the minimum levels of illumination as follows:

Area Level, (ft candles)
.....

Saloon	30
Generator Compartment	20
Cabins	20
Heads and Baths	20
Galleys	30

(b) Exterior Lighting

Exterior deck lighting shall consist of watertight incandescent type fixtures. Sufficient lighting shall be provided to maintain a minimum illumination level of ten (10) foot candles on the deck for safe operations at night.

(c) Emergency Lighting

An emergency lighting system shall be provided consisting of twenty-four (24) V DC light fixtures arranged to provide adequate lighting to continue operation in the event of generator failure. As a minimum, the following number of fixtures shall be supplied in the areas specified:

Area	No. of Fixtures
Saloon	1
Generator Compartment	2
Cabins (one each room)	6
Crew Mess room	1

(d) Search Light

One (1) 175 mm diameter 24 V DC watertight search light with cabin control shall be furnished and installed on the house roof and be convenient for control along with the controls for the anchor windlass.

19.1.6 Fans

Wall mounted fans of requisite capacity for each individual person to be provided. The crew mess room and officer's saloon cum office room are to be provided with two bulkhead fans (in each compartment) of sufficient capacity in positions as per direction of the Purchaser.

19.1.7 Cables and Cable Installation

(a) Electric Cable

All cables shall be of such qualities complying with the requirements of the classification society.

All cables used for alternating current circuits shall be multiple conductor cables.

All electric cables shall have conductors of current carrying capacities sufficient for loads connected to them.

Ethylene propylene rubber insulated, PVC sheathed, metal braided cables shall generally be used.

(b) Electric Cable Installation

Cables shall be in single continuous lengths without joints, from their terminals to terminals.

Where cables run in groups, they shall be supported in metal hangers so arranged as far as practicable as to permit painting of the cables. Cables shall be structures without causing undue disturbances to the cables. Cables shall be installed in accessible positions, as far as practicable, so that no cable may be exposed to drip or accumulation of water or high temp etc.

Where cables penetrate watertight decks or bulkheads, watertight cable glands or stuffing box with compound shall be fitted. where cables penetrate beams or non-watertight decks or bulkheads, bushings or comings with round edges shall be used as necessary for protecting of cable. Due caution shall be given for rat-proofing of such openings.

19.2 Fuel Oil system

A fuel oil fill and storage system shall be provided. Fill stations, port and starboard, shall terminate in 90^0 valves with flanges, gaskets, and cover plates. Tank vents shall terminate in 90^0 outboard turns to vent buttons with corrosion resistant flame screens

Fuel service piping shall be designed to permit service to both the diesel generator set and the survey boat fueling stations from the tank (s). Fuel tanks shall have drain valves to allow water drainage from the bottom.

Boat fueling stations, port and starboard, shall have flexible hoses with off valves at the nozzles, flow meters to indicate the volume dispensed, and lockable, quick acting shut off valves in the pipe before the flow meter.

19.3 Fresh Water System and Bilge/Wash deck/River Water System

(a) Piping in General

Pipes, valves, cocks, flanges, etc. shall be of such materials, qualities and dimensions as to comply with marine practice and intended purpose. Provision for suitable arrangement shall be made in respect of vibration, mechanical damage and passage through bulkheads and decks as well as sufficient number of sectional shut-off valves.

(b) Fresh Water

A gravity tank of $1m^3$ capacity for supply and distribution of fresh water complete with necessary pipes and fittings shall be installed on the upper deck roof and from this tank distribution lines shall be led to wash basins and galley where so specified.

(c) Bilge/Wash deck/River Water

A gravity tank of $1m^3$ capacity for supply and distribution of river water complete with necessary piping and fittings shall be installed on the upper deck roof and from this tank distribution lines shall be led to W/C's and shower heads as specified.

A complete piping system including all necessary manifolds, valves and fittings shall be provided to allow the pump to function as a bilge pump to drain the bilges of all compartments as well as to function for wash deck services.

20. NAVIGATION AND COMMUNICATION EQUIPMENT

20.1 Navigation Lights

A full set of 220 V AC navigation lights with control panel, including bow, side, stern, and anchor lights, shall be provided in the size and type as per regulation for a vessel of this size and class. Anchor lights shall be installed on a suitable mast if required.

20.2 Search Lights

One (1) 175 mm diameter 24 V DC watertight search light with cabin control shall be furnished and installed on the house roof and be convenient for control along with the controls for the anchor windlass.

20.3 4 nos. Mobile sets of reputed make for each house boat.

21. Fire Fighting and Life Saving Appliances

21.1 Fire Fighting Appliances

Fire extinguishers of requisite capacity shall be installed outside the galley, generator room, inside accommodation spaces etc. as required by the competent Authority.

Fire buckets, fire axe, sand box etc. are also to be provided as required.

21.2 Life Saving Appliances

Life buoys and life jackets are to be supplied as per requirement of the competent authority.

G. Floating Pipe, Shore pipe and Floater (For 20" Cutter Suction Dredger).

G-1.0 Floating Pipe

Principal Particulars

Length O.A. (approx) each	: 6.0m
Inner diameter	: 500mm
Thickness	: 8.00 mm
Materials	: M.S.

1.1 General Description

It is the intent of this specification to describe and explain the scope of works and materials required for manufacturing of all welded steel pipes with flange for dredgers. The pipes shall be of simple finish but of quality construction and workmanship such as to ensure smooth surfaces. The construction of steel pipes with flange should strictly comply with this specification.

1.2 Measurements

Steel pipes to be made of 8 mm thick steel plate having 500 mm inner dia and 6m in length including flanges of 22 mm thick plate at both ends. There should not be more than one welding joint longitudinally and there should not be more than one joint in circumference.

G-2.0 Shore Pipe

Principal Particulars

Length O.A. (approx) each	:	6.0m
Inner diameter	:	500mm
Thickness	:	8.00 mm
Materials	:	M.S.

2.1 General Description

It is the intent of this specification to describe and explain the scope of works and materials required for manufacturing of all welded steel pipes with flange for dredgers. The pipes shall be of simple finish but of quality construction and workmanship such as to ensure smooth surfaces. The construction of steel pipes with flange should strictly comply with this specification.

2.2 Measurements

Steel pipes to be made of 8 mm thick steel plate having 500 mm inner dia and 6m in length including flanges of 22 mm thick plate at both ends. There should not be more than one welding joint longitudinally and there should not be more than one joint in circumference.

G-3.0 Floater

Principal Particulars		
Length O.A. (approx)	:	4.88 m
Outside diameter	:	1.02 m
Thickness	:	6 mm
Materials	:	M.S.

Steel materials for the Steel Floaters shall be of open hearth or electric furnace process shipbuilding quality Lloyd's Grade - A or equivalent mild steel of uniform surfaces.

3.1 General Description

The Steel Floaters shall comprise of two (2) steel cylindrical floats joined together at both ends by 'U' channels of cross-section 176 x 76 x 6 mm fabricated from M.S. angles at a distance of 2.134 m centre to centre of the cylindrical floats. M.S. angles 76x 76 x 6 mm shall be fastened to the U channel at both ends top and bottom and welded to the end plates.

The end plates shall be stiffened internally with M.S. flat bar 76 x 6 mm and the cylindrical shell shall have longitudinal stiffeners.

Pipe seats shall be made of M.S. flat bar 76 x 6 mm and contoured to be in good contact with outside wall of the delivery pipe. The seat shall be welded to the supper flange of the U channel. Stiffening shall be provided under the pipe seat with M.S. flat bar 76 x 6 mm.

Each cylindrical float shall be subdivided by two (2) No. transverse water-tight bulkheads of M.S. plate 6 mm thick placed at a distance of 1.524 m from each end. Threaded plug holes and plugs shall be provided on each water-tight compartment.

Each floater shall be provided with U-clamp for each pipe seat. The clamp shall be made from M.S. flat bar 76 x 6 mm and bent to half-round shape. M.S. bolts shall be welded at each end of the half-round strap so that they can be secured to the upper flange of U-channel with nuts which shall also be provided by the Supplier.

3.2 Dimensions

a) Cylindrical

Length	:	4.88m
Outside diameter	:	1.02 m
No. of W.T. bulkheads	:	2
No. of longitudinal stiffeners	:	4
No. of air plugs	:	1 each W/T compartment Total 3 Nos.
Plate thickness	:	6 mm

b) U-channel

Length	:	2850mm
Cross-section	:	176 x 76 x 6 mm

c) Pipe Seat and U-Clamp : Suitable for 20" Cutter Suction

G-4.0 Materials

Steel materials for the steel piped with flange and Floater shall be open hearth or electric furnace processed shipbuilding quality Lloyd's Grade: A or equivalent mild steel of uniform surfaces. The manufacturer must produce such certificate to the owner before commencing actual work.

The steel pipes, steel plates, Floaters and the welding joints should confirm to specification. A certificate from any Classification Society to be obtained confirming the specification in respect materials and workmanship etc. for constructing the steel pipe, floater and these certificates is to be furnished along with the supply.

G-5.0 Welding

Electric arc welding shall be applied to all connection of structural members, the make, type, quality of electrodes are to be approved by a Classification Society and the authorized representatives of the authority. Welding techniques must be approved by the owner prior to construction. Welding of any structural members shall only be made after preparing the edges properly as per shipbuilding practice.

G-6.0 Painting Works for Steel Pipes

Prior to application of paints, steel surfaces shall be cleaned by scraping and power brushing in order to remove loose scales, rust and dusts etc. The cylindrical pipes are to be painted as per normal shipbuilding practice. Necessary certificate is to be produced from the paint manufacturer confirming quality of paint (marine). After application of each coat, the manufacturer should obtain clearance from the authorized representative of the authority for applying a second coat.

The pipes shall be coated according to the following standard:

Description	**Number of treatment**	**Coats**	**DF Thikness**
Steel Pipes with flange	Red lead primer	x 1	50 micron
	Anticorrosive	x 1	50 micron
	Black enamel paint	x 2	30 micron

G-7.0 Painting Works for Floaters

The Floaters with U-Clamp shall be painted as per normal shipbuilding practice in any of the approved paint schemes. All paint shall be of marine quality and of reputed make approved by the Purchaser. The surface shall be cleared by Sand blasting machine to bare metal and dried before applying the priming coat and each coat shall be dry before applying the subsequent coats. A through inspection of the applied coat shall be undertaken to ensure that there is no incidence of flaking, blisters or other flaws before applying the next coat. The paint shall be in sound condition at the time of delivery to the Purchaser.

The paint shall be applied in the following sequence maintaining the dry film thickness given below or the painting operation shall be carried out paint manufacturer's recommendations.

	Area	Number of treatment	coats	DFT
a)	Under water	Priming coat	x 1	25 micron
	portion	Anti-corrosive	x 3	25 x 3 =75
		Anti-fouling	x 1	26 micron
b)	Above water	Primer	x 1	25 micron
	portion	Anti-corrosive	x 2	25x2=50 micron
		Finish coat (Anti-corrosive Red)		25 micron
c)	Inner surface	Primer	x 1	25 micron
		Anti-corrosive	x 2	25x2=50 micron

G-8.0 Inspection/Test

From time to time inspection by the authority's representative (s) shall be carried out during construction. It will be the responsibility of the manufacturer to obtain approval of the concerned authorized representative (s) of the Purchaser at the following stage of construction:

a) As and when steel materials and electrodes have been purchased and made available at the yard site;
b) After edge preparation of plates prior to welding;
c) After preparation of the surfaces for painting works; and
d) On application of each coat of paint.

G-9.0 Marking

Each pipe must have the BIWTA marks of non-corrosive marine paint near the two ends.

G-10.0 Liability

Anything not mentioned in the specification but required for safe and worthy construction and usage of the pipes with flange, shall be supplied and fitted by the supplier.

G-11.0 Drawings

Relevant drawings are to be provided for Floating pipe, Shore pipe and Floater.

H. Floating Pipe, Shore pipe and Floater (For 18" Cutter Suction Dredger).

H-1.0 Floating Pipe

Principal Particulars

Length O.A. (approx) each	: 6.0m
Inner diameter	: 450mm
Thickness	: 8.00 mm
Materials	: M.S.

H-1.1 General Description

It is the intent of this specification to describe and explain the scope of works and materials required for manufacturing of all welded steel pipes with flange for dredgers. The pipes shall be of simple finish but of quality construction and workmanship such as to ensure smooth surfaces. The construction of steel pipes with flange should strictly comply with this specification.

H-1.2 Measurements

Steel pipes to be made of 8 mm thick steel plate having 450 mm inner dia and 6m in length including flanges of 22 mm thick plate at both ends. There should not be more than one welding joint longitudinally and there should not be more than one joint in circumference.

H-2.0 Shore Pipe

Principal Particulars

Length O.A. (approx) each	:	6.0m
Inner diameter	:	450mm
Thickness	:	8.00 mm
Materials	:	M.S.

2.1 General Description

It is the intent of this specification to describe and explain the scope of works and materials required for manufacturing of all welded steel pipes with flange for dredgers. The pipes shall be of simple finish but of quality construction and workmanship such as to ensure smooth surfaces. The construction of steel pipes with flange should strictly comply with this specification.

2.2 Measurements

Steel pipes to be made of 8 mm thick steel plate having 450 mm inner dia and 6m in length including flanges of 22 mm thick plate at both ends. There should not be more than one welding joint longitudinally and there should not be more than one joint in circumference.

H-3.0 Floater

Principal Particulars		
Length O.A. (approx)	:	4.88 m
Inside diameter	:	1.0 m
Thickness	:	6 mm
Materials	:	M.S.

Steel materials for the Steel Floaters shall be of open hearth or electric furnace process shipbuilding quality Lloyd's Grade - A or equivalent mild steel of uniform surfaces.

3.1 General Description

The Steel Floaters shall comprise of two (2) steel cylindrical floats joined together at both ends by 'U' channels of cross-section 127 x 64 x 6 mm fabricated from M.S. angles at a distance of 2.134 m centre to centre of the cylindrical floats. M.S. angles 76x 76 x 6 mm shall be fastened to the U channel at both ends top and bottom and welded to the end plates.

The end plates shall be stiffened internally with M.S. flat bar 76 x 6 mm and the cylindrical shell shall have longitudinal stiffeners.

Pipe seats shall be made of M.S. flat bar 76 x 6 mm and contoured to be in good contact with outside wall of the delivery pipe. The seat shall be welded to the supper flange of the U channel. Stiffening shall be provided under the pipe seat with M.S. flat bar 76 x 6 mm.

Each cylindrical float shall be subdivided by two (2) No. transverse water-tight bulkheads of M.S. plate 6 mm thick placed at a distance of 1.524 m from each end. Threaded plug holes and plugs shall be provided on each water-tight compartment.

Each floater shall be provided with U-clamp for each pipe seat. The clamp shall be made from M.S. flat bar 76 x 6 mm and bent to half-round shape. M.S. bolts shall be welded at each end of the half-round strap so that they can be secured to the upper flange of U-channel with nuts which shall also be provided by the Supplier.

3.2 Dimensions

a) Cylindrical

Length	:	4.88 m
Inside dia.	:	1.0 m
No. of W.T. bulkheads	:	2
No. of longitudinal stiffeners	:	4
No. of air plugs	:	1 each W/T compartment Total 3 Nos.
Plate thickness	:	6 mm

b) U-channel

Length	:	2850 mm
Cross-section	:	127 x 64 x 6 mm

c) Pipe Seat and U-Clamp : Suitable for 18" Cutter Suction

H-4.0 Materials

Steel materials for the steel piped with flange shall be open hearth or electric furnace processed shipbuilding quality Lloyd's Grade: A or equivalent mild steel of uniform surfaces. The manufacturer must produce such certificate to the owner before commencing actual work.

The steel pipes, steel plates and the welding joints should confirm to specification. A certificate from any Classification Society to be obtained confirming the specification in respect materials and workmanship etc. for constructing the steel pipe and these certificates is to be furnished along with the supply.

H-5.0 Welding

Electric arc welding shall be applied to all connection of structural members, the make, type, quality of electrodes are to be approved by a Classification Society and the authorized representatives of the authority. Welding techniques must be approved by the owner prior to construction. Welding of any structural members shall only be made after preparing the edges properly as per shipbuilding practice.

H-6.0 Painting Works for Steel Pipes

Prior to application of paints, steel surfaces shall be cleaned by scraping and power brushing in order to remove loose scales, rust and dusts etc. The cylindrical pipes are to be painted as per normal shipbuilding practice. Necessary certificate is to be produced from the paint manufacturer confirming quality of paint (marine). After application of each coat, the manufacturer should obtain clearance from the authorized representative of the authority for applying a second coat.

The pipes shall be coated according to the following standard:

Description	**Number of treatment**	**Coats**	**DF Thikness**
Steel Pipes with flange	Red lead primer	x 1	50 micron
	Anticorrosive	x 1	50 micron
	Black enamel paint	x 2	30 micron

H-7.0 Painting Works for Floaters

The Floaters with U-Clamp shall be painted as per normal shipbuilding practice in any of the approved paint schemes. All paint shall be of marine quality and of reputed make approved by the Purchaser. The surface shall be cleared by Sand blasting machine to bare metal and dried before applying the priming coat and each coat shall be dry before applying the subsequent coats. A through inspection of the applied coat shall be undertaken to ensure that there is no

incidence of flaking, blisters or other flaws before applying the next coat. The paint shall be in sound condition at the time of delivery to the Purchaser.

The paint shall be applied in the following sequence maintaining the dry film thickness given below or the painting operation shall be carried out paint manufacturer's recommendations.

	Area	Number of treatment	coats	DFT
a)	Under water	Priming coat	x 1	25 micron
	portion	Anti-corrosive	x 3	25 x 3 =75
		Anti-fouling	x 1	26 micron
b)	Above water	Primer	x 1	25 micron
	portion	Anti-corrosive	x 2	25x2=50 micron
		Finish coat (Anti-corrosive Red)		25 micron
c)	Inner surface	Primer	x 1	25 micron
		Anti-corrosive	x 2	25x2=50 micron

H-8.0 Inspection/Test

From time to time inspection by the authority's representative (s) shall be carried out during construction. It will be the responsibility of the manufacturer to obtain approval of the concerned authorized representative (s) of the Purchaser at the following stage of construction:

e) As and when steel materials and electrodes have been purchased and made available at the yard site;
f) After edge preparation of plates prior to welding;
g) After preparation of the surfaces for painting works; and
h) On application of each coat of paint.

H-9.0 Marking

Each pipe must have the BIWTA marks of non-corrosive marine paint near the two ends.

H-10.0 Liability

Anything not mentioned in the specification but required for safe and worthy construction and usage of the pipes with flange, shall be supplied and fitted by the supplier.

H-11.0 Drawings

Relevant drawings are to be provided for Floating pipe, Shore pipe and Floater.

I. Rubber Hose Pipes (For 20" Cutter Suction Dredger)

1.1 Introduction

These specifications describe the requirements for the Rubber Hose Pipe, which shall be provided by the Supplier in good conditions. Rubber Hose Pipes fitted with M. S adapter at each end of rubber hose pipe.

1.2 Workmanship

The Rubber Hose Pipe shall be delivered to the Purchaser in new condition, clean and free of all debris and shall be manufactured of new materials and components. Special measures shall be taken to prevent wear, damage or deterioration before delivery. Materials and workmanship involved in the manufacturing of the hose shall be of a quality conforming to good commercial/marine practice.

1.3 Standard Parts

All articles, fittings and suppliers used in the manufacturing of the rubber hose pipe shall be new, suitable for heavy duty marine application, of recent manufacture, free from defects and imperfections, and be products of good commercial graded materials that are currently produced by reputable manufactures. Materials not specifically mentioned herein but are used shall be suitable for he purpose intended.

1.4 Standard

The Rubber Hose Pipe should conform to approved standards for similar equipment. The supplier shall obtain a certificate from any Classification Society in respect of materials and workmanship for manufacturing of the hosed and furnish this certificate along with the supply.

1.6 Materials and Measurement

Material: Best quality rubber to withstand high pressure and reinforced with minimum 4 layer of Polyester net.

Measurements : Inside diameter 516mm up to a length of 230 mm at each end.
Inside diameter 500mm up to length of 1540mm in he middle
Total length-230+1540+230=2000mm.
Total wall thickness-30 mm
Thickness of wear layer in the inner surface-12mm Min
Working pressure-10 Bars
Bursting pressure-20 Bars
Bending angle-45^0 (under pressure)

1.7 Inspections and Test

Inspection and Test Certificates to be issued by an internationally reputed Classification Society or approved agency, certifying that the rubber hoses have been manufactured as per specification. In addition the goods shall be inspected by international reputed classification society prior to shipment.

1.8 Drawings

Relevant drawings are to be provided for Rubber Hose pipes.

1.9 Country of Origin: EU Countries/USA/ Australia/ Canada/Japan/India/Korea/China.

2.0 Hose Adapter

3.0 Hose Clamp

J. Rubber Hose Pipe (For 18" Cutter Suction Dredger)

1.1 Introduction

These specifications describe the requirements for the Rubber Hose Pipe, which shall be provided by the Supplier in good conditions. Rubber Hose Pipes fitted with M. S adapter at each end of rubber hose pipe.

1.2 Workmanship

The Rubber Hose Pipe shall be delivered to the Purchaser in new condition, clean and free of all debris and shall be manufactured of new materials and components. Special measures shall be taken to prevent wear, damage or deterioration before delivery. Materials and workmanship involved in the manufacturing of the hose shall be of a quality conforming to good commercial/marine practice.

1.3 Standard Parts

All articles, fittings and suppliers used in the manufacturing of the rubber Hosed Pipe shall be new, suitable for heavy duty marine application, of recent manufacture, free from defects and imperfections, and be products of good commercial graded materials that are currently produced by reputable manufactures. Materials not specifically mentioned herein but are used shall be suitable for he purpose intended.

1.4 Standard

The Rubber Hose Pipe should conform to approved standards for similar equipment. The supplier shall obtain a certificate from any Classification Society in respect of materials and workmanship for manufacturing of the hosed and furnish this certificate along with the supply.

1.6 Materials and Measurement

Material: Best quality rubber to withstand high pressure and reinforced with minimum 4 layer of Polyester net.

Measurements : Inside diameter 466mm up to a length of 230 mm at each end.
Inside diameter 450mm up to length of 1540mm in the middle
Total length-230+1540+230=2000mm.
Total wall thickness-30 mm
Thickness of wear layer in the inner surface-12mm Min
Working pressure-10 Bars
Bursting pressure-30 Bars
Bending angle-45^0 (under pressure)

1.7 Inspections and Test

Inspection and Test Certificates to be issued by an internationally reputed Classification Society or approved agency, certifying that the rubber hoses have been manufactured as per specification. In addition the goods shall be inspected by international reputed classification society prior to shipment.

1.8 Drawings

Relevant drawings are to be provided for Rubber Hose pipes.

1.9 Country of Origin: EU Countries/USA/ Australia/ Canada/Japan/India/Korea/China.

2.0 M.S Hose Adapter

3.0 Hose Clamp

K.0 FS Wire

a) Dia 26 mm (each coil 300 m) -10 Coils

Specification:

Construction of the Rope: 6x19(12+6+1) FC
Normal Tensile Strength: 165 kg/sq.mm
Lay of Wire: Right Hand Regular Lay
Breaking Load (minimum): 35000kg
Grade: A (Galvanized)

b) Dia 24 mm (each coil 300 m)-10 Coils

Specification:

Construction of the Rope: 6x19(12+6+1) FC
Normal Tensile Strength: 165 kg/sq.mm
Lay of Wire: Right Hand Regular Lay
Breaking Load (minimum): 30000kg
Grade: A (Galvanized)

c) Dia 20 mm (each coil 300 m)-10 Coils

Specification:

Construction of the Rope: 6x19(12+6+1) FC
Normal Tensile Strength: 165 kg/sq.mm
Lay of Wire: Right Hand Regular Lay
Breaking Load (minimum): 22000kg
Grade: A (Galvanized)

d) Dia 16 mm (each coil 300 m)-10 Coils

Specification:

Construction of the Rope: 6x19(12+6+1) FC
Normal Tensile Strength: 165 kg/sq.mm
Lay of Wire: Right Hand Regular Lay
Breaking Load (minimum): 13500kg
Grade: A (Galvanized)

e) Dia 14 mm (each coil 300 m)-10 Coils

Specification:

Construction of the Rope: 6x19(12+6+1) FC
Normal Tensile Strength: 165 kg/sq.mm
Lay of Wire: Right Hand Regular Lay
Breaking Load (minimum): 10000kg
Grade: A (Galvanized)

Country of Origin: EU Countries/USA/ Australia/ Canada/Japan/India/Korea/China.