APPENDIX 4-1-1

OUTLINE OF SPECIFICATIONS

FOR

TRAINING SHIP

IN

THE REGIONAL MARITIME ACADEMY

OF

THE REPUBLIC OF IVORY COAST

JULY, 1980

C O N T E N T S

III. MACHINERY PART

IV. ELECTRIC PART

I. GENERAL

1. General

The vessel shall be designed and constructed as a single screw diesel driven ocean going training boat.

The vessel shall be a single decker with long forecastle having raked stem and trawling-slipway-stern, all accommodation placed fore, engine room placed amidship, and freezing room, lobby placed aft as shown on the General Arrangement Plan.

The vessel shall be designed to carry out fishing training and fishing equipments shall be arranged for the purpose.

The kind of fishing training duty shall be stern trawl fishing and shrimp trawl fishing.

The hull under upper deck shall be devided into following compartments from forward:

Forepeak tank
Student's accommodation
Engine room
Freezing room and lobby
Steering engine room

Accommodation quarter shall be designed for 26 persons.

The plan for approval shall be submitted to the Owner according to the Builder's usual practice.

The units shall be metric system in general.

The vessel shall be registered under the flag of Ivory Coast and shall be designed/constructed in compliance with the Rules and Regulations listed in section 4. "Class and Rules".

2. Principal dimension

Length o.a.	abt.	33.00 m
Length b.p.		28.00 m
Breadth, mld.		7.60 m
Depth to upperdeck, mld.		3.50 m
Draught designed, mld.		2.80 m
Initial trim		1.0 m

3. Gross tonnage

abt. 220 GRT (JG Rule)

4. Class and Rules

The vessel shall be designed, manufactured and built under the supervision by and to the classification requirements of Bureau Veritas (BV) and registered under the symbols of: ✠ I 3/3 E

The following Rules and Regulations shall be applied or referred to also:

Rules and Regulations of Classification Society (BV)

International Telecommunication Convention.

IMCO stability recommendation for fish vessels (A-168)

Maritime Regulations of Japan applicable for this kind of ship.

5. Capacity

Fuel oil tank	abt.	44 m^3
Lube oil tank	abt.	3 m^3
Fresh water tank	abt.	30 m^3
Freezing room	abt.	21 m^3
Lobby	abt.	26 m^3

6. Complement

Captain	1P
Chief engineer	1P
Crews	4P
Instructors	4P
Students	16P
Total	26P persons on board

7. Speed and endurance

Sea speed on designed draught of 2.80m at main engine developing 85% of Maximum Continuous Rating (MCR) — abt. 10.0 knots

Trail speed on approximately light ship condition, at main engine developing 750ps — abt. 11.0 knots

Fuel oil consumption (CSR of main engine and 60% load of generator engine) — abt. 3.3 tons/day

Endurance at speed of 10 knots, assuming full diesel fuel oil consumed by main engine and generators — abt. 2,400 sea miles

8. Trim and stability

The vessel shall be designed to have suitable trim and stability throughout various conditions expected.
The builder shall submit preliminary trim and stability calculation for various conditions to the Owner at preliminary design stage.

9. Subcontractors

Subcontractors shall be Japanese manufactures unless otherwise specified, and the material, apparatus and equipment from the subcontractors shall be of their products.

10. Spare

Spare parts shall be supplied in accordance with the requirements of the specified the Classification Society, and/or Manufacturer's normal standards.

11. Delivery

The vessel which shall be delivered from the Builder to the Owner is a seaworthy condition under the requisite legal formalities.
The vessel shall be fully equipped with all necessary outfitts ready for navigation, except for spare lubricants, fuel oil, provisions, and special goods those specially stand on customs of registered country (e.g. books, medicine, etc.).

12. Transportation

The vessel shall be transported to her port of registry after her delivery at the Builder's shipyard.
All costs and expenses of the preparation for single voyage and the transportation to the above port, including insurance premium are at the Builder's account.

13. Fishing tools

The following fishing tools shall be supplied at the Builder's account.
1 set - Bottom trawl net.

1 set - Shrimp net
Complete with ground gears and floats, towing shackle, and a pair of otterboard.

2 coils - Trawl and shrimp warp.

1 set - Miscellaneous trawl and shrimp gears.

II. HULL

1. Hull construction

Structural steel of hull construction shall be of mild steel approved by the Classification Society, and steel including casting and forging shall have quality complying with the requirements and tests of the Classification Society.

Steel materials not specified by the Classification Society shall be in compliance with Japanese Industrial Standard (JIS) or the Builder's practice.

Hull structure shall be of welded construction, and no rivetting shall be applied.

Scantlings of all structural members shall be in compliance with the requirements of the Classification Society.

Scantlings not specified by the Classification Society shall be as per the Builder's practice.

Transverse framing system shall be adopted in general.

Watertight bulkhead shall be of flat plate type with vertical stiffeners.

Stem shall be of welded steel plate construction, forming raked stem.

Stern frame shall be of welded construction with steel casting part of neck bearing, and propeller boss, and shoe piece.

Rudder shall be of balanced type rudder with neck bearing and bottom pintle.

Bilge keel which consists of bulb plate and flat pad shall be fitted on each side of the vessel, for approx. 30% length of the vessel amidship.

Keel shall be of flat plate type and welded each other and with bottom shell plates.

False keel of slab type shall be fitted under the flat keel plates.

Steel bulwark shall be provided as shown on the General Arrangement Plan.

2. Equipment and outfit

2.1 Hatch etc.

Following small hatch shall be provided as shown on the General Arrangement Plan.

One small hatch of bos'n store, on forecastle deck

One escape hatch from student's accommodation, on forecastle deck.

One escape hatch from engine room, on upper deck

Two small hatchs of steering engine room, and fishing gear space

One hatch of working room on upper deck.

Oil tight or weathertight manhole of shell be fitted to double bottom tanks, deep tanks, cofferdams and gravity tanks.

Manhole covers shall be fitted with synthetic rubber packings and fixed with stainless steel stud bolts.

2.2 Anchoring and mooring

Anchors, etc.:

2 - Bower anchors, stockless type, each 420kg

1 - Stream anchor, stockless type, 140kg

1 - Bow anchor chain cable, electrically welded, grade U-2 with stud, 17.5mm dia, x 275m

1 - Stream anchor cable, 6W/12S, 18mm dia. x 90m

1 - Tow line, steel wire rope, 6W/12S, 18mm dia. x 180m

2 - Mooring ropes, synthetic rope, 26mm dia. x 120m

Anchor windlass:

Horizontal type, electric driven, 1 set

Consists of 2-gypsy wheels, and 2-warping heads.

Duty capacity of 2 tons x 12m/min at gypsy wheel

2.3 Steering gear

Elec-hydraulic driven, rapson slide, 1-ram 2-cylinders, 1 set

Duty capacity of 2.5t-m x 28 sec/65 deg.

One set of hydraulic power unit, and one hand pump

2.4 Mast, post and booms

1 - Radar mast, fabricated of steel pipe, fitted with radar scanner, antenna & flag yard, antenna for direction finder, navigation lights, air phone, VHF antenna, speaker and steps.

1 - Derrick post, gate type, fabricated of steel plate, fitted with hand rails, vertical ladders, topping brackets & goosneck brackets for 0.5 tons derrick boom out riggers and after boom for trawl net handling tackles, eye plates for span stays, antenna post fabricated to steel pipe, etc.

1 - Gallows, fabricated of steel plate, fitted with bracket for net throwing, eye plates for net handling, etc.

1 - Derrick boom, fabricated of steel pipe.

1 - Aft boom, fabricated of heavy steel pipe.

2 - Outrigger, fabricated of heavy steel pipe.

2.5 Fishing gears

Following fishing gears shall be provided for trawl.

1 - Trawl winch, hydraulic, incorporated with:
  2-main drum, 3t x 60m/min
  1-center drum, 5t x 25m/min
  2-warping head, 3t x 30m/min

2 - Fishing winch, hydraulic,
  1-drum, 1.5t x 25m/min

1 - Try net winch, hydraulic
  Duty capacity of 0.6t x 40m/min

2.6 Refrigeration

Freezing room and working room shall be arranged in rear of engine room below upper deck.

Each shall be thermo-insulated and fitted with cooling coils to maintain the specified respective temperature in the space as follows.

Temperature:

Freezing room	-30°C by semi-airblast
	Freezing capacity abt. 1.4t/24h
Lobby	-20°C by grid coil.

Following refrigerating machineries shall be arranged in the engine room.

1 - R-22 compressor, reciprocating, 22KW electric motor driven

1 - Condensor pump

1 - Condensor

1 - Receiver

2.7 Ladder etc.

Inclined ladder or stairways shall be arranged between exposed decks and inside accommodations as shown on the General Arrangement Plan.

Inclined steel ladders on exposed decks shall consist of angle bar stringer and galvanized chequered plate steels with round edge, and fitted with handrails.

Stairways inside accommodation shall be of wood fitted with aluminium nonskid fittings on steps and those in engine casing shall be of steel consisting of flat bar stringer and chequered steel plate steps.

Steel round bar steps or vertical ladders shall be fitted to mast, funnel etc.

Steel handrails consisting of steel galvanized pipe and steel round bars and steel pipe stanchion shall be fitted on around of compass deck and forecastle deck as shown on the General Arrangement Plan.

Awning of vinylon canvas shall be installed over upper deck as shown on the General Arrangement Plan.

Awning stanchions, ridges and spars shall be of detachable type steel pipes and/or steel wire rope.

3. Accommodation and sundry space

3.1 Arrangement of accommodation

Living space

2 - Single berth cabin for captain and chief engineer

2 - Double berth cabin for crews

2 - Double berth cabin for instructors

4 - 2~6 berth cabins for students

Public space

Mess room

Navigation space

Wheelhouse with chart space

Sanitary space

Shower and lavatory, toilet

Commissary space

Galley

Sundry space

Air conditioning unit room, provision store, steering gear room, fishing gear space, bos'n store.

3.2 Joiner work

Bulkhead, lining, and ceiling

Corridor bulkhead	18mm thickness chipboard or plywood
Divisional bulkhead	18mm thickness chipboard of plywood
Wall lining	6mm thickness plywood lined on steel wall inside of all cabins, public spaces, navigation spaces. No lining on steel wall facing corridor

Overhead ceiling	4mm thickness plywood at interior surface of deckhead in all cabins, public spaces, navigation spaces, passageway.
Finish of joiner work	
Polyester resin overlaid	Wall and overhead of cabins, Public spaces, navigation spaces, passageway.
Painted	Other spaces except above.

Clear headroom

1,900mm in general

3.3 Deck covering and floor matting

Deck covering in accommodation shall be as follows.

Vinyl flooring (2mm) on latex base deck composition (8mm)

officer class cabins, mess room, wheel house and cabin under upper deck.

Epoxy base deck composition (4mm)

Galley

Tile on cement

Lavatory, toilet

Deck paint

Stores, lockers, air condition room

Weather deck covering shall be as follows.

Wooden plank of Japanese cypress, 65mm fn thickness

Exposed upper deck except outside of inner bulwark where wooden gratings shall be provided

Wooden plank of Japanese cypress, 50m/m in thickness

Exposed fore castle deck

Deck paint

All exposed decks except above.

3.4 Heat and sound insulation

Glass wool of 50mm thickness (bulk density of 12 kg/m^3) at:

Walls facing to weather, provision store, engine room, and deckheads facing to weather.

3.5 Side scuttle, window, and skylight

250mm dia. side scuttle for cabins, public rooms, and sanitary rooms.

700mm high windows for wheelhouse, fixed and hinge-up alternately.

One clear view screen for wheelhouse window.

3.6 Furnitures and fittings

Design and arrangement of cabin furnitures and fittings shall be in accordance with the Builder's practice.

In general, wooden furniture shall be provided, but steel furniture of commercial stock, such as desk, revolving chair, file-cabinet, etc. shall also be used.

All beds to be 2,000mm x 800mm fitted with rack and bed lamp.

Material of wood shall be:

Lauan in cabins, public spaces, wheelhouse.

Wooden furniture shall be finished with clear lacquer, and the top of table shall be melamine plastic laminated.

3.7 Commissary equipment

Galley equipments:

1 - Electric range, 4-hot plates and 1-oven, 1-grill

1 - Electric water boiler

1 - Refrigerator, market stock, abt 250 lit.

1 - Sink, double tub, stainless top

3.8 Cold store

Meat room	abt. 2.0m^3	at -18°C
Vegetable room	abt. 2.5m^3	at + 2°C
Dry. prov.	abt. 4.0m^3	

One set of R-22 refrigerating unit, electric motor driven shall be provided.

4. Painting and cathodic protection

4.1 Surface protection

Hull structural steel plates of 6mm and over and steel rolled sections which is painted except fittings and equipments shall be shot-blasted to average grade SA 2.5.

One coat of wash primer shall be applied immediately after shot-blasting.

4.2 Painting schedule

Shell bottom	2-AC (chlorinated rubber)
	2-AF (")
Shell boottop	2-AC (")
	2-BT (")
Shell topside	2-AC (")
	2-TS (")
Weather deck	2-UP
	2-DP
Deckhouse outside	2-UP
	2-FP
Engine room	2-UP
	2-FP
	(1-tar epoxy at tank top)
Fresh water tank	2-pure epoxy
Fuel oil tank	Oil wiped
Ballast water tank	1-TE

Remarks: AC=Anti-corrosive paint, AF=Anti-fouling paint
BT=Boottop paint, TS=Topside paint, UP=Undercoating
DP=Deck paint, FP=Finish paint, TE=Tar epoxy

4.3 Cathodic protection

Zinc anodes shall be fitted at around stern part, kingstone box and bilge keel.

5. Ventilation and air conditioning

Accommodation

All living rooms and public rooms except for wheelhouse and galley where only spot supply of cool air shall be air conditioned.
The system shall be of low velicity monoduct with central unit consisting of R-22 compressor, electric motor driven condensor, fin-tube air cooler, supply fan, etc.
The system shall meet following conditions:

	Outside	Inside	Fresh air intake
Summer	32 °C, 80% RH	27°C 50% RH	30%

Galley and sanitary space

Galley shall be ventilated by 0.4KW mechanical supply and exhaust fan.

Sanitary space shall be ventilated by 0.4KW mechanical exhaust fan.

Machinery space

Two (2) sets of 2.2KW supply fans and one (1) set of 0.75KW exhaust fan shall be provided for the machinery space.

Stores

Natural ventilators shall be provided in bos'n store, paint store, battery room, electric store, rope store, provision store etc.

6. Hull piping

General

Pipes, valves, flanges, and other fittings shall be in accordance with the Japanese Industrial Standard (JIS) or the Builder's standard.

Fuel oil transfer system

System: Independent piping

Material: Steel pipe (SGP)

Control: Manual valve operation in engine room

Fresh water system

System: Hydropneumatic system

Material: Steel pipe (SGP), galvanized

Sterilizing: ultra-violet-ray type for potable water line

Sea water system

System: Constant running system of sea water service pump. Served to sanitary, galley, and condenser of air conditioning unit and prov. ref. machine

Material: Steel pipe (SGP), galvanized

7. Life saving equipment

Life raft	Inflatable type (15P)	2 sets
Life buoy		4 sets
Self igniting light	Contained in wooden case	2 sets
Self activating smoke signal	"	2 sets
Parachute signal	"	4 sets
Thunder light	"	2 sets
Radio buoy		1 set
Life jacket	Stowed in each locker	26 sets
Life line throwing		1 set
FRP boat with portable boat davit (including buoyant oar, crutch, rudder, bailer, life line)		1 set
Carrying personal by line		1 set

8. Fire fighting equipment

Fire hydrants (sea water)

Applied for accommodation space, engine room and weather deck in accordance with the rule requirements.

Material: Pipe ; Steel (SGP)
Hose valve ; Bronze
Other valve ; Cast iron

Fire extinguishers

Location	Type and capacity	No.
Engine room	foam, 45 lit	1
	foam, 9 lit	4
Accommo. space (including store etc.)	foam, 9 lit	4
	powder 6 kg	1

Fire pump

A fire main pump to be installed in engine room. The pump to be used commonly with general service pump. An emergency fire pump (12PS diesel engine driven) to be installed in steering engine room.
Electric type fire detector to be provided in engine room, student's room and galley.

Fire protective clothing 2 sets

III MACHINERY PART

1. Main Machineries

1-Main engine

Vertical four cycle inline air started single acting airless injection trunk piston turbo-charged non-reversible type marine diesel engine.

Maximum rating (MCR): 750ps at not less than 1,000rpm

Continuous service rating (CSR): 85% of MCR

No. of cylinder: Not less than 6

Fuel oil: Diesel fuel oil

Cooling system: Cylinder jacket — fresh water
Piston ———— lub. oil
Turbocharger ——— fresh water
Air cooler ——— sea water

Accessories
1 - Turbocharger
1 - Air cooler
1 - Mechanical type governor
1 - Cooling fresh water pump
1 - Turning gear (manual turning bar)
1 - Lub. oil cooler

1-Reduction gear

Vertical off-set type helical gear reduction and reversing gear with hydraulic, wet type multi-disc clutch and thrust bearing.

Accessories
1 - Lub. oil pump
1 - Lub. oil cooler
1 - Lub. oil filter

1-Propeller	3 blades fixed pitch propeller, of manganese bronze. Propeller dia: abt. 1.7m
2-Intermediate shafts	Forged steel, having coupling flanges integral with the shaft.
2-Intermediate shafts bearing	Oil disc, white metal bearing
1-Propeller shaft	Forged steel with coupling flange, fitted with sleeves at both ends and lined with rubber for remaining part.
1-Stern tube	Solid cast iron, with bronze bushes with lignumvitae strips. A stuffing box of bronze to be fitted at the fore end of the stern tube. Forced flushing water to be supplied from cooling sea water system.
2-Diesel generators	Vertical four cycle inline air started single acting airless injection trunk piston turbo-charged type diesel engine. Output: abt. 185ps at 1,500rpm Fuel oil: Diesel fuel oil Cooling system: Cylinder jacket — fresh water Piston ———— Lub. oil L.O. cooler ——— sea water

	Accessories:	1 - Trubocharger 1 - Mechanical type governor with governor motor 1 - Lub. oil pump 1 - Lub. oil cooler 1 - Cooling fresh water pump
	Alternators:	AC 380V, 50hz, 150KVA
2-Main air reservoirs	Vertical cylindrical type 80L x 30kg/cm^2	
1-Main air compressor	Motor driven, vertical type fresh water cooled air compressor 10m^3/h x 30kg/cm^2	
1-Aux. air compressor	Diesel engine driven, sea water cooled air compressor 10m^3/h x 30kg/cm^2 (diesel)	
1-Fresh water cooler (for main engine, generator engines main air compressor)	Horizontal shell and tube type with WAX type automatic temperature control valve. 20m^2	

2. Pumps

1-Cooling fresh water pump (for jacket cooling)	Main engine driven, horizontal centrifugal pump 32m^3/h x 20m
1-Cooling sea water pump (for F.W. cooler, main engine L.O.cooler, Air cooler, R/G L.O. cooler and G/E L.O. cooler)	Motor driven, horizontal centrifugal pump 60m^3/h x 15m
1-Sea water service pump	Motor driven, horizontal centrifugal pump 25m^3/h x 25m
1-Fire/bilge/G.S. pump	Motor driven, horizontal centrifugal pump 60/30m^3/h x 20/40m

1-Fresh water service pump	Motor driven, horizontal centrifugal pump $1.5m^3/h$ x 13m
1-Condenser cooling sea water pump	Motor driven, horizontal centrifugal pump $20m^3/h$ x 12m
1-Bilge pump	Motor driven, horizontal piston pump $17m^3/h$ x 20m
1-Bilge pump for oily bilge separator	Motor driven, horizontal piston pump $0.25m^3/h$ x 20m
1-F.O. serv. pump	Motor driven, horizontal gear pump $3m^3/h$ x $2kg/cm^2$
1-Standby L.O.pump for main engine	Motor driven, horizontal gear pump $12m^3/h$ x $5kg/cm^2$
1-Standby L.O. pump for reduction gear	Motor driven, horizontal gear pump $2m^3/h$ x $13kg/cm^2$

3. Other equipments

2-Supply vent. fans	Motor driven, vertical axial 200m^3/min x 30mmAq
1-Exhaust vent.fan	Motor driven, vertical axial 60m^3/min x 30mmAq
1-Oily bilge separator	0.25m^3/h
1-Overhaul gear	Chain block 1.0 ton manual travelling
1-Grinder	Motor driven 220mm, 2 wheels, 0.4KW
1-Drilling machine	Motor driven, 13mm, 0.2KW
1-Electric welder	AC 200 Amp
1-Gas welder	Acetylene/Oxigen
1-F.O. flowmeters	Rotary piston type

4. Refrigerating system

Raw fish to be frozen in the freezing room by means of semi- air blasting to $-30^{\circ}C$,

Designed condition:

Ambient temp.	$+32^{\circ}C$ or below
Sea water temp.	$+32^{\circ}C$ or below
Average temp. of raw fish before freezing	$+28^{\circ}C$ or below
Average temp. of frozen fish after freezing	$-30^{\circ}C$

Temp. to be maintained:

Freezing rooms	abt. $-30^{\circ}C$
Lobby	abt. $-20^{\circ}C$

Freezing capacity:

Semi-air blast freezing	abt. 1.4t/24h

Ref machineries:

1-Reciprocating R-22 ref. compressors
22KW electric motor driven
1-R-22 condensor
1-R-22 receiver
1-R-22 oil separator
1-R-22 accumulator
1-Dryer
4-Freezing fans

5. **Material used for machineries and piping**

Centrifugal pump

Shaft packing to be of semi-metallic gland type

Materials to be as follows.

Casing	**Cast iron**
Impeller	**Phosphoric bronze**
Shaft	**Stainless steel**
Pump bed	**Cast iron**

Gear Pump

Shaft packing to be of semi-metallic gland type

Materials to be as follows.

Casing	**Cast iron**
Cover	**Cast iron**
Gear	**Carbon steel**
Shaft	**Carbon steel**

Piston pump

shaft packing and materials

(according to maker's standard)

Pipes

Cooling sea-water system ..... steel, galvanized

Fresh water system ..... steel, galvanized

Fire and bilge ..... steel, galvanized

R-22 refrigerant ..... steel

Other system ..... steel

Valve body

30kg/cm^{2}g, comp. air ..... Cast or forged steel

Sea suction & overboard discharge ..... Cast steel (50mm & above)

Cast bronze (40mm & below)

Other system ..... Cast iron (50mm & above)

Cast bronze (40mm & below)

6. Automation & remote control

1 set - Main engine ahead-astern, clutch on-off and speed control from wheel house

1 set - Automatic start and stop system for main air compressor

1 set - Automatic start and stop system for F.O. service pump

1 set - Automatic start and stop system for fresh water pump

1 set - Automatic temperature control for fresh water cooling system

1 set - Alarm panel in engine room

The alarm panel of wall mounted type contained with main engine alarms, generator engine alarms, ref. plant alarms, and electric dial reading type fish hold thermometer.

IV ELECTRIC PART

1. Electric supply System

Power and major capacity heater and navigation equipment	..... AC 380V
Lighting, navigation equipment, radio equipment, machinery control and minor capacity heater	..... AC 220V
Emergency source	..... DC 24V

2. Electric generator

Main generator ... 2-150KVA (120KW), 0.8PF, 1,500rpm enclosed, self ventilated, dripproof and class "F" insulation, bracket type bearing, Brushless type. These generators shall be driven by diesel engines.

3. Battery

Emergency source	...	200AH 24V 1 set Lead acid type
Battery for radio equipment	...	200AH 24V 1 set Lead acid type

4. Charging Device

One (1) set of float charging and discharging board for battery shall be located at the suitable place.

The silicon rectifier shall be as follows.

	No.	Max. output Current(A)	Max. output Voltage(V)
For general service	1	30	35
For radio service	1	30	35

5. Transformer

The transformers shall be installed as follows.

Each transformer shall be of single phase, 50HZ dry type, air cool by natural ventilation and to have class B or H insulation.

	No.	Capacity	voltage pri/sec (V)
For general service	3	10 KVA	380/220

6. Switchboard

The main switchboard consisting of generator panel, 380 volts feeder panel and 220 volts feeder panel shall be installed in engine room.

(1) Construction and Installation

The switchboard shall be of dead front and self standing type, and shall be made of steel frame work.

The switchboard shall be provided with hand rails.

Insulation rubber mat shall be provided in front and rear of the switchboard.

(2) Meter

All meters mounted on the switchboard shall be of the semi-flush and 100mm rectangular type. The accuracy of meter shall be within 2.5 percent of full scale deflection.

(3) Generator Air Circuit Breaker

The circuit breakers for generators shall be of manual operated trip free type having over current trip, instantaneous trip, under voltage trip and reverse power trip features.

(4) Feeder Circuit Breaker

Molded case circuit breakers with inverse time thermal trip and instantaneous magnetic trip features shall be provided for 380 volts and 220 volts out going circuits.

Steering gear motor feeders shall be protected against short circuit only.

7. Shore connection equipment

One (1) set of 380 volts 50HZ three phase, 100 amperes, shore connection box having a moulded case circuit breaker and phase sequence indicating lamp shall be installed at suitable place and permanently connected to main switchboard.

8. Electric motor and control

Machinery space	... Totally enclosed or drip proof squirrel cage induction motor
Exposed to the weather	... Totally enclosed waterproof squirrel cage induction motor
Insulation	... Class B or E, in general
Control	... Grouped starter type or Independent type

9. Lighting fixtures and outfits

In general, lighting fixtures and accessories shall be as follows:

Non water tight	Accommodation spaces
Drip-proof type	Outside spaces exposed to sweat and stores in accommodation spaces, engine room, steering engine room and provision store.
Explosion-proof type	Paint store and Battery room

In general, the ship shall be lighted by incandescent or fluorescent type lighting fixtures as follows:

Fluorescent type	Each cabin
	Inner passage way
	Wheelhouse
	Mess room
	Engine room
Incandescent type	Engine room (partically) and other spaces except above mentioned

The socket for incandescent lamp shall be of bayonet type in general.

All switches shall be of double type and all plugs and receptacles shall be of three-pole type except special service.

The fixtures and outfits shall be fed from 220 volts A.C. and those material which are installed on exposed weather deck shall be of material such as plastic resin according to builder's practice.

10. Nautical equipment

1 - Magnetic compass.
1 - Gyro compass with 3 repeaters combined with auto pilot
1 - Automatic direction finder
1 - Radar, 5KW, 7" CRT, 48 miles range (wall type)
1 - Taffrail log
1 - Omega receiver
1 - Sonar (Not - scanning type)
1 - Fish finder, 2KW, 28KHZ and 50KHZ
1 - Net recorder
1 - Crear view screen, 300mmØ
1 - Air horn, with automatic time controller
1 - Electric transister clock
1 - Freezing room thermometer, 6 points
1 - Daylight signal, portable type
1 - Search light, 2KW
1 - Morse light
1 - Loran "C" receiver

11. Interior communication equipments

1 - Common battery telephone, 1 : 2 (W/H < Eng. room / Steer eng. room)

1 - Deck announcing and public addressor system, 30W

1 - General alarm

1 - Engine telegraph, 1 : 1 Push button type

1 - Rudder angle indicator, 1 : 1 Synchro type

12. Radio equipment

1 - 400W SSB Transceiver

Transmitter; A1, A2H, A3A, A3H, A3J, F1

Fully synthesized in a range of 1.6MHZ to 26MHZ

Receiver; A1, A2, A2H, A3, A3A, A3H, A3J, F1

100KHZ - 30MHZ in 30 bands

1 - All wave receiver

1 - VHF harbor telephone, 12 channels, 20W

1 - SOS buoy

13. Electric cable and installation

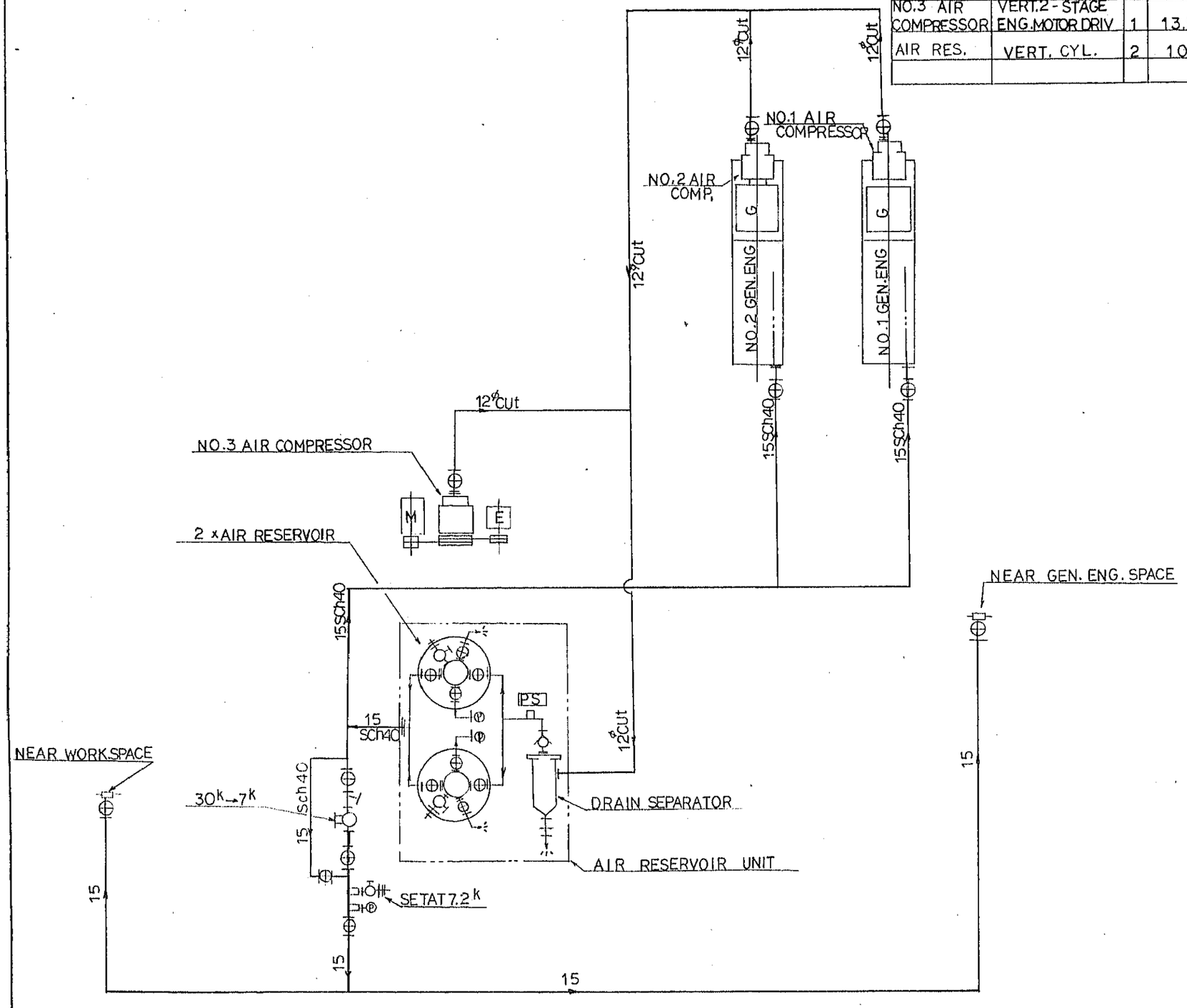
JIS cable approved by the classification society shall be provided as follows.

General use ..... Ethylenepropylene (EP) rubber or polyvinyle chloride (PVC) insulated, PVC sheathed and steel wire braided cable (Type PYC and YC)

Exposed to the weather ..... PVC covered on the above cable (Type PYCY)

LIST OF MACHINERY

NAME	TYPE	NO.	CAPACITY	REMARKS
NO.1&2 AIR COMPRESSOR	VERT.2-STAGE ENG. DRIV.	2	abt.20 $m^3/h \times 30 kg/cm^2$	
NO.3 AIR COMPRESSOR	VERT.2-STAGE ENG.MOTOR DRIV	1	13.5 $m^3/h \times 30 kg/cm^2$	6PS/3.7kw
AIR RES.	VERT. CYL.	2	100 ℓ	



BIBLIOGRAPHY

6

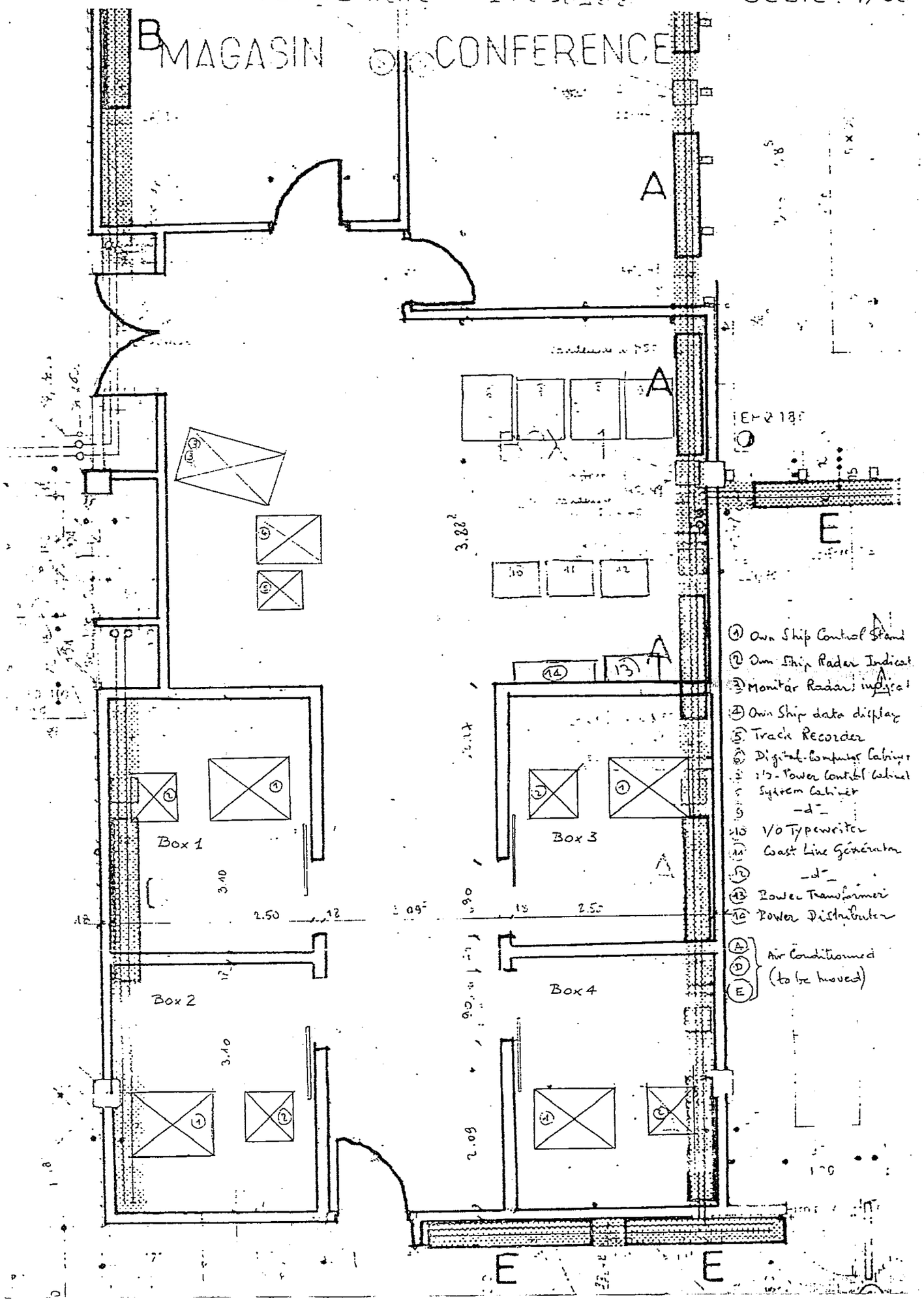
DIAGRAM OF COMPRESSED AIR SYSTEM

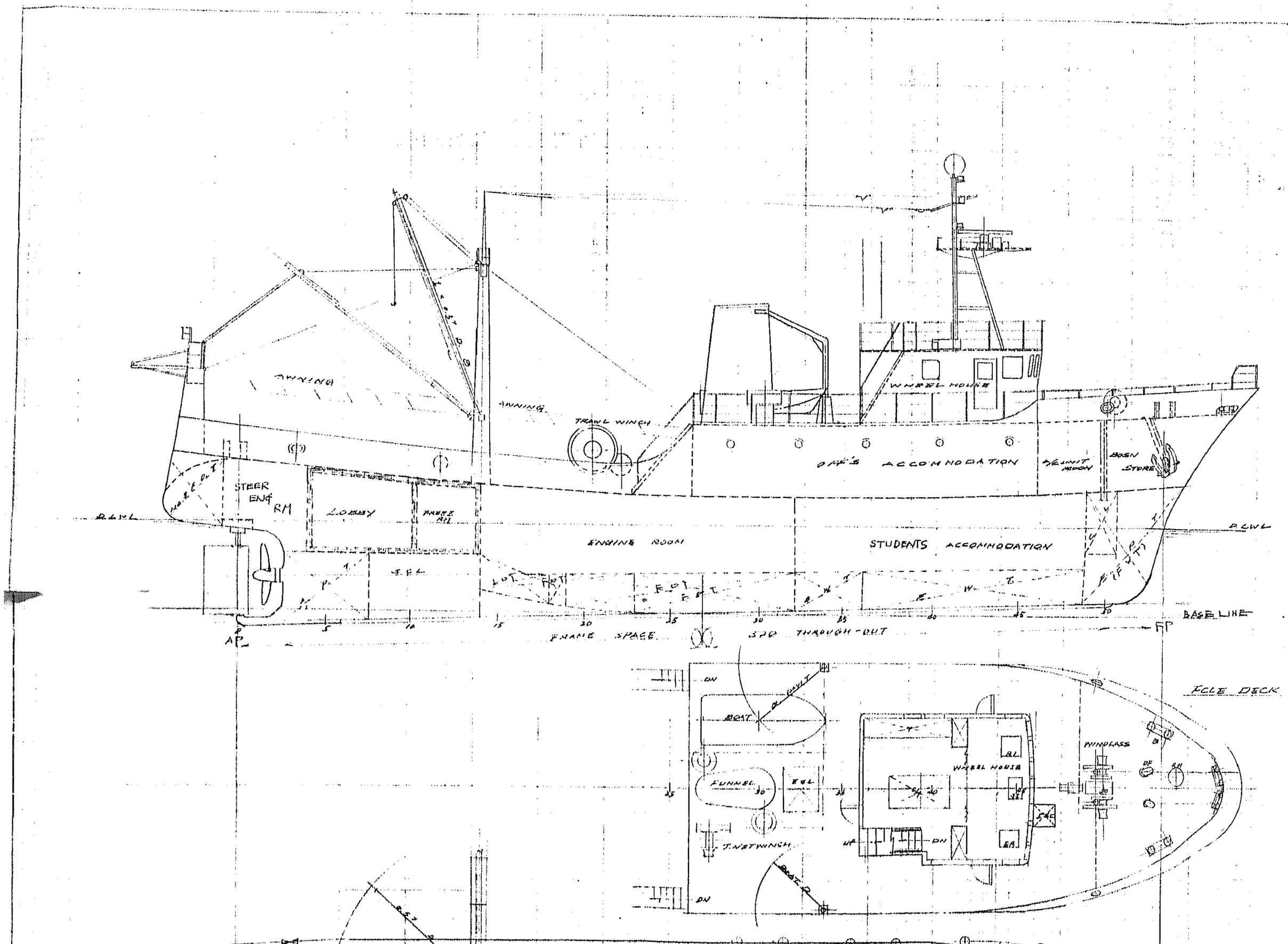
DWG. NO. MM-PD-01-6

Navigation Radar Simulator System

Layout of Room

Arrangement Proposed Scale : 1/50




AWNING
AWNING
TRAWL WINCH
WHEEL HOUSE
STEER ENG RM
LOBBY
ENGINE ROOM
CAPT'S ACCOMMODATION
STUDENTS ACCOMMODATION
BOSN STORE
AP
FP
BASE LINE
FRAME SPACE 500 THROUGH-OUT
FCLE DECK
BOAT
FUNNEL
WHEEL HOUSE
WINDLASS
T. NETWINCH
DN
UP

AP

FRAME SPACE

SHD THROUGH VENT

FP

BASE

FCLE

DN

BOAT

B. DAVIT

FUNNEL

E&L

T. NET WINCH

WHEEL HOUSE

WINDLASS

UP

ER

LIPPE

WINCH

HATCH

TRAWL WINCH

GALLEY

BATTERN

C. AWN

DRYING

ENGINE

MESS ROOM

PASS WAY

CAP

BOAT STORE

LAV.

CH. ENG

HC

ENGS

MESS

TEACH

FISHING GEAR SPACE

STEER ENG RM

LOBBY

FREEZ CH

ENGINE ROOM

STUDENT (GP)

STUDENT (PP) 3P

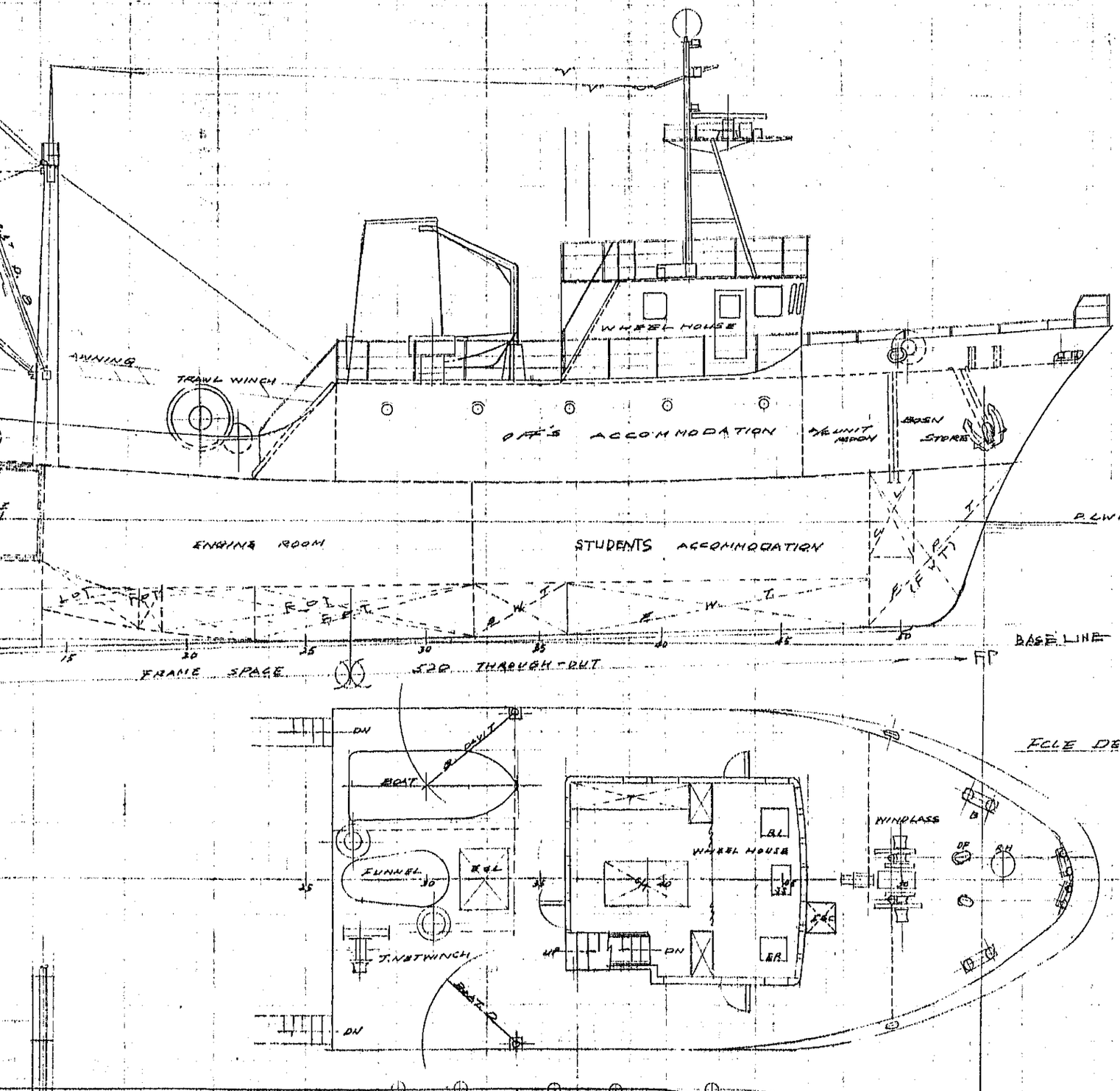
STUDENT (4P)

STUDENT 2P

A/C UNIT RH

HOLD

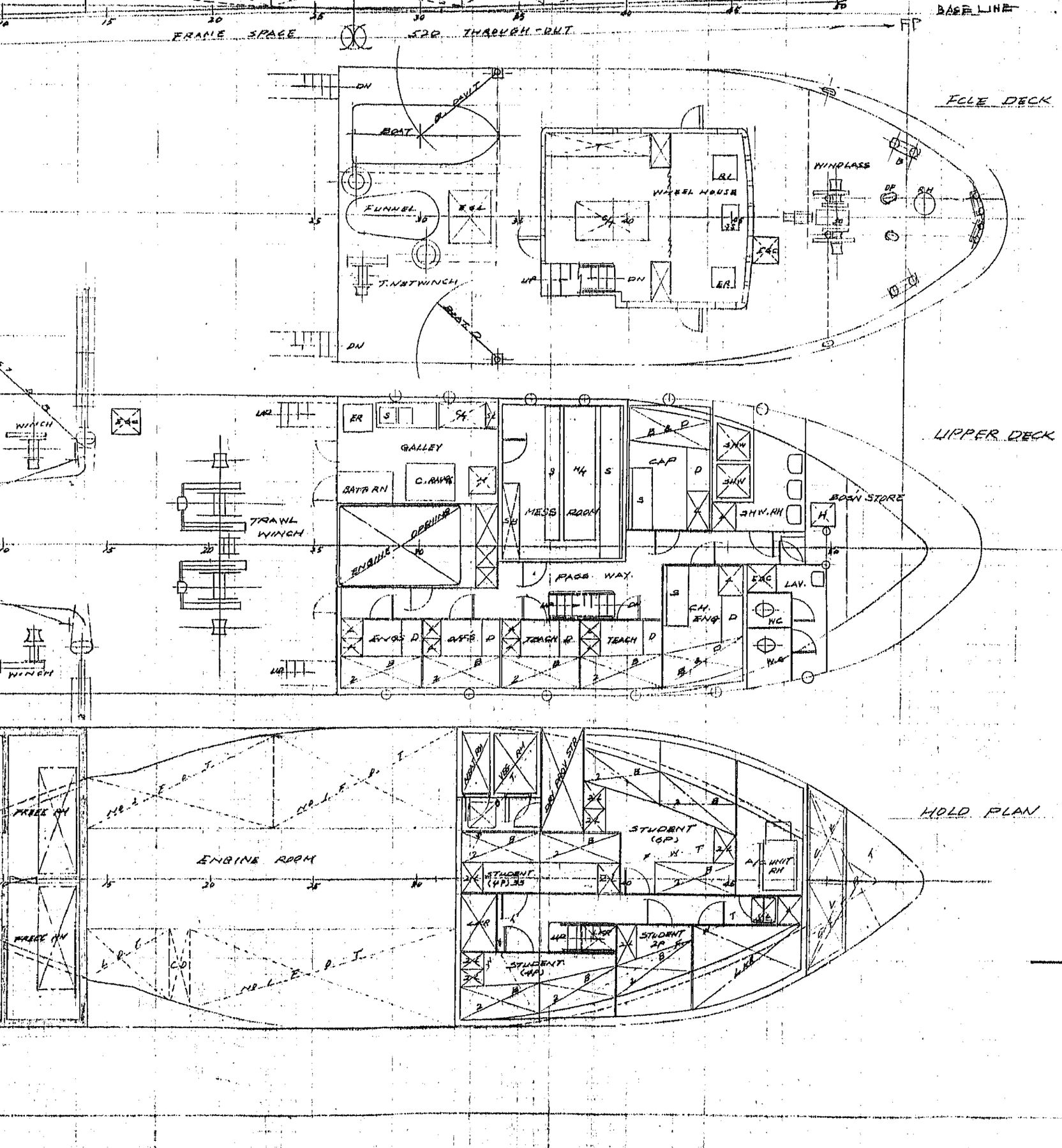
APPENDIX
4-1-2



PRINCIPAL PARTICULARS

LENGTH OVER ALL	ABT	33'-00
LENGTH B.P.		28'-00
BREADTH MLD		7'-6.0
DEPTH MLD		3'-5.0
DRAFT MLD		2'-8.0
GROSS TONNAGE	ABT	220 T
MAIN ENGINE	1 SET DIESEL	750 BHP
SPEED		10.0
CAPACITY F.O		44 M³
F.W		30 M³
FREET RM		21 M³
LOBBY		2.6 M³
COMPLEMENT		26 P

BREADTH MLD		7.60
DEPTH MLD		3.50
DRAFT MLD		2.80
GROSS TONNAGE	ABT	220 T
MAIN ENGINE	1 SET DIESEL	750 BHP
SPEED		10.0
CAPACITY F.O		44 M³
F.W		30 M³
FRESH RN		21 M³
LOBBY		26 M³
COMPLEMENT		26 P



TRAINING BOAT

GENERAL ARRANGEMENT

SCALE 1/100

APPENDIX 4-2-1

OUTLINE OF SPECIFICATIONS

FOR

NAVIGATION RADAR SIMULATOR SYSTEM

IN

THE REGIONAL MARITIME ACADEMY

OF

THE REPUBLIC OF IVORY COAST

JULY , 1980

C O N T E N T S

OUTLINE SPECIFICATION FOR NAVIGATION RADAR SIMULATOR SYSTEM IN THE REGIONAL MARITIME ACADEMY OF THE REPUBLIC OF IVORY COAST

1. GENERAL

(1) Purpose

This Navigation Radar Simulator is to be designed for the purpose of giving trainees the following trainings.

a) Basic method of navigation radar handling

b) Reading and judging the minimum distance to targets and plotting

c) Ship's operation and maneuvering for collision avoidance

d) Case by case measures

This radar simulator system automatically provides simulations of ship's maneuver with high accuracy, and trainees will have similar understanding in reading of the indicator to those with an actual radar indicator.

(2) Feature

The Radar Simulator has the following salient features:

a) The major units for calculating the motional characteristics and positions of ships are built in modular design providing highly stable performance.

b) A high performance digital computer with the most up-to-date techniques, is used to provide radar simulations with high accuracy.

c) The circuits for digital output signals and synchro drive signals are all solid-state in order to provide high accuracy and reliability.

d) A signal distribution board is used for interconnections between the computer and the peripherals, which will facilitate operation and adjustments.

e) Functions for the motional characteristics are generated using polynomial and broken-line approximation which can be chosen.

f) Highly reliable monolithic and integrated circuits are extensively used in the computer and its peripherals.

g) Components and units having interchangeability are extensively used reducing the number of replacements and spare parts.

h) A complete set of necessary program documentation is provided with the system for the purpose of training and maintenance.

i) The components of materials of the equipments, except special ones, conform to the standard of the Japanese Industrial Standards.

j) The units are to be principally of metric system.

2. COMPONENTS

This system is composed of following major equipments which are shown as following table.

Item No.	Name of Equipment	Q'ty	Remarks
1.	Own ship control stand	4	
2.	Own ship radar indicator	4	
3.	Instructor's console	1	
4.	Monitor radar indicator	4	
5.	Coast line generator	2	
6.	Digital computer cabinet with paper tape reader	1	
7.	Track recorder	1	
8.	System cabinet	2	
9.	Input/output (I/O) power control cabinet	1	
10.	Input/output(I/O) typewirter	1	
11.	Power transformer	1	

3. OUTLINE OF FUNCTION

3.1 General

This simulator calculates and displays the relative positions of four own ships in reference of six navigable other ships by means of digital computer and electronical peripheral device in the operation areas. Those areas are arranging in Latitude 0° - 60° and Longitude 0° - 180°. In addition to the above mentioned function, this equipment is to be capable of generating six fixed targets (buoys, small islands etc.) and/or coast line in the training areas by means of transparent coast line generator and each own ship indicator superimposes the fixed targets and the coast line together with other ship's echo.

In normal exercise, each own ship is operated by each group of trainees respectively and movable target vessels are operated by an instructor.

3.2 Function of each equipment

(1) Own ship control stand

The control stand is equipped with an engine

telegraph for setting speed, a steering wheel, a speed indicator, a propeller revolution indicator, a helm angle indicator, a compass repeater, a rudder angle indicator and a horn control buzzer.

(2) Own ship radar indicator

This radar indicator is a typical type of the marine radar unit with 12" PPI display. The major controlling function is as mentioned below:

Radar on - standby - off switch

Aerial rotation switch

Mode of presentation switch - North up or Ship's Head up

Heading marker alignment control or switch

Range selection switch

Gain control

Scale illumination control or switch

Display brilliance control

Bearing marker control

(3) Instructor's console

The instructor's console is composed of several control panels with four monitor radar indicators. The control panel has the function to set the initial position of own ships and other ships,

to set speed, course, size and fade-out range of other ships and to monitor position of other ships.
The monitor radar indicator has 10" PPI display. A buzzer provided with is jointly operated with Horn Control Buzzer of own ship control stand.

(4) Coast line generator

This unit generates the coast line appearing on each radar indicator, and the line follows up own ship movement and changes from time to time.

(5) Track recorder

The recording of tracks of own ship and other ships on recording paper is operated with specified control panel on instructor's console.
This recorder records tracks of own ship and moving targets and also the time which serve to judge the relative positions of ships at any given time.

(6) System cabinet

This system cabinet houses the following circuitries.

1) Timing and antenna signal generator

2) Target video generators

3) Noise generator

4) Video mixer and distributor

5) Indicator drive signal generator

(7) I/O and power control cabinet

This cabinet is composed of the I/O device and the power control unit. The I/O device unit is designed to allow data exchange between CPU external devices by utilizing common bus of computer and to change forms of data. The power control unit is composed of a power control panel, a relay panel, a power supply and terminal board panel, and control power supply for all units in the simulator system.

(8) I/O Typewriter

The I/O typewriter, a peripheral to the computer, can be used to print out and tabulate at fixed interval (6 min.) for such necessary items as the courses and speeds of own ship and target ships, their relative bearing and relative distance, CPA and TCPA. These data can be used for plotting ship maneuver and evaluation data for training.

(9) Communication system

This is a interphone system which is imitated to V.H.F. and is capable of establishing communication between own ships and instructor.

4. PERFORMANCES

4.1 Own ship's characteristics

Through Instructor's Console, it is capable to select one of vessel within six types of vessels.
The characteristics of own ship are as shown below:

No.	Item	Specification	Remarks
1	Operation area	Lat. 0° ± 60° Long. 0° ± 180°	Max. detection range is 200 NM.
2	Initial position setting	Lat. 0° ± 60° Long. 0° ± 180°	Can be set at any point in operational area. (1 minute step)
3	Helm angle	35° to right and left	
4	Rudder angle	35° to right and left	
5	Engine telegraph setting (Electrical)	(1) AHEAD 4 steop for FULL HALF SLOW DEAD SLOW (2) ASTERN 7 steop for FULL HALF SLOW DEAD SLOW STOP F.W.E. STANDBY	Speed can be set within 30 kts.
6	Acceleration/ deceleration characteristics	Varies according to an exponential function	
7	Course	0° - 360°	Compass repeater indicator
8	Fade-out range	0 - 60 NM	

(2) Type of vessels

200GT

1,000GT

5,000GT

13,000GT

50,000GT

100,000GT

4.2 Target ship's characteristics

The specifications for target ships are shown in the following table.

No.	Item	Specification	Remarks
1	Operation area	Lat. 0° ± 60° Long. 0° ± 180°	
2	Initial position setting	Bearing and distance are set in reference to own ship (centre)	
3	Speed	0 - 30.0 kt	
4	Course	0° - 360°	1.0° step
5	Fade-out range	0 - 60 NM	
6	Ship size	6 types (same to own ship)	No difference as to the size of echo

4.3 Own ship radar indicator

The major specifications for the Radar Indicator are shown in the following table.

No.	Item	Specification	Remarks
1	Indicating method	PPI indication	
2	CRT diameter	12 inches	
3	Sweep range	Min. 0.75 NM Max. 48 NM	Changeable in 7 steps (0.75, 1.5, 3, 6, 12, 24 and 48 NM)
4	Pulse-repetition rate	Approx. 1,000 PPS	
5	Antenna revolution	22 rpm	
6	Bearing indication	True bearing/relative bearing selectable	Accuracy of $\pm$ 1°
7	Electronic bearing line (EBL)	Inter-scan system with an origin movable to any desired point within a square having a side measuring 2/3 of CRT scope diameter which may be superposed over time markers and variable range rings on the scope	
8	Heading marker	Electronic flash line with automatic reset ON-OFF switch	
9	Plotter	Reflection type	
10	OFF-centre	Off-cenreing limits 2/3 tube radius	
11	True motion	True motion in 3 to 24 NM allowable	

4.4 Sea condition characteristics

The major specifications for the sea conditions characteristics are shown in the following table.

No.	Item	Specification	Remarks
1	Tidal current	(1) Direction 0°-360° (2) Speed 0 - 9 kt	1°step 1 kt steps
2	Noise	Level adjustment	Over the whole range
3	Sea clutter	(1) Range 0 - 3 NM (2) Characteristics attenuation with distance (3) Direction 0°-360°	-20 dB/NM

4.5 Coast Line Generator

The major specifications for the coast line generator are shown in the folloiwng table.

No.	Item	Specification	Remarks
1	Type	PPI fling spot type	
2	Scanning method	Fixed deflection coil type	
3	Map detection method	Transparence method	
4	Map channel	One channel	Time shearing method
5	Number of map film	Each 5 sheets	

4.6 Digital computer

The major specifications for Digital Computer are shown in the folloiwng table.

No.	Item	Specification	Remarks
1	Word length	16 bits or 32 bits for 1 word	
2	Decimal point	Fixed point system	
3	Arithmetic	Pure binary parallel operation	
4	Cycle time	1μ sec.	(IT)
5	Memory capacity	128 KB	

4.7 I/O typewriter

The major specifications for the I/O typewriter are shown in the following table.

No.	Item	Specification	Remarks
1	Printing speed	600 characters/min.	
2	Max. printed characters	74 characters/line	
3	Reading speed	600 characters/min.	
4	Punching speed	600 characters/min.	

4.8 Track Recorder

The major specifications for the track recorder are shown in the following table.

No.	Item	Specification	Remarks
1	Number of pen	One pen	
2	Chart size	Approx. 380mm x 250mm	
3	Track speed	400mm/sec.	
4	Range accuracy	$\pm$ 0.2 % below	

5. SPARE PARTS, TEST EQUIPMENT AND TOOLS

5.1 Spare parts

Necessary spare parts for this system are provided in accordance with the manufacturer's standard.

5.2 Measuring equipment and tools

Necessary measuring equipment and tools are supplied by manufacturer.

5.3 Documents and drawings

The technical documents and drawings in English are provided by manufacturer.

The final documents is to be delivered by manufacturer after the date of completion of the system.

6. SERVICE CONDITION

6.1 Power requirement

(1)	Frequency	:	50 HZ ± 1 HZ
(2)	Voltage	:	380V three-phase three-wire
(3)	Voltage fluctuation	:	Within ± 5%
(4)	Power consumption	:	Approx. 10 KVA
(5)	Frequency variation	:	Within ± 2% per 1 sec.

6.2 Environmental condition

(1)	Operating ambient	:	10°C to 35°C
(2)	Relative humidity	:	Below 80%

Note: The caloric value of the radar simulator system is approx. 8,600 Kcal.

7. TRANSPORTATION, INSTALLATION, ADJUSTMENT AND TESTS

7.1 Transportation

Manufacturer is to be responsible for transportation from maker's plant in Japan to landing port.
Ivorian side is to be responsible for transportation from landing port to the installation site.

7.2 Installation

(1) After the consignment arrives at the site, manufacturer is to be in attendance with the unpacking. Installation, mounting, laying cable and inter-unit wiring is to be undertaken by Ivorian side under the technical assistance of engineers dispatched from manufacturer.
Materials, cables, hardwares and tools to be necessary for installation, cable laying and wiring are to be prepared by manufacturer.
(Except usual type tools)

(2) The planning of the installation is to be performed by Ivorain side. Rough arrangement of equipments is shown as a attached figure. After the contract, manufacturer will examine the facility and make the information for the following works to be done by Ivorian side.

a) Fundamental works of building.
b) Electric works of primary electric power.

The information on the detailed installation plan, such as drawings of the layout, mounting, interconnection of the cable etc. is also to be prepared by manufacturer.

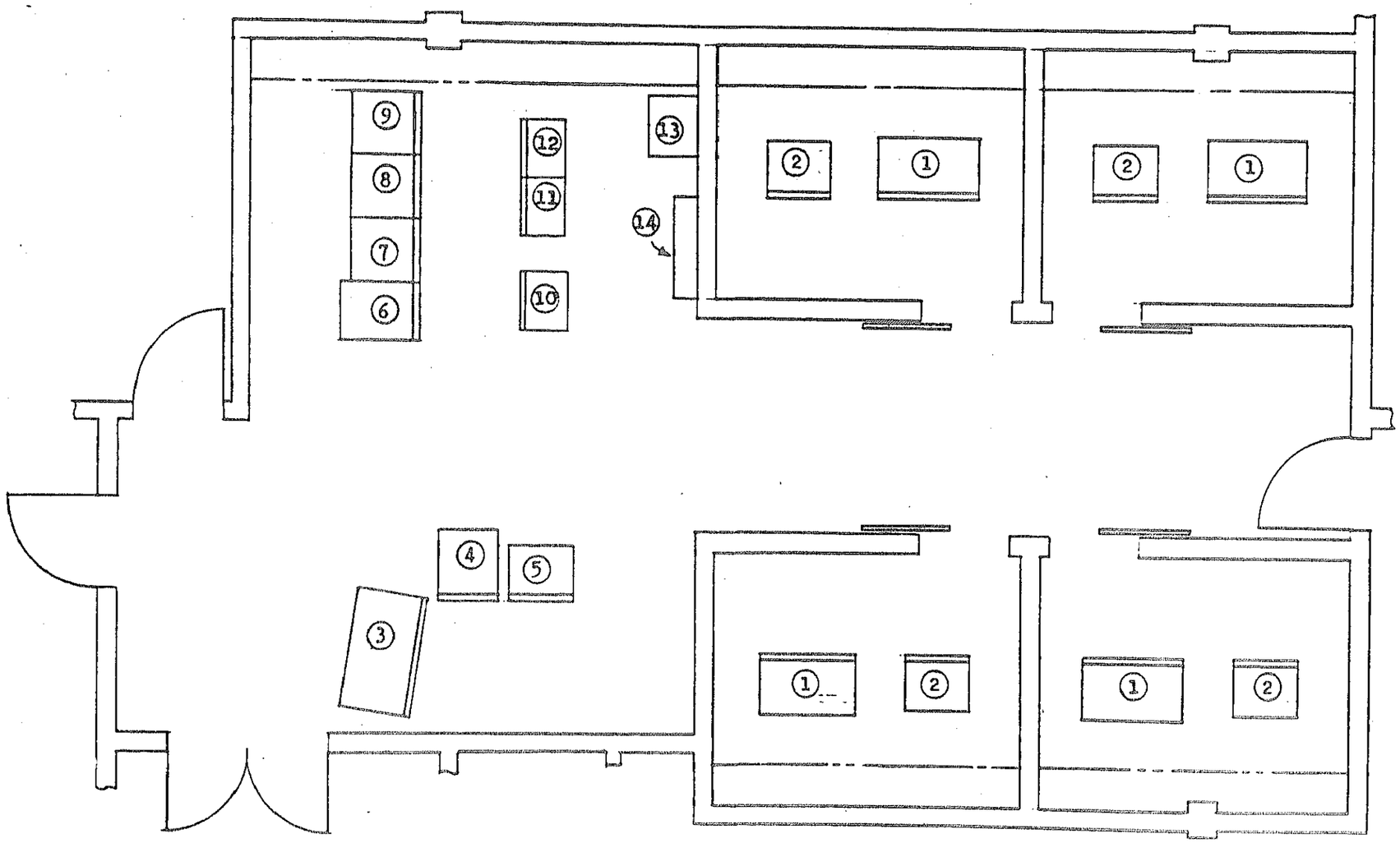
7.3 Adjustment and instruction of handling

After installation is completed, manufacturer is to carry out conductance test, turning on electricity test, fine adjustment and overall test. In the course of these tests and adjustments, engineers of manufacturer shall instruct the user the operation of the equipment, handling, inspection, maintenance and repairs.

In this case, Ivorian side is to be required of necessary electricity, water and air conditioning etc. The measuring equipments requried are to be provided by manufacturer, including those to be delivered to Ivorian side.

7.4 Tests

The equipment is to be tested for acceptance in the manufacturer premise prior to shipment and on the site after the completion of installation.



(NOTE)

(1) Symbol

(a) 2 — Front

(b) Reserved area for airconditioning

(2) Equipment

1 Own Ship Control Stand
2 Own Ship Radar Indicator
3 Monitor Radar Indicators
4 Instructor's Console
5 Track Recorder
6 Digital Computer Cabinet
7 I/O and Power Control Cabinet
8 System Cabinet
9 System Cabinet
10 I/O Typewriter
11 Coast Line Generator
12 Coast Line Generator
13 Power Transformer
14 Power Distributor.
(Customer Furnished)

(3) Scale : 1/50

LAYOUT PLAN for NAVIGATION RADAR SIMULATOR
THE REGIONAL MARITIME ACADEMY
THE REPUBLIC OF IVORY COAST

APPENDIX 4-3-1

S P E C I F I C A T I O N S

F O R

MARINE MACHINERY IN THE REGIONAL MARITIME ACADEMY

OF THE REPUBLIC OF IVORY COAST

JULY, 1980

DWG. NO. MM-SP-01

2ND EDITION

C O N T E N T S

CHAPTER 1. GENERAL

1. GENERAL

It is the intent of this specification and the plans to desribe design, construction, material, etc. of "THE MARINE MACHINERY IN THE REGIONAL MARITIME ACADEMY OF THE REPUBLIC OF IVORY COAST".

The plans;

General arrangement for marine machinery

..... Dwg. No. MM-GA-01 2 ND Edition

Piping diagram for marine machinery

..... Dwg. No. MM-PD-01 2 ND Edition

Anything not amntioned in, nor covered with the specification and the plans to be in accordance with the manufacturer's latest standard design and practice. Minor changes due to the development of detail design and manufacturer's standard to be allowed.

The marine machinery to be five (5) items as follows;

Item 2 Diesel generating set

Item 3 Refrigerating plant

Item 4 Hydraulic steering gear

Item 5 Miscellaneous machinery

Item 8 Cooling water system
(including air cooling tower)

2. SCOPE OF WORKS

Materials supply and construction works regarding 5 items marine machinery to be carried out according to the following table.

I : Ivorian side

M : Manufacturers

No.	I t e m	Assignment I	Assignment M
1	Five (5) items of machinery and equipments		
	Manufacturing and trial testing in the shop		o
	Transportation to Abidjan port (CIF base)		o
	Transportation to the site from the port	o	
	Shifting to each fitting place at the site	o	
	Fitting on the foundation	o	
	Supervising at fitting		o
2	Other installations		
	Construction of the machinery houses	o	
	Construction of the fundations for all machinery and equipment	o	
	Construction of fuel oil (diesel oil) storage tank	o	
3	Piping for machinery & equipments shown in the piping system diagram		

No.	I t è m	Assignment I	Assignment M
	Piping material such as pipes, valves, hangers, bands & insulations.		o
	Manufacturing of main pipes in the shop		o
	Manufacturing and fitting of pipes at the site	o	
	Fitting of insulation material at the site	o	
	Painting work at the site	o	
	Supervising of piping work at the site		o
4	Pipings except above 3 shown as dotted line in the piping system diagram		
	Material	o	
	Manufacturing and fitting	o	
5	Wiring between machinery & equipments supplied by the manufacturers		
	Material of wiring such as cable & cable fitting accessories		o
	Fitting work cable	o	
	Supervising of cable fitting work		o
6	Wiring except above 5 such as general light, etc.	o	
7	Other miscellaneous installation in the machinery houses		
	Drain channels and covers for bilge	o	
	Pipe passage channels and covers	o	
	Fitting of overhauling beams	o	

No.	I t e m	Assignment	
		I	M
	Gratings, rudders and supports around machinery and equipments as shown in the arrangement drawing	o	
	Building of partial floor as shown in the arrangement	o	
	Other necessary general installations in the machinery houses	o	
8	Technical advice for adjustment and trial test of machinery and equipments		o
9	Instructions for operations of machinery and equipments as specified.		o

Notes:-

1. The machinery houses to be constructed to be able to convey and fit the machinery and equipments at their fitting palces in the houses.
   If a fork lift car is available for transportation of heavy machinery, the pass way to be constructed to endure for both loads of the machinery and the lift car.

2. Crane and fork lift necessary for transportation and fitting work to be supplied by Ivorian side with repair workers.

3. Foundations for machinery fitting to be constructed to have enough strength for machinery weight and external forces if any.

4. Fuel oils, lubricating oils, city water for industrial service, electrfcity, etc. necessary for adjustment and trial test of machinery and equipments to be arranged in time according to the construction schedule.

5. Water reserve tank for air cooling tower to have about 5 m^3 capacity and to have enough strength for the foudation of the tower.
   Make-up water of about 1m^3/h to be supplied to compensate losses and blow down water of the air cooling tower.

6. All works in the list to be carried out according to total construction schedule.

7. Materials supply and/or construction works not described in the above table to be borne by Ivorian side.

3. GENERAL CONDITION FOR EACH ITEM

1) Rules, regulations and standerds

The machinery and equipments to be designed, manufactured and tested in accordance with the following rules, regulations and standards where applicable.

A) NIPPON KAIJI KYOKAI ..... Rules and regulations for the construction and Classification of ships.

B) Japanese Industrial Standard (JIS)

C) Japan Electric Machinery Industry Association.

D) ISO metric threads for screw thread.

2) Unit

All drawings and data to be in accordance with the metric system.

All thermometers to be calibrated in degree centigrade.

3) Language

All drawings, technical data, calculations, and instruction books to be submitted in English.

Name plates to be in English. Caution plates to be in English. Graphic panel to be written in English.

4) Design conditions

Machinery and equipment to be designed in accordance with the outside conditions as follows.

A) Ambient temperature

The maximum ambient temperature ; 45 °C

B) Cooling water

Fresh water; 35°C

5) Inspection, Test and Trial

Machinery and equipments to be inspected, adjusted and tested at the manufacturer's shop according to manufacturer's standard practice.

The inspector of Classification Sociaty to attend if necessary.

Inspection, adjustment, test and trial to be carried out at the machinery houses at the site after completion of installation, piping and wiring works. Advising engineers for the above test and trial to be despatched from the manufacturers.

6) Technical guidance for operation and maintenance

Technical guidance for operation and maintenance to the counter parts to be carried out as follows by instructors from the manufacturers.

Diesel engines;	One (1) week
Refrigerating plant;	One (1) week
Hydraulic steering gear;	One (1) week
Miscellaneous machinery;	One (1) week
Electrical equipments;	One (1) week

7) Guarantee

The machinery and equipment to be guaranteed against damage of failure due to defects in design, material and work manship

of the manufacturer for a period of one (1) year from the date of taking over at the site or 18 months after delivery from the manufacturers shop whichever is shorter.

ITEM 2. DIESEL GENERATING SET

1. GENERAL

Two (2) sets of generator units which consist of each engine, generator and air compressor and other related auxiliaries to be provided.

The engine, generator and air compressor with hand driven clutch to be installed on a common bed.

Other auxiliaries to be installed separately with the engine units.

2. PARTICULAR

1) Diesel engine

Type and Number	Four (4) cycle trunk piston, vertical, solid injection, water cooled, marine diesel engine, Two (2) sets
Continuous rating	abt. 165 PS at 1,500 rpm
Governor	Hydraulic, all speed control type
Fuel oil	Gas oil (cetane No. 45 or more) or Marine diesel fuel oil (JIS heavy oil grade A can be used) Consumption; abt, 200 gr/PS-hr
Starting system	Air starting(at engine side)
Lubricating system	Forced lubricating by gear pump
Cooling system	Forced circulating by plunger pump
Temp. of cooling water inlet	35 °C

2) Generator

Type and Number	Drip-proof., horizontal, self-ventilated, revolving-field type, Two (2) sets
Rated output	130 KVA (104 KW)
Voltage x Frequency	A.C. 380 V x 50 Hz
Power factor	0.8
No. of phase	3 phase
Revolution	1,500 rpm
No. of pole	4 poles
Bearing	Ball bearing (both ends)
Insulation	Class F

3) Air compressor

Type and Number	Vertical, 2-stages, Two (2) sets
Capacity	abt. 20 m^3/hr x 30 kg/cm^2
Cooling system	Water cooling
Temp. of cooling W. inlet	35 °C
Revolution	1,200 rpm
Driving	By hand clutch

Remark; The air compressors to be used not only for engine starting but also general service.

3. CONSTRUCTION AND MATERIAL

Construction and material to be in accordance with the manufacturer's standard.

4. ACCESSORIES

1) Assembled on diesel engine

	(Q'ty/engine)
Fuel feed pump	1 set
Cooling water pump	1 set
Fuel filter	1 set
Lub. oil pump	1 set
Press. regulating valve (for L.O.)	1 set
Lub. oil filter	1 set
Lub. oil cooler	1 set
Exhaust manifold	1 set
Fuel injection pump	1 unit
Fuel injection nozzle & holder ass'y	1 unit
Governor	1 set
Air breather ass'y	1 set
Others	maker standard

2) Assembled on air compressor

	(Q'ty/1 comp.)
After cooler	1 set
Air discharge check valve	1 set
Automatic high press. drain valve	1 set
Oil tank (L.O.)	1 set
Clutch (hand type)	1 set

3) Other accessories and auxiliaries

Exhaust silencer	1 set
Expantion joint	1 set
Air reservoir (100 ℓ x 30 kg/cm^2)	2 sets

(with drain separator, valve header, check valve & connection pipes)

Aux. air compressor 1 set

Type	Vertical, 2-stages
Capacity	abt. 13 m^3/hr
Revolution	abt. 700 rpm
Pressure	30 kg/cm^2
Driving	V-belt drive (with V-blet & V-pulley)

Diesel engine for aux. air comp. 1 set

Type	Horizontal, 4-cycle, water cooled
Output	abt. 6 PS
Cooling system	Condenser type
Lub. system	Forced lubrication
Accessories	Fuel oil tank x 1 set
	V-pulley x 1 set

Motor for aux. air comp. 1 set

Type	Enclosed type with fan
Output	3.7 KW at 1500 rpm
Pole	4 pole

(Aux. air com., diesel engine & motor are to be installed on common bed.)

Fuel oil tank (diesel oil) 1 m^3 1 set

Lub. oil purifier 1 set

Motor driven, centrifugal, self-discharge type,
compelte with heater and two (2) pumps,
Nominal capacity; 700 L/hr

Lub. oil settling tank 300 L 1 set

Fuel oil transfer pump 1 set

Motor driven, abt. 1 m^3/h x 2~3 kg/cm^2G
Motor 0.4 KW

5. ELECTRIC AND CONTROL SYSTEM

1.) Switchboard

Construction

The switchboard to be of dead front box frame construction with a drip cover over the top and to have hinged front panels that can be opened without disturbing the meters, pilot lamps, etc. mounted on them.

The rear of the switchboard to have removable sheet steel covers so that it may be inaccessible to others than qualified persons.

Polyestel premics are used as an insulation material for various devices, wiring and bus bars.

The switchboard to consist of following panels.

2....Diesel generator panels

1....Synchronizing panel

1....380V Feeder panel

Component

A) Generator air circuit breaker (ACB)

The circuit breaker for the generator to be of trip free type having inverse time trip, short time delay trip, instantaneous overcurrent trip and under voltage trip features.

Each circuit breaker to be provided with necessary interrupting capacity against short circuit current.

B) Meter

Voltmeters, ammeters, wattmeters, etc. to be class 1.5 (error: within 1.5% of full scale).

Voltmeters to be calibrated up to about 120% of their rated value and ammeters up to about 130%. Wattmeters is capable of indicating 15% reverse power of their full load.

C) Fuse

Control and instrument circuits to be protected by fuses except circuits where the opening of the fuse might introduce a hazard in operation, such as circuit breaker tripping control circuits.

D) Bus bar

All bus bars to have sufficient current carrying capacity for continuous operation and provision to be made for withstanding mechanical strains caused by a large motor starting or short circuit current.

All bus bars to be made of commercial copper, and to be provided with silver surfaced contacts.

Bus bar supports to be ofmoisture resistant and polyestel premics resin materials.

Equipment

A) Diesel generator panels

1.... Air circuit breaker

1.... Reverse power relay

2.... Current transformer for ammeter

2.... Potential transformer for voltmeter

1.... Voltage adjuster of A.V.R.

B) Synchronizing panel

1.... Automatic synchronizing device

1.... Automatic power and frequency control device

C) 380V Feeder panel

Molded case circuit breakers

2.) Control console

Control console to have following equipments.

1.... Voltmeter for main bus

1.... Voltmeter for diesel generators and commercial power

1.... Frequency meter for main bus

1.... Frequency meter for diesel generators and commercial power

2.... Wattmeter

2.... Ammeter with selector switches for reading each phase

2.... Air circuit breaker "ON" push button switches with its indicating lights (Red)

2.... Air circuit breaker "OFF" push button swithces with its indicating lights (Green)

2.... Generator running indicating lights (White)

2.... Governor control switches for each generator

1.... Commercial circuit breaker "ON" push button switch with its indicating light (Red)

1.... Commercial circuit breaker "OFF" push button switch with its indicating light (Green)

1.... Commercial power available indicating light (White)

1.... Synchroscope with a selector switch

1 set.... Synchronizing lamp (two lamps-transparent)

1.... Change over switch for selection of automatic synchronizing and automatic load sharing "AUTO" or "MANUAL"

1 set.... Earth detecting lights with a test switch for checking the AC 380V feeder bus (transparent)

8.... Alarm indicating lights (Red)

(included annunciator)

2 - Lubricating oil pressure low

2 - Cooling water temperature high

2 - Engine over speed

1 - Air vessel pressure low

1 - Diesel oil tank level low

1.... Change over switch for selection of load sharing mode between each generators and commercial power

Parallel running condition to be as follows

Run mode	Running condition
Two diesel generators running	Load sharing between each diesel generator
One or two diesel generators and commercial power running	Diesel generator(s) to be constant power running and commercial power are parallel running only

6. SPARE PARTS AND SPECIAL TOOLS

Necessary spare parts for one year's normal operation to be supplied according to manufacturer's standard.

Special tools necessary for overhauling and maintenance to be supplied according to manufacturer's standard.

7. GRAPHIC PANEL

One (1) set of the graphic panel, drawing main structure of the engine and generator, to be provided.

ITEM 3 REFRIGERATING PLANT

1. Number and type

One (1) set, composed of compressor unit, condenser unit and ref. chamber unit.

2. PARTICULAR

1) Compressor unit

Ref. compressor

One set, R-22 freon gas compressor

Cooling capacity;	2,000 Kcal/hr
Condensing temperature;	43°C
Evaporating temperature;	-20°C
Revolution;	470 rpm
Motor;	1.5KW, 1,500rpm
	AC 380V, 50Hz, 3ϕ

2) Condenser unit

One set, horizontal shell and tube type

Cooling surface area;	0.87 m^2
Cooling water;	35°C, abt. 1 m^3/hr

3) Ref. chamber unit

A) Ref. chamber

One set, unit type

Net valume;	8 m^3
Keeping temperature;	-10°C

B) Unit cooler

One set, fin tube type

Cooling surface area;	6.92 m^2
Fan:	abt. 16 m^3/min, 2 sets
	motor 0.4 KW 2 sets

3. Construction and material

Refrigerating plant to be composed of three units, compressor, condenser and ref. chamber unit and they to be installed with suitable distance for the purpose of education.

The compressor unit to be fitted with a oil separator, a gauge panel, a pressure switch and piping.

The condenser unit to be fitted with a safety valve, a pressure gauge, a thermometer and ref. outlet valve.

The ref. chamber unit containes a fan cooling unit, a thermostat and a thermometer and fitted with a solenoid valve and a thermo expansion valve at its outside wall.

A groop starter to be installed separately.

A dryer to be fitted in the piping system between the condenser unit and the ref. chamber unit.

Main parts material;

Compressor

Piston;	Cast iron
Crank case	Cast iron
Cylinder;	Cast iron
Crank shaft;	Carbon steel

Condenser

Water cover;	Cast iron
Tube;	Alminium brass
Tube plate;	Naval brass

Ref. chamber

Frame	Wood
Lining;	Stainless steel
Floor grating & shelves;	Wood
Insulation;	100 mm polyurethane

4. Accessories

Oil separator;	1
Dryer	1
Dual pressure switch	1
Thermo expansion valve;	1
Thermo stat and solenoid valve;	1 set
Pressure gauge and thermometers:	1 set

5. Spare parts and special tools

Necessary spare parts for one year's normal operation to be supplied according to manufacturer's standard.

Special tools necessary for overhauling and maintenance to be supplied according to manufacture's standard.

6. Graphic Panel

One (1) set of the graphic panel, drawing main system of the plant and main structure of the compressor, to be provided.

ITEM 4 HYDRAULIC STEERING GEAR

1. Number and type

One (1) set, electro hydraulic, HELE-SHAW type steering gear set

2. Particular

Steering gear

Max torque corresponding to Max. working press.	8.5 ton-m
Rudder angle from hard over to hard over	70 deg.
Turning speed of rudder for 70 deg.	30 sec
Diameter of ram	125 mm
Normal radius of tiller arm	280
Ram stroke for max. steering angle (70 deg.)	329
Ram stroke for limit rudder angle (74 deg.)	422

Hydraulic pump

Diameter of piston	12 mm
Stroke of piston	10.0 mm
Actual displacement	9.9 lit./min
Max. working pressure	195 kg/cm^2

Electric motor

2.2 kW, 1,500 rpm

Emergency pump

Hand pump type	
Actual displacement	20 cc/rev.
Turning speed of rudder	30-60 deg-sec.

3. Construction and material

All compoment of the hydraulic steering gear set such as hydraulic oil pump, steering mechanism, oil tank, steering stand, and other accessories to be mounted on a common bed

Main parts matirial to be as follows;

Tiller	; Cast steel
Key	; Forged steel
Roller	; Carbon steel
Ram	; Carbon steel
Cylinder	; Nodular cast iron
Common bed	; Steel plate

4. Spare parts and special tools

Necessary spare parts for one year's normal operation to be supplied according to manufacture's standard.

Special tools necessary for overhauling and maintenance to be supplied according to manufacture's standard.

5. Graphic Panel

One (1) set of graphic panel, drawing main structure and function, to be provided.

ITEM 5 MISCELLANEOUS MACHINERY

1. Diesel Engine (Main and Auxiliary)

Following machinery to be supplied for the purpose of training overhauling and maintenance. These machinery to be installed without piping and wiring and not to be driven.

Consumable spare parts due to overhauling and assembly such as gasket and packing to be supplied.

Special tools necessary for overhauling and maintenance to be supplied.

1) Particular

Type and number,

For main engine — Four cycle trunk piston vertical solid-injection, water cooled marine diesel engine with reduction gear and clutch, One (1) set

For aux. engine — Same type as above without gear and clutch One (1) set

Output ; Continuous rating-180ps at 1,250 rpm
One hour rating -200ps at 1,300 rpm

Bore, Stroke ; abt. 150mm x 200mm

Fuel oil consumption ; abt. 205 gr/ps/h

Fuel injection pump ; Bosch type

Starting ; Compressed air

2) Construction and material

To be in accordance with the manufacturer's standard

3) Accessories

Lubricating oil cooler	1 set
Cooling water pump	1 set
Fuel oil injection pump	1 set
Fuel filter	1 set
Lubricating oil pump, filter	1 set
Reduction gear (For main diesel engine only)	1 set
Clutch and reversing mechanism (For main diesel engine only)	1 set
Pipings, valves, gauges, etc.	1 set

2. Gasoline engine

Type ; 4 stroke, overhead valve type vertical, water cooled gasoline engine.

Number of set ; Two (2) sets

Number of cylinder ; 4

Output ; Maximum 18 - 41 PS
Continuous 15 - 35 PS

Revolution ; 1,500 - 3,600 rpm

Main parts material : Manufacturer's standard

3. Fuel oil injection pump

Sulzer RD 68 type ; One (1) set

Bosch PF type ; One (1) set WM type

One (1) set DD type

One (1) set ED type

4. Centrifugal type water pump and dispalcement type oil pump

Vertical type centrifugal water pump

Number ; One (1) set

Suction and delivery bore ; 100 x 100 mm

Capacity ; 50 m^3/h x 20 mTH

Main parts material

Casing ; Cast iron

Impeller ; Bronze

Shaft ; Stainless steel

Horizontal type centrifugal water pump

Number ; One (1) set

Suction and delivery bore ; 125 x 125 mm

Capacity ; 100 m^3/h x 20 mTH

Main parts material ; same as above

Vertical type gear pump

Number ; One (1) set

Suction and delivery bore ; 125 x 100 mm

Capacity ; 30 m^3/h

Maximum pressure ; 5 kg/cm^2G

Main parts material

Casing ; Cast iron

Gear ; Carbon steel

Shaft ; Carbon steel

Horizontal type gear pump

Number ; One (1) set

Suction and delivery bore ; 65 x 50 mm

Capacity ; 5 m^3/h

Maximum pressure ; 5 kg/cm^2G

Main part material ; Same as above

Note ; All pumps not to be provided with motor.

5. Graphic Panel

Each one (1) set of the graphic panel, drawing main structure of the machinery, to be provided as follows;

One (1) set for main and auxiliary engine

One (1) set for gasoline engine

One (1) set for fuel oil injection pump

One (1) set for centrifugal pump

One (1) set for gear pump

ITEM 8 COOLING WATER SYSTEM

The generator engines, air compressors and the condenser of the ref. plant to be cooled by this system which to be consisted of a air cooling tower, a cooling water reserve tank, cooling water pumps and pipings.

The air cooling tower to be mounted on the cooling water reserve tank which to be installed outside of the machinery house, at the same or higher level than the generator engine house.

1. Air cooling tower

   1) Type, Number

      Counter flow, unit type, one (1) set

   2) Paticular

      Water flow; 25 m^3/h

      Inlet/outlet temperature; 50°C/35°C

      Heat load ; 375,000 Kcal/h

      Outside wet bulb temperature; 30°C

      Cooling fan; 1.5KW, 1 set

      Water loss; 0.73 m^3/h

   3) Main parts material

      Casing; Fiber reinforced plastic (FRP)

      Water distributor; Poli-vinyl chloride (PVC)

      Packing material; PVC

      Fan impeller; Aluminium alloy

2. Water reserve tank

   1 set, abt. 5 m^3

   (To be provided by the Ivorian side)

3. Cooling water pump

For engine and air compressor cooling

One (1) set per One (1) engine,

(attached with the engines)

For ref. plant cooling

Motor driven, horizontal centrifugal type, 1 set

1.2 m^3/h x 10 mTH

0.4 KW, 1,500 - 3,000 rpm

Remarks; Independent cooling water pump and cooling water tank for diesel engine are not provided as the engine driven pump can take suction directly from the cooling water reserve tank because the tank can be installed at the same level or higher level than the generator due to its small capacity.

APPNEDIX 4-3-2

GENERAL ARRANGEMENT

F O R

MARINE MACHINERY IN THE REGIONAL MARITIME ACADEMY

OF THE REPUBLIC OF IVORY COAST

JULY, 1980

DWG. NO. MM-GA-01
2ND EDITION

APPENDIX 4-3-3

PIPING DIAGRAM

F O R

MARINE MACHINERY IN THE REGIONAL MARITIME ACADEMY

OF THE REPUBLIC OF IVORY COAST

JULY, 1980

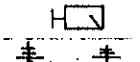
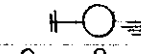
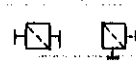
DWG. NO. MM-PD-01

2ND EDITION

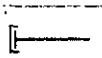
C O N T E N T S

Symbols for Valves, Cocks and Fitting on Piping Diagram.

管系統図における 付着品の記号

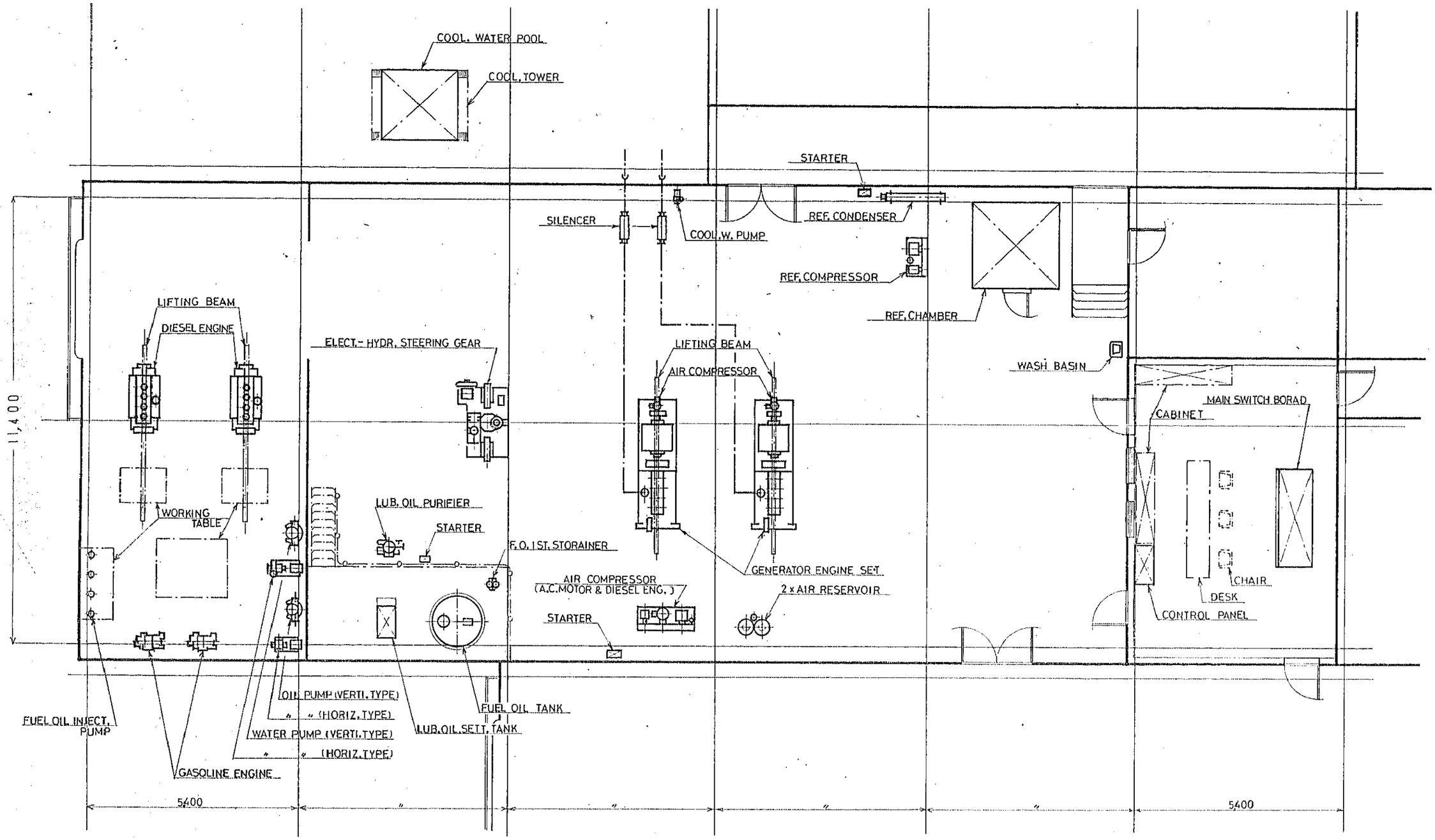
SYMBOL	NAME	名 称
	Stop Valve	玉 止 弁
	Gate Valve	仕 切 弁
	Butterfly Valve	蝶 形 弁
	Ball Valve	ボール バルブ
	Hose Valve	ホース バルブ
	Emergency Shut off Valve	危急遮断弁
	Screw-down Check Valve	ネジシメ逆止弁
	Swing Check Valve	スイング逆止弁
	Lift Check Valve	リフト 逆止弁
	Check Valve	逆 止 弁
	Foot Valve	フート バルブ
	Self-closing Valve	自動閉鎖弁
	Safery Valve or Relief Valve	安全弁，調節弁
	Reducing Valve	減圧弁
	Float Valve	フロート 弁
	Regulative Valve(Tow-way, Three-way)	調整弁(二方口、三方口)
	Solenoid Valve	電磁弁
	Tow-way Cock or Screw Cock	二方コック，ネジコック
	Three-way Cock	三方コック
	Cock with Lock	錠付コック
	Simplex Strainer	単式コシ器
	Duplex Strainer	複式コシ器
	Y-type Strainer	Y型 コシ器
	Mud Box	マッド ボックス
	Rose Box	ローズ ボックス
	Drain Trap	ドレン トラップ
	Hand Pump	ハンド ポンプ
	Educter	エゼクター
	Hose Connection	ホース カップリング
	Hopper	ホッパー

Symbols for Valves, Cocks and Fitting on Piping Diagram.

SYMBOL	NAME	名称
	Orifice	オリフィス
	Spectacle Flange	メガネフランジ
	Distance Piece	員通ピース
	Air Pipe Head	空気抜管
	Air & Filling Pipe Head	空気抜兼充填管頭
	Filling Pipe Head (With Flange)	充填管頭(フランジ付)
	Filling Pipe Head (With Cap)	充填管頭(ネジ蓋付)
	Sounding Pipe Head (Self-closing type)	測探管頭(自動閉鎖装置付)
	Sounding Pipe Head (Cap type)	測探管頭(キャップ型)
	Expansion Joint (Bellow type)	伸縮接手(ベローズ型)
	Expansion Joint (Sleeve type)	伸縮接手(スリーブ型)
	Float Gauge	フロートゲージ
	Grass Column Level Gauge (With Cock)	ガラス液面計(コック付)
	Sight Glass	サイトグラス
	Flow Meter	流量計
	Boss for Thermometer	温度計用座
	Thermometer (With case)	温度計(ケース付)
	Pressure Gauge (With Cock)	圧力計(コック付)
	Compound Gauge (with Cock)	連成計(コック付)
	Hose (Rubber or Cloth)	ホース(ゴムヌはクロス)
	Flexible Tube	フレキシブルチューブ

Symbols for Valves, Cocks and Fitting on Piping Diagram

SYMBOL	NAME	名 称
HLS	Hjgh Level Switch	高液面スイッチ
LLS	Low Level Switch	低液面スイッチ
PS	Pressure Switch	圧力スイッチ
TS	Thermo Switch	温度スイッチ
HLA	High Level Alarm	高液面警報
LLA	Low Level Alarm	低液面警報
HPA	High Pressure Alarm	高圧力警報
LPA	Low Pressure Alarm	低圧力警報
HTA	High Temperature Alarm	高温度警報
LTA	Low Temperature Alarm	低温度警報
L	Level Remote Indicator	遠隔指示液面計
P	Pressure Remote Indicator	遠隔指示圧力計
T	Thermal Remote Indicator	遠隔指示温度計
TE	Thermo Element	温度検出端



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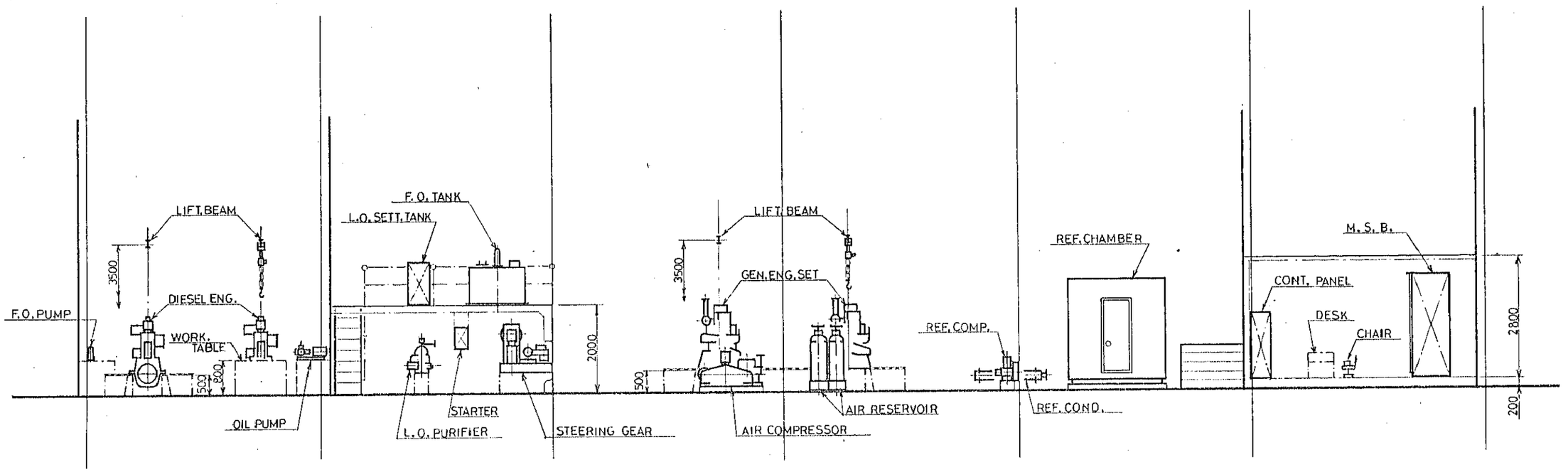
GENERAL ARRANGEMENT PLAN



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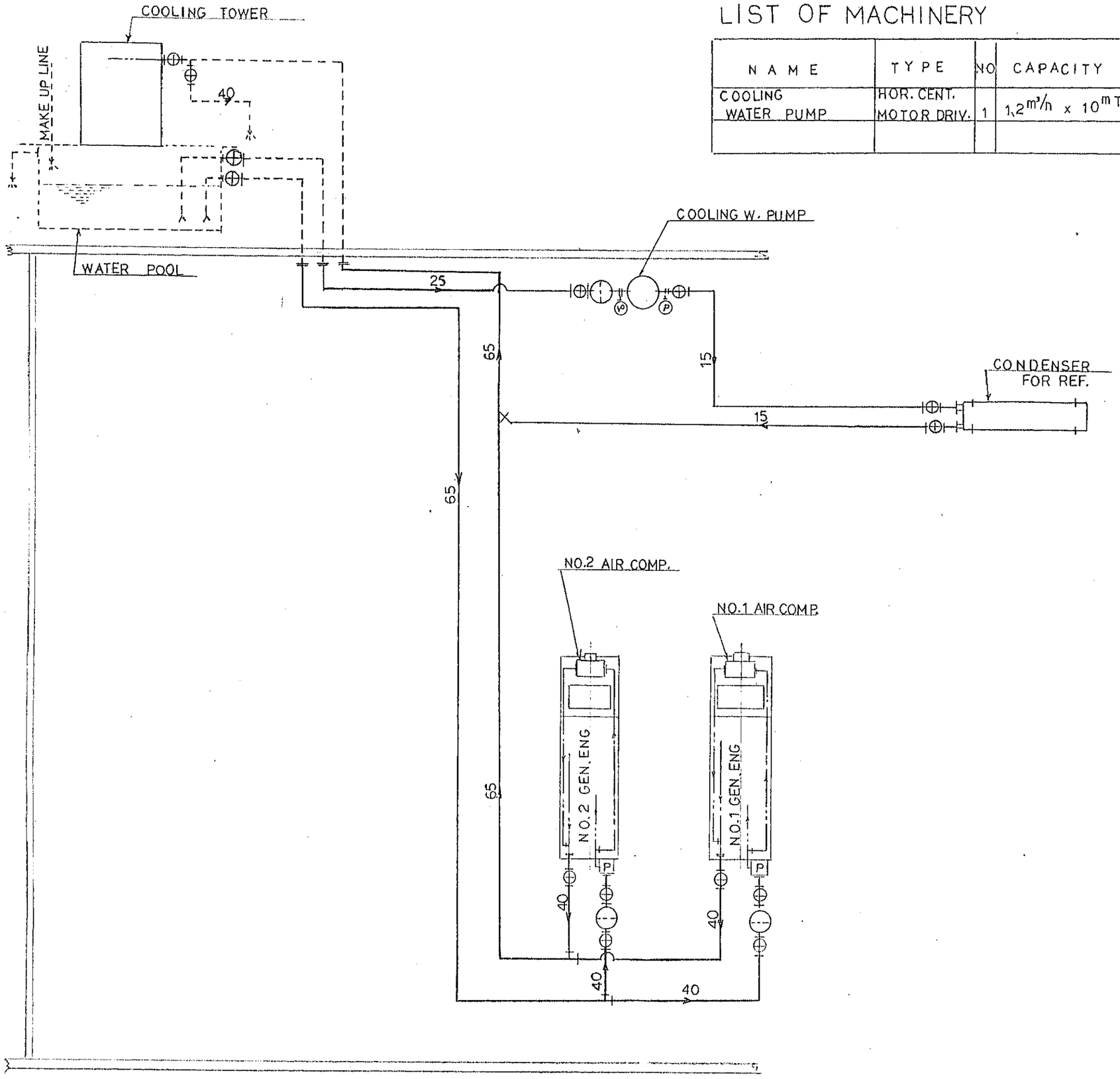
GENERAL ARRANGEMENT
ELEVATION



LIST OF MACHINERY

NAME	TYPE	NO	CAPACITY	REMARK
COOLING WATER PUMP	HOR. CENT. MOTOR DRIV.	1	1.2 m^3/h x 10 ^mTH	0.4 kw

BIBLIOGRAPHY

NOTE: —

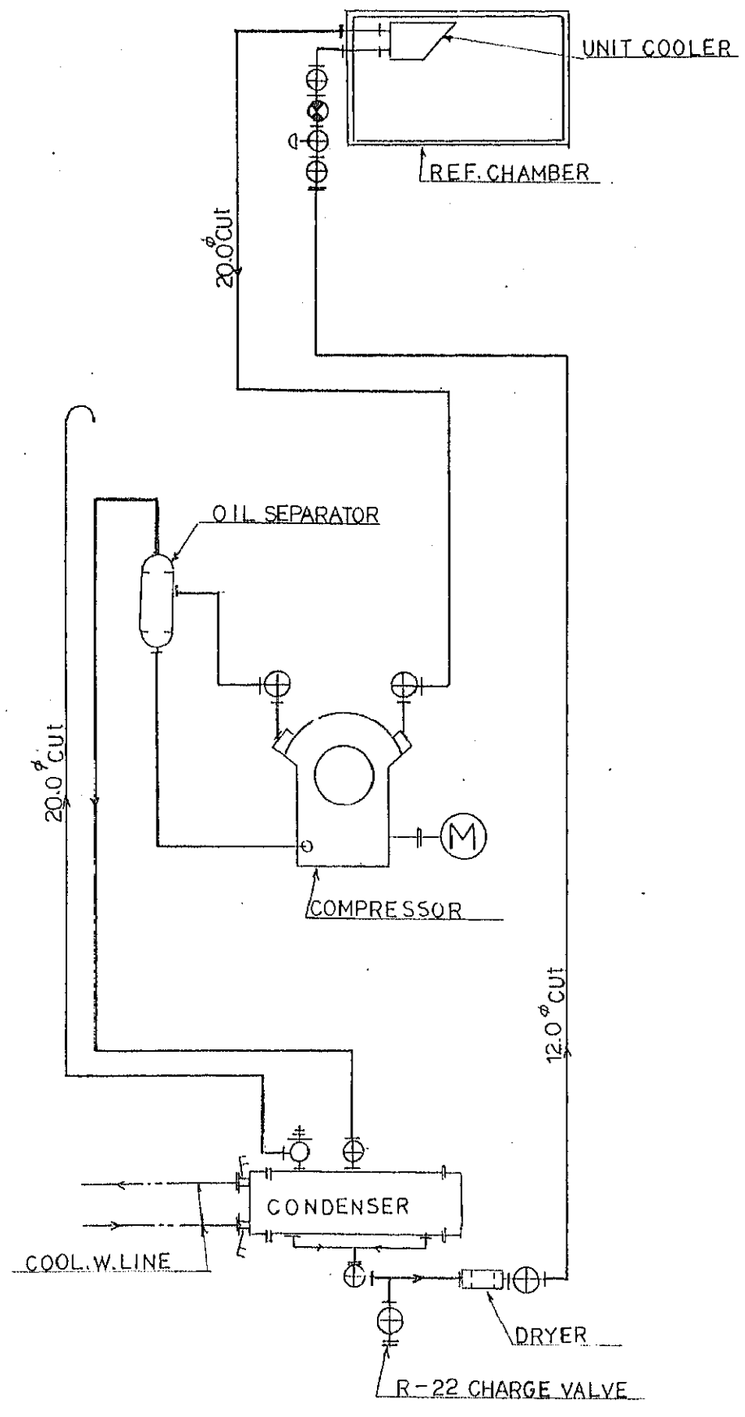
AIR COOLING TOWER PIPING SYSTEMS OUTSIDE OF THE HOUSE (SHOWN AS DOTTED LINE) TO BE PROVIDED & INSTALLED BY IVORIAN SIDE

(1)

DIAGRAM OF COOLING WATER SYSTEM

DWG NO. MM-PD-01-1

REFRIGERATING PLANT



LIST OF MACHINERY

NAME	TYPE	NO	CAPACITY	REMARK
R-22 COMPRESSOR	RECIPRO.	1	2000 Kcal/h	1.5 kw
REF. CHAMBER	BOX TYPE	1	8 m³ (-10°C)	

NOTES:—

1) KIND OF PIPE LINE

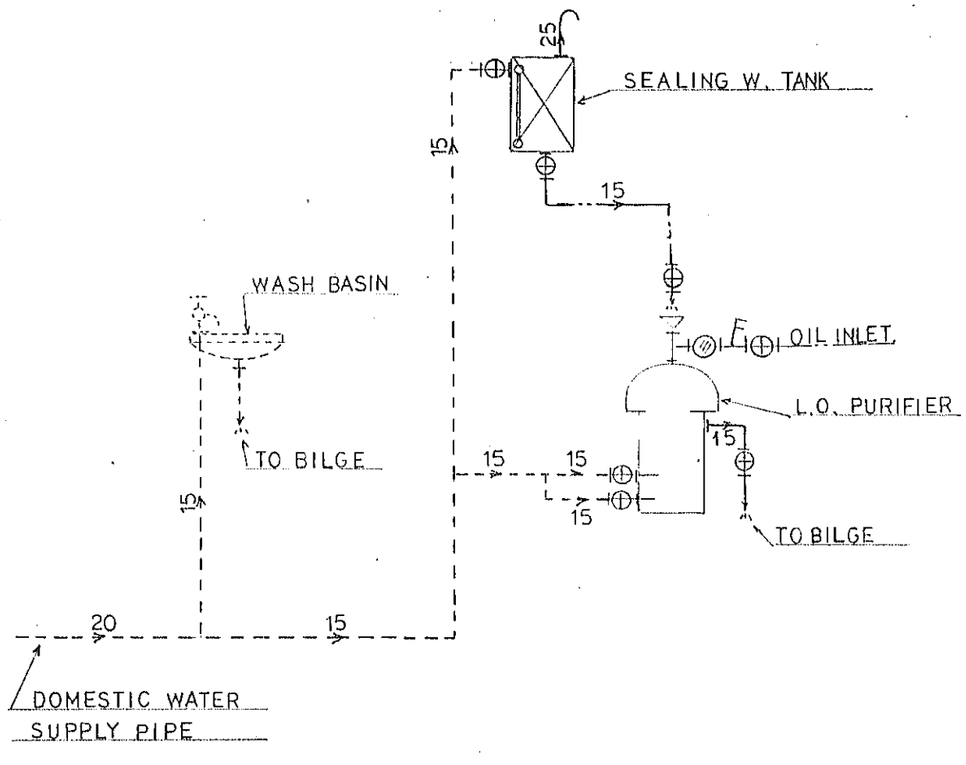
——— REF. PIPE LINE

——— · · ——— F.W. LINE

- - - - - - - - - DOMESTIC WATER SUPPLY LINE

2) ALL DOMESTIC W. PIPING WORKS INCLUDING WASH BASIN ARE TO BE CARRIED OUT BY IVORIAN SIDE

BIBLIOGRAPHY



(2)

DIAGRAM OF DOMESTIC W. SUPPLY & REF. PLANT SYSTEM

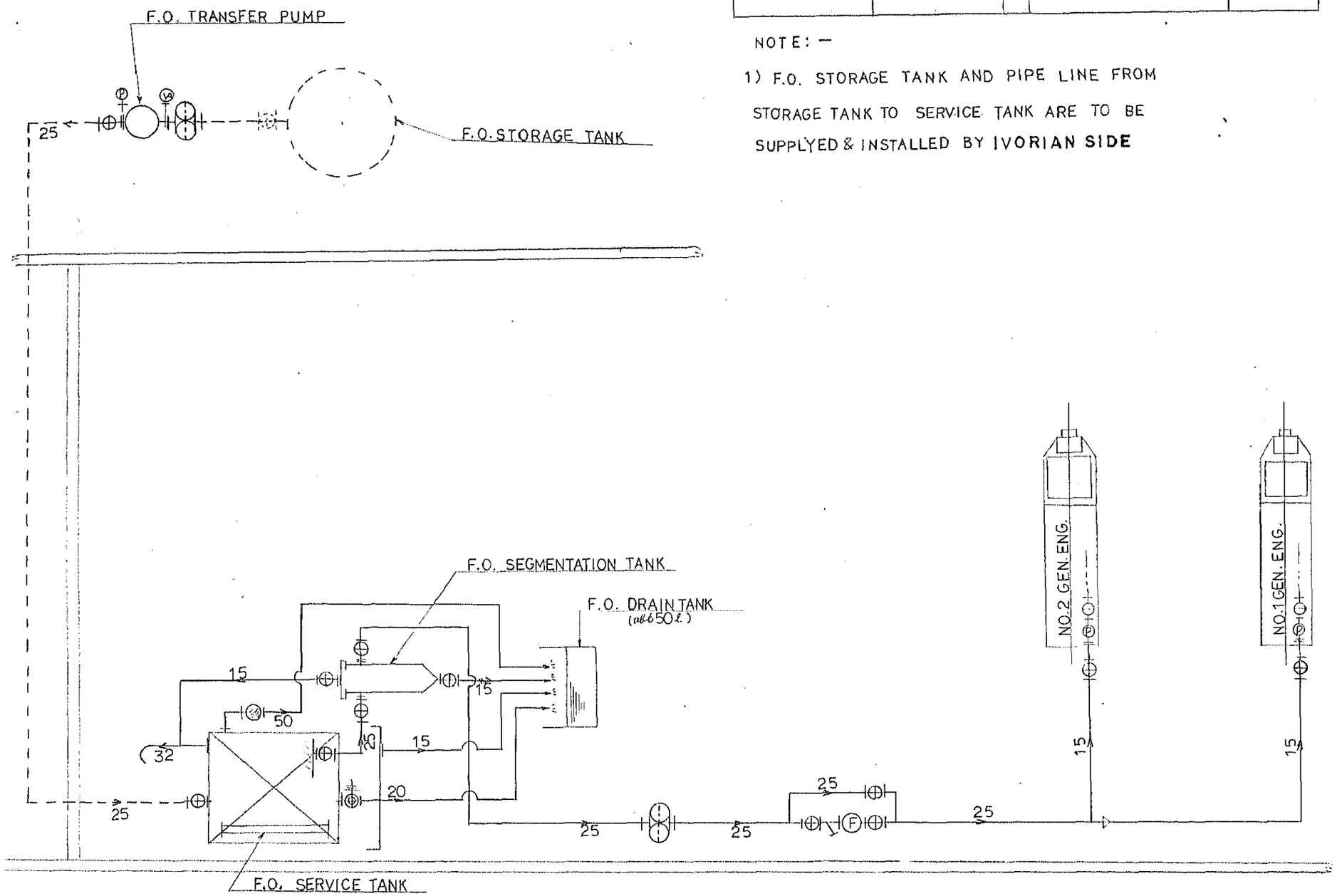
D W G. NO.	MM-PD-01-2

LIST OF MACHINERY

NAME	TYPE	NO	CAPACITY	REMARKS
FUEL OIL TRANSFER PUMP	HORIZ. GEAR MOTORDRIVE	1	$0.8^{m^3/h} \times 30^{m} \times 0.4^{kw}$	

NOTE: —

1) F.O. STORAGE TANK AND PIPE LINE FROM STORAGE TANK TO SERVICE TANK ARE TO BE SUPPLYED & INSTALLED BY **IVORIAN SIDE**



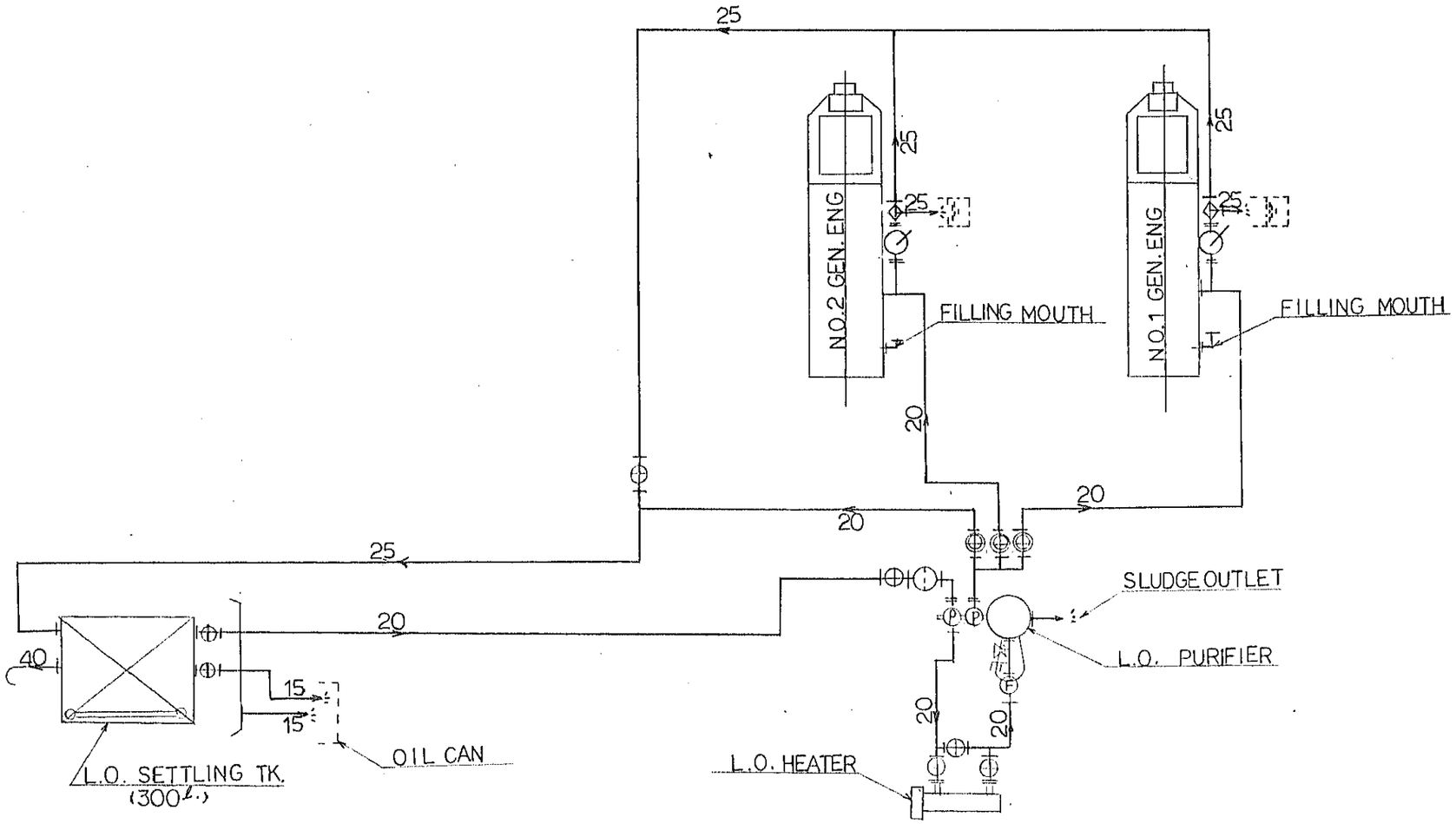
(3)

DIAGRAM OF FUEL OIL SYSTEM

DWG. NO. MN - PD - 01 - 3

LIST OF MACHINERY

NAME	TYPE	NO.	CAPACITY	REMARKS
L.O. PURIFIER	CENTRIFUGAL	1	700ℓ/h × 1.5kw	
L.O HEATER	ELECT. TYPE	1	3kw	



4

DIAGRAM OF LUB. OIL PURIF. SYSTEM

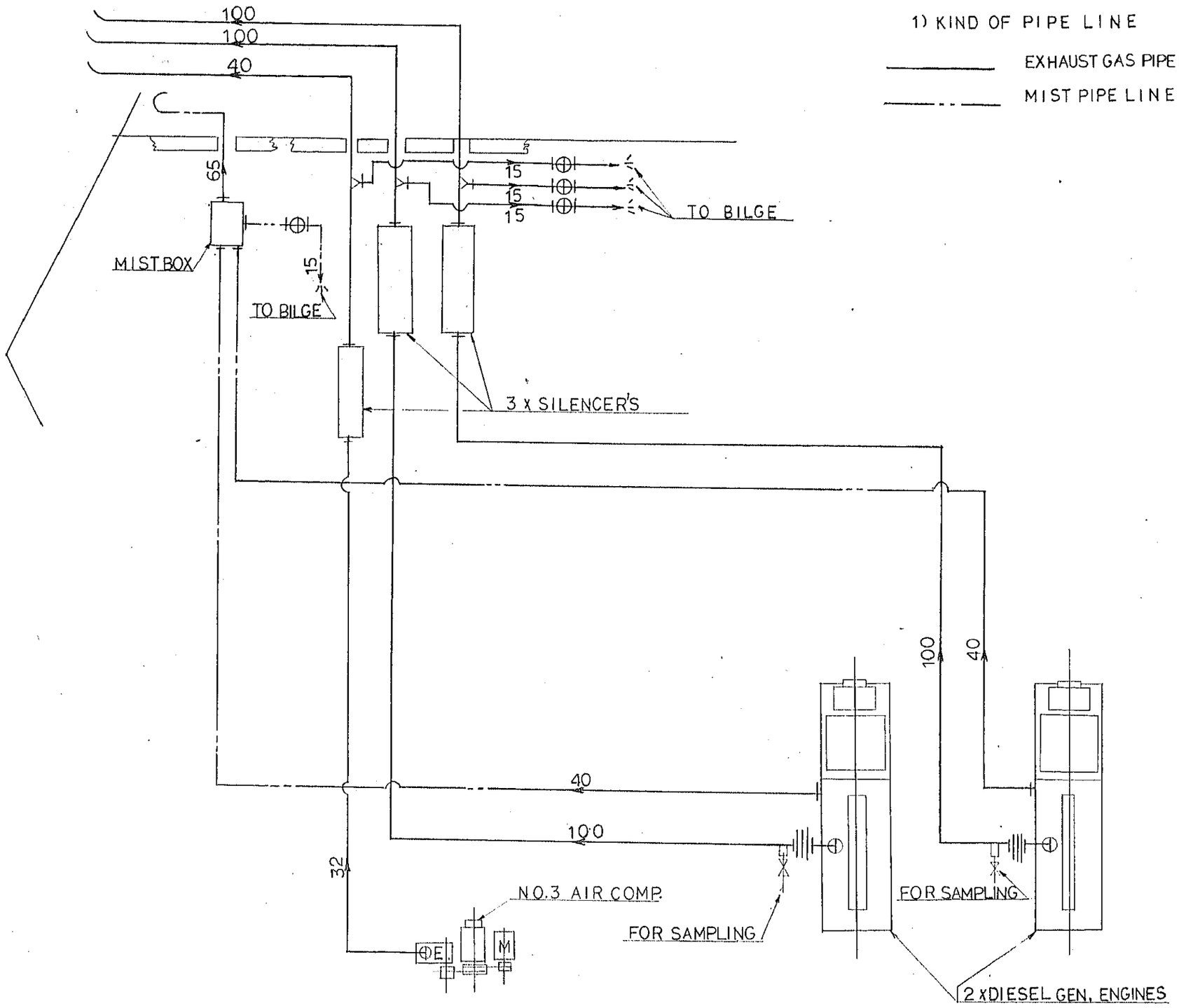
DWG. NO. MM-PD-01-4

NOTES: —

1) KIND OF PIPE LINE

EXHAUST GAS PIPE LINE

MIST PIPE LINE



(5)

DIAGRAM OF MIST & EXHAUST GAS LINE

DWG. NO. MM-PD-01-5