

Directorate of Naval Architecture

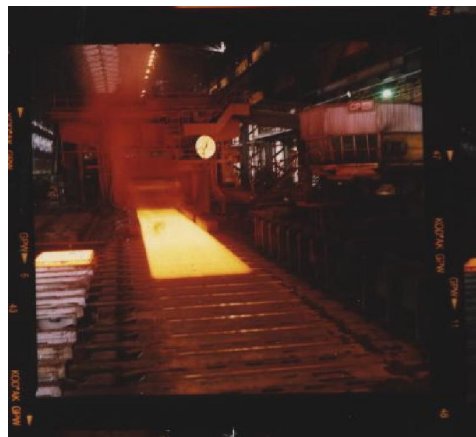
Indigenised Production of Warship Building Steel and Weld Consumables

1. Steels for the warship hull applications, currently in use in the country, were being imported till recently. The type and grade of steel used for ship construction in Eastern and Western block countries are widely different. Since many of the Indian Warships are of foreign origin, both from east and west, a wide variety of structural steel grades have proliferated in usage for the naval vessels, which has caused problems of inventory, uncertain availability, difficulty in procurement etc. Till recently even for indigenously built ships most of the structural steel used was imported. A strong need was therefore felt to overcome these problems by indigenous development of selected Warship Building Steel, a strategic material for improved self-reliance of a builders Navy as ours.



2. Based on an identified road map, the project of indigenous development and production of DMR 249A steel plates, bulb structural sections, etc. for ship/submarine applications has been successfully completed. Defense Metallurgical Research Laboratory (DMRL), Hyderabad and HQATVP partnered IHQ-MoD(N) in development of DMR 249A steel. M/s Steel Authority of India Ltd (SAIL) and M/s Essar Steel have successfully rolled DMR 249A steel plates and bulb bars are being rolled by M/s Krishna Industries.

3. It has now been decided that indigenous DMR 249A grade steel would be used for all warship building / repair activities to be undertaken by the Indian Navy and the indigenously produced DMR 249A grade steel will replace all other steels in vogue in the Indian Navy (except U3, AK25 & HY 80).



4. Indigenous weld consumables associated for welding of DMR 249A steel have also been successfully developed through a project steered by IHQ(N) in association with Naval Materials Research Laboratory (NMRL), Ambernath(Thane). Consequent to successful completion of this project, weld consumables are now available in various categories viz. Manual Metal Arc Welding, Gas Metal Arc Welding, Submerged Arc Welding.

5. Order for about 7500 tonnes of DMR 249A steel has been placed by on M/s SAIL by M/s Cochin shipyard and M/s GRSE, Kolkata for the ADS and ASW

corvette ship building projects and about 4500 tonnes of DMR 249A steel plates have already been delivered to the shipyards.

6. To meet the total requirement of the new construction projects, an approx amount of 28,000T of DMR 249A steel would need to be rolled. It is estimated that total savings on current prices gained by indigenized production of DMR 249A grade steel would be approx Rs 80 crores.

Indigenised Production of Non-Magnetic U3 Steel

8. The steel hull minesweepers of the Indian Navy - SNMs - of Russian origin have been built with non-magnetic austenitic grade steel namely U3 steel. In view of the non-availability of imported U3 steel for repair and maintenance of the SNMs, a project for indigenized production of U3 steel was taken up in association with M/s MIDHANI (M/s Mishra Dhatu Nigam Ltd), Hyderabad. U3 steel has now been successfully produced by M/s MIDHANI, Hyderabad and is indigenously available for repair and maintenance SNMs .

MARPOL compliant Long-life Paint System- Underwater hull

9. Conscientious initiatives have been undertaken with regard to structural preservation systems to enhance the dry docking interval for warships to a period of five years. The efforts include the introduction of long life paint systems for underwater hull, tanks and machinery spaces with the following salient aspects:

- (a) Robust paints manufactured by firms of international repute have been identified.
- (b) A stipulated performance guarantee has been contracted with the firms wherein the manufacturer stands guarantee for the service life of the paint and application of the paint is done under the supervision of the manufacturer.
- (c) The robust paints identified are high solid volume environmental friendly paints, capable of anti corrosive protection upto 10 years.
- (d) MARPOL compliant Tri-Butyl Tin (TBT) free antifouling systems capable of antifouling protection upto 5 years also introduced.

Indigenised Deck Underlay

10. Driven by the need for enhanced and reliable anticorrosive protection in addition to homogeneity and improved aesthetes epoxy based deck underlays indigenously developed by of M/s Macrotech, Kolkata , M/s Apurva Build care, Mumbai and M/s JD Jones , Mumbai have been inducted for onboard use after extensive trials.

Indigenised Polylist Dock Blocks and Polymeric Rubbing Strakes in lieu of Wood Based Dock Block and Fenders

11. The construction of wooden dock blocks for dry-docking of ships and manufacture of wooden fenders/rubbing strakes has become an unprofitable proposition in view of exorbitant cost of wood, its tendency to rot and become unusable in short span of time and potential fire hazard. To overcome the above,

initiatives have been taken by this Directorate in association with Naval Materials Research Laboratory (NMRL), Ambarnath(Thane) to replace the teak wood for construction of dock blocks by use of indigenously developed POLYLIST dock blocks and to replace wooden fenders by polymeric rubbing strakes at the Naval Dockyards. In view of the successful field trials of the POLYLIST dock blocks (by docking of IN warships) and polymeric rubbing strakes, these new generation materials have been inducted into the Navy.

Hydro blasting

12. High pressure water jet blasting or Hydro blasting for surface preparation of steel substrates is one of the fast emerging technologies in shipbuilding industry. Consequently the problems caused by dust pollution and by the disposal of spent abrasives are eliminated. In view of the simplicity of technique the simplicity of the technique and environment friendly aspects hydro blasting has been introduced an additional method for surface preparation of steel substrates for Naval applications.

Maintenance Of Underwater Hull Of Ships In Afloat Condition

13. Optimising the resources of dry dock at our dockyards and suitable adoption of technological advancements in the field of underwater and waterborne engineering support for reducing dock dependency with regard to maintenance / repair of ships and submarines, has been actively considered at this Headquarters and the technology of underwater maintenance in afloat condition has been introduced for Indian Naval Applications with the aim to

- (a) Increase the during inter-docking intervals
- (b) Enable maintenance in afloat condition to enhance availability of warships

14. Directives have been issued to HQWNC / ND(MB) to execute maintenance contract with Joint Venture partner of M/s UMC International, UK (leading firm in underwater maintenance afloat) and to start with the above, Delhi, Brahmaputra & 'G' class ships have been identified.

Floating Dock Navy –1

15. The refit of FDN-1 was undertaken by Colombo Dockyard Ltd, Colombo at a cost of US \$ 13.84 million. The refit of the dock commenced on 27 Apr 04 and was completed by Colombo Dockyard Ltd, Colombo on 15 Jul 05.

16. FDN-1 is now fully operational and is being exploited for use since 18 Jul 05. So far 09 ships have been docked/undocked. This includes 03 LCUs, 02 FACs, 01 LST, 01 Tug and 01 Barge.



17. Various measures have been instituted for Safe Exploitation and Maintenance and are considered satisfactory. Towards this end, Comprehensive Standing Orders, Spares procurement procedure, personnel policy have been finalised. Further, Comprehensive Maintenance Schedule, Ops cum Refit Cycle, D 787 and Navy Order are under issue. FDN-1 is being maintained under LRS classification.

Pollution Control Measures Initiated On IN Ships

18. Pollution control measures are being initiated on IN ships on a voluntary basis in two phases: -

(a) **PHASE-I: Sewage** Annex IV of the MARPOL 73/ 78 regulations of the International Maritime Organisation (IMO) requires treatment of sewage prior discharge from ships into the seas. Indian Navy has initiated a case for fitment of Sewage Treatment Plants (STP) on existing IN ships with sufficient residual life. 18 such ships have been identified. All new construction ships are being fitted with STPs.

(b) **PHASE-II: Oil and Garbage** As part of phase-II a drive is being initiated to ensure MARPOL compliance for IN ships w.r.t treatment of oil (Annex I) and garbage (Annex V) generated onboard.

Directorate of Fleet Maintenance

1. The Directorate of Fleet Maintenance is responsible for formulation of refits policies, planning, scheduling and monitoring of refits and promulgation of ops cum refit cycles for ships, submarines and Yard craft. The directorate also interacts with other directorates and with Ministry of Defence in respect of Administration, Training, Manpower, Budget for Dockyard Apprentice School (DAS), Indian Naval Ship Maintenance Authority (INSMA), Yard craft and offloading of ships / submarines refit to PSU's / Private shipyards.

2. The Directorate is actively involved in improving the quality and efficiency of the yards by laying greater tress on Total Quality Management (TQM), Human Resources Development (HRD) and other developmental activities related to costing and productivity improvement.

ONGOING ISSUES

Human Resource Development

3. Leveraging human resource for improving the productivity is of paramount importance to our dockyards. Accordingly, human resource development activities are adequately prioritised. Seminars are regularly held in Naval Dockyards to focus various issues concerning human resource development. The important initiatives in the development of human resource are mentioned in the succeeding paragraphs.

Cadre Training Plan for Industrial Trades.

4. The Cadre Training Plan for dockyard/NSRY personnel has been prepared and promulgated by DFM. The training plan highlights training requirements for the yard personnel at various stages of career progression. The Cadre Training Plan gives broad guidelines and objectives for the courses planned. The yards have been conducting regular courses as per CTP and the progress as such is a success.

Productivity Linked Bonus

5. Both Dockyards contribute in getting Productivity Linked Bonus for industrial community. PBL is disbursed during Dussehra festival every year. This year the PLB of maximum admissible 40 days has been achieved.

6. **INS Tarangini.** INS Tarangini was on overseas deployment to Europe from Apr 05 to Nov 05 for participation in the International Fleet review (IFR) and International Festival of the Sea (IFO)_S at Portsmouth, UK and Tall ships Events in the region.

GENERIC PLAN FOR THE NEXT YEAR

7. **MCGS Guardian** MCGS Guardian, Ex IN SDB T61 was transferred to the Mauritius National Coast Guard (MNCG) in 1993. The MNCG has extensively exploited the ship for the last 12 years. The ship is undergoing Medium Refit at ND (MB) for duration of 09 months.
8. **SCGF PS 'Topaz' (Ex Tarmugli)** An in service Trinkat class Fast Attack craft (FAC) was gifted to Seychelles Coast Guard in Feb 05 the ship has been re christened as SCG PS "TOPAZ". Presently Product Support to the Seychelles Govt for the ship is being provided by IN.
9. **SLNS Sayura** SLNS Sayura, an Offshore Patrol Vessel (OPV), was built at HSL, Visakhapatnam and was commissioned as INS Sarayu on 08 Oct 1991. The ship was subsequently sold to Sri Lanka on 01 Nov 2000. Last year during 'Joint Declaration' made on conclusion of the visit of Sri Lankan President to India, it was agreed that refit of SLNS Sayura would be carried out in India and cost of the refit will be born by Indian Govt. The Medium refit of the ship is scheduled to commence from Mar 06.

Directorate of Dockyards

INTRODUCTION

1. Directorate of Dockyards (DODY) is the nodal Directorate at Integrated Headquarters of Ministry of Defence (Navy) for development of technical/ repair infrastructure at Naval Dockyards (Mumbai and Visakhapatnam), NSRYs (Kochi, Port Blair, and Karwar) and INS Eksila. It undertakes monitoring and coordination of projects under execution, associated budgeting, replacement/ induction of new equipment and their sanctions for Dockyards and NSRYs. The special repairs to marine assets are also under the ambit of DODY and so is the formulation of all policy aspects regarding modernisation/ augmentation of repair facilities.

2. The Directorate is headed by the Principal Director of Dockyards (PDODY) of the rank of Commodore. Organisationally he comes directly under Assistant Chief Of Material (Dockyards and Refits) (ACOM (D&R)). Some of the important functions carried out by PDODY are as follows: -

(a) Formulation of all policy aspects regarding modernisation/ augmentation of repair facilities and replacement of machinery and equipment pertaining to Naval Dockyards, NSRYs and INS Eksila through Director General Naval Projects (DGNP).

(b) Drawing up the three years Annual Technical Works Programme (ATWP) for modernisation and augmentation of repair facilities of Naval Dockyards, NSRYs and INS Eksila. Thereafter, obtain Approval in Principle (AIP) from MoD for works approved under this programme for that FY and subsequently, obtain necessary financial sanctions from CNS/ MoD for individual works which are beyond the powers of local Commander- In- Chiefs (C-in-C).

(c) Monitoring progress of sanctioned technical works, executed by DGNPs through Quarterly Progress Review Meetings (QPRM), Chaired by ACOM (D&R) and Working Group Meeting (WGM), chaired by Joint Secretary (Navy).

(d) Coordination of all works pertaining to capital dredging which forms part of the sanctioned naval projects at Mumbai and Visakhapatnam.

(e) Ensuring timely allotment of funds, monitoring expenditure and submitting the requisite budget returns for the following capital and revenue heads operated by DGNPs and Naval Dockyards respectively.

NAVAL SHIP REPAIR ORGANISATIONS

3. The Naval Dockyards Mumbai and Visakhapatnam are the two premier Dock Yards of Indian Navy for undertaking repair and refit works of the Western and Eastern Fleet ships. Besides these Dockyards. The Naval Ship Repair Yards, Kochi, Port Blair and Karwar caters to the repair/ maintenance needs of the ships based in these naval bases.

(a) The Naval Dockyard Mumbai has a maritime heritage of over 250 years. The yard is spread over 200 acres of land in the heart of south Mumbai, has a workforce of over 10000 civilian personnel, in 101 technical repair work shops, to cater for the repair and refit work of the Naval ships based in Mumbai.

(b) The Naval Dockyard, Visakhapatnam was christened on 29 Mar 1972. The present day yard evolved from being a Boat Repair shop at HMIS Circars in 1940, and later as a Base Repair Organisation (BRO) in 1953. The yard is spread over 704 acres of land, with 28 jetties, 03 dry docks, slipway and 10 groups of technical repair workshops to cater for the ships and yard crafts based in Visakhapatnam. The yard is manned by 8000 civilian employees besides serving Naval officers and men.

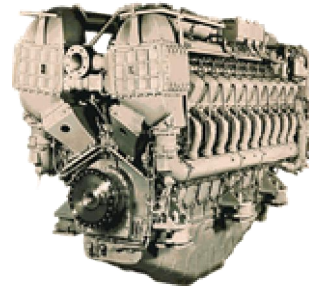
(c) The Naval Ship Repair Yard, Kochi has the genesis from BRO established in pre-independence days for the support of Royal Navy ships. The yard has strength of 900 industrial personnel. The creation of infrastructure at Naval Ship Repair Yard, Port Blair commenced with formation of Base Maintenance Unit in 1972, upgraded to BRO in 1979, and further upgraded to Naval ship repair yard in 1993. The docking requirement of the ships based in Port Blair is met by the Floating Dry Dock maintained by the yard. The infrastructure at Naval Ship Repair Yard, Karwar is the early stage of creation.

AUGMENTATION OF SHIP REPAIR YARDS

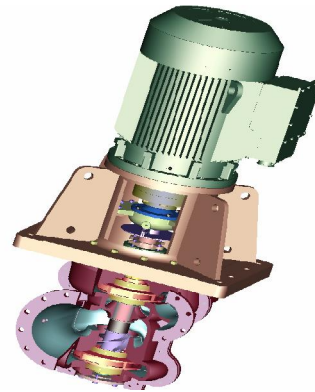
4. The technical repair infrastructure at Naval ship repair organisations, subsequent to its creation and up gradation are periodically augmented to keep pace with advancement of technology, new induction equipment, and increase in fleet strength. The Mumbai and Visakhapatnam Dockyards and INS Eksila are augmented through project organisations created specifically for this purpose namely DGNPs. The Naval Ship Repair Yards, Kochi, and Port Blair are augmented through MES organisations. Augmentation of NSRY, Karwar is yet to commence. The Annual Technical Works Programme (ATWP) is the tool used for modernisation and augmentation of repair facilities of Naval Dockyards, NSRYs and INS Eksila.

Directorate of Marine Engineering

1. **Re-powering of Ships.** Enhancing operational availability of ships by increasing Mean Time Between Overhauls (MTBO) of engines and augmenting product support for spares for various IN ships is being actively considered by DME.. Various re-engining projects on other ships are already underway.



2. **Standardisation of Centrifugal Pumps.** With a view to arrest proliferation of different types of centrifugal pumps presently installed onboard IN ships, ensure efficient management of inventory and have better product support, this directorate has identified a standard range of 29 pumps which would be able to replace 345 types of 2700 centrifugal pumps fitted onboard various IN ships. There are 19 types of pumps from the 29 type identified standard pumps which are already in Navy and these have been accorded PAC. It has been decided to install these standard pumps on new construction ships as well as for replacement of existing pumps as and when they are declared BER.



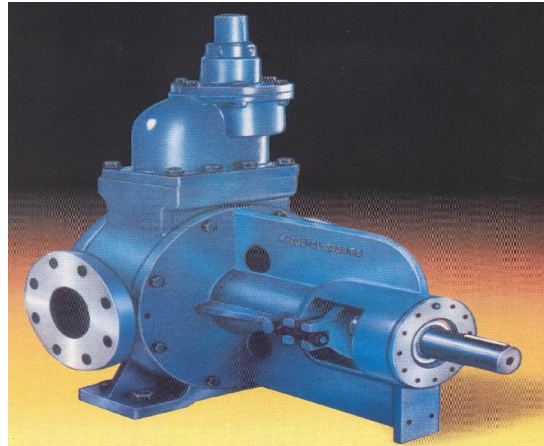
3. **Change over to Ozone Friendly Refrigerants.**

India being a signatory to the Montreal protocol is working towards adhering to the agreements of the protocol. Since the production of ozone depleting gases like R-11 and R-12 would stop from 2010 onwards, the IN is gearing itself to meet the stipulations by perspective planning and management of Ozone Depletion Substances (ODS). The change over is being done in two phases the first phase for the ships in commission and the second phase for the new construction projects. For the ships in commission, R-12 AC and Ref plants are being replaced with indigenous plants using lesser depleting R-22 gas. This replacement is being undertaken on ships in a phased manner. All new construction projects and ships undergoing Mid Life Update (MLU) are being fitted with plants using R-134A, a non-CFC refrigerant.



4. **Import Substitution of Screw Pumps.** Import substitutes have been identified for following screw pumps: -

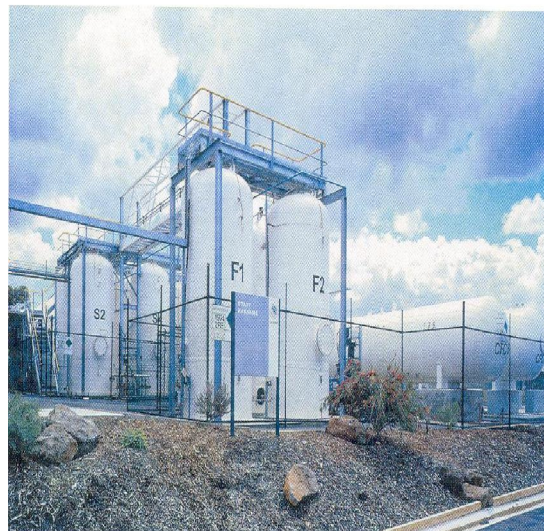
- (a) Avcat transfer Pump
- (b) Hello Fuelling Pump
- (c) Fuel Transfer Pump
- (d) Fuel Booster Pump
- (e) Hello Hangar Pump
- (f) GTG Fuel Feed Pump
- (g) Boiler Fuel Feed Pump
- (h) Fuel Stripping Pump
- (j) GT Lub Oil Transfer Pump
- (k) RG Lub Oil Transfer Pump
- (l) GT Fuel Feed Pump
- (m) Helo Fuel Transfer Pump



5. **Gas Turbine Overhaul.** INS Eksila, an overhaul center for all types of gas turbines being used in service has been created at Visakhapatnam. Presently, only DE-59 GTs and Turbo compressors of 1250-E Gas Turbine Generators are being overhauled at Eksila. Augmenting this centre to facilitate repairs of all the new induction gas turbines is being progressed by DME. Negotiations with OEMs to develop infrastructure, procure repair manuals and tools/appliances are being steered. This expansion project is tentatively scheduled for completion by May 2006. Creation of this facility would make the Navy self reliant for overhaul of all Gas Turbines



6. **Halon Management.** India has a 10 year grace period and an obligation to stop the consumption of Halons by year 2010. IN has already instituted proactive measures to tackle the declining availability of Halons. A three pronged strategy that includes identification of Halon alternatives, Halon banking facility for existing stockpiles and creation of Halon Recovery & Recycling Facility (HRRF) has been initiated. Technical evaluation and field trials of the HRRF has been completed and the staff evaluation report is being compiled. Creation of Halon Banking facility and HRRF will avoid release of these Ozone depleting



Halons into the atmosphere. A test plan for alternative agents namely FM 200 and NAF S 125 are being formulated by DME in consultation with Centre for Fire Explosives and Environment Safety (CFEES) to ascertain efficacy of these agents for use on board

FUTURE PLANS

7. **ADMINISTRATIVE ISSUES**

- (a) **Amendment to NI.** Amendment to NI 1/S/2003 to include financial powers of Naval Attaches.
- (b) Re-Designation of FMUs as Fleet Repair Yards.

8. **REFIT ISSUES**

- (a) **Induction of standardised range of equipment in IN.** Introduction of standardised Pumps, Coolers, SV mounts, Valves etc on the various ships to be progressed through vendor development and reverse engineering.
- (b) **Kaveri Marine Gas Turbine.** Testing of integrated KMG T at ND(V) test house followed by qualification testing to be carried out.

9. **INFRASTRUCTURE ISSUES**

- (a) **Halon Recovery and Reclamation Facility (HRRF).** Setting up of one mobile HRRF each at Mumbai and Visakhapatnam.
- (b) **Fire Fighting Simulator at INS Shivaji.** Progressing the setting up of Fire Fighting Training Simulator (FFTS) at NBCD School.
- (c) **Training for High Pressure Boilers.** Creation of a training facility at INS Shivaji for training on exploitation of High Pressure Boiler.
- (d) **DC Simulator.** Setting up of a Damage Control Simulator at Kochi.

10. **DEVELOPMENT AND INDUCTION ISSUES**

- (a) **Development of High Capacity Fuel cells.** Development of phosphoric acid fuel cell prototype packs upto 10 KW to be progressed.
- (b) **Indigenous development of TIC.** Indigenisation of Helmet mounted TIC to be carried out with IRDE, Dehradun
- (c) **Ship Installed Chemical Agent Detection System.** Procurement and installation of 21 Ship Installed Chemical Agent Detection Systems (SICADS) to be carried out.
- (d) **Indigenisation of Fire Fighter Suit.** Indigenous Fire Fighter Suit to be developed .

Directorate of Indigenisation

INTRODUCTION

1. A separate Directorate has been established at the Integrated Headquarters, Ministry of Defence (Navy), New Delhi in order to act as a single point authority to meet the ever growing Indigenisation requirements in the Indian Navy. The Directorate would be handling issues regarding indigenisation of all equipment and spares except armament & aviation, which would be handled as hithertofore. The Indigenisation function being carried out by the DGQA and other Directorates will now be transferred to the new Directorate, which has its office at West Block-5, RK Puram, New Delhi.

2. **ONGOING ISSUES**

- (a) Creation of Holistic software and hardware for accord of CFI.
- (b) Commenced CFI accord and Indigenisation wef Jan & Feb 2006 respectively.

3. **PLAN FOR NEXT ONE YEAR**

- (a) Setting up of Indigenisation Units at Mumbai & Vizag.
- (b) Setting up of a Naval Indigenisation Establishment.

4. **LIST OF ITEMS TO BE INDIGENISED FOR WHICH VENDOR PARTICIPATION IS SOLICITED**

ENGINEERING

- (a) Diesel engines for motorboats, gensets upto 1.5 MW and main propulsion engines for ships and submarines.
- (b) Boilers, in that typically small auxiliary boilers for domestic services and distilling plants.
- (c) Steam and gas turbines – 1 to 1.5 MW Gas turbine generator is a product for which we are seeking an indigenous solution or licensed manufacture.
- (d) Gearboxes of all types especially low noise gearboxes of combined plants.
- (e) Propellers and shafting for applications ranging from Aircraft Carriers to motor boats including controllable and reversing pitch propellers.
- (f) HP & LP Air Compressors

- (g) Pneumatic and Hydraulic Systems
- (h) Centrifugal Pumps and centrifuges
- (j) Distillation and Reverse Osmosis Plants
- (k) Piping systems and Valves (NAB)
- (l) A/C and Ref machinery
- (m) Motor boats and Diving equipment
- (n) Fire-fighting and NBC protective equipment.

ELECTRICAL

- (a) Alternators and Generators
- (b) Switch boards and Distribution equipment
- (c) Motors and Conversion Machinery.
- (d) Heavy duty batteries
- (e) Emergency lighting, CFL etc.
- (f) Soft starters
- (g) Missile, Rocket and Torpedo launchers.
- (h) Anti air, surface and submarine fire control systems and Electro-optical fire control systems.
- (j) Sonars and echo sounders
- (k) Electro-magnetic and acoustic sweeps for mine-counter measures.
- (l) Missile handling gear.
- (m) Missile loaders.
- (n) Computerized Missile test stands.
- (p) Communication equipment, including INMARSAT receivers Global Positioning System receivers
- (q) Anemometers and Chronometers.
- (r) Sensors and transmitters
- (s) Signal conditioning systems, Controllers and Actuators
- (t) Instrumentation
- (u) Ship design and simulation packages.
- (v) Computer Based training packages.
- (w) Network management & Information security.

HULL AND DECK MACHINERY

- (a) Shipbuilding quality Special steels. Materials used in ship construction such insulating materials, acoustic suppression tiles etc.
- (b) Capstans, Winches, Anchors and Chain Cables
- (c) Underwater Paints
- (d) Steel and Nylon ropes, Pneumatic Fenders
- (e) Hydraulic lifts and Domestic Machinery
- (f) Life Rafts and life jackets
- (g) Canvas Awnings and Fire Retardant furnishings
- (h) Cold and Hot Insulation Materials
- (j) Aircraft Hangar Doors, Helo traversing gear etc.
- (k) Single Arm Hydraulic Davits & cranes
- (l) Hangar Shutters
- (m) Anodes for Aluminium Hull
- (n) Vibro Acoustic Dampening Coatings
- (p) Ultra High Pressure Hydro Blasting Machine
- (q) RAS arrangement
- (r) Acoustic Rubber tile
- (s) Bow Sonar Dome
- (t) Modular laundry