APPENDIX I

GLOSSARY

AUTOMATIC COMBUSTION CONTROL (ACC) SYSTEM–A system that automatically controls the fuel and air mixture in a boiler.

AUXILIARY MACHINERY–Any system or unit of machinery that supports the main propulsion units or helps support the ship and the crew; for example, pump, evaporator, steering engine, air-conditioning and refrigeration equipment, laundry and galley equipment, and deck winch.

BACK PRESSURE–The pressure exerted on the exhaust side of a pump or engine.

BALLASTING–The process of filling empty tanks with seawater to protect the ship from underwater damage and to increase its stability See DEBALLAST-ING.

BLOW TUBES–Use of steam to remove soot and carbon from the tubes of steaming boilers.

BLUEPRINT–Reproduced copy of a drawing (usually having white lines on a blue background).

BOTTOM DEAD CENTER (BCD)–The position of a reciprocating piston at its lowest point of travel.

BOILER–A strong metal tank or vessel, composed of tubes, drums, and headers, in which water is heated.

BOILER CENTRAL CONTROL STATION–A centrally located station for directing the control of all boilers in the fireroom.

BOILER DESIGN PRESSURE–Pressure specified by the manufacturer, usually about 103 percent of normal steam drum operating pressure.

BOILER INTERNAL FITTINGS–All parts inside the boiler that control the flow of steam and water.

BOILER OPERATING PRESSURE–The pressure at which a boiler is maintained while in service.

BOILER OPERATING STATION–A location from which a boiler is operated.

BOILER RECORD SHEET–A NAVSHIPS form maintained for each boiler, which serves as a monthly summary of operation.

BOILER REFRACTORIES–Materials used in the boiler furnace to protect the boiler from heat.

BOILER ROOM–A compartment containing boilers but not containing a station for operating or firing the boilers Refers specifically to bulkhead-enclosed boiler installations.

BOILER TUBE CLEANER–A cylindrical brush that is used to clean the insides of boiler tubes.

BOILER WATER–The water actually contained in the boiler.

BOTTOM DEAD CENTER (BCD)–The position of a reciprocating piston at its lowest point of travel.

BOURDON TUBE–A thin-walled tube bent into the shape of a letter C, which tends to straighten out when pressure is exerted. As the tube straightens, it moves a pointer around a gauge dial.

BRAZING–A method of joining two metals at high temperature with a molten alloy.

BRINE–A highly concentrated solution of salt in water, normally associated with the overboard discharge of distilling plants.

BRITTLENESS–A property of a material that causes it to break or snap suddenly with little or no prior sign of deformation.

BULL GEAR–The largest gear in a reduction gear train The main gear, as in a geared turbine drive.

BURNERMAN–Person in the fireroom who tends the burners in the boilers.

BUSHING–A renewable lining for a hole through which a moving part passes.

BYPASS–To divert the flow of gas or liquidAlso, the line that diverts the flow.

CALIBRATION–The comparison of any measuring instrument with a set standard of a greater accuracy.

CANTILEVER–A projecting arm or beam supported only at one end.

CAPILLARY TUBE–A slender, thin-walled, small-bored tube used with remote-reading indicators.

CARBON DIOXIDE–A colorless, colorless gas used as a fire-extinguishing agent and for inflating life rafts and life jackets.

CARBON PACKING–Pressed segments of graphite used to prevent steam leakage around shafts.

CASUALTY POWER SYSTEM–Portable cables that are rigged to transmit power to vital equipment in an emergency.

CENTRAL CONTROL STATION (CCS)–The CCS is the main operating station from which a majority of the engineering plant machinery can be controlled and monitored on modern naval ships.

CHECK VALVE–A valve that permits the flow of a liquid in one direction only.

CIRCUIT BREAKER–An electrical device that provides circuit overload protection.

CLUTCH–A form of coupling designed to connect or disconnect a driving or driven member.

COLD IRON–The condition of an idle engineering plant when all port services are received from an external source such as shore or tender.

CONDENSATE–Water produced in the cooling system, of the steam cycle, from steam that has returned from the turbine or from steam that has returned from various heat exchangers.

CONDENSER–A heat-transfer device in which steam or vapor is condensed to water.

CONDUCTION–A method of heat transfer from one body to another when the two bodies are in physical contact.

CONSTANT PRESSURE GOVERNOR–A device that maintains a constant pump discharge pressure under varying loads.

CONTROLLABLE REVERSIBLE-PITCH PROPELLER (CRPP)–A propeller whose blade pitch can be varied to control the amount of thrust in both ahead and astern directions.

CONTROLLER–A device used to stop, start, and protect motors from overloads while the motors are running.

COOLER–Any device that removes heat.

CORROSION–The process of being eaten away gradually by chemical action, such as rusting.

COUNTERSINK–A cone-shaped tool used to enlarge and bevel one end of a drilled hole.

CREEP-RESISTANT ALLOY–A metal that resists the slow plastic deformation that occurs at high temperatures when the material is under constant stress.

CROSS-CONNECTED PLANT–A method of operating two or more systems as one unit.

CURTIS STAGE–A velocity-compounded impulse turbine stage that has one pressure drop in the nozzles and two velocity drops in the blading.

DEAERATING FEED TANK (DFT or DA tank)–A device used in the waste-heat boiler system to remove dissolved oxygen and noncondensable gases from the feedwater.

DEBALLASTING–The process by which seawater is emptied from tanks to protect the ship from underwater damage and to increase its stabilitySee BALLASTING.

DEGREE OF SUPERHEAT–The amount by which the temperature of steam exceeds the saturation temperature.

DIESEL FUEL MARINE–A fuel oil.

DIRECT CURRENT (dc)–current that moves in one direction only.

DIRECT DRIVE–One in which the drive mechanism is coupled directly to the driven member.

DISTILLATE–Water produced in distilling plants.

DISTILLING PLANT–A system that converts seawater into fresh water commonly called evaporators (evaps).

DRAWING–An illustrated plan that shows fabrication and assembly details.

DRUM, STEAM–The large tank at the top of the boiler in which the steam collects.

DRUM, WATER–A tank at the bottom of a boiler.

DUCTILITY–The property possessed by metals that allows them to be drawn or stretched.

ECONOMIZER–A heat-transfer device on a boiler that uses the gases of combustion to preheat the feedwater.

EDUCTOR–A jet pump that uses water to empty flooded spaces.

EFFICIENCY–The ratio of the output to the input.

ELASTICITY–The ability of a material to return to its original size and shape.

ELECTRODE–A metallic rod (welding rod) used in electric weldingIt melts when current is passed through it.

ELECTROHYDRAULIC STEERING–A system having a motor-driven hydraulic pump that creates the force needed to position the ship's rudder.

ELECTROLYSIS–A chemical action that takes place between unlike metals in systems using salt water.

ELECTROMOTIVE FORCE (emf)–A force that causes electrons to move through a closed circuit, expressed in volts.

ELEMENT–A substance that consists of chemically united atoms of one kind.

ENERGY–The capacity for doing work.

ENGINE ORDER TELEGRAPH (EOT)–A device on the ship's bridge that is used to give orders to the engine roomAlso called annunciator.

ENGINEER'S BELL BOOK–A legal record of all ordered main engine speed changes.

ENGINEERING OFFICER OF THE WATCH (EOOW)–officer on duty in the engineering spaces.

ENGINEERING OPERATING STATION (EOS)–

EQUIVALENTS PER MILLION (EPM)–The number of equivalent parts of a substance per million parts of another substanceThe word equivalent refers to the equivalent chemical weight of a substance.

EROSION–A gradual wearing away, such as a gully that is eroded by water.

EVAPORATOR–A distilling device that produces fresh water from seawater.

EXPANSION JOINT–A junction that allows for expansion and contraction.

FATIGUE–The tendency of a material to break under repeated strain.

FEED HEATER–A heat-transfer device that heats the feedwater before it goes to the boiler.

FEEDWATER–Water of the highest possible level of purity made in evaporators for use in boilers.

FERROUS METAL–Metal with a high iron content.

FIREBOX–The section of a ship's boiler where fuel oil combustion takes place.

FIRE MAIN–The saltwater line that provides fire-fighting water and flushing water throughout the ship.

FIRE TUBE BOILER–A boiler in which the gases of combustion pass through the tubes and heat the water surrounding them.

FLAREBACK–A backfire of flame and hot gases into a ship's fireroom from the fireboxCaused by a fuel oil explosion in the firebox.

FLASH POINT OF OIL–The temperature at which oil vapor will flash into tire, although the main body of the oil will not ignite.

FLEXIBLE I-BEAM–An I-shaped steel beam on which the forward end of a turbine is mounted; it allows for longitudinal expansion and contraction.

FLOOR (DECK) PLATES—The removable deck plating of a fireroom or engine room aboard ship.

FLUID–A substance that tends to flow or conform to the shape of a container.

FLUX–A chemical agent that retards oxidation of the surface, removes oxides already present, and aids fusion.

FORCE–Anything that tends to produce or modify motion.

FORCED DRAFT–Air under pressure supplied to the burners in a ship's boiler.

FORCED-DRAFT BLOWERS–Turbine-driven fans that supply air to the boiler furnace.

FORCED-FEED LUBRICATION–A lubrication system that uses a pump to maintain pressure.

FORGING–The forming of metal by heating and hammering.

FRESHWATER SYSTEM–A piping system that supplies fresh water throughout the ship.

FUEL OIL MICROMETER VALVE–A valve, installed at the burner manifold, that controls the fuel oil pressure to the burners.

FUEL OIL SERVICE TANKS–Tanks that provide suction to the fuel oil service pumps for use in the fuel oil service system.

FUSE–A protective device that will open a circuit if the current flow exceeds a predetermined value.

GALLONS PER MINUTE (GPM or gpm)–A unit of measurement.

GAS FREE–A term used to describe a space that has been tested and found safe for hot work (welding and cutting).

GAS GENERATION (GG)–The high-pressure section of the main propulsion gas turbineIt includes the compressor, combustor, high-pressure turbine, front frame, compressor rear frame, turbine mid frame, transfer gearbox, and the controls and accessories.

GAUGE (SIGHT) GLASS–A device that indicates the liquid level in a tank.

GEARED-TURBINE DRIVE–A turbine that drives a pump, generator, or other machinery through reduction gears.

GROUNDED PLUG–A three-pronged electrical plug used to ground portable tools to the ship's structureIt is a safety device that must always be checked before portable electrical tools are used.

HALIDE LEAK DETECTOR–A device used to locate leaks in refrigeration systems.

HANDHOLE–An opening large enough for the hand and arm to enter for making slight repairs and for inspection purposes.

HARDENING–The heating and rapid cooling (quenching) of metal to induce hardness.

HEADER–A large pipe to which smaller pipes are connected so that the liquid may pass freely from one pipe to the other(s).

HEAT EXCHANGER–Any device that allows the transfer of heat from one fluid (liquid or gas) to another.

HERTZ–A unit of frequency that equals 1 cycle per second.

HYDROGEN–A highly explosive, light, invisible, nonpoisonous gas.

HYDROMETER–An instrument used to determine the specific gravity of liquids.

HYDROSTATIC TEST–A pressure test that uses water to detect leaks in closed systems.

IGNITION, COMPRESSION–The heat generated by compression in an internal combustion engine that ignites the fuel (as in a diesel engine).

IGNITION SPARK–The electric spark that ignites the mixture of air and fuel in an internal combustion engine (as in a gasoline engine).

IMPELLER–An encased, rotating element provided with vanes that draws in fluid at the center and expels it at a high velocity at the outer edge.

IMPULSE TURBINE–A turbine in which the major part of the driving force is received from the impulse of incoming steam. See REACTION TURBINE.

INDIRECT DRIVE–A drive mechanism coupled to the driven member by gears or belts.

INERT–Inactive.

INJECTOR–A device that forces a fluid into an area. Injectors are used in the diesel engine to deliver fuel into the cylinders and in boilers to force water into the boilers.

INSULATION–A material used to retard heat transfer.

INTERCOOLER–An intermediate heat transfer unit between two successive stages, as in an air compressor.

JACKBOX–A receptacle, usually secured to a bulkhead, into which telephone plugs or jacks are inserted.

JOB ORDER—An order issued by a repair activity to its own subdivision to perform a repair job in response to a work request.

JP5–A fuel oil similar to DFM.

JUMPER-Any connecting pipe, hose, or wire normally used in emergencies aboard ship to bypass damaged sections of a pipe, a hose, or a wireSee BYPASS.

JURY RIG–Any temporary or makeshift device.

LABYRINTH PACKING–Rows of metallic strips or fins that minimize steam leakage along the shaft of a turbine.

LAGGING–A protective and confining cover placed over insulating material.

LIGHT OFF–To start a tire, as in light off a boiler.

LINE UP–To align a system for operation.

LOGBOOK–Any chronological record of events, such as an engineering watch log.

LOG, ENGINEERING–A legal record of important events and data concerning the machinery of a ship.

LOGROOM–The engineer's office aboard ship.

LUBE OIL PURIFIER-A unit that removes waste and sediment from lubricating oil by centrifugal force.

MACHINABILITY–The ease with which a metal may be turned, planed, milled, or otherwise shaped.

MAIN CONDENSER–A heat exchanger that converts exhaust steam to feedwater.

MAIN DRAIN SYSTEM–A system used for pumping bilges; consists of pumps and associated piping.

MAIN INJECTION (SCOOP INJECTION)–An opening in the skin of a ship through which cooling water is delivered to the main condenser and main lube oil cooler by the forward motion of the ship.

MAKEUP FEED–Water of required purity for use in ship's boilers This water is needed to replace water lost in the steam cycle.

MALLEABILITY–That property of a material that enables it to be stamped, hammered, or rolled into thin sheets.

MANIFOLD–A fitting with numerous branches that directs fluids between a large pipe and several smaller pipes.

MANUAL BUS TRANSFER (MBT)–A device that will transfer electrical power from the normal power supply to an alternate power supply, manually.

MECHANICAL ADVANTAGE (MA)–The advantage (leverage) gained by the use of devices, such as a wheel to open a large valve, chain falls and block and tackle to lift heavy weights, and wrenches to tighten nuts on bolts.

MECHANICAL CLEANING–A method of cleaning the fire sides of boilers by scraping and wire brushing.

MICROMHOS–Electrical units used with salinity indicators to measure the conductivity of water.

MICRON–A unit of length equal to 1 millionth of a meter.

MOTOR GENERATOR SET–A machine that consists of a motor mechanically coupled to a generator and usually mounted on the same base.

NIGHT ORDER BOOK–A notebook containing standing and special instructions from the engineering officer to the night engineering officers of the watch.

NITROGEN-An inert gas that will not support life or combustion.

NONFERROUS METALS–Metals that are composed primarily of some element or elements other than iron (usually nonmagnetic).

OIL KING–A petty officer who receives, transfers, discharges, and tests fuel oil and maintains fuel oil records; certified to test and treat boiler water and feedwater.

OIL POLLUTION ACTS–The Oil Pollution Act of 1924 (as amended), the Oil Pollution Act of 1961, and the Federal Water Pollution Control Act of 1970 prohibit the overboard discharge of oil or water that contains oil, in port, in any sea area within 50 miles of land, and in special prohibited zones.

ORIFICE–A small opening that restricts flow, such as an orifice plate in a water piping system.

OVERLOAD RELAY–An electrical protective device that automatically trips when a circuit draws excessive current.

OXIDATION–The process of various elements and compounds combining with oxygenThe corrosion of metals is generally a form of oxidation; for example, rust on iron is due to oxidation.

PANT, PANTING–A series of pulsations caused by minor, recurrent explosions in the firebox of a ship's boilerUsually caused by a shortage of air.

PARTS PER MILLION (PPM)–Comparison of the number of parts of a substance with a million parts of another substanceUsed to measure the salt content of water.

PITOMETER LOG–Device that indicates the speed of a ship and the distance traveled by measuring water pressure on a tube projected outside the ship's hull.

PLASTICITY–A property that enables a material to be excessively and permanently deformed without breaking.

PREHEATING–The application of heat to the base metal before it is welded or cut.

PRIME MOVER–The source of motion, such as a turbine or an automobile engine.

PUNCHING TUBES–Process of cleaning the interiors of tubes.

PURPLE-K POWDER (PKP)–A fire - extinguishing agent.

PYROMETER–An instrument used for measuring temperatures.

RADIATION, HEAT–Heat emitted in the form of heat waves.

REACH RODS–A length of pipe used as an extension on valve stems.

REACTION TURBINE–A turbine in which the major part of the driving force is received from the reactive force of steam as it leaves the bladingSee IMPULSE TURBINE.

REDUCE–Any coupling or fitting that connects a large opening to a smaller pipe or hose.

REDUCING VALVES–Automatic valves that provide a steady pressure lower than the supply pressure.

REDUCTION GEAR–A set of gears that transmit the rotation of one shaft to another at a slower speed.

REEFER–A refrigerated compartmental authorized abbreviation for refrigerator.

REFRACTORY–Various types of heat-resistant, insulating material used to line the insides of boiler furnaces.

REFRIGERANT 12 (R-12)–A nonpoisonous gas used in air-conditioning and refrigeration systems.

REGULATOR (GAS)–An instrument that controls the flow of gases from compressed gas cylinders.

REMOTE OPERATING GEAR–Flexible cables attached to valve wheels so that the valves can be operated from another compartment.

RISER–A vertical pipe leading off a large horizontal pipe; for example, a fire main riser.

ROTARY SWITCH–An electrical switch that closes or opens the circuit by a rotating motion.

ROTOR–The rotating part of a turbine, pump, electric motor, or generator.

SAE–Abbreviation for the Society of Automotive Engineers.

SAFETY VALVE–An automatic, quick opening and closing valve that has a reset pressure lower than the lift pressure.

SALINITY–Relative salt content of water.

SALINOMETER–A hydrometer that measures the concentration of salt in a solution (brine density).

SATURATION PRESSURE–The pressure corresponding to the saturation temperature.

SATURATION TEMPERATURE–The temperature at which a liquid boils under a given pressureFor any given saturation temperature, there is a corresponding saturation pressure.

SCALE–An undesirable deposit, mostly calcium sulfate, that forms in the tubes of boilers and distilling plants.

SECURE–To make fast or safe-the order given on completion of a drill or exercise. The procedure followed when any piece of equipment is to be shut down.

SENTINEL VALVES–Small relief valves used primarily as a warning device.

SHAFT ALLEY–The compartment of a ship that propeller shafts pass through.

SKETCH–A rough drawing indicating major features of an object.

SLIDING FEET–A mounting for turbines and boilers that allows for expansion and contraction.

SLUDGE–The sediment left in fuel oil tanks, lube oil sumps, and boiler water drums.

SOLID COUPLING–A device that joins two shafts rigidly.

SOOT BLOWER–A soot removal device that uses a steam jet to clean the fire sides of a boiler.

SPECIFIC HEAT–The amount of heat required to raise the temperature of 1 pound of a substance 1$FAll substances are compared to water that has a specific heat of 1 Btu/lb/°F.

SPEED-LIMITING GOVERNOR–A device that limits the rotational speed of a prime mover.

SPEED-REGULATING GOVERNOR–A device that maintains a constant speed on a piece of machinery that is operating under varying load conditions.

SPLIT PLANT–A method of operating an electrical or propulsion plant so that it is divided into two or more separate and complete units.

SPRING BEARINGS–Bearings positioned at varying intervals along a propulsion shaft to help keep it in alignment and to support its weight.

STANDBY EQUIPMENT–Two identical auxiliaries that perform one functionWhen one auxiliary is running, the standby is connected so that it maybe started if the first fails.

STATIC–A force exerted by reason of weight alone as related to bodies at rest or in balance.

STEAMING WATCH–Watches stood when the main engines are in use and the ship is underway.

STEAM LANCE–A device that uses low-pressure steam to remove soot from inside boilers and to remove carbon from boiler tubes.

STEERING ENGINE–The machinery that turns the rudder.

STERN TUBE–A watertight enclosure for the propeller shaft.

STRAIN–The deformation, or change in shape, of a material that results from the weight of an applied load.

STRENGTH–The ability of a material to resist strain.

STRESS–A force that produces or tends to produce deformation in a metal.

STUFFING BOX–A cavity in which packing is placed to prevent leakage between a moving shaft and a fixed part of a valve or pump.

STUFFING TUBE–A packed tube that makes a watertight fitting for a cable or small pipe passing through a bulkhead.

SUMP–A container, compartment, or reservoir used as a drain or receptacle for fluids.

SUPERHEATER–A unit in the boiler that dries the steam and raises its temperature.

SWASHPLATES–Metal plates in the lower part of the steam drum that prevent the surging of boiler water with the motion of the ship.

SWITCHBOARD–A panel or group of panels that distribute electrical power throughout the ship, normally with automatic protective devices.

TAKE LEADS–A method of determining bearing clearance.

TANK TOP–The top side of tank section or double bottom of a ship.

TOP DEAD CENTER (TDC)–The position of a reciprocating piston at its uppermost point of travel.

TEMPERING–The heating and controlled cooling of a metal to produce the desired hardness.

THIEF SAMPLE–A sample of oil or water taken for analysis.

THROTTLEMAN–The person in the engine room who operates the throttles to control the main engines.

THRUST BEARING–A bearing that limits the end play and absorbs the axial thrust of a shaft.

TOP OFF–To fill up a tankA ship tops off its tanks with fuel oil before leaving port.

TORQUE–The force that produces or tends to produce rotation.

TOUGHNESS–The property of a material that enables it to withstand shock as well as to be deformed without breaking.

TRANSFORMER–An electrical device used to step up or step down an ac voltage.

TRICK WHEEL–A steering wheel in the steering engine room or emergency steering station of a ship.

TUBE EXPANDER–A tool that expands replacement tubes into their seats in boiler drums and headers.

TURBINE–A multibladed rotor driven by steam, hot gas, or water.

TURBINE STAGE–One set of nozzles and the succeeding row or rows of moving blades.

TURBINE TURNING GEAR–A motor-driven gear arrangement that Slowly rotates idle propulsion shafts, reduction gears, and turbines.

UPTAKES (EXHAUST TRUNKS)–Large enclosed passages that direct the flow of exhaust gases to the stacks.

VACUUM–A space that has less than atmospheric pressure in it.

VENT–A valve in a tank or compartment that primarily permits air to escape.

VISCOSITY–A liquids resistance to flow.

VOID–An empty, watertight compartment separating other compartments.

VOLATILE–The term that describes a liquid that vaporizes quickly.

VOLTAGE–Electric potential (emf).

VOLTAGE TESTER–A portable instrument that detects electricity.

WATER TUBE BOILER–Boilers in which the water flows through the tubes and is heated by the gases of combustion.

WATER WASHING–A method of cleaning to remove contaminants.

WELDING LEAD–The conductor through which electrical current is transmitted from the power source to the electrode holder and welding rod.

WIPED BEARINGS–A bearing in which the babbitt has melted because of excess heat.

WIREWAYS–Passageways between decks and on the overheads of compartments that contain electric cables.

WORK REQUEST–Request issued to a naval shipyard, tender, or repair ship for repairs.

ZERK FITTING–A small fitting that can be applied to a grease gun to force lubricating grease into bearings or moving parts of machinery.

ZINC–A cheap, renewable metal placed in saltwater systems so that electrolysis will act upon the zinc rather than the ship's structure.

APPENDIX II

REFERENCES

Chapter 1

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Standard Organization and Regulations of the U.S. Navy, OPNAVINST 3120.32B, Department of the Navy, Office of the Chief of Naval Operations, Washington, D.C., 1986.

Chapter 2

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Hull Maintenance Technician 3 & 2, Vol. 1, NAVEDTRA 10571-1, Naval Education and Training Program Development Center, Pensacola, Florida, 1984.

Chapter 3

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Chapter 4

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Naval Ships' Technical Manual, S9086-HY-STM-000, Chapter 254, "Condensers, Heat Exchangers, and Air Ejectors," Naval Sea Systems Command, Washington, D.C., 1979.

Chapter 5

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Naval Ships' Technical Manual, S9086-GY-STM-008, Chapter 221, "Boilers," Naval Sea Systems Command, Washington, D. C., 1977.

Chapter 6

Naval Ships' Technical Manual, S9086-G9-STM-000, Chapter 231, "Propulsion Turbine (Steam)," Naval Sea Systems Command, Washington, D. C., 1982.

Naval Ships' Technical Manual, S9086-HY-STM-000, Chapter 254, "Condensers, Heat Exchangers, and Air Ejectors," Naval Sea Systems Command, Washington, D.C., 1979.

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Chapter 7

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Chapter 8

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Naval Ships' Technical Manual, S9086-H7-STM-000, Chapter 262, "Lubricating Oil, Greases, Hydraulic Fluids, and Lubrication Systems," Naval Sea Systems Command, Washington, D.C., 1983.

Naval Ships' Technical Manual, S9086-SN-STM-000, Chapter 541, "Petroleum Fuel, Storage, Use and Testing," Naval Sea Systems Command, Washington, D.C., 1982.

Chapter 9

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Naval Ships' Technical Manual, S9086-RH-STM-000, Chapter 503, "Pumps," Naval Sea Systems Command, Washington, D.C., 1981.

Chapter 10

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Naval Ships' Technical Manual, S9086-RH-STM-000, Chapter 503, "Pumps," Naval Sea Systems Command, Washington, D. C., 1981.

Naval Ships' Technical Manual, 0901-LP-480-0001, Chapter 9480, "Piping Systems," Naval Sea Systems Command, Washington, D.C., 1973.

Chapter 11

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Standard Organization and Regulations of the U.S. Navy, OPNAVINST 3120.32B, Department of the Navy, Office of the Chief of Naval Operations, Washington, D.C., 1986.

Navy Occupational Safety and Health (NAVOSH) Program, OPNAVINST 5100.23B, Department of the Navy, Office of the Chief of Naval Operations, Washington, D. C., 1983.

Chapter 12

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

Naval Ships' Technical Manual, S9086-H7-STM-000, Chapter 262, "Lubricating Oil, Greases, Hydraulic Fluids, and Lubrication Systems," Naval Sea Systems Command, Washington, D C., 1983.

Naval Ships 'Technical Manual, S9086-RJ-STM-000, Chapter 504, "Pressure, Temperature, and Other Mechanical and Electromechanical Measuring Instruments," Naval Sea Systems Command, Washington, D.C., 1980.

Chapter 13

Fireman, NAVEDTRA 10520-H, Naval Education and Training Program Development Center, Pensacola, Florida, 1987.

INDEX