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# ENGINEERING Casualty EXERCISES

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## P R E F A C E

This manual has been prepared to aid the Chief Engineer and his Assistants in conducting shipboard training and exercises in engineering casualty control for Engine Department personnel.

Engineering casualty control is concerned with prevention, minimization and correction of the effects of operational failures in the machinery, electrical and piping systems of ships. Maintenance of all engineering services in a state of maximum reliability is required under all conditions of operation.

Although the information contained herein is a guide for training rather than an operational manual, I cannot emphasize too strongly the need for all engineering department personnel to excel in the application of the training procedures set forth in this guide.

Commander  
Military Sea Transportation Service  
Pacific Area

## - I N T R O D U C T I O N -

Engineering Casualty Control is the key to insuring the safe operation of the engineering plant of your ship. Casualty prevention is the most effective form of casualty control. Casualties do occur, however, either as a result of personnel failures or machinery and electrical and piping systems failures. To correct these failures, immediate casualty control action by Engine Department personnel is required. This action minimizes the casualty and maintains control of the ship's engineering plant.

In order to have an effective engineering casualty control program, it is necessary to train personnel. This training familiarizes personnel with the ship's machinery and piping and electrical systems, and with the casualty control action applicable to engineering functions. Casualty control training is a continuing process.

In refresher drills, realistic simulation of casualties must be preceded by adequate preparation. The amount of advance preparation required is not readily apparent. In conducting minor casualties, care must be taken to fully visualize possible errors and the consequences which might result from the handling of simulated problems. The simulation of major casualties must be preceded by a thorough analysis and by careful instruction to all participants.

Desire for realistic drills must not detract from sound judgment of the state of training and technical ability of the crew. In the preliminary phases, a so called "dry run" is useful to impart knowledge of casualty control procedures without endangering ship's equipment. In a dry run, a casualty is announced and the affected personnel report to take action. Under careful supervision, the personnel go through the motions of corrective action. Realistic timing of actions may be made at this time. Dry runs should always be conducted before actually attempting to simulate any involved casualty, regardless of the state of training of the engineering personnel.

Casualty prevention is the maintenance of equipment and machinery by engineering personnel as instructed by manufacturer's manuals, operating instructions and other authorized books and publications. Equally important is the continual alertness of operating personnel.

If an engineering casualty occurs, the watch engineer must take immediate action. If the ship is operating in open waters, after notifying the bridge and the Chief Engineer, it is imperative and permissible to secure the affected equipment before serious damage occurs. When maneuvering in restricted waters, it is imperative that continuity of service be maintained. Damaged units must be removed from service and stand-by or alternate units put into operation before searching for the cause of trouble. The safety of the ship may depend upon the engineering personnel's ability to shift rapidly from normal operating condition to an alternate emergency method. This is casualty control.

ENGINEERING CASUALTY EXERCISES (AUXILIARIES)

- A-1 CAPACITY OF DISTILLING PLANT REDUCED
- A-2 HIGH SALINITY OF DISTILLATE
- A-3 LOSS OF VACUUM (DISTILLING PLANT)
- A-4 HIGH PRESSURE AT SUCTION SIDE OF COMPRESSOR (REFRIGERATION PLANT)
- A-5 HIGH DISCHARGE HEAD PRESSURE (REFRIGERATION PLANT)
- A-6 LOW DISCHARGE HEAD PRESSURE (REFRIGERATION PLANT)
- A-7 COMPRESSOR RUNS CONTINUOUSLY (REFRIGERATION PLANT)
- A-8 HIGH REEFER BOX TEMPERATURES (REFRIGERATION PLANT)
- A-9 RUPTURE IN HYDRAULIC TELE MOTOR SYSTEM (LOSS OF STEERING)
- A-10 RUPTURED HYDRAULIC PIPING TO ONE STEERING RAM (LOSS OF STEERING)
- A-11 FAILURE OF HYDRAULIC TELE MOTOR SYSTEM (STEERING GEAR)
- A-12 FAILURE OF ELECTRIC TRANSMITTER (HELM) (LST TYPE STEERING GEAR)
- A-13 FAILURE OF ELECTRIC STEERING MOTOR (LST TYPE STEERING GEAR)
- A-14A LOSS OF AIR PRESSURE AND/OR REDUCED CAPACITY OF COMPRESSOR
- A-14B ABNORMAL COMPRESSOR OPERATING TEMPERATURE (AIR COMPRESSOR)

ENGINEERING CASUALTY EXERCISES (FIRE ROOM)

- B-1 LOSS OF FUEL OIL PRESSURE
- B-2 WATER IN FUEL OIL
- B-3 LOSS OF FEED PUMP SUCTION
- B-4 LOW WATER IN BOILER
- B-5 HIGH WATER IN BOILER
- B-6 MAJOR FUEL OIL LEAK
- B-7 FORCED DRAFT BLOWER FAILURE
- B-8 HIGH SALINITY IN BOILER WHILE STEAMING
- B-9 BOILER CASING EXPLOSION WHILE LIGHTING OFF  
WITH LITTLE OR NO FORCED DRAFT
- B-10 FUEL OIL FIRE (MAJOR FIRE IN FIRE ROOM)
- B-11 FUEL OIL FIRE (FIRE IN BOILER CASING)
- B-12 FLAREBACK
- B-13 BRICK OR PLASTIC FALLING OUT OF FURNACE WALL
- B-14 BOILER TUBE OR OTHER PRESSURE PART CARRIES AWAY
- B-15 LOSS OF FEED PUMP PRESSURE
- B-16 FAILURE OF EMERGENCY OR AUXILLARY FEED PUMP TO TAKE SUCTION
- B-17 WATER GLASS CARRIES AWAY ON BOILER
- B-18 FAILURE OF COMBUSTION CONTROL SYSTEM (HAGAN SYSTEM)
- B-19 FAILURE OF COMBUSTION CONTROL SYSTEM (BAILEY SYSTEM)
- B-20 STACK UP-TAKE FIRE

ENGINEERING CASUALTY EXERCISES (DIESELS)

- D-1 ENGINE SLOWS DOWN
- D-2 ENGINE STOPS SUDDENLY
- D-3 LOSS OF AIR PRESSURE TO AIR CLUTCH (1ST TYPE)
- D-4 ELECTRIC POWER FAILURE TO GOVERNOR CONTROL MOTOR AND AIR CLUTCH
- D-5 UNABLE TO START ENGINE (ELECTRIC STARTING)
- D-6 LOW LUBE OIL PRESSURE
- D-7 ENGINE OVERSPEEDS
- D-8 LEAK IN LUBE OIL COOLER
- D-9 HIGH FRESH WATER COOLING TEMPERATURE
- D-10 LOW SALT WATER COOLING PRESSURE
- D-11 REDUCTION GEAR COOLING WATER AND LUBE OIL PUMP FAILS  
(1ST TYPE)
- D-12 REDUCTION GEAR COOLING WATER AND LUBE OIL PUMP FAILS  
(AOG TYPE)
- D-13 GOVERNOR FAILURE
- D-14 LOSS OF STARTING AIR
- D-15 LOSS OF FUEL OIL PRESSURE
- D-16 WATER IN ENGINE CYLINDERS AND/OR CRANKCASE OR AIR INTAKE PORTS (BOX)
- D-17 SHIP SERVICE DIESEL GENERATORS #1 AND #2 DISABLES (AOG 1-11 TYPE)
- D-18 LOSS OF SANITARY WATER PRESSURE (AOG TYPE)

ENGINEERING CASUALTY EXERCISES (ELECTRICAL)

- E-1 ERRATIC OR UNSTABLE VOLTAGE-SHIP'S SERVICE SWITCHBOARD
- E-2 FIRE BEHIND SHIP'S SERVICE SWITCHBOARD
- E-3 OVERSPEEDING OF SHIP'S SERVICE GENERATOR
- E-4 HOT BEARINGS OF SHIP'S SERVICE GENERATOR
- E-5 SHORT CIRCUIT IN MAIN CIRCUIT BREAKER
- E-6 LOSS OF POWER TO I. C. SWITCHBOARD
- E-7 LOSS OF ELECTRICAL POWER TO STEERING GEAR
- E-8 FAILURE OF RUDDER ANGLE INDICATOR SYSTEM
- E-9 SELF-EXCITED D. C. GENERATOR FAILS TO EXCITE
- E-10 POOR COMMUTATION D. C. MACHINES
- E-11 OVERHEATING OF GENERATORS

ENGINEERING CASUALTY EXERCISES (ENGINE ROOM)

- M-1 JAMMED MAIN ENGINE THROTTLE (AHEAD-ASTERN)
- M-2 LOSS OF/OR LOW LUBRICATING OIL PRESSURE
- M-3 LOSS OF/OR LOW LUBRICATING OIL PRESSURE (TURBO-ELECTRIC DRIVE)
- M-4 LOSS OF VACUUM
- M-5 PROPELLER OR SHAFT DAMAGE
- M-6 HOT BEARINGS
  - (A) TURBINE BEARINGS (B) REDUCTION GEAR (C) LINE SHAFT BEARINGS
- M-7 LEAK IN MAIN CONDENSER
- M-8 MAIN TURBINE VIBRATIONS
- M-9 CASUALTY TO THE DEAERATING FEED TANK
- M-10 FIRE IN PROPULSION GENERATOR
- M-11 FIRE IN PROPULSION MOTOR
- M-12 FIRE IN PROPULSION CONTROL CUBICLES AND/OR CABLES
- M-13 LOSS OF FORWARD OR AFT ENGINE ROOM  
(ONE GENERATOR TWO MOTOR OPERATION)

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-1 DISTILLING PLANT CAPACITY OF DISTILLING PLANT REDUCED</p> <p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Distilling unit not delivering its rated capacity.</li> <li>2. Irregular temperatures and pressures.</li> <li>3. Irregular water levels.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Low steam pressure to unit or air ejector</li> <li>2. Excessive scale deposits on tubes.</li> <li>3. Air leaks.</li> <li>4. Feed water temperature low.</li> <li>5. Tube nest drains not functioning properly.</li> <li>6. Irregular feed water levels.</li> <li>7. Reduced or loss of vacuum.</li> </ol>		<ol style="list-style-type: none"> <li>1. Check steam pressure to unit and air ejector.</li> <li>2. Check for air leaks in system.</li> <li>3. Check the scale deposit and clean if excessive.</li> <li>4. Check feed water temperature and water levels.</li> <li>5. Check tube nest drains for proper operation.</li> <li>6. Check out air ejector.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduction in evaporating fresh water.</li> <li>2. Possible contamination of fresh water.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-2 DISTILLING PLANT</p> <p>HIGH SALINITY OF DISTILLATE</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. High salinity indicated by electronic salinity indicator.</li> <li>2. Chemical tests indicate high salinity concentration in distillate.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Leak in tubes or fittings of unit.</li> <li>2. Priming due to too high a water level being maintained.</li> <li>3. Too high a steam pressure to unit.</li> <li>4. Leak in condensate cooler.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discharge contaminated distillate into bilge.</li> <li>2. Check for water level being maintained.</li> <li>3. Check steam pressure and temperature to unit.</li> <li>4. Check for leaks in each effect (hydrostatic test).</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduced or loss of evaporation capacity of unit.</li> <li>2. Contamination of fresh water.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
A-3 DISTILLING PLANT LOSS OF VACUUM	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Reduced or loss of vacuum indicated on vacuum gauge.</li> <li>2. Irregular temperatures noted on effects.</li> <li>3. Reduced distillate rate.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Air ejector not operating properly.</li> <li>2. Air leaks in unit and piping</li> <li>3. Loss of seal in condensate pump, pump shaft scored, packing, worn or packing gland loose, etc.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check out air ejector.</li> <li>2. Check out for air leaks in unit and packing.</li> <li>3. Check condensate pump and piping for loss of seal.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduced distillate capacity.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-4 REFRIGERATION PLANT</p> <p>HIGH PRESSURE AT SUCTION SIDE OF COMPRESSOR</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. High pressure indicated on compressor gauge suction side.</li> <li>2. Freeze-back (frost) on suction piping and compressor.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Overfeeding of expansion valve.</li> <li>2. Leaking suction valves or piston rings.</li> <li>3. Improper functioning of low-pressure control switch.</li> <li>4. Discharge valves leaking.</li> </ol>	<ol style="list-style-type: none"> <li>1. Regulate expansion valve; check thermal element attachment.</li> <li>2. Examine valve discs or piston rings. Replace if necessary.</li> <li>3. Examine discharge valves, if leaking, replace.</li> <li>4. Readjust or replace low pressure control switch.</li> </ol>	

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-6 REFRIGERATION PLANT</p> <p>LOW DISCHARGE HEAD PRESSURE</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Low discharge pressure indicated on compressor gauge, discharge side.</li> <li>2. Freeze-back to compressor suction side.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Too much cooling water flowing through condenser.</li> <li>2. Discharge valves leaking.</li> <li>3. Expansion valve not functioning properly, causing liquid refrigerant to flood back to compressor from cooling coils.</li> <li>4. Insufficient refrigerant in system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check cooling water volume and its temperature going through the condenser. Throttle valve if necessary.</li> <li>2. Check compressor valves, repair or replace as necessary.</li> <li>3. Check expansion valve, use by-pass, hand control if not functioning properly and replace.</li> <li>4. Check for sufficient refrigerant in system, add charge if necessary.</li> </ol>	

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-7 REFRIGERATION PLANT</p> <p>COMPRESSOR RUNS CONTINUOUSLY</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Continuous running of compressor.</li> <li>2. Reefer box temperatures not coming down.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Shortage of refrigerant in system.</li> <li>2. Discharge or suction valves leaking badly.</li> <li>3. Head gasket (blown) leaking between cylinders.</li> <li>4. Improper functioning of low pressure switch.</li> <li>5. Relief valve leaking.</li> <li>6. Compressor overloaded.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for proper amount of refrigerant in system, add if necessary.</li> <li>2. Test valves; if leaking repair or replace.</li> <li>3. Replace head gasket.</li> <li>4. Adjust or replace low pressure switch.</li> <li>5. Repair relief valve.</li> <li>6. Check the amount of perishables in reefer boxes in relation to compressor capacity.</li> </ol>	

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-8 REFRIGERATION PLANT</p> <p>HIGH REEFER BOX TEMPERATURES</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. High temperature indicated on reefer box thermometers.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Automatic thermostatic controls not functioning or are not adjusted properly</li> <li>2. Excessive amount of frost on the cooling coils.</li> <li>3. Re-circulating air flow fans not operating.</li> <li>4. Improper storage of stores in the reefer boxes.</li> <li>5. Expansion valve restricted from moisture in system freezing.</li> <li>6. Low refrigerant in system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check out thermostatic controls for proper operation, repair or replace if necessary use hand-by pass regulation of refrigerant.</li> <li>2. Check reefer box coils for heavy frost and proper stowage defrost if necessary.</li> <li>3. Check expansion valve operation, or moisture at valve orifice; adjust or clean. Put dehydrator in operation, if moisture is present.</li> <li>4. Check re-circulating air flow fans for proper operation; repair or replace if necessary.</li> <li>5. Check system for proper amount of refrigerant in system, recharge if system low.</li> </ol>	

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-9 STEERING GEAR</p> <p>RUPTURE IN HYDRAULIC TELEMOTOR SYSTEM (LOSS OF STEERING)</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Ship fails to respond to course changes as initiated by the helm.</li> <li>2. Rudder angle indicator does not record rudder position changes.</li> <li>3. Loss of pressure noted on the wheel (transmitter) and receiver with movement of the wheel (helm).</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Relief valve fails to function, causing excessive pressure on system rupturing piping.</li> <li>2. Rupture caused by outside force.</li> <li>3. Failure of piston packing, either in transmitter or receiver unit.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove telemotor pin from link controlling steering engine differential valve and insert pin in trick-wheel mechanism.</li> <li>2. Shift to electric steering on bridge.</li> <li>3. Ready local hand pump for steering, if installed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of steering control on the bridge.</li> <li>2. Loss of reduced maneuverability.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-10 STEERING GEAR</p> <p>RUPTURED HYDRAULIC PIPING TO ONE STEERING RAM (LOSS OF STEERING)</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Ship fails to respond to course changes as initiated by the helm.</li> <li>2. Rudder angle indicator does not indicate rudder movement.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Relief valve fails to function, causing excessive pressure on system, rupturing pipe.</li> <li>2. Ruptured-caused by outside force.</li> </ol>	<ol style="list-style-type: none"> <li>1. Secure affected ram.</li> <li>2. Operate on one ram after securing valves as per instructions posted in steering engine room.</li> <li>3. Replenish hydraulic oil lost and purge system.</li> <li>4. Repair or replace relief valve and ruptured piping.</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of steerage.</li> <li>2. Loss or reduced maneuverability.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p><b>A-11 STEERING GEAR</b></p> <p><b>FAILURE OF HYDRAULIC TELE MOTOR SYSTEM</b></p>	<p><b>SYMPTOMS</b></p> <ol style="list-style-type: none"> <li>1. Lag in operation of helm due to air in system.</li> <li>2. Hydraulic pressure reduced in telemotor system.</li> <li>3. Unable to get full fudder response.</li> </ol> <p><b>CAUSES</b></p> <ol style="list-style-type: none"> <li>1. Air entrainment in telemotor system.</li> <li>2. Low oil level in replenishment tank.</li> <li>3. Leaking by-pass valve.</li> <li>4. Automatic centering replenishing valve sticking or leaking.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove telemotor pin from link controlling steering engine differential valve and insert pin in trick-wheel mechanism.</li> <li>2. Shift to electric steering on the bridge.</li> <li>3. Ready local handpump for steering, if installed.</li> <li>4. Fill replenishing tank and purge system.</li> <li>5. Check by-pass valve, repair or replace if badly leaking.</li> <li>6. Check operation of centering replenishing valve-free up; repair as necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of steerage.</li> <li>2. Loss or reduced maneuverability.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-12 STEERING GEAR LST TYPE</p> <p>FAILURE OF ELECTRIC TRANSMITTER (HELM)</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Ship fails to respond to course changes as initiated by the helm.</li> <li>2. Rudder angle indicator does not indicate rudder movement.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Power failure to (helm) transmitter unit.</li> <li>2. Open in (helm) transmitter unit wiring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Shift selector switches in after steering station to after steering and take control of helm from after station.</li> <li>2. Check out power circuits in transmitter. Replace fuses or repair circuit that is open.</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of steerage.</li> <li>2. Loss or reduced maneuverability.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-13 STEERING GEAR LST TYPE</p> <p>FAILURE OF ELECTRIC STEERING MOTOR</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Ship fails to respond to course changes as indicated by the helm.</li> <li>2. Rudder angle indicator does not indicate rudder movement.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Power failure to motor.</li> <li>2. Open or short circuit in motor windings.</li> <li>3. Reduction gear failure of motor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Engage rudder quadrant brakes.</li> <li>2. Disengage driving motor clutch.</li> <li>3. Install chain on coupling of hand steering control.</li> <li>4. Disengage rudder quadrant brakes.</li> <li>5. Station one man on each crank of hand steering gear. (35° Stbd. to 35° port requires 45 revolutions of hand crank)</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of steerage.</li> <li>2. Loss or reduced maneuverability.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-14A AIR COMPRESSOR</p> <p>LOSS OR AIR PRESSURE AND/OR REDUCED CAPACITY OF COMPRESSOR</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Low air pressure alarm rings, if installed.</li> <li>2. Excessive pressure drop indicated on receiver tank pressure gauge.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Failure of compressor prime mover.</li> <li>2. Restricted (dirty) air intake filters, ruptured or plugged (restricted) inter or after coolers.</li> <li>3. Failure of pressure controller device and unloader.</li> <li>4. Relief valve leaking, rupture in piping system and/or air volume demand greater than compressor capacity.</li> <li>5. Dirty or broken compressor air valves.</li> <li>6. "V" belt drive slippage.</li> </ol>	<ol style="list-style-type: none"> <li>1. Start up and cut into service the standby air compressor, if installed. Follow manufacturer's instruction for starting idle compressor.</li> <li>2. Check out the prime mover of affected unit.</li> <li>3. Check the condition of the intake filters, if dirty, clean with washing soda solution.</li> <li>4. Check the operation and settings of the pressure controller device and unloader.</li> <li>5. Check coolers for leaks or restriction. Repair or clean if necessary.</li> <li>6. Check piping, relief valve, etc. for leaks or ruptures and correct same.</li> <li>7. Check compressor air valves, clean or replace if dirty or broken.</li> <li>8. Check "V" belt drive tension and set up same if slipping.</li> </ol>	<p>1. Loss or reduced air capacity.</p>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>A-14B AIR COMPRESSOR</p> <p>ABNORMAL COMPRESSOR OPERATING TEMPERATURE</p>	<p><u>SYMPOMS</u></p> <ol style="list-style-type: none"> <li>1. Smell of hot oil in area of compressor.</li> <li>2. Excessive temperature and pressure rise indicated on compressor and thermometers.</li> <li>3. Inter-cooler relief valve blowing off.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Loss of, or insufficient cooling water (water cooled).</li> <li>2. Fins of inter and after cooler dirty and/or cooling fan inoperative (air cooled).</li> <li>3. Dirty and/or broken compressor intake and discharge valves.</li> </ol>	<ol style="list-style-type: none"> <li>1. Secure affected unit immediately.</li> <li>2. Start up and cut into service the standby air compressor, if installed. Follow manufacturer's instructions for starting idle compressors.</li> <li>3. Check cooling water to unit. Clean coolers and water jackets if restricted.</li> <li>4. Check cooler for air leaks, plug if leaking.</li> <li>5. Clean fins on coolers of air-cooled units, check fan for operation, correct same if inoperative.</li> <li>6. Check compressor air valves (intake and discharge) for leaky condition or broken. Clean or replace as necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduced or loss of air capacity.</li> <li>2. Explosion or fire resulting from excessive temperatures.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
B-1 FIRE ROOM  LOSS FUEL OIL PRESSURE	<p><u>SYMPOMS</u></p> <ol style="list-style-type: none"> <li>1. F. O. pressure gauge not registering pressure.</li> <li>2. Burner fires going out.</li> <li>3. Loss of steam pressure.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Failure of F. O. service pump.</li> <li>2. Failure of automatic combustion controls.</li> <li>3. Restriction in F. O. piping system.</li> <li>4. Loss of suction to F. O. pump.</li> <li>5. F. O. recirculating valve open.</li> </ol>	<ol style="list-style-type: none"> <li>1. Close burner valves, leave 1 register open.</li> <li>2. Shift to manual combustion control.</li> <li>3. Shift to standby F. O. pumps.</li> <li>4. Shift F. O. suction to tank or known oil source.</li> <li>5. Clean strainers and check valve lineup of the F. O. system.</li> <li>6. Secure boiler steam stops, if necessary, to prevent the total loss of steam pressure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Boiler flare back.</li> <li>2. Loss of steam.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
B-2 FIRE ROOM  WATER IN FUEL OIL	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Burners sputtering, fire going out.</li> <li>2. Loss of steam pressure.</li> <li>3. Temperature of F. O. fluctuating.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. F. O. contaminated with ballast salt water.</li> <li>2. F. O. contaminated with fresh water leaking from steam heating coils.</li> </ol>	<ol style="list-style-type: none"> <li>1. Shift F. O. suction to uncontaminated F. O. tank.</li> <li>2. Secure burner valves.</li> <li>3. Reduce boiler load (conserve steam). Secure boiler stops if necessary.</li> <li>4. Clean F. O. lines of contaminated F. O. and when clear, relight boilers in accordance with lighting off procedures as posted in fire room.</li> </ol>	<ol style="list-style-type: none"> <li>1. Boiler flare back.</li> <li>2. Loss of auxiliary and main propulsion power.</li> <li>3. Slag build up in furnace.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-3 FIRE ROOM</p> <p>LOSS OF FEED PUMP SUCTION</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Feed pump pressure gauge not registering pressure.</li> <li>2. Feed pump overspeeding.</li> <li>3. Low water level in boiler.</li> <li>4. High water level in deaerating tank.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Feed pump failed.</li> <li>2. Feed pump vapor bound.</li> <li>3. Deaerating tank empty.</li> </ol>	<ol style="list-style-type: none"> <li>1. Shift to standby feed pump.</li> <li>2. Shift feed pump suction if necessary.</li> <li>3. Take action procedures of low water in boiler if water level goes out of sight.</li> <li>4. Refer to B-4.</li> </ol>	<ol style="list-style-type: none"> <li>1. Damage feed pump.</li> <li>2. Damaged boilers.</li> <li>3. Loss of auxiliary and main propulsion power.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
B-4 FIRE ROOM  LOW WATER IN BOILER	<p><u>SYMPTOMS</u></p> <p>1. Low water level indicated in water glasses or eye-hi level indicator.</p>	<p>-</p> <p>1. Secure fuel oil supply to burners. 2. Close feed water check valves. 3. Blow down water level gauge glasses to determine true water level in boiler. 4. Secure blower to boiler and secure stop valves. 5. Relieve boiler pressure by hand releasing gear of boiler safety valves. 6. No attempt should be made to put boiler back in operation until boiler has been inspected for damage.</p>	<p>1. Boiler tube failure. 2. Loss of auxiliary and main propulsion power.</p>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-5 FIRE ROOM</p> <p>HIGH WATER IN BOILER</p>	<p><u>SYMPOMS</u></p> <ol style="list-style-type: none"> <li>1. Full water level indicated in gauge glass.</li> <li>2. Reduced superheat temperature.</li> <li>3. Carry-over (priming) (moisture) to main and auxiliary steam prime movers, causing them to vibrate and slow down.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Excessive feed pump pressure.</li> <li>2. Defective feed water level regulator.</li> </ol>	<ol style="list-style-type: none"> <li>1. Close feed check to boiler.</li> <li>2. Reduce load of steam driven prime movers to eliminate or reduce carry over and priming of boiler, lowering water level in boiler.</li> <li>3. If necessary, remove boiler from line, securing burners, stop, etc., and use surface blow if so fitted, or the bottom blow to lower water level, frequently blowing down gauge level glass to determine true water level in boiler.</li> <li>4. Follow lighting off procedure when putting boiler back in service.</li> <li>5. Adjust feed pump pressure regulator.</li> <li>6. Control water level by manual control till defective feed water level regulator has been repaired.</li> </ol>	<ol style="list-style-type: none"> <li>1. Serious casualties to steam-driven prime movers.</li> <li>2. Loss or reduced steaming capacity of boiler affected during correcti action period.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
B-6 FIRE ROOM  MAJOR FUEL OIL LEAK	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Visual evidence.</li> <li>2. Pressure gauge readings indicate F.O. loss.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Rupture in F.O. piping system.</li> <li>2. Vibrations caused strainer covers to loosen and/or various drain valves to open.</li> </ol>	<ol style="list-style-type: none"> <li>1. Secure F.O. service pump and suction valve from settler tank, conserve steam.</li> <li>2. Alert ship and ready fire fighting equipment.</li> <li>3. Correct cause of F.O. leak and remove fire hazard.</li> <li>4. Put boiler and its associated equipment back in service.</li> <li>5. Condition may necessitate carrying out the procedure for loss of pressure.</li> <li>6. Refer to B-1</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of main and auxiliary steam equipment.</li> <li>2. Fire or fire hazard present.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-7 FIRE ROOM</p> <p>FORCED DRAFT BLOWER FAILURE</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Low or loss of pressure on draft indicator gauge.</li> <li>2. Excessive black smoke from boilers.</li> <li>3. Boiler panting.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Mechanical or electrical failure of prime mover of blower, or blower itself.</li> <li>2. Destrangement to damper or linkage.</li> </ol>	<ol style="list-style-type: none"> <li>1. If two blowers are in operation, speed up blower not affected and open up crossover dampers, if so fitted, reduce steam requirements to meet combustion balance.</li> <li>2. On systems with only one blower, or not fitted with crossover dampers, secure boiler and operate at reduced rate one boiler operation.</li> <li>3. For maximum steaming capacity, use boiler with blower for main propulsion and operate affected boiler on natural draft for auxiliary steam supply, reduce auxiliary steam requirements as much as possible. Secure exhaust blowers for the space and increase speed of supply blower</li> </ol>	<p>1. Reduced steaming capacity.</p>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-8 FIRE ROOM</p> <p>HIGH SALINITY IN BOILER WHILE STEAMING</p> <p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. High reading on the electrical conductivity meters or salinity indicators.</li> <li>2. Testing of boiler water samples.</li> <li>3. Excessive water in system necessitating dumping.</li> <li>4. Loss of superheat due to priming.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Contamination leakage from:             <ol style="list-style-type: none"> <li>a. Main and/or auxiliary condensers</li> <li>b. Salt water cooled air ejectors</li> <li>c. Distilling plants</li> <li>d. Salt water cooled gland-exhaust condenser</li> </ol> </li> </ol>		<ol style="list-style-type: none"> <li>1. Reduce boiler load to prevent priming.</li> <li>2. Locate source of salinity and correct same.</li> <li>3. Remove boilers from line, one at a time, and freshen up by bottom blow and feeding.</li> <li>4. Do not let the water level get below a safe level in the gauge glass.</li> <li>5. Restore compound ratios within the boiler.</li> <li>6. Use continuous blow to evaporators, while steaming, for re-distilling.</li> </ol>	<ol style="list-style-type: none"> <li>1. Severe priming.</li> <li>2. Heavy scaling of boiler shell and tubes.</li> <li>3. Resulting in overheating of the boiler tubes.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-9 FIRE ROOM</p> <p>BOILER CASING EXPLOSION WHILE LIGHTING OFF WITH LITTLE OR NO FORCED DRAFT</p> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Insufficient draft.</li> <li>2. Poor atomization.</li> <li>3. Inadequate circulation of air between casings.</li> </ol>		<ol style="list-style-type: none"> <li>1. Close quick-closing master fuel-oil valve and each individual burner supply valve.</li> <li>2. Notify Watch Engineer.</li> <li>3. Employ fire fighting procedure as necessary.</li> <li>4. Stop fuel-oil service pump.</li> <li>5. Stop feed pump and close checks to prevent high water level.</li> <li>6. Insure that the casing, furnace and fire room are well vented of explosive flames.</li> <li>7. Do not re-light until extent of damage to boiler has been ascertained.</li> </ol>	<ol style="list-style-type: none"> <li>1. Grave injury to personnel.</li> <li>2. Serious damage to boiler, its fittings and accessories.</li> <li>3. Damage to boiler refractories.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-10 FIRE ROOM</p> <p>FUEL OIL FIRE (MAJOR FIRE IN FIRE ROOM)</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Visually seeing smoke in area.</li> <li>2. Smell of smoke in area.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Poor housekeeping: <ol style="list-style-type: none"> <li>a. Oil rags, inflammable materials, etc., not properly controlled in the space.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Close quick-closing master valve and stop all fuel pumps.</li> <li>2. Secure burners and close registers.</li> <li>3. Stop forced draft blowers.</li> <li>4. Notify Watch Engineer.</li> <li>5. Secure the ventilation supply and exhaust fans.</li> <li>6. Use foam, high velocity fog, CO<sub>2</sub>, in that order.</li> <li>7. Secure boilers.</li> <li>8. If engine room is abandoned, secure blowers and use CO<sub>2</sub> smothering system.</li> </ol> <p>NOTE: If blowers are in operation, judgment must be used in deciding whether to keep them in operation or immediately shut them down. Conditions may arise in which speeding up blowers may be the saving of personnel by sweeping back the flames, giving men the opportunity to escape. Supply blowers should then be secured as soon as safety of personnel permits. It may be desirable to keep the exhaust blowers in operation in order to remove smoke and fumes. When using water, position all-purpose nozzle handle on "fog".</p>	<ol style="list-style-type: none"> <li>1. Loss of main propulsion unit and engine room power.</li> <li>2. Loss of ship.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-11 FIRE ROOM</p> <p>FUEL OIL FIRE (FIRE IN BOILER CASING)</p> <p>B-11</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Paint blistering on boiler front air-casing.</li> <li>2. Smoke emitting from boiler registers and casing.</li> <li>3. High stack temperature.</li> </ol>	<ol style="list-style-type: none"> <li>1. Secure burners and stop fuel oil service pumps.</li> <li>2. Stop forced draft blowers and secure dampers.</li> <li>3. Turn on steam smothering in boiler casing.</li> <li>4. Notify Watch Engineer.</li> <li>5. Secure boiler and inspect for possible damage.</li> </ol>	<ol style="list-style-type: none"> <li>1. Severe warping of boiler parts.</li> <li>2. Derangement of boiler.</li> <li>3. Reduced or loss of steam capacity output.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-12 FIRE ROOM</p> <p>FLAREBACK</p>	<p><u>SYMPTOMS</u></p> <p>1. Explosion</p> <p><u>CAUSES</u></p> <p>1. Temporary interruption of fuel supply.</p> <p>2. Inadequate draft.</p> <p>3. Unburned combustible gases, from any cause, in furnace tube banks, uptakes, or air casing.</p> <p>4. Pressure in the furnace momentarily exceeds that in air casing.</p> <p>5. Failure to use torch when relighting fires.</p>	<p>1. Close quick-closing master oil valve to burner manifold also burner supply valves.</p> <p>2. Notify Watch Engineer.</p> <p>3. Use fire fighting equipment as necessary.</p> <p>4. Secure boiler main steam stop.</p> <p>5. Adjust feed check valves or stop feed pumps as necessary to prevent high water.</p> <p>6. Speed up forced draft blowers and burn any oil accumulations from furnace floor.</p>	<p>1. Oil fire at or near boiler front.</p> <p>2. Grave injury to personnel.</p> <p>3. Serious damage to boiler, its fittings and accessories.</p> <p>4. Stack uptake fire.</p>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-13 FIRE ROOM</p> <p>BRICK OR PLASTIC FALLING OUT OF FURNACE WALL</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Vibration or panting of the boiler.</li> <li>2. Overheating of boiler casing.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Action of slag accumulations.</li> <li>2. Rapid changes of the furnace temperatures.</li> <li>3. High sustained furnace temperature.</li> <li>4. Improper operation of boilers and combustion control.</li> </ol>	<ol style="list-style-type: none"> <li>1. If practicable, secure all burners.</li> <li>2. Notify Watch Engineer.</li> <li>3. If necessary to continue operating the boiler, burners adjacent to the location of the brick or plastic fall-out should be cut out to avoid damage to the boiler casing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Severe warping of boiler casing.</li> <li>2. Secure steaming boiler before serious damage occurs.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-14 FIRE ROOM</p> <p>BOILER TUBE OR OTHER PRESSURE PART CARRIES AWAY</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Hissing noise from the interior or exterior of the boiler.</li> <li>2. Increased make up feed requirements.</li> <li>3. Visually seeing steam and water escaping.</li> <li>4. Higher F.O. pressure required.</li> <li>5. Increased F.O. consumption.</li> </ol>	<ol style="list-style-type: none"> <li>1. Secure fuel oil to burners.</li> <li>2. Speed up blowers to carry steam up the smokestack.</li> <li>3. Simultaneously secure boiler stops, notify Watch Engineer.</li> <li>4. Open safety valves by hand to relieve steam pressure.</li> <li>5. Except when failure was caused by low water or large leak, continue to feed the boiler so as to maintain water level until boiler has cooled.</li> <li>6. Secure all air to boiler as soon as pressure has decreased and steam does not escape into fire room.</li> <li>7. Allow boiler to cool slowly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduced or loss of steam supply.</li> <li>2. Damage to brick and furnace insulation of boiler from steam and water.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-15 FIRE ROOM</p> <p>LOSS OF FEED PUMP PRESSURE</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Feed pump pressure gauge not registering pressure.</li> <li>2. Low water level in boilers.</li> <li>3. High water level in deaerating tank.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Loss of pump suction by:             <ol style="list-style-type: none"> <li>a. D.C. heater or tank empty.</li> <li>b. Vapor or air bound feed pump.</li> <li>c. Overspeed governor on feed pump tripped.</li> <li>d. Pressure regulator governor failure.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Secure affected pump and put standby main feed pump into service.</li> <li>2. Reduce steam consumption demand.</li> <li>3. Put emergency auxiliary feed pump into service.</li> <li>4. If water goes out of sight in boiler gauge glass, put into action casualty control for low water in boiler.</li> <li>5. Refer to B-4.</li> </ol>	<ol style="list-style-type: none"> <li>1. Casualty to feed pump.</li> <li>2. Reduced or loss of auxiliary and main propulsion power.</li> <li>3. Casualty to boilers.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-16 FIRE ROOM</p> <p>FAILURE OF EMERGENCY OR AUXILIARY FEED PUMP TO TAKE SUCTION-</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Indication on pressure gauge or feed pump discharge.</li> <li>2. Lowering of the water level in the boilers.</li> <li>3. Erratic operation of the feed pump.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. D.C. heater or tank empty that pump is taking suction from.</li> <li>2. Pump vapor bound or air locked.</li> <li>3. Mechanical failure to pump: <ol style="list-style-type: none"> <li>a. Steam valve settings</li> <li>b. Suction or discharge valves in water end</li> <li>c. Pumps piston rings, water or steam end worn beyond maximum wear limits; packing gland water end not set up properly</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Secure pump.</li> <li>2. Start up a main feed pump taking suction from known feed water available supply, maintaining a safe water level in boilers.</li> <li>3. If water goes out of sight, use procedure for low water in boiler (Refer to B-4).</li> <li>4. Check out causes for the casualty and correct.</li> </ol>	<ol style="list-style-type: none"> <li>1. Securing boiler due to low water.</li> <li>2. Reduced or loss of auxiliary and main propulsion power.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-17 FIRE ROOM</p> <p>WATER GLASS CARRIES AWAY ON BOILER</p>	<p><u>SYMPOTMS</u></p> <ol style="list-style-type: none"> <li>1. Visual: cracked or broken gauge glass.</li> <li>2. Dripping of water and hissing of steam escaping from gauge glass assembly.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Worn gauge glass.</li> <li>2. Improper installation of gauge glass.</li> </ol>	<ol style="list-style-type: none"> <li>1. Use quick closing valves and secure top and bottom of water column of damaged glass.</li> <li>2. Open drain on water column of damaged glass.</li> <li>3. Replace damaged glass following manufacturer's instruction for installation of gauge glass.</li> <li>4. Use other glass for water level indication and maintaining proper water level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Serious injury to personnel close to gauge glass when gauge glass carried away.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
B-18 FIRE ROOM  FAILURE OF COMBUSTION CONTROL SYSTEM (HAGAN SYSTEM)	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Reduced boiler steam pressure.</li> <li>2. Irregular operation of combustion control system.</li> <li>3. Low air pressure alarm rings.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Air supply below minimum required pressure.</li> <li>2. Defect in mechanism of combustion controls.</li> </ol>	<ol style="list-style-type: none"> <li>1. Shift to manual combustion control.</li> <li>2. Check out master sender of system.</li> <li>3. Check out compensating relay of unit.</li> <li>4. Check out variable ratio regulator of unit.</li> <li>5. Check out receiving regulator of unit.</li> <li>6. Check out air supply system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduced or loss of steam pressure.</li> <li>2. Loss of main propulsion and auxiliary equipment.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>B-19 FIRE ROOM</p> <p>FAILURE OF COMBUSTION CONTROL SYSTEM (BAILY SYSTEM)</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Reduced boiler steam pressure.</li> <li>2. Irregular operation of combustion control system.</li> <li>3. Low air pressure alarm rings.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Air supply below minimum required pressure.</li> <li>2. Defect in mechanism of combustion control.</li> </ol>	<ol style="list-style-type: none"> <li>1. Shift to manual combustion control.</li> <li>2. Check out master pressure controller unit.</li> <li>3. Check out air relay units.</li> <li>4. Check out selector valves.</li> <li>5. Check out fuel air ratio controllers.</li> <li>6. Check out power units.</li> <li>7. Check out air supply system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduced or loss of steam pressure.</li> <li>2. Loss of main propulsion and auxiliary equipment.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
B-20 FIRE ROOM  STACK UP-TAKE FIRE	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Stack temperature rising rapidly above normal.</li> <li>2. Uptake casing point blistering and burning metal warping.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Poor and incomplete combustion.</li> <li>2. Accumulation of soot.</li> <li>3. Insufficient soot blowing and cleaning of tubes and uptakes.</li> <li>4. Defective soot blowers or improper sequence of blowing tubes.</li> </ol>	<ol style="list-style-type: none"> <li>1. Secure F.O. to boiler and close air register.</li> <li>2. Use portable and/or semi-portable CO<sub>2</sub> fire extinguisher if necessary.</li> <li>3. Use steam soot blowers.</li> <li>4. Ready fire fighting equipment in area.</li> <li>5. Reduce steam demand and secure steam stops on boiler if necessary.</li> <li>6. Inspect affected boiler for damage and test prior to putting boiler back in service.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduced steaming capacity.</li> <li>2. Burned out air heater and possible economizers if installed.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
D-1 DIESEL ENGINE  ENGINE SLOWS DOWN	<p><u>SYMPTOMS</u></p> <p>1. Will not respond to throttle.</p> <p><u>CAUSES</u></p> <p>1. Governor and/or controls not functioning properly.</p> <p>2. Fuel oil pump capacity impaired.</p> <p>3. Obstructed exhaust system.</p>	<p>1. If twin screw, reduce speed of unit not affected.</p> <p>2. Notify bridge.</p> <p>3. Check out fuel oil system, filters, strainers, etc.</p> <p>4. Check out governor and controls.</p> <p>5. Check fuel oil pump capacity.</p> <p>6. Check exhaust system for obstructions.</p>	<p>1. Reduced power output of unit affected.</p> <p>2. Reduced maneuverability.</p>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>D-2 DIESEL ENGINE STOPS SUDDENLY</p> <p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Will not respond to throttle.</li> <li>2. Unable to restart engine.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Obstructed fuel oil supply system.</li> <li>2. Governor or controls not functioning properly.</li> <li>3. Air bound IN fuel oil system.</li> <li>4. Frozen or seized bearing and shafting.</li> </ol>		<ol style="list-style-type: none"> <li>1. If twin screw, reduce speed of unit. Do not overload engine.</li> <li>2. Notify bridge.</li> <li>3. Check our fuel oil supply system for obstructions or air bound.</li> <li>4. Check out governor and control.</li> <li>5. Jack over unit to see if free.</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of power of unit.</li> <li>2. Reduced or loss of maneuverability.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
D-3 LST TYPE DIESEL  LOSS OF AIR PRESSURE TO AIR CLUTCH	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Engine overspeeds and trips out.</li> <li>2. Low air pressure alarm rings.</li> <li>3. Indication of loss of air supply on gauge reading.</li> <li>4. Odor from clutch slipping (burning).</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Interruption in supply line of air to clutch and assembly.</li> <li>2. Ruptured air line or clutch tire.</li> <li>3. Air compressor failure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Bring throttle and clutch control to stop position.</li> <li>2. Check out air compressor. Refer to: A-14A</li> <li>3. Check for rupture in air supply system.</li> <li>4. Check for obstruction in air supply system.</li> <li>5. If clutch is afire, use CO<sub>2</sub> Ready fire fighting equipment.</li> <li>6. Reduce speed of unaffected unit to prevent overloading.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduced or loss of maneuverability.</li> <li>2. Fire in engine space.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>D-4 DIESEL ENGINE</p> <p>ELECTRIC POWER FAILURE TO GOVERNOR CONTROL MOTOR AND AIR CLUTCH</p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Engine will slow down to idling speed.</li> <li>2. Clutch control will return to neutral position.</li> <li>3. Engine will not respond to governor clutch controller.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Blown fuses in controller circuit.</li> <li>2. Power failure to controller circuit.</li> <li>3. Open circuit in system.</li> <li>4. Dirty or broken contacts in controller.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check power to controller.</li> <li>2. Check fuses to controller.</li> <li>3. Check for open circuit in system.</li> <li>4. Check controller for broken or dirty contacts.</li> <li>5. Use manual throttle control and manual clutch control until casualty to unit is corrected.</li> </ol>	<ol style="list-style-type: none"> <li>1. Momentary reduced, or loss of, maneuverability.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p><b>D-5 DIESEL ENGINE</b></p> <p><b>UNABLE TO START ENGINE (ELECTRIC STARTING)</b></p>	<p><u>SYMPTOMS</u></p> <ol style="list-style-type: none"> <li>1. Engine will not turn over when pressing starter button.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Batteries are low or dead.</li> <li>2. Poor connection in starter button, batteries or open circuit in system.</li> <li>3. Starter motor open or badly worn motor brushes.</li> <li>4. Engine frozen, or water in cylinders.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace or charge batteries.</li> <li>2. Check starter electrical system for open or poor connections.</li> <li>3. Check condition of starting motor.</li> <li>4. Check engine for freeness by jacking over.</li> <li>5. Use air motor to start engine and make repairs to electrical starting system.</li> </ol>	

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>D-6 DIESEL ENGINE</p> <p>LOW LUBE OIL PRESSURE</p>	<p><u>SYMPOTNS</u></p> <ol style="list-style-type: none"> <li>1. Pressure gauge indicates low lube oil pressure.</li> <li>2. L.O. low pressure alarm will ring.</li> <li>3. Engine noise will increase (bearings, valve gear, etc.)</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Low lube oil in sump.</li> <li>2. Restricted lube oil strainers and/or filters and lines.</li> <li>3. Lube oil pump failure.</li> <li>4. Broken lube oil line.</li> </ol>	<ol style="list-style-type: none"> <li>1. Secure engine immediately</li> <li>2. Check L.O. level in sump.</li> <li>3. Check L.O. strainers, filters and lines.</li> <li>4. Check L.O. pump capacity.</li> </ol>	<ol style="list-style-type: none"> <li>1. Overheating of engine.</li> <li>2. Burned out or seizing of bearings, shaft, pistons, etc.</li> <li>3. Loss of use of unit.</li> <li>4. Possible crankcase explosion.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
<p>D-7 DIESEL ENGINE</p> <p>ENGINE OVERSPEEDS</p> <p><u>SYMPOMS</u></p> <ol style="list-style-type: none"> <li>1. Rapid increase in engine operating speed.</li> <li>2. Over-speed trip out and stops engine.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Improper adjustment or governor parts failure.</li> <li>2. Low oil level in governor.</li> <li>3. Fuel pump or injector racks sticking.</li> <li>4. Throttle linkage loose or binding.</li> <li>5. Removal of load from engine too rapidly. (heavy seas, gen. load, etc.)</li> </ol>		<ol style="list-style-type: none"> <li>1. Bring engine controller to stop or slow speed.</li> <li>2. Check governor for parts failure or low oil level.</li> <li>3. Check throttle linkage and injector racks for proper freeness, etc.</li> <li>4. Operate engine with proper loads and speed for condition present.</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of power of unit affected.</li> </ol>

ENGINEERING CASUALTY	INDICATED SYMPTOMS AND/OR CAUSES	ACTION TO BE TAKEN	ASSOCIATED CASUALTIES
D-8 DIESEL ENGINE  LEAK IN LUBE OIL COOLER	<p><u>SYMPOMS</u></p> <ol style="list-style-type: none"> <li>1. Engine sump level dropping.</li> <li>2. Test cock on cooler indicates L.O. in cooling water.</li> <li>3. Lube oil pressure drops.</li> </ol> <p><u>CAUSES</u></p> <ol style="list-style-type: none"> <li>1. Ruptured tube or inner gasket leaking in L.O. cooler.</li> </ol>	<ol style="list-style-type: none"> <li>1. Secure Engine.</li> <li>2. Pressure test cooler, plug tube, renew gaskets, or replace cooler.</li> </ol>	<ol style="list-style-type: none"> <li>1. Loss of power of unit while repairing.</li> </ol>