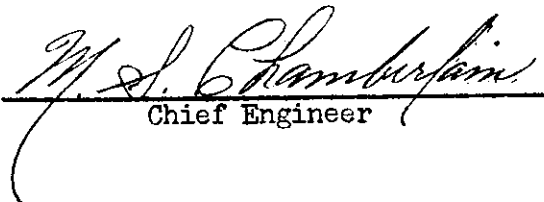


1 MAY 1968

OPERATING INSTRUCTIONS FOR MAIN COMPRESSOR

STARTING:

1. Check oil level in compressor.
2. Open compressor discharge valve.
3. Open tank drain valve.
4. Set start switch on automatic.
5. Start compressor and allow it to run until dry air is coming from tank drain, then close drain valve.
6. Check lube oil pressure on compressor and watch tank pressure to be sure automatic switch stops compressor at the designed cut-out pressure of 125 lbs.
7. The compressor should start and come up to speed before the unloading valve closes, and loads the machine, it should also unload at the cut-off pressure and come to a stop without a load.
8. Inter-cooler relief valve setting 60#.
9. After cooler and receiver Safety Valve setting 125#.
10. Pressure switch; cut in @ 80#; cut out @ 100#.
11. Oil pressure 25# to 40#.
12. Oil filter: Turn handle to clean once each day. Clean sediment chamber once each week.

  
Chief Engineer

1 MAY 1968

OPERATING INSTRUCTIONS: MAIN PLANT CHECK OFF LIST FOR GETTING UNDERWAY

Perform the following operations in sequence and at the time indicated. Vessel is presumed to be on normal auxiliary watch. Mark the time for performing each operation and return sheets with log file. Boiler check off list to be used by water tender of the watch for submission with log in same manner.

<u>ITEM</u>	<u>TIME</u>	<u>OPERATION</u>
-------------	-------------	------------------

- |    |         |   |
|----|---------|---|
| #1 | 4 Hrs.  | Set full steaming watch. The watch officer is to be kept fully informed of the boiler status and any changes by the watertender of the watch. Open main injection (Normally low suction) and overboard discharge valves on main circulator and start main circulator at slow speed. Start main lube oil service pump and circulate oil through cooler. Open cooling water outlet. Crack cooling water inlet and open heating steam to cooler. When main lube oil reaches 100 degrees F. circulate oil through turbines and gears. Check safety devices. In cold weather, warm up lubricating oil eight (8) hours before getting underway.   |
| #2 | 3 Hrs.  | Put wicks in all spring bearings and check oil supply. #2 Engine Room check bearings in #2 Engine Room, shaft alley, and refrigeration room. Hang warning sign on throttle, engage and start turning gear, being sure to turn on lube oil to same.  |
| #3 | 2½ Hrs. | Check turbine clearances. Open drains (5) and throttle drains (3). Open suction and discharge valves for main condensate pump to be used. Open vent on same to condenser. Open leakoff from gland steam to after condenser and drain to lower drain tank. Turn on steam to gland-seal ejector. Turn on gland steam. Start condensate pump at low speed. Shift recirculating line to main condenser (air Ejector should not be started until water circulation is established through the inner and after condensers). Open suction valves and discharge valves on main air ejector (open steam to second stage of air ejector). See that the inter condenser drain is open. Maintain the lube oil temperature at 110 degrees F. |
| #4 |         | When 10" vacuum shows, close first stage heater vent valve on auxiliary condenser and open same on main condenser. <u>CAUTION: NEVER OPEN VENT ON MAIN CONDENSER UNTIL ABSOLUTELY SURE THAT VENT ON AUXILIARY CONDENSER IS CLOSED.</u> Open first stage of air ejector at 12" of vacuum. At 27" vacuum close auxiliary condensate pump valve on suction cross-over and open corresponding valve on main condensate pump in use.   |

MAIN PLANT CHECK OFF LIST FOR GETTING UNDERWAY - CONT'D

<u>ITEM</u>	<u>TIME</u>	<u>OPERATION</u>
#5	2 Hrs.	Open steam to governor valve, making sure lube oil line is lined up to governor valve. Back all throttle valves, astern guarding valve, bleeder valves, nozzle valves, and throttle balancing valves, and reset lightly.
#6		(a) Synchronize clocks with Bridge. (b) Test Engine Order Telegraphs. (c) Receive clearance from Bridge to test Steering Gear. (d) Start Steering Gear. When ready to test, notify Bridge and read corresponding rudder angle of degrees over the telephone to the Bridge. (e) Test both Telemotor and Electric Steering. This will leave control of both engines to the Bridge Officer for any Emergency Condition.
#7	1½ Hrs.	Get permission from the Bridge to turn over main engines. Disconnect turning gear (remove warning sign). Open bulkhead stops and then crack stops. Warm up main steam line for about five (5) minutes. Open main stops together.
#8	1 Hr. & 10 min.	Open astern guarding valve and throttle balancing valves. Open root valve to desuperheating water to astern steam. speed up main circulator slightly. Admit steam through ahead throttle to turn engine at 5 RPM. Operate at that speed for five (5) minutes. Then go ahead, gradually building up to 10 RPM over a fifteen (15) minute period. Start all idle generators.
#9		With shaft turning at 5 RPM, check operation of low oil pressure trip governor system. Check over speed trip at 10 RPM.
#10		Bridge will announce setting of SPECIAL SEA DETAIL.
#11	15 min.	#1 Engine Room report ready to #2 Engine Room. Electricians put on 23V headset in both engine rooms.
#12	10 min.	#2 Engine Room report <u>ready and standing by</u> to Chief Engineer.
#13		While waiting for bells, rock engines ahead and astern at not over 5 RPM for two out of every five (5) minutes.
#14		After Engine has been underway for twenty (20) minutes, close throttle drain valves and main turbine drain valves.
#15		When through maneuvering, close throttle balancing (astern) valve and astern guarding valve. Crack valve on vent condenser to first stage heater. Secure one generator, so that three are in operation in accordance with generator schedule.
#16		Set nozzle combination and open bleeders as required.

*M. S. Chamberlain*

USNS GENERAL JOHN FIFE (TAF 110)  
OFFICE OF THE CHIEF ENGINEER

OPERATING INSTRUCTIONS FOR MAKE-UP EVAPORATOR

1. Open feed line valve and raise water level in shell to  $\frac{1}{2}$  full.
2. Open air supply to feed regulating valve.
3. Open vapor line valve.
4. Open steam to coils slowly until evaporator is at normal operating temperature.

To put a boiler on continuous blow to the make-up evaporator:

1. Open air supply to continuous blow regulator.
2. Open continuous blow line valves from boiler.
3. Secure feed line to evaporator.

*M. L. Humphreys*  
*Chief Engr.*

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USNS GENERAL JOHN POPE (TAF 110)

OFFICE OF THE CHIEF ENGINEER

OPERATING INSTRUCTIONS FOR CONTAMINATED EVAPORATOR

STARTING

1. Open evaporator feed pump suction and discharge valves.
2. If drain collection tank is empty or low open the feed valve located on top of the tank and raise the water level to and maintain at operating level.
3. Open exhaust and steam valves and cylinder drains on feed pump, when cylinders are free of water close drains and run pump slowly until evaporator shell is at normal operating level (about  $\frac{1}{2}$  full).
4. Open air supply to fuel pump regulator.
5. Open valves in vapor line from evaporator to system to be used.
6. Open valves in actuating line to steam regulating valve for steam to coils of evaporator.
7. Open stop valve in steam line to coils slowly and operate by hand until pressure is high enough to operate regulating valve in steam line.
8. Check and make sure all drains of the contaminated system are returning to the drain collection tank and that all return traps are in operation.

SECURING

1. Secure steam to coils.
2. Secure feed pumps.
3. Secure air to feed pump regulator.
4. Allow to cool for a short time and secure vapor line valve.

*J. S. Chamberlain*  
*Chief Engr.*

USNS GENERAL JOHN TOPE  
OFFICE OF THE CHIEF ENGINEER

OPERATING INSTRUCTIONS FOR FRESH WATER PRESSURE SYSTEM

STARTING:

1. Check oil level in pump crankcase.
2. Open pump suction valve and valve of tank suction is to be taken from.
3. Open pressure tank discharge valve to system.
4. Open air charging valve to pressure tank and charge air into tank until water level is visible in sight glass. If water level is below sight glass start pump and raise water level into sight before charging with air.
5. Make sure that valves are open in pressure line to pressure switch and start pumps.
6. Pump should shut off at ninety (90) pounds pressure. Water level in sight glass should be visible at top of glass at the cut off pressure. If above the glass more air charge is necessary.

SECURING:

1. Stop pump.
2. Close tanks discharge valves.
3. Close pump suction valve.
4. Pull knife switch in pump controller box.

*M. S. Humphreys*  
*Chief Eng.*


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USNS GENERAL JOHN POPE, (T-AP 110)  
FPO San Francisco, California 96601

1 MAY 1968

SUBJ: OPERATING INSTRUCTIONS - HOT WATER HEATERS

1. Open water supply stop valve.
2. Open water outlet valve.
3. Open circulating pump suction and discharge valves.
4. Start hot water circulating pump/
5. Open return steam stop valve from heater coils.
6. Open steam supply stop valve from 70# steam line.
7. With hot water circulating pump in operation, adjust Thermo control regulator to maintain 140 degrees fahrenheit, and not to exceed 150 degrees fahrenheit in the tank. Refer: BuShips Manual 35-2-10 (G)

  
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Chief Engineer

USNS GENERAL JOHN POPE  
OFFICE OF THE CHIEF ENGINEER

OPERATING INSTRUCTIONS FOR SANITARY PRESSURE SYSTEM

1. Check oil level in pump crank case.
2. Open pump suction valve and make sure sea suction valve is open.
3. Open pressure tank discharge valve to system.
4. Open air charging valve and charge air into tank until water level is visible in sight glass. If water level is below sight glass start pump and raise water level into sight before charging tank with air.
5. Make sure valves are open in pressure line to pressure switch and start pump.
6. Pump should shut off at eighty (80) pounds pressure. Water level in sight glass should be visible at top of glass at cut off pressure if above the glass more air charge is needed.

Securing:

1. Stop pump.
2. Close tank discharge valve.
3. Close pump suction valve.
4. Pull knife switch in pump controller box.

*W. L. Chamberlain*  
*Chief Eng.*

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USNS GENERAL JOHN FOFE, (T-AP 110)  
FPO San Francisco, California 96601

1 MAY 1968

SUBJ: OPERATING INSTRUCTIONS - FIRE PUMP

STARTING:


1. Open the discharge and suction valves.
2. Turn rheostat to slow position.
3. Press start button.
4. With the rheostat slowly raise speed of pump to produce desired pressure.

SECURING:

1. Reverse action noted under starting.

NOTE: There are three (3) electric driven fire pumps on this vessel; One (1) in each engine room and one (1) in the evaporator machinery space. Normally one (1) pump will be on the line supplying standby water pressure to the Fire Main as well as service water to Sanitary System. The pressure will be no less than 75 P.S.I. during this condition.

2. During Fire Drills or in case of actual fire conditions all three (3) pumps will be put in service and Fire Main pressure immediately increased and maintained at 125 P.S.I. until the Emergency has been corrected.
3. These three (3) pumps are supplemented with two (2) Emergency Diesel fire pumps located at 5-20-2 and 5-187-2.
4. Relief valve setting is 125 P.S.I. At each drill these valves will be floated, this action and pressure at which the valve floated will be logged and underlined.

  
Chief Engineer

USNS GENERAL JOHN POPE, T AP 110  
FPO San Francisco, California 96601

1 MAY 1968


SUBJ: OPERATING INSTRUCTIONS - BILGE PRIMING PUMP.

STARTING:

1. Determine water seal is applied to pump. NOTE: If the pump is started dry serious damage will occur.
2. Start pump motor by closing the switch.
3. Adjust seal water so the unit runs warm to the touch.
4. Once the proper seal has been adjusted, with adjusting valve, use the lever handle shut-off valve to open and close the water supply when the pump is started and stopped.

STOPPING:

1. Open switch to motor.
2. Close lever handle shut-off valve.

  
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Chief Engineer

USNS GENERAL JOHN POPE, (T-AP 110)  
FPO San Francisco, California 96601

1 MAY 1963

SUBJ: OPERATING INSTRUCTIONS - BILGE PUMP.

STARTIN G:


1. Determine vacuum priming pump is in service.
2. Open discharge valve.
3. Open suction valve.
4. Open suction valve to compartment to be pumped.
5. Start motor.

SECURING

1. Reverse procedure listed under startin g.

SAFETY PRECAUTION

1. Close all bilge suction and discharge valves when finished pumping bilge. ~~and stopping feed pump.~~

  
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Chief Engineer

USNS GENERAL JOHN POPE (TAF 110)  
c/o Fleet Test Office  
San Francisco, California

OPERATING INSTRUCTIONS FOR SUBMERSIBLE BILGE PUMP

STARTING

1. Open bilge overboard discharge valve by turning air operated valve to open position. Open pump discharge valve.
2. Open valve from drip feed lubricating box.
3. Open suction valve from bilge to be pumped.
4. Start pump and check suction and discharge pressure gauges.

This pump should not be operated for more than three (3) minutes if it fails to pick up suction. Find and correct the cause of failure to pump before re-starting pumps.

SECURING

1. Stop pump.
2. Close drip lubricators.
3. Close suction valves. Close discharge valves.
4. Close overboard discharge valve.

*M. S. Chamberlain*  
*L. H. Jones*

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USNS GENERAL JOHN JOE (TAP 110)  
c/o Fleet Post Office  
San Francisco, California

OPERATING INSTRUCTIONS FOR DIESEL OIL TRANSFER PUMPS

STARTING:

1. Open pump cylinder drains and pumps exhaust valve.
2. Open pump suction valve at manifold.
3. Open pump discharge valve and check to be sure valves are opened to tank to be filled.
4. Open suction valve at tank and start pump slowly by opening steam throttle valve, when cylinders are free of water close drains.
5. ~~These pumps can be used to fill the galley diesel tank and the fore and aft emergency fire pump tanks. When filling the galley tanks or the emergency generator tank a man must be stationed at the sight glass in the overflow line located on the forward engine room bulkhead, number one engine room. When filling either the forward or after emergency fire pump tanks, a man must be stationed at the tank with sound powered telephone to notify the operator when tank is full. There is no overflow return line from these tanks.~~

SECURING:

1. Close steam throttle valve.
2. Close exhaust valve and open drains.
3. Close pump suction valve and pump discharge valve.
4. Close valve in line to tank filled.

*W. A. G. Humphreys*  
*Lt. Engr.*

USNS GENERAL JOHN POPE  
OFFICE OF THE CHIEF ENGINEER

OPERATING INSTRUCTIONS FOR DIESEL OIL PURIFIER

STARTING:

1. Check oil in gear case.
2. Start purifier and allow it to come up to speed.
3. Prime bowl with hot water through priming funnel until water overflows into water discharge chamber then close priming cock.
4. Open discharge valve and gradually open supply valve.

The operator must, before starting, be sure the bowl cover is properly locked in place and the brake released.

SECURING:

1. Press stop button and pull knife switch.
2. Close supply valve.
3. Close discharge valve.
4. Apply brake and stop bowl.

*M. S. Chamberlain*  
*Chief Engr.*

USNS GENERAL HOHN 101E  
OFFICE OF THE CHIEF ENGINEER

OPERATING INSTRUCTIONS FOR EMERGENCY DIESEL FIRE PUMPS

STARTING:

1. Check oil in crankcase.
2. Open fuel supply valve.
3. Open suction and discharge valves.
4. Open throttle control level 1/3 on the quadrant.
5. Press the heater button for forty-five (45) seconds.
6. Release the heater button and press the starter button.
7. When engine is running open the salt water cooling water inlet valve and check the fresh water cooling supply tank.
8. Open throttle enough to maintain one hundred and twenty (120) pounds on the discharge line.

In starting the operator should not crank the engine for more than ten seconds at a time with the starting motor, if the engine does not start in ten (10) seconds:

1. Vent the fuel oil filter by loosening the vent screw.
2. Vent the fuel suction chamber of the injection pump by loosening the vent plug.
3. Vent the fuel lines at the nozzles by loosening vent screw. There is no governor to maintain a steady discharge pressure, the operator must control the throttle at all times while the pump is in operation to meet any changing load.

SECURING:

1. Close throttle valve.
2. Close suction valve after pump stops.
3. Close discharge valve.
4. Close salt water cooling line valve.
5. Close fuel supply valve.

*W. S. Chanderiani*  
*Chief Eng.*

USNS GENERAL JOHN FOPE (TAF 110)

OPERATING INSTRUCTIONS: MAIN AIR CONDITIONING UNIT

STARTING

1A. Charge the Chill Water line by filling the same from the Auxiliary Condensate pump discharge until the line overflows from the overflow line. Use caution in filling so vacuum is not lost from the Auxiliary Condenser.

1. Line up the Condenser Salt Water Circulating System and start the pump. The discharge pressure should register 10 or 12 lbs.

2. Line up the Chill Water system and start the pump. Do not exceed 80 lbs. pressure.

3. Start the Auxiliary Oil pump on the panel board. Determine that the pressure registers 5 or 6 lbs. The Amber light on the board will go out. Push the start button and hold for several seconds until the Green light appears, then release the push button. The Green light should remain on.

4. Determine that the Steam Turbine Casing Drains are open. Drain all condensate from the steam and exhaust lines.

5. Set the turbine trip and regulator.

6. Set the manual throttle/or steam stop valve to minimum.

7. Open the throttle valve slowly until the turbine starts. Allow the turbine to idle slowly long enough to warm up, by using the speed regulator. When the unit is warm and all condensate has been removed from the steam lines, close all the drains and bring the unit up to speed.  
NOTE: The overspeed governor is set at 4400 R.P.M.

8. Do not exceed 4400 R.P.M. Use the governor control for this adjustment.

9. Do not allow the turbine to cycle in excess of 25 lb. differential on the nozzle block.

10. Adjust the speed control to control the cycling as instructed in item 9, but maintain adequate speed to continue lowering the Chill Water Temperature until the set limits are maintained.

*W. S. Chandler*  
*Lt. Eng.*



USNS GENERAL JOHN POPE (T-AP 110)

OPERATING INSTRUCTIONS: MAIN AIR CONDITIONING UNIT

RUNNING:

1. Do not allow the turbine to surge/or cycle. Control this with the governor control.
2. Watch the head pressure guage on the Control Board. This will vary with the load and temperature of the Condensor water ranging from inches of vacuum to 15 lbs pressure at which point the high head pressure limit switch will cut out and shut down the unit.
3. Watch the vacuum or low side pressure guage. This will range from 5 inches of vacuum to approximately 19 inches of vacuum depending on load conditions.
4. Watch the center oil pressure guage. This will rise to approximately 10 to 12 lbs., then the auxiliary oil pump will cut out automatically and the red light on the panel board will go out.
5. Watch the compressor line shaft bearing next to the coupling. The normal running temperature should be from 100° to 120° F. Normally excessive load conditions will raise the temperature higher. 140°F and above is a sign of trouble; locate and correct the trouble or secure the compressor.
6. Watch the compressor thrust bearing temperature; normal running temperature is 60°F to 80°F.
7. Maintain 10 to 15 lb. lube oil pressure on the turbine.
8. Maintain the lube oil temperature on the turbine between 110° and 120°F.
9. When the pin nears the red hand on the Bristol Recorder the turbine will start to throttle and in turn will surge/or cycle. Do not exceed 25 lb. nozzle steam pressure differential; use the speed control to accomplish this.
10. Maintain the hourly log as provided.

NOTE: When any limit switch cuts out, it will trip the turbine governor and the green light on the panel board will go out. It is not possible to get the unit started again until you push the start button on the panel board and the green light is lit again. If the green light will not stay on, locate the limit switch that is open and wait for the reset point. Do not attempt to start the turbine until the green light is lit.

*M. S. Chandrasekhar*  
*C. H. Singh*

USNS GENERAL JOHN POPE (T-AP 110)

AIR CONDITIONING COMPRESSORS

OPERATING INSTRUCTIONS AND SAFETY PRECAUTIONS

The information furnished hereon was furnished by Mr. Jack Doyle, Worthington Corporation Service Representative:

1. TEST OF UNIT BEFORE STARTING: AFTER A PROLONGED SHUT DOWN.

a. If the chill water and the refrigerant temperatures are in close relation (one (1) degree maximum differential) this will indicate very little air in the system. If the air accumulation is excessive, check for leaks with the Halide Torch. If necessary, to get the unit running due to shaft seal leakage, first start the oil pump (this will seal the unit). Then start the circulator and compressor. Just crack the drain on the water leg of the purge unit, which will assist in removing the air and moisture from the system.

2. TO TEST FOR REFRIGERANT LEAKS IN THE SYSTEM WITH THE UNIT SHUT DOWN.

a. Run warm water thru the evaporator (water from an outside source). This will start the Freon 11 to gassify and build up a pressure in the evaporator. Do not exceed 5 lbs pressure in the evaporator, then test for leaks.

NOTE: Excessive air in the system will displace the gas and cause excessive heating of the compressor. This excess air, if in sufficient quantity, will displace the gas entirely; as air is lighter than freon 11.

3. Maintain 120 degrees F. maximum temperature on sump oil. Excessive oil temperatures will result in carbon deposits within the oil piping and filters.

4. Clean the lube oil filters once each week (minimum) by turning the plug cock to position "B", drain the filter casing and remove the filters.

NOTE: In replacing the filter cover, particular attention is directed to a perfect or undamaged cover plate gasket.

5. To add oil while the unit is running, remove the plug in the atmospheric side of the float trap.

6. SAFETY PRECAUTION: Do not allow the refrigerant temperature to go below 38°F.

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*W. A. Chamberlain*  
*E. H. Engle*

USNS GENERAL JOHN POPE (T-AP 110)

OPERATING INSTRUCTIONS: MAIN AIR CONDITIONING UNIT

SECURING:

1. Manually trip the turbine governor.
2. Secure the throttle valve.
3. Open all atmospheric casing and steam line drains.
4. Secure the water to the lube oil coolers.
5. As the compressor slows down the center oil pressure oil guage will drop to 5 or 8 lbs. pressure and the red light will appear. This will indicate that the auxiliary oil pump is back in circuit and will maintain oil pressure on the compressor until the unit stops.
6. When the unit has completely stopped, and ONLY THEN, turn off the on and off switch. The red light will go out and the seal on the compressor will close. The oil pressure guage will drop below zero.
7. Check the seal on the compressor to be sure it is closed. If the seal is not properly closed air will leak into the system.
8. When the unit has come to rest, stop the auxiliary oil pump.

PURGE UNIT:

1. This unit is fully automatic and will take care of itself.
2. The Purge Unit can be shut off and on by a switch marked Purger on the panel. The white light lit indicates that the Purger is on. It should operate all the time the unit is in operation.
3. When the unit is secure the oil heater will go into circuit and is indicated by an amber light on the panel.
4. Secure all sea valves.

*M. S. Chamberlain*  
*Lt. Engr.*

*57*

USNS GENERAL JOHN POPE (T-AP 110)

OPERATING INSTRUCTIONS AND SAFETY PRECAUTIONS

POTABLE/OR FRESH WATER HOSE AND CONNECTIONS

1. Obtain the key to this cabinet from the First Assistant Engineer.
2. Previous to connecting the hose to the shore hydrant, turn on the water and flush the hydrant from 15 to 30 seconds.
3. Previous to connecting the hose on the shipboard fitting, flush the hose for not less than 60 seconds.
4. Do not remove the plugs/or caps from the hose until ready to make the connections.
5. After taking fresh water, drain the hose well, roll up the same, install plugs and caps and stow the hose in the cabinet provided with a padlock. Snap the lock so the hose may not be used except for replenishment of potable water.
6. Should it be necessary to disinfect the hose, fill with a solution containing not less than 50 PPM chlorine. Allow to stand not less than two (2) minutes and then flush 30 to 60 seconds.

*M. A. Chamberlain*  
*Ch. Engr.*

SUBJECT: HULLS 268-77. INSTRUCTIONS FOR STOPPING MAIN TURBINE,  
ETC. - WHEN ABANDONING SHIP

In the event of an emergency necessitating abandoning ship, the following steps should be taken to shut down the main propelling machinery, etc., in order to bring the ship to rest as soon as possible. This is in accordance with emergency regulations of the Coast Guard Inspection and Navigation, dated April 18, 1942, and letter from H.C. Shepherd, dated October 31, 1942.

1. Stop fuel oil service pumps by opening emergency stop switches located in the control room on "B" deck. Access to the control room is from the athwartship passage forward of the aft machinery casing.
2. Close main steam stop valves which are located just aft of the boilers on the centerline of the ship. Operation of these valves is from the athwartship grating aft of the boilers on "B" deck level. The valve handwheels are painted red.

*M. J. Chamberlain*  
*Chief Eng.*

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## FIREROOM CASUALTIES

FIREROOM CASUALTY ALARM SHALL BE USED WHEN OUTSIDE ASSISTANCE IS BELIEVED NECESSARY

### SERIOUS STEAM LEAK IN BOILER

#### PROCEDURE IN CASE OF SERIOUS STEAM LEAK IN BOILER

1. Close stop and secure injured boiler simultaneously.
2. Gradually open the safety valves as soon as possible to relieve pressure. Open connections from superheater to auxiliary exhaust line.
3. Shut off oil to burners and close registers.
4. Except in case of low water when consequent overheating is involved, continue the feed supply until the fires are out, to prevent the heating surfaces becoming uncovered and burned. In such cases start the auxiliary feed pump after the auxiliary feed check has been opened. The main feed supply shall be shut off if other boilers are being fed from the latter. Special care shall be taken to maintain the water at the proper height in all other boilers in use and to provide additional water from the reserve feed tanks if necessary, to prevent a shortage in the main feed tanks.
5. Speed up blowers to drive escaping steam up the stack.
6. After the pressure has been reduced, stop the blowers, close all air leads to the furnace and let the boiler cool slowly.

### LOW WATER

Low water is generally the result of in-attention on the part of the water-tender and the man tending the checks or of their attention having been diverted to some other duties other than the major one, that of maintaining the proper water level, in the boilers. Failure of the feed pumps, the developing of leaks in the feed discharge line or elsewhere, a defective check valve, hot or low water in the feed tank, failure of automatic devices on water gauges, or clogged gauge glasses, combined with failure to use trycocks, together with many other defects, causing incorrect water level to be shown which if not discovered and remedied promptly may cause low water in the boiler. Low steam pressure may be caused by low water. When the water level falls low enough to uncover portions of the tubes, the immersed heating surface will be reduced and, other conditions remaining the same, the steam pressure will drop. Ordinarily a drop in steam pressure is due to an increased use of steam and the natural tendency to counteract it, is to cut in more burners and accelerate the fires. This procedure is correct in most cases. If, however, the fall in pressure is due to low water, accelerating the combustion will result in serious damage to the boiler and possibly to the personnel. The possibility of a fall in pressure being an indication of low water must always be born in mind and when any pronounced or unusual drop in steam pressure occurs, the reason for which is not apparent, the level of the water in the gauge glass shall be checked by trycocks before additional burners are cut in. If the water is below the lowest trycock, carry out procedure for low water.

### FIREROOM CASUALTIES (CONT'D)

Whenever the water falls out of sight in the guage glasses and below the lowest try-cock:

1. Shut off oil supply to burners.
2. Open the Safety valves by hand cautiously and relieve pressure gradually.
3. Close the feed check valves.
4. Close boiler steam stop valves.
5. Shut all registers and allow boilers to cool as slowly as possible, shutting down blower if possible.
6. Never attempt to bring water level back to normal after it has dropped below the lowest try-cock.

### HIGH WATER

When the water level is too high, priming will occur. This is especially true when the steam demand is high and fluctuating rapidly. In such cases the proper level to be carried must be determined by experience to prevent priming. (Report fact to the Officer of the Watch)

### FLAREBACKS

A flareback is due to the explosion of a mixture of oil vapor or gas and air in the furnace. Such an explosion may cause grave injury to the personnel and serious damage to the boiler, its fittings and attachments. A flareback is most apt to occur when lighting off or when attempting to relight an atomizer from a hot brick wall. During bombing or gunfire a condition similiar to a flareback may occur and at such times particular care must be exercised to prevent a flareback. At times blowers may be adversely affected by the shock of gunfire, bombs, or torpedoes, and their operation should be closely watched. Boiler walls, fuel lines are also apt to be affected by similiar shocks. During gunfire, personnel should, as much as possible, stand clear of the possible path of a flareback.

### PROCEDURE IN CASE OF A FLAREBACK

1. Close master oil valve shutting off all oil to the furnace.
2. Speed up the blowers if in operation unless flareback causes fire in fireroom in which case judgement must be used to keep them in operation to keep flames away from personnel or to stop them immediately to prevent draft for the fires.
3. Keep fireroom doors closed.
4. Stop the oil service pumps.

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40-B

### PROCEDURE IN CASE OF FIRE

In attempting to extinguish an oil fire never use water except as a last resort and then in large quantities at high pressure, otherwise the only affect will be to spread the flames over a larger area.

Fuel oil in bulk is difficult to ignite and is not capable of spontaneous combustion. There is little danger of oil in the tank becoming ignited but in such an event steam hose connections must be made to the tank and steam turned on to smother the flames.

In case of an oil fire in the bilges: close the master oil valve, shutting off oil atomizers; sound the casualty alarm; stop the oil pump, start the foam fire extinguisher and steam hose; and direct the hose streams on the fire to smother the flames. If the fire is large all hatches, blower flaps, ventilators, etc. in the compartment, should be closed and steam turned on the compartment to smother the flames after ascertaining that all personnel have left the compartment.

If the blowers are in operation, judgement must be used in deciding to keep the blowers running or to immediately shut them down. They will feed air to the flames and aid in combustion but, these conditions, when speeding up the blowers, may be the one thing that will save the personnel by giving them an opportunity to escape. In general the blowers should be secured as soon as safety to personnel permits.

The fireroom force must be thoroughly drilled to handle an oil fire promptly, as it is only a matter of minutes before an oil fire assumes serious proportions.

Throw sand instantly on any small fire as it starts. This instant action may prevent a large fire.

### PANTING

Panting or vibration in a boiler if continued will loosen the brickwork. Constant panting is a sign of a bad feature in the design of the furnace or the atomizer. If it should occur, change atomizers or use a different combination of burners and report the fact to the Officer of the Watch.

*M. S. Chamberlain*

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## MACHINE SHOP EQUIPMENT

### PRECAUTIONS FOR THE MAINTENANCE OF MACHINERY

1. Before applying power to a machine, be sure the machine is ready for starting. For example, move the carriage of a lathe by hand feed to insure that all locking devices have been released.
2. Do not lay work or hand tools on the ways of a machine.
3. Be sure to avoid scoring the platen of a planer or drilling holes in the table of a drill press or gouging the vise or footstock of a milling machine.
4. Do not use the table of any machinery for a work bench.
5. When using a toolpost grinder on a lathe, cover the ways and other finished surfaces to protect against grit.
6. Pneumatic power-driven hand tools should be lubricated after each 8 hours of operation or more often if found necessary.
7. Before an electric power-driven hand tool is issued from the tool room, it should be carefully examined for mechanical defects.
8. When securing for sea, take all precautions to insure that machinery or components shall not sway or shift with the motion of the ship. These precautions should include the following:
  - a. Top-heavy equipment such as a radial drill press shall have the arm lowered to rest on the table or base of the machine and then locked and blocked securely.
  - b. Secure chain falls, trolleys, overhead cranes, and other suspended equipment, such as counter-weights on boring mills and drill presses.
  - c. Secure tailstocks of lathes.
  - d. Secure spindles of horizontal boring mills.
  - e. Protect and secure tools stowed in cabinets or drawers. Secure drawers and cabinet doors.
  - f. Inspect foundation bolts of top-heavy equipment and take steps to insure adequate factor of safety in case of heavy seas.

*W. S. Chamberlain*  
*Chief Engineer*

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## MACHINE SHOP EQUIPMENT

### CLEANING AND LUBRICATING

In order to insure proper operating condition of all power-driven tools on board at all times, the following procedure should be followed during each weekly inspection (subject to postponement if weather conditions make it unsafe to release locking devices):

- a. Remove or release all blocking and locking devices.
- b. Wipe all exposed finished surfaces with a clean rag and remove any indication of rust.
- c. Oil and grease machine according to manufacturers' instructions and apply a film of oil to finished surfaces.
- d. Operate all carriages, tables, rails, heads, rams, turrets, etc., by hand to insure that they are free to move before applying power, then operate the machine under power to the full travel of the various moving parts to insure full distribution of lubricating oil.

### INSPECTION AND CARE

Coolant systems, electrical equipment, and driving belts should be inspected and cared for as follows:

- a. COOLANT SYSTEMS: - Coolant systems should be drained of sludge and sediment on a regular monthly schedule; oftener if necessary.
- b. ELECTRICAL EQUIPMENT: - All electrical equipment, including switches, motors, controllers, etc., should be inspected by an electrician and cleaned and maintained in accordance with chapters 60 and 63 of Bu-Ships Manual.
- c. DRIVING BELTS: - Driving belts should be inspected monthly for wear and slippage, and should be kept free from oil and grease.

*M. S. Humphreys*  
Chief Eng.

## INSTRUCTION MANUAL

FOR

### FOSTER WHEELER TRIPLE EFFECT DISTILLING UNIT

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This is a triple effect, low pressure, submergen tube distilling or evaporating plant and consists primarily of three boilers or shells containing in their lower sections a series of tubes, through steam passes and in passing gives up its heat to the sea water that covers them causing the water to boil. The steam thus created by this section is called vapor and, in its condensed form, distillate, rather than steam and condensate. This vapor rising to upper part of the shell in the 1st and 2nd effects comes in contact with another but smaller series of tubes, through which the feed water flows, pre-heating it before it enters the shell proper. In the 3rd Effect the rising vapor enters the Distilling Condenser, located in the upper part of the shell, where it is condensed into distillate.

In its condensed form this vapor becomes fresh water; the various minerals and impurities, originally contained in the sea water, having been left in the bottom of the shell from where they are pumped over the side in the form of brine.

The original source of heat is either live steam from the boilers or exhaust steam from the Low Pressure Turbine but in either case it is reduced to 5% psi before entering the 1st Effect Tube Nest Header. After passing through the tube nest the condensate is returned to the boiler feed water system through the DC Heater. Aside from the live steam used to operate the Air Ejector, this is the only place that boiler steam is used in the plant.

Instead of condensing this vapor from the 1st Effect Shell back into water and thereby wasting the BTU's that it contains, it is sent into the 2nd Effect Tube Nest Header where it gives up its heat to the sea water in the 2nd Effect Shell thereby creating enough vapor to operate the 3rd Effect in the same manner.

In its passage through the 2nd and 3rd Effect Tube Nests the vapor exchanges its heat causing the sea water to vaporize and itself to condense. It now passes through drain regulators, which are merely float operated steam traps, through the flash tanks, to the Distilling Condenser Condensate pump, to the Test Tanks and from there distributed to the various fresh water storage compartments by means of the Fresh Water Pump.

Sea water is put through the system by means of the Distilling Condenser Circulating Water Pump which discharges through the Distillate Cooler to the Distilling Condenser. After leaving the Condenser about 85% of this water is discharged over the side while the remaining 15% is picked up by the Evaporator Feed Pump.

The evaporator Feed pump discharges through the Air Ejector After Condenser to the 2nd and 1st Effect Vapor Feed Heaters, respectively, where, as the name implies, it is pre-heated by the vapor in the shell before entering the 1st Effect Shell.

When sufficient water has entered the 1st Effect Shell, instead of closing the feed check valve to this Effect, the surplus is allowed to enter the 2nd Effect Shell and then in turn, the 3rd Effect Shell.

The Feed Water having passed through each Effect, carrying with it the impurities remaining from the distilling process in the previous Effect, finally reaches the 3rd Effect Shell and from there it is pumped over the side by the Brine pump.

Do not assume that the 2nd and 3rd Effects are apparatus to further purify the vapor after it has left the 1st Effect. With the plant operating correctly each effect will produce fresh water. The additional Effects are for the purpose of utilizing the heat value contained in the vapor, produced in the preceding Effect, thereby bringing this type of Evaporator to a point of efficiency where it will produce approximately  $2\frac{1}{2}$  pounds of distilled water per pound of steam as compared to a Single Effect Evaporator's average of slightly less than 1 pound of water per pound of steam.

#### FUNCTIONS OF THE VARIOUS PUMPS

1. DISTILLING CONDENSER CIRCULATING WATER PUMP.  
Provides sea water to condense and cool the distillate and supplies feed water for the Evaporator Feed Pump.
2. EVAPORATOR FEED PUMP.  
Takes sea water from the Distilling Condenser discharge line to feed the Evaporators.
3. BRINE PUMP.  
Discharges the brine from the 3rd Effect Shell over the side. Also used when shocking tubes to drain the 1st and 2nd Effect Shells independently.
4. DISTILLING CONDENSER CONDENSATE PUMP.  
Takes the distillate from the 3rd Effect Flash tank and the Distilling Condenser and discharges it into the Test Tanks.
5. FRESH WATER PUMP.  
Distributes the distillate from the Test Tanks to the various storage compartments.
6. TUBE NEST DRAIN PUMP.  
Returns the condensate from the 1st Effect Tube Nest to the boiler feed water system through the DC Heater.

#### TO START EVAPORATORS

1. Test all pumps to make sure they will operate when needed.
2. The following valves must be open before starting the plant:
  - a. Sea Suction.
  - b. Discharge from Distilling Condenser Circulating Water Pump.
  - c. Discharge from Distilling Condenser.
  - d. Overboard discharge.
  - e. Suction and Discharge from Evaporator Feed pump.
  - f. 3rd Effect Shell discharge to Brine pump.

- g. Vent to Brine pump from 3rd Effect Shell.
  - h. All vents on Vapor Feed Heaters and Distilling Condenser heads.
  - i. All vents on Tube Nest Headers.
  - j. Both valves in the 1st Effect Tube Nest return line - one at the DC Heater, the other at the Drain Regulator.
  - k. Feed stops on the 2nd and 3rd Effect Shells.
  - l. Either drain to bilge or return to Double Bottoms from Air Ejector Condenser.
  - m. Brine pump discharge. Do not open until ready to start the pump.
3. Check 1st and 2nd effect Shell Drains to Brine pump and make sure they are closed.
  4. Start Distilling Condenser Circulating Water Pump.
  5. Start Evaporator Feed pump.
  6. Close vents in Vapor Feed Heaters and Distilling Condenser Head so that there is only a trickle of water being discharged.
  7. Open Feed valve to 1st Effect. When 5 inches of water shows in the glass, open 2nd Effect Check valve and allow water to rise to the same level, then open 3rd Effect Check valve. When water has come to 5 inches in this shell open Brine Overboard discharge valve and start Brine pump.
  8. Adjust Brine pump overboard valve so that the water level in the 3rd Effect remains constant.
  9. Notify Engine Room to open steam to Air Ejector.
  10. Start the Air Ejector. Drain the steam line before putting pressure on it.
  11. Start the Tube Nest Drain pump.
  12. Put Steam on the plant by opening the Stop valve on whichever unit is to be operated.
  13. When distillate appears in the 3rd Effect Drain Regulator glass, start the Distilling Condenser Condensate pump.
  14. Close vents on Tube Nest Headers to a cracked open position.
  15. The plant is now producing and the Distillate is entering the Test Tanks. Open the Test Tank Drain valve to the bilges and allow this water to flush out the tanks until such time as the Salinity Indicator indicates that the plant is producing water of the proper purity for which it is to be used. This will be 1/10 grain per gallon for Boiler Feed and up to 2 g.p.g. for Drinking purposes. Note that at the present time the Salinity Indicator readings are about 3/10 g.p.g. less than a chemical test.

#### OPERATING NOTES

1. Maintain <sup>80</sup>~~150~~ psi on steam to Air Ejector.

2. If it becomes necessary to completely close the 1st Effect Feed valve open Air Ejector Condenser Leak-Off valve, located at the 2nd Effect Vapor Feed Heater Inlet, so as to insure sufficient circulation of water through the above-mentioned Condenser. This will prevent steam being blown to waste through the vent pipe. Under normal operating conditions this valve should be completely closed.
3. Open all vents on Vapor Feed Heaters and Distilling Condenser Head when starting up to prevent them from becoming air-bound. After air has been vented close valve so that only a trickle of water issues.
4. All vents on Tube Nest Headers should be opened wide on starting up. After plant is in operation for a short time close to a cracked open position. Adjust these vent valves so that the difference in temperature between the Supply Steam and the Drain return on each Tube Nest Header is as follows: 1st Effect 5° 2nd Effect 10° to 15° 3rd Effect 20° to 30°
5. Make sure that the 1st and 2nd Effect shell Drain valves are closed and the 3rd Effect Drain to Brine pump is open before starting up.
6. Keep  $\frac{1}{2}$  glass of water in the 1st Effect Drain Regulator in order to avoid blowing steam to waste. Desuperheater line will not work if this regulator is dry.
7. Keep 1st Effect Supply Steam below 240° and preferably at 230° by means of the desuperheater line, to prevent hard scale from forming on the tubes.
8. Vent to Brine pump, located in the center of the 3rd Effect Shell at the after end should remain open while pump is operating.
9. Brine Overboard valve should be closed as much as possible without allowing brine to reach a higher concentration than 1.5/32. Open the overboard valve to reduce concentration. Close to increase.
10. Vacuum in 3rd Effect Shell should be maintained at 26 $\frac{1}{2}$ ". Control this by means of the Distilling Condenser discharge valve. Open valve to increase vacuum.
11. Temperature of Feed Water entering the 1st Effect Vapor Feed Heater should be about 158°. Temperature will vary with the amount of water fed to the 1st Effect Shell. Slow feed, higher temperature - fast feed, lower temperature.
12. If Fresh Water pump does not show a discharge pressure upon starting up, it is probably air-bound. Stop the pump and open the pet cock in the top of the impeller casing. When air has discharged and a steady stream of water appears, close pet cock and start the pump. It is, of course, assumed that there is water in the Test Tank and that the various valves are lined up properly.
13. Do not open valves in Discharge line from Brine pump unless pump is operating. If check valve in this line fails to work while pump is cut out, sea water will flood the system.

14. For Drinking or Wash Water up to 5 grains of salt per gallon it is possible to carry the water at a considerably higher level. The higher the water level carried, the greater the capacity of the plant.

15. SALINITY INDICATOR.

If the #7 cell on #1 plant or #7 cell on #2 plant registers a high salt content, it will indicate a leaking tube in the Air Ejector Condenser and the condensate may be drained into the bilge rather than to the Double Bottoms without either affecting the operation of the plant or contaminating the Boiler Feed Water.

If #6 on #1 plant or #4 on #2 plant is too high there is a leak in the 1st Effect Tube Nest. Notify the Engineer on watch and, if, in his opinion the contamination is too much, the plant will have to be shut down.

If Distillate in Condenser and Tube Nest Drains in 2nd and 3rd Effects show a correct reading but Distillate to Cooler outlet reads high, there is a leaking tube in the Distillate Cooler. Send the Distillate direct to the Test Tank by by-passing the cooler.

If it becomes necessary to bypass the Distillate Cooler, the Salinity Indicator cell #1 will still be used to indicate the quality of the final distillate but the Compensator will have to be set to the temperature on the Cooler Inlet thermometer instead of the Cooler Outlet.

#### SECURING THE PLANT

1. Notify the Engineer on watch that plant is about to be secured.
2. Secure Air Ejector.
3. Close 12 lb. steam to 1st Effect.
4. Stop Tube Nest Drain Pump.
5. Open all Tube Nest Header vents wide.
6. Stop Distilling Condenser Condensate pump and Fresh Water pump.
7. Keep the following pumps running for about 15 minutes to cool off the plant: Distilling Condenser Circulating Water, Evaporator Feed and Brine pumps. Fill each glass full on each effect.
8. Close Sea Suction and Overboard Discharge valve.

#### SHOCKING AND SECURING

1. Open Air Ejector Condenser Leak-off Valve. (1" valve in the Feed Water line at the 2nd Effect Vapor Feed Heater inlet)
2. Close Feed Check valves to all 3 Effects.
3. Secure Air Ejector, both vapor and steam lines.
4. Shut down Evaporator Feed pump.