

CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY -  
MARINE ENGINEER OFFICER

EXAMINATIONS ADMINISTERED BY THE  
SCOTTISH QUALIFICATIONS AUTHORITY  
ON BEHALF OF THE  
MARITIME AND COASTGUARD AGENCY

STCW 78 as amended MANAGEMENT ENGINEER REG. III/2 (UNLIMITED)

040-36 - ENGINEERING, DRAWING AND SHIP SYSTEMS

WEDNESDAY, 12 DECEMBER 2018

1315 - 1615 hrs

Examination paper inserts:

DRG - 040  
DRG - 041  
DRG - 042  
DRG - 043  
DRG - 044

GURJINDER LABANA.  
(9646538943)

Notes for the guidance of candidates:

1. Candidates are required to obtain 50% of the total marks allocated to this paper to gain a pass AND also obtain a minimum 40% in Sections A and B of the paper.
2. Non-programmable calculators may be used.
3. All formulae used must be stated and the method of working and ALL intermediate steps must be made clear in the answer.

Materials to be supplied by colleges:

Candidate's examination workbook

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# ENGINEERING, DRAWING AND SHIP SYSTEMS

Attempt ALL questions

Marks for each part question are shown in brackets

## Section A

### 1. Piping Systems - DRG. 040

- (a) State what item 'O' is and describe its function. (2)
- (b) (i) Describe how the main engine jacket water is kept in a warm condition, when in port. (1)  
(ii) Describe the purpose of the deaerating tank alarm. (1)
- (c) Describe how to isolate the main engine air cooler for maintenance, stating whether the main engine jacket water heating can be maintained during the procedure. (4)
- (d) Describe the function of the thermostatic valves. (2)

### 2. Mechanical Assembly DRG - 041

- (a) State EACH of the following items, explaining the purpose of EACH:
  - (i) Item 31; (2)
  - (ii) Item 10; (2)
  - (iii) Item 47. (2)
- (b) State how the assembly is secured in place. (2)
- (c) State the limit of movement of the assembly when in service. (2)

3. Ship's Construction Drawing DRG - 042

- (a) State the frame numbers between which the flat side of the hull and flat bottom of the hull start. (2)
- (b) State the total number of plate sections used to form the hull around frame number 69. (2)
- (c) Explain how, from the drawing, the approximate length of the vessel between perpendiculars can be gauged. (2)
- (d) State the specification of steel used to connect the hull plating to the transom plating. (2)
- (e) State the closest proximity of a plate seam to a transverse girder. (2)

4. Hydraulic and Pneumatic System Drawings DRG - 044

- (a) Explain the function of valve blocks A1 and A2. (2)
- (b) State what type of pumps the main and servo pumps are. (2)
- (c) Explain the function of solenoids B1 and B2. (2)
- (d) Explain the function of Emergency Pushbuttons IV-1 and IV-2. (2)
- (e) Explain the function of the torque motor. (2)

5. Electrical Power Systems and Control Drawings DRG - 043

- (a) Describe the normal connection configuration between No.1 and No.2 main switchboards. (2)
- (b) Explain what EACH of the following items signify: (2)
  - (i) Item A; (2)
  - (ii) Item B; (2)
  - (iii) Item C. (2)
- (c) State what the following symbol indicates, including values: (2)



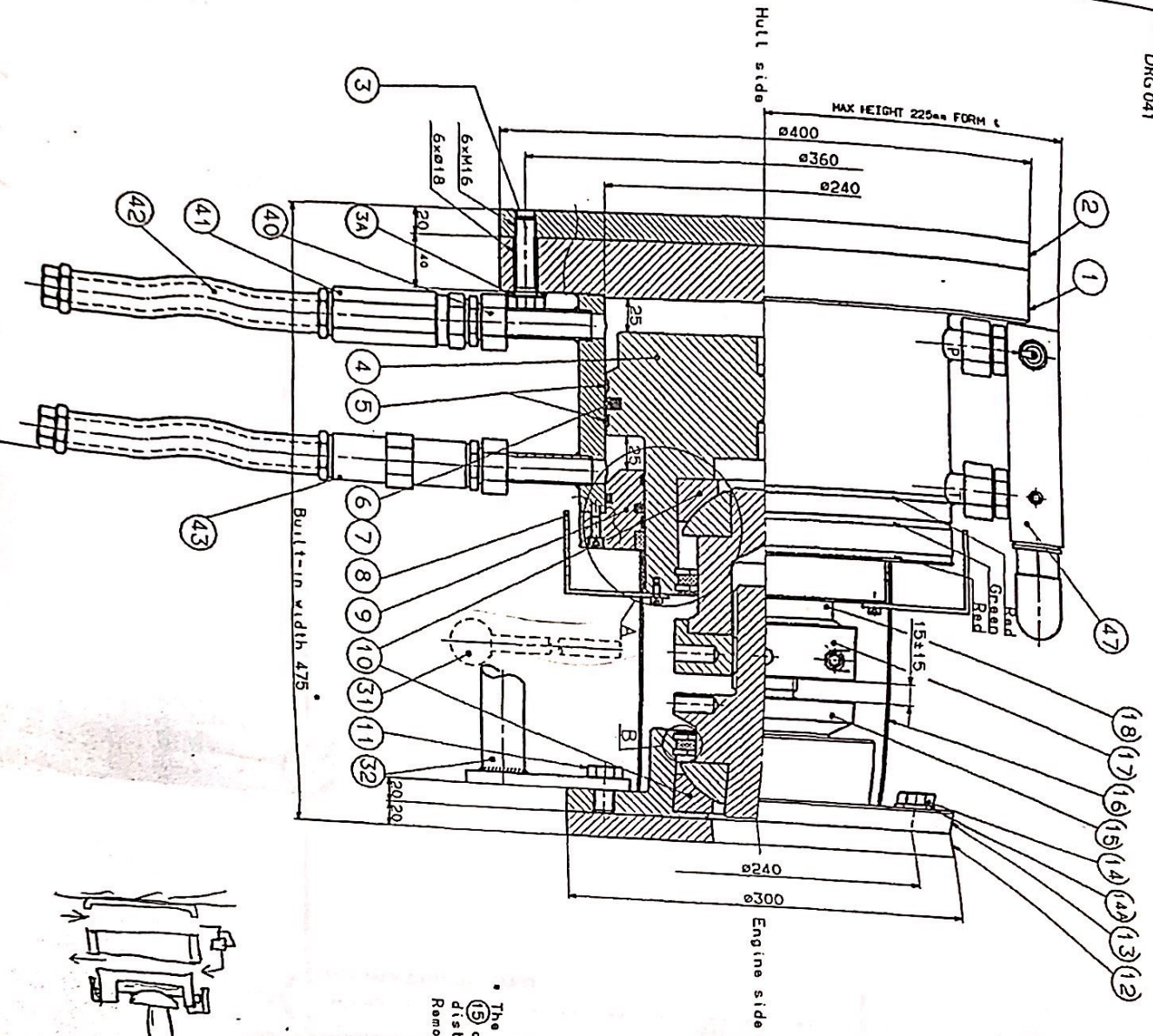
**Section B**

**6. Drawing 040**

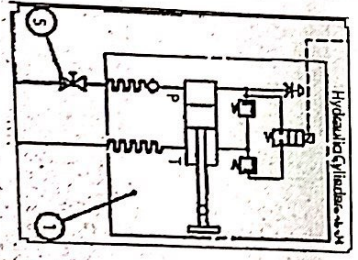
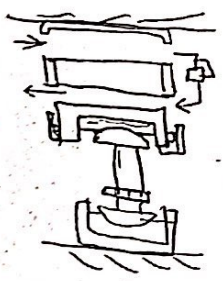
- (a) Using drawing references, explain the procedure for changing over the cooling water system from in port condition to at sea condition. The procedure should include all changes to plant configuration. (15)
- (b) When the vessel goes to sea, valve 'B1' is in the open condition. Describe the effects on the plant and regulating systems. (10)

**7. Drawing 044**

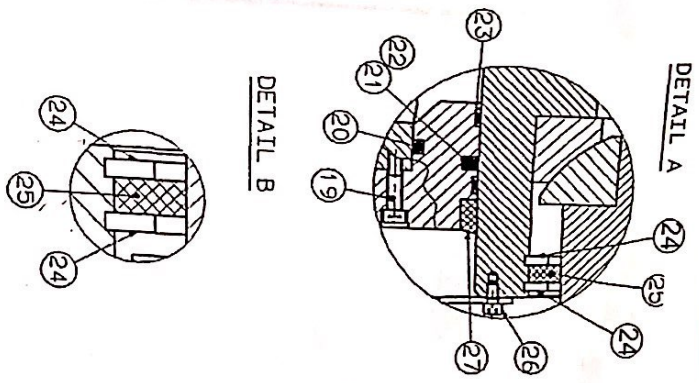
- (a) Explain, using drawing references, the normal operation of the system shown, including servo and main system oil flows and solenoid operation. (10)
- (b) With one power unit only in service, explain using drawing references, the sequence of automated actions that occur to maintain operational safety, should the running unit develop a hydraulic leak. (10)
- (c) Explain using drawing references, the actions required to operate the rudder in emergency control, should remote control of the system fail. (5)

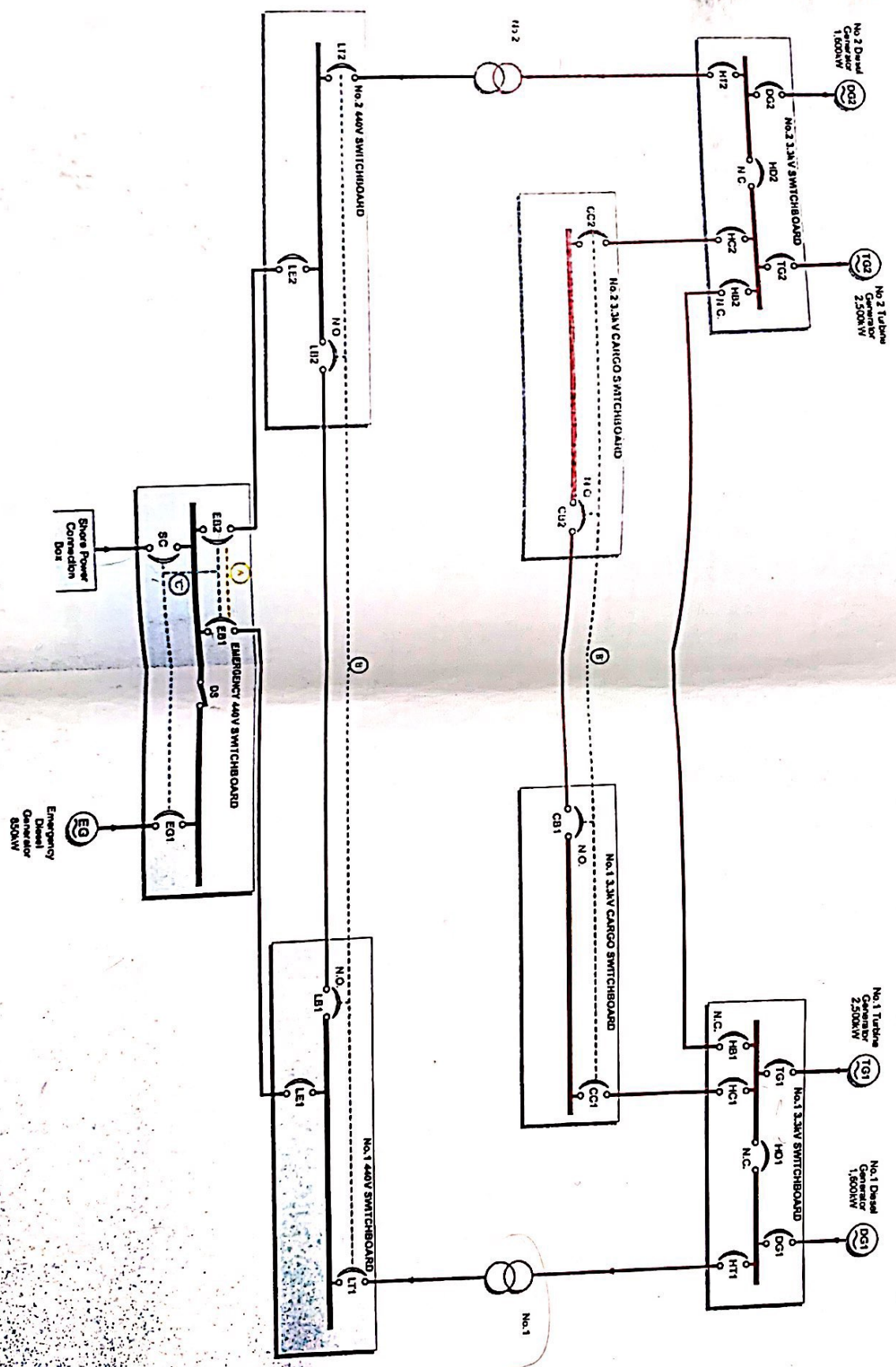


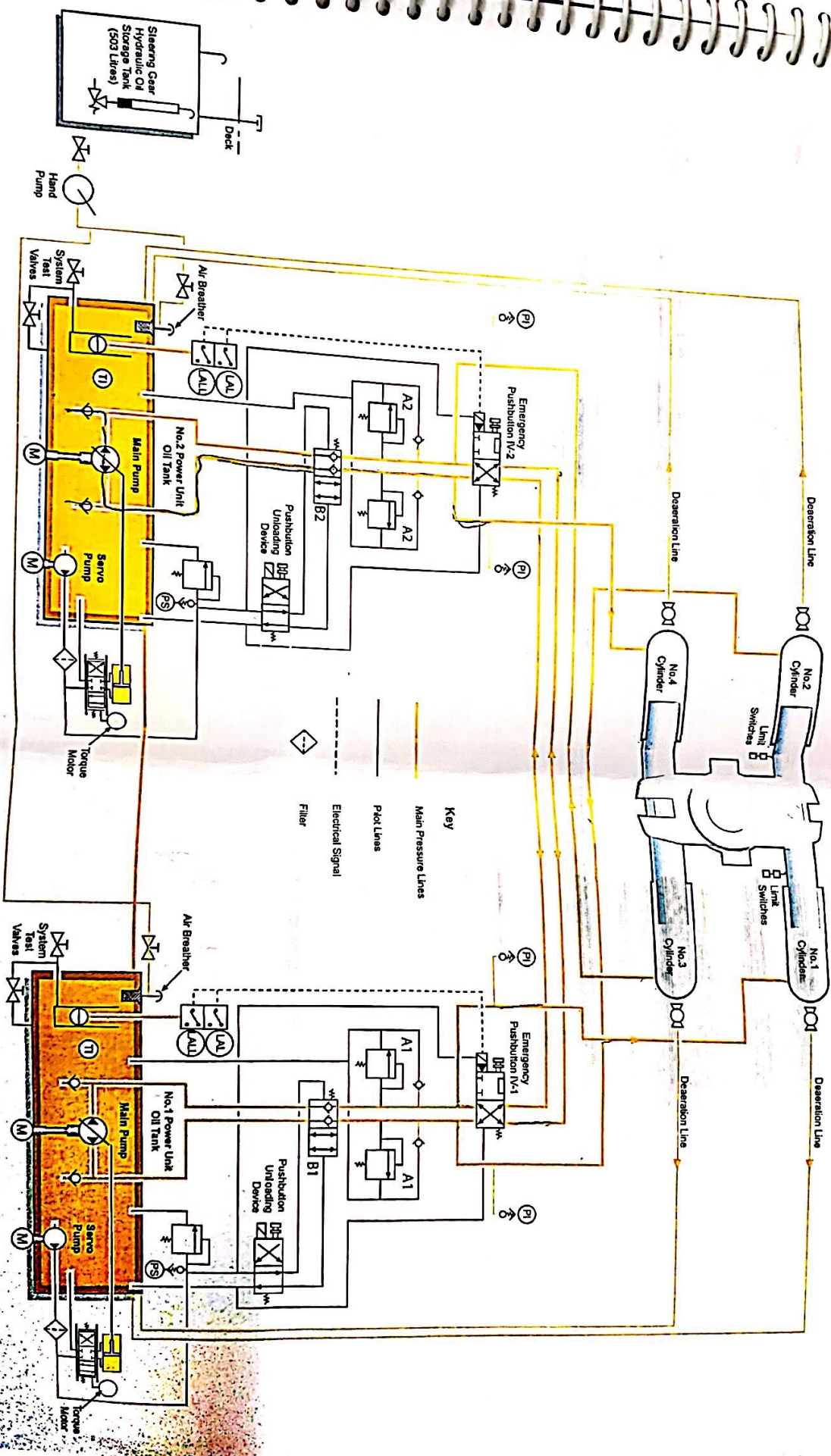
• The built-in width of 475 mm is based on 15 mm space between (15) and (17), and that the cylinder is in green position, i.e. distance between cylinder rod and cylinder top is 25 mm. Remove the transport bracket item (32) after installation.

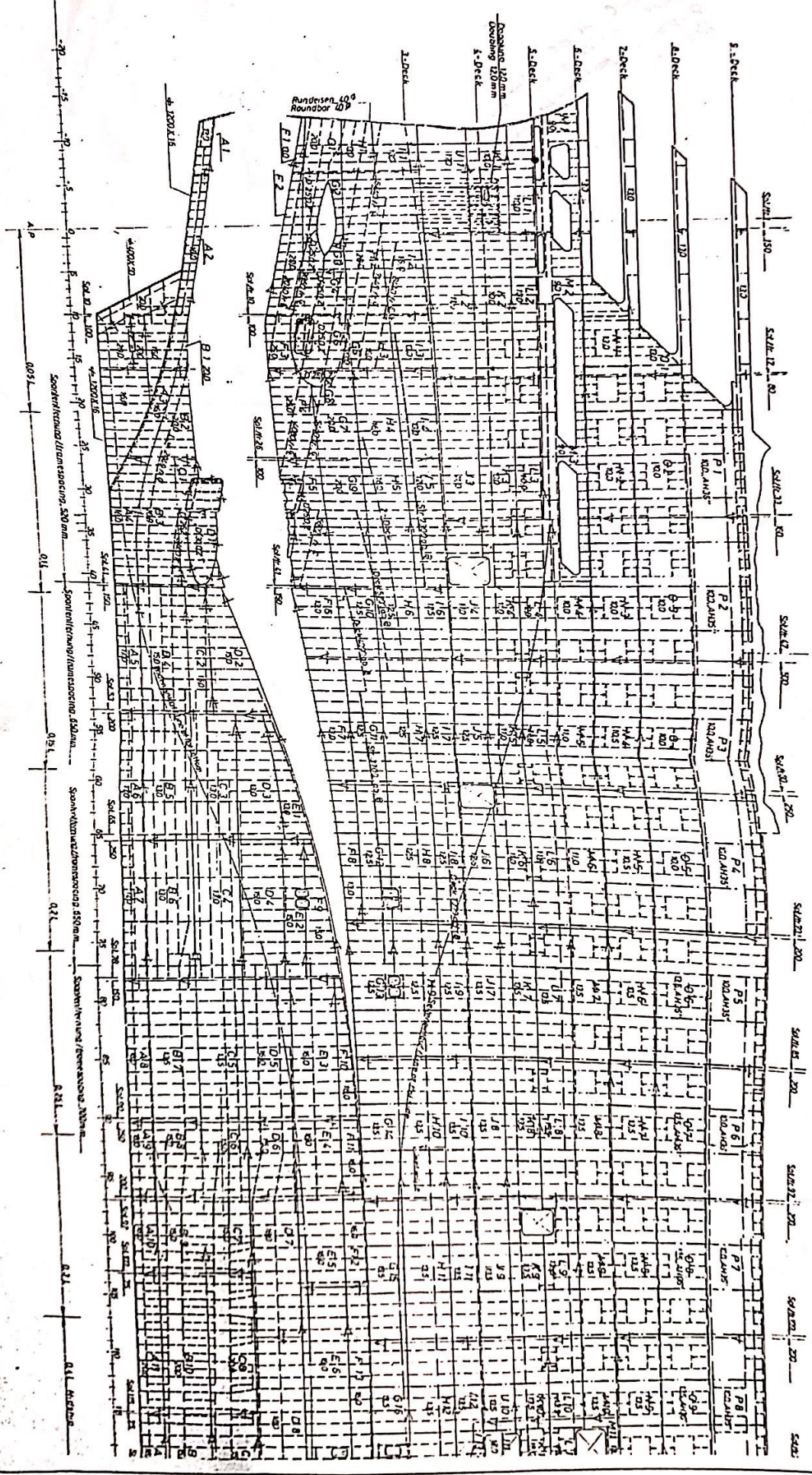


DETAIL B

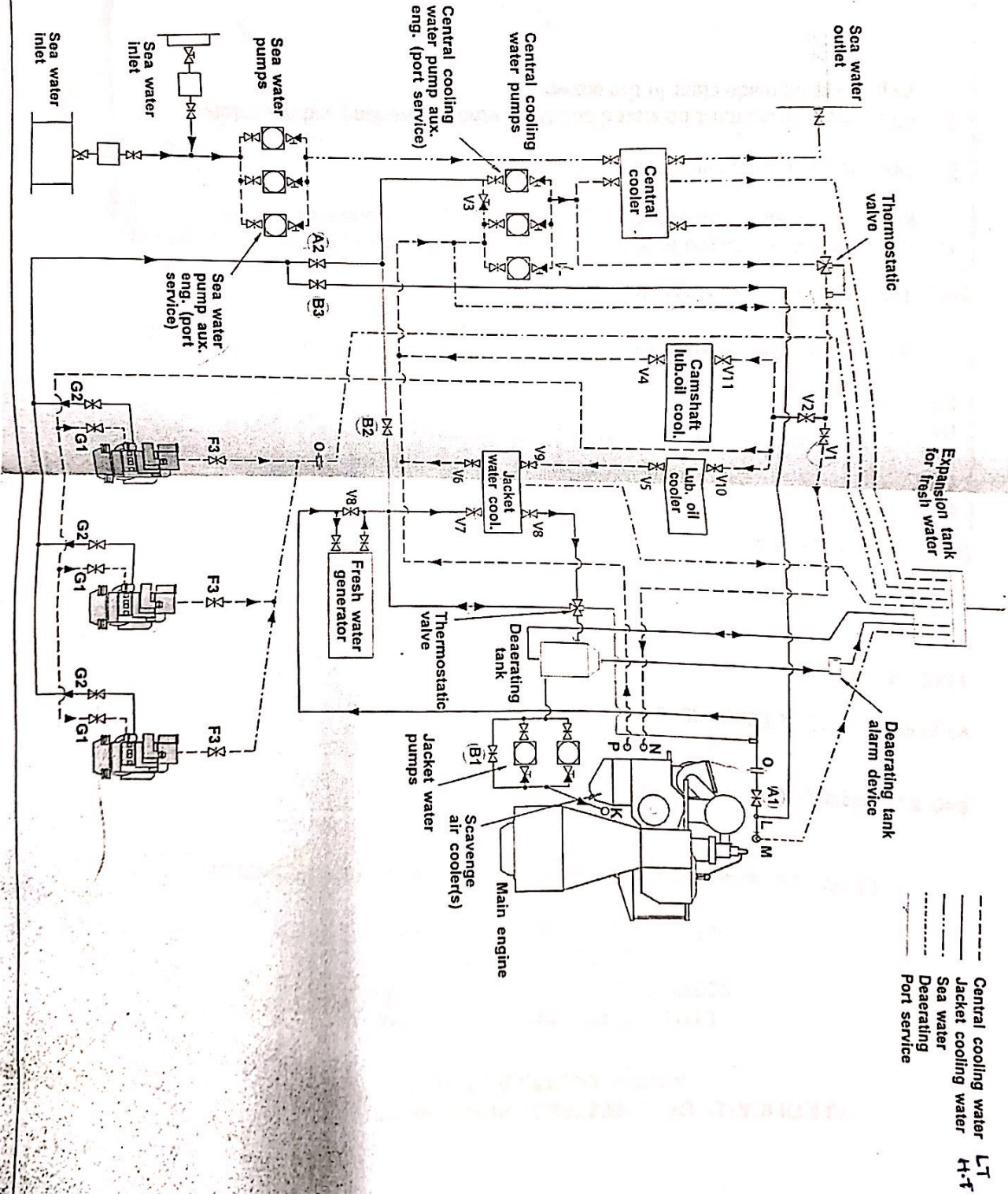












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**STCW 78 as amended MANAGEMENT ENGINEER REG. III/2 (UNLIMITED)**

**040-36 - ENGINEERING, DRAWING AND SHIP SYSTEMS**

**WEDNESDAY, 17 OCTOBER 2018**

**1315 - 1615 hrs**

Examination paper inserts:

- DRG - 050
- DRG - 051
- DRG - 052
- DRG - 053
- DRG - 054

Notes for the guidance of candidates:

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# ENGINEERING, DRAWING AND SHIP SYSTEMS

Attempt ALL questions

Marks for each part question are shown in brackets

## Section A

### 1. Piping Systems - DRG - 050

- (a) State the following device, describing its function. (2)



- (b) Identify the valve actuated by the OMD unit to prevent overboard discharge, should the oil content be above 15 ppm. (2)

- (c) Explain the options available for pumping E.R. bilges, including where they can be pumped to. (3)

- (d) Explain the options available for lowering of the bilge holding tank, including where it can be lowered to and state what the normal operating procedure for lowering the tank would be. (3)

### 2. Mechanical Assembly DRG - 051

- (a) State what item '31' is, and explain its purpose. (2)

- (b) State the item numbers of the casing seal rings and explain the purpose of each. (2)

- (c) State the item numbers of the casing sections that make up the pump assembly. (2)

- (d) State what type of pump is illustrated and what is the benefit of this type of assembly. (2)

- (e) State where this type of pump may be used and explain why. (2)

[OVER

3. Ship's Construction Drawing DRG - 052

- (a) State the frame numbers between which the flat side of the hull and flat bottom of the hull start. (2)
- (b) State the maximum sounding of the forepeak tank. (2)
- (c) State the approximate diameter of the bow thrust tunnel, explaining how this was ascertained. (2)
- (d) State the thickest plate section evident on the drawing and identify its location. (2)
- (e) Explain what '(p-only)' repeated along the base line indicates. (2)

4. Hydraulic and Pneumatic System Drawings DRG - 053

- (a) Explain the function and operation of the rotary servo. (2)
- (b) Describe the operation of item 'K' when the system is functioning normally. (2)
- (c) Explain the function of valve block 'H'. (2)
- (d) Describe the pumps used in the system. (2)
- (e) Explain the oil flow path used to remove the excess heat generated in the system when operating. (2)

5. Electrical Power Systems and Control Drawings DRG - 054

- (a) Explain, using drawing references, the normal configuration of the switchboard supply breakers, detailing which breakers would normally be closed and which would normally be open. (3)
- (b) Explain the difference between the galley substation transformers and the accommodation substation transformers. (2)
- (c) State the function of the 400 v and 230 v substation interconnection breakers, identifying when they are used. (2)
- (d) Explain how the distribution network would be set up, to enable both port and starboard shore connections to be used in parallel. Assume the aft lounge, main theatre and thrusters etc. would not be supplied, but the engine room sub stations would. (3)

**Section B**

6. Drawing 052

During a dock inspection, two indentations in the ship's hull have been noted.

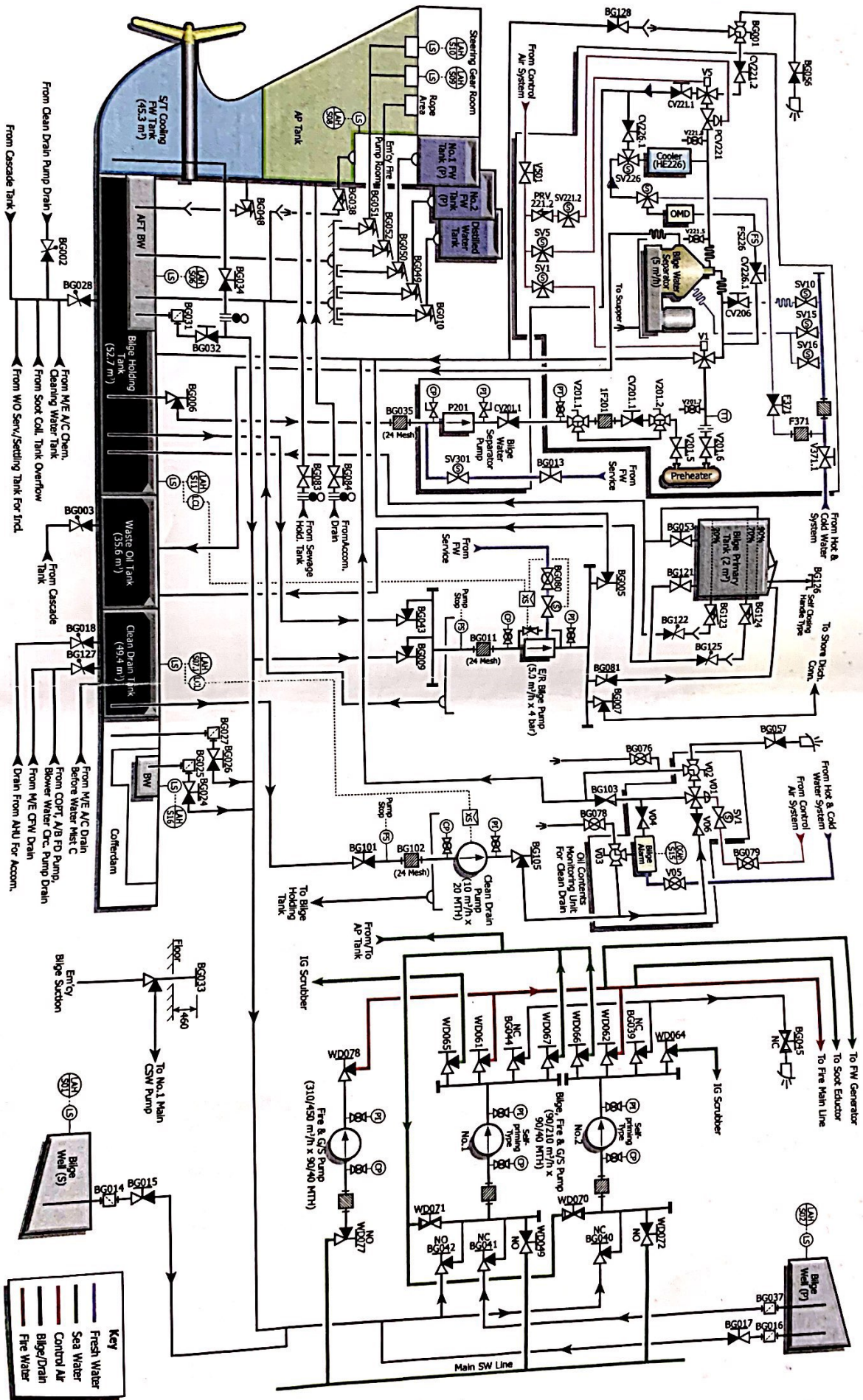
(a) The first indentation is approximately 300 mm deep and is located between frames 136 and 140 and longitudinal 35 and 37. State the approximate size of the area of plate required to repair the damage, the specification of steel, and describe what complications involved in the repair are evident from the drawing. (15)

(b) The second indentation is also approximately 300 mm deep and is located between frames 104 and 105 and longitudinal 49 and 51. State the area of plate required for repair, specification of the plate and describe any complications that are evident from the drawing. (10)

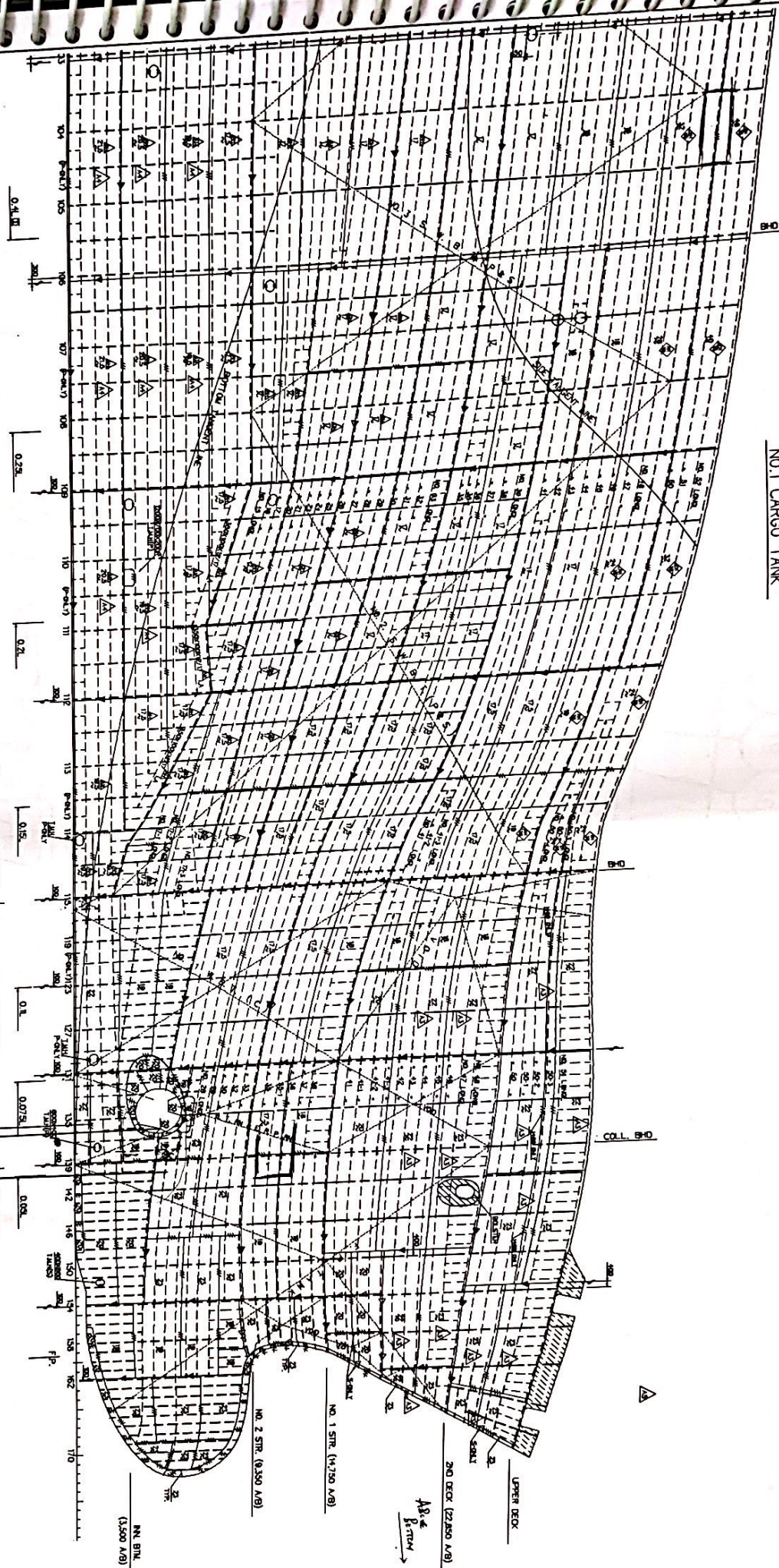
7. Drawing 053

(a) Explain the operation of the system shown. Explanation should include identification pumps that supply flow to solenoids and process of activation of different required actions and automated actions. (15)

(b) Explain emergency actions required and operation of system should automated operation of system fail. (10)



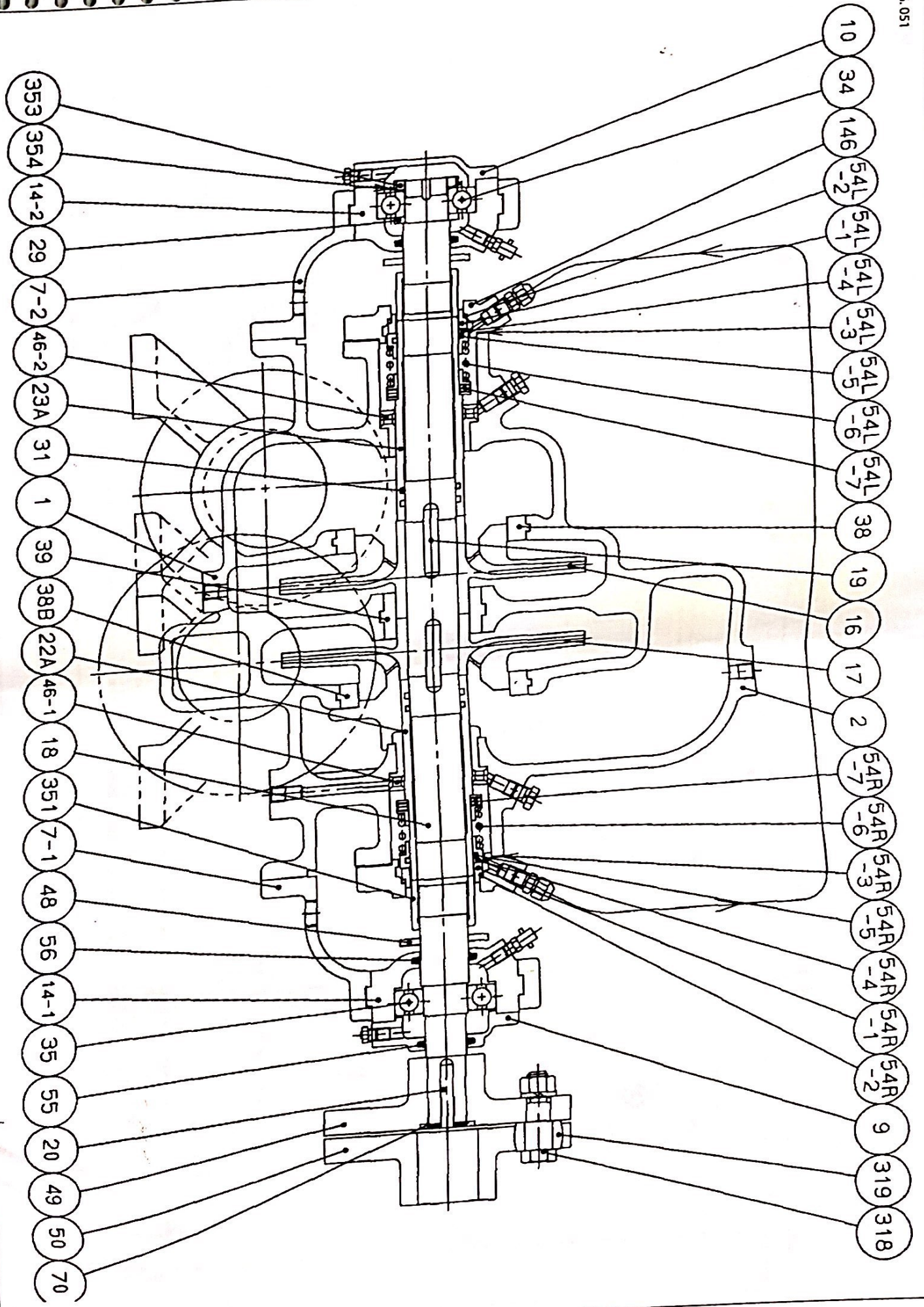
NO. 1 CARGO TANK



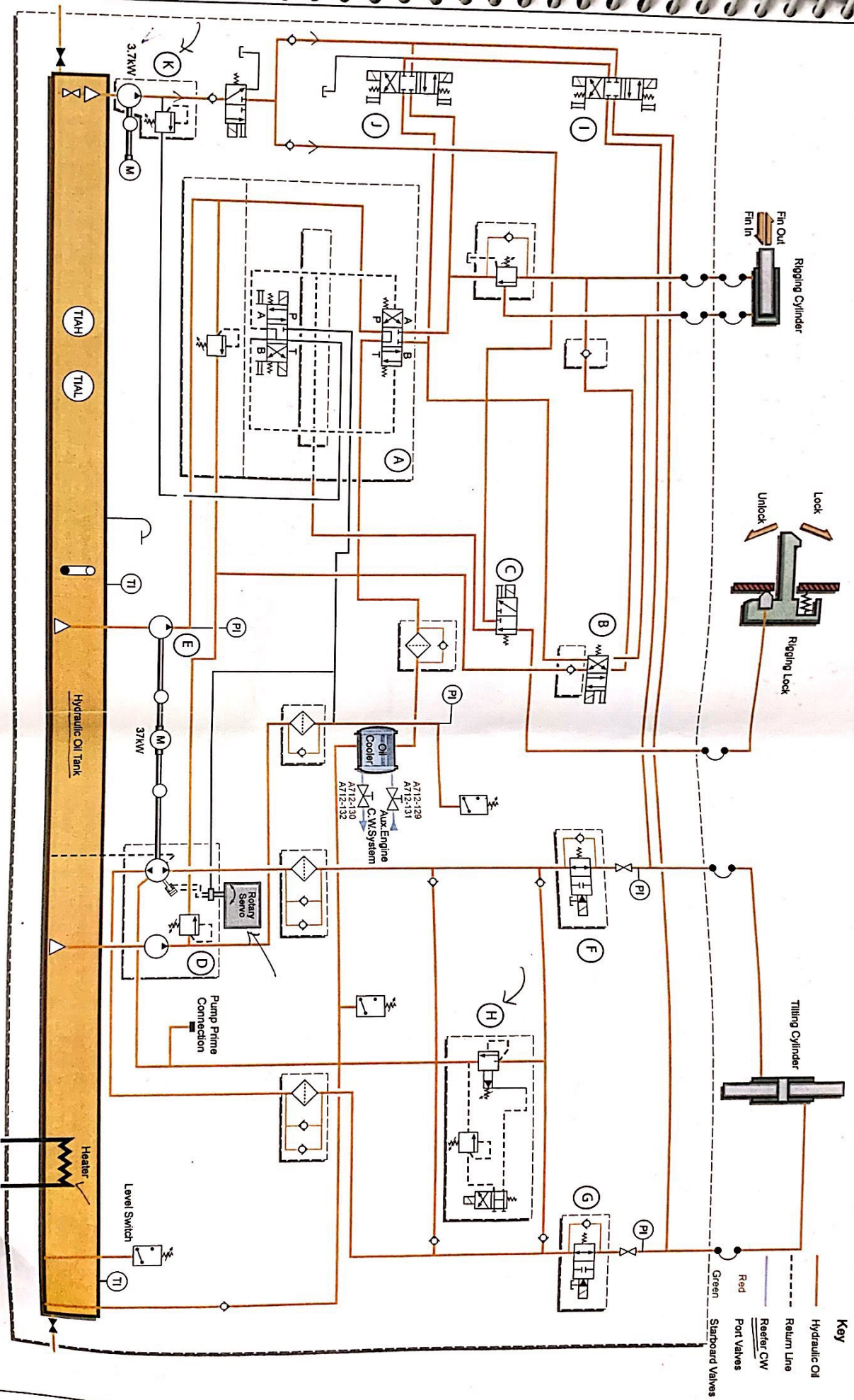
SS : SEE WAGESHIP SECTION (H-7000-201)	L. NO. 50 - 52 : 400X140 F.B	L. NO. 50 - 52 : 400X132 F.B	L. NO. 50 - 52 : 400X72 F.B	L. NO. 50 - 51 : 425X111-150X118 F.B(T)	L. NO. 48 - 51 : 425X111-400X118 F.B(T)
	L. NO. 47 - 48 : SEE WAGESHIP SECTION (H-7000-201)	L. NO. 47 - 48 : 400X100X118 I.A	L. NO. 47 - 48 : 400X100X118 I.A	L. NO. 42 - 48 : 475X111-150X118 F.B(T)	L. NO. 41 - 43 : 425X111-150X118 F.B(T)
	L. NO. 41 - 46 : SEE WAGESHIP SECTION (H-7000-201)	L. NO. 35 - 39 : 350X100X117 I.A	L. NO. 27 - 31 : 400X100X118 I.A	L. NO. 37 - 39 : 300X80X117 I.A	L. NO. 29 - 36 : 350X100X117 I.A
	L. NO. 15 - 28 : 400X100X118 I.A	L. NO. 15 - 28 : 400X100X118 I.A		L. NO. 28 - 28 : 400X100X118 I.A	

PLUS SFT TIE BRACKETS ON EACH SIDE OF THE WAGES.

BRIG LOWER : 425X111-400X118 F.B(T)







**Key**  
Hydraulic Oil  
Return Line  
Reeler CW  
Port Valves  
Starboard Valves

