

**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, SYSTEMS AND SHIP'S DRAWINGS**

**WEDNESDAY, 29 MARCH 2017**

**1315 - 1515 hrs**

Examination paper inserts:

DRG - 001  
DRG - 002  
DRG - 003  
DRG - 004  
DRG - 011

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

## ENGINEERING, SYSTEMS AND SHIP'S DRAWINGS

Attempt ALL questions

Marks for each part question are shown in brackets

### Section A

#### 1. Piping Systems - DRG - 001

- (a) Explain the purpose of EACH temperature regulating valve in the system shown. (2)
- (b) State the pipe specification used for the main engine jacket water inlet. (2)
- (c) Describe the fitting requirement for all horizontal sections of pipe running to the expansion tank, stating the reason for this requirement. (2)
- (d) Describe the options available for maintaining main engine jacket water in a warm condition when in port, stating, with reasons, the preferred option. (4)

#### 2. Mechanical Assembly - DRG - 002

- (a) Describe the type of shaft seal arrangement used on the pump. (2)
- (b) State what type of impeller is fitted to the pump. (2)
- (c) Describe item 46, stating its purpose. (2)
- (d) Describe item 48, stating its purpose. (2)
- (e) Describe the main casing sections which make up the pump assembly. (2)

#### 3. Ship's Construction Drawing - DRG - 003

- (a) State the dimensions of the plate sections on the flat bottom of the hull mid-ship. (2)
- (b) Identify the longitudinal girders between which the pipe tunnel runs. (2)
- (c) Identify, using drawing references, the location of No.3 double bottom tank. (2)
- (d) State the frame number at which you would expect the bilge keel to stop. (2)
- (e) State what the hull plate thickness is at the sheer strake. (2)

4. Hydraulic and Pneumatic System Drawings - DRG - 004

(a) Describe EACH of the following devices, stating the function of EACH:

(i)



(2)

(ii)



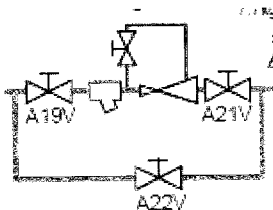
(2)

(iii)



(2)

(iv)



(2)

(b) If fuel and lubricating oil purifier alarms activated and air can be heard escaping in the engine room, identify the valve that should be checked to ensure it was in the closed position.

(2)

5. Electrical Power Systems and Control Drawings - DRG - 011

(a) State the purpose of the circuit shown.

(2)

(b) State the type of device and its function for EACH of the following:

(i) C29

(2)

(ii) T1

(2)

(c) State what type of neutral the vessel uses.

(2)

(d) State what type of excitation is used.

(2)

## Section B

### 6. Piping Systems Drawing - DRG - 001

- (a) Describe how the cooling system valves should be set up, including flow paths, in order to use the generator jacket water to maintain the main engine in a warm condition in port. (10)
- (b) Describe the effect on the system, and any impact on other controllers, if the HT temperature regulating valve were to stick in the HT cooler full open position, when the vessel is in port. (15)

### 7. Ship Construction Drawing - DRG - 003

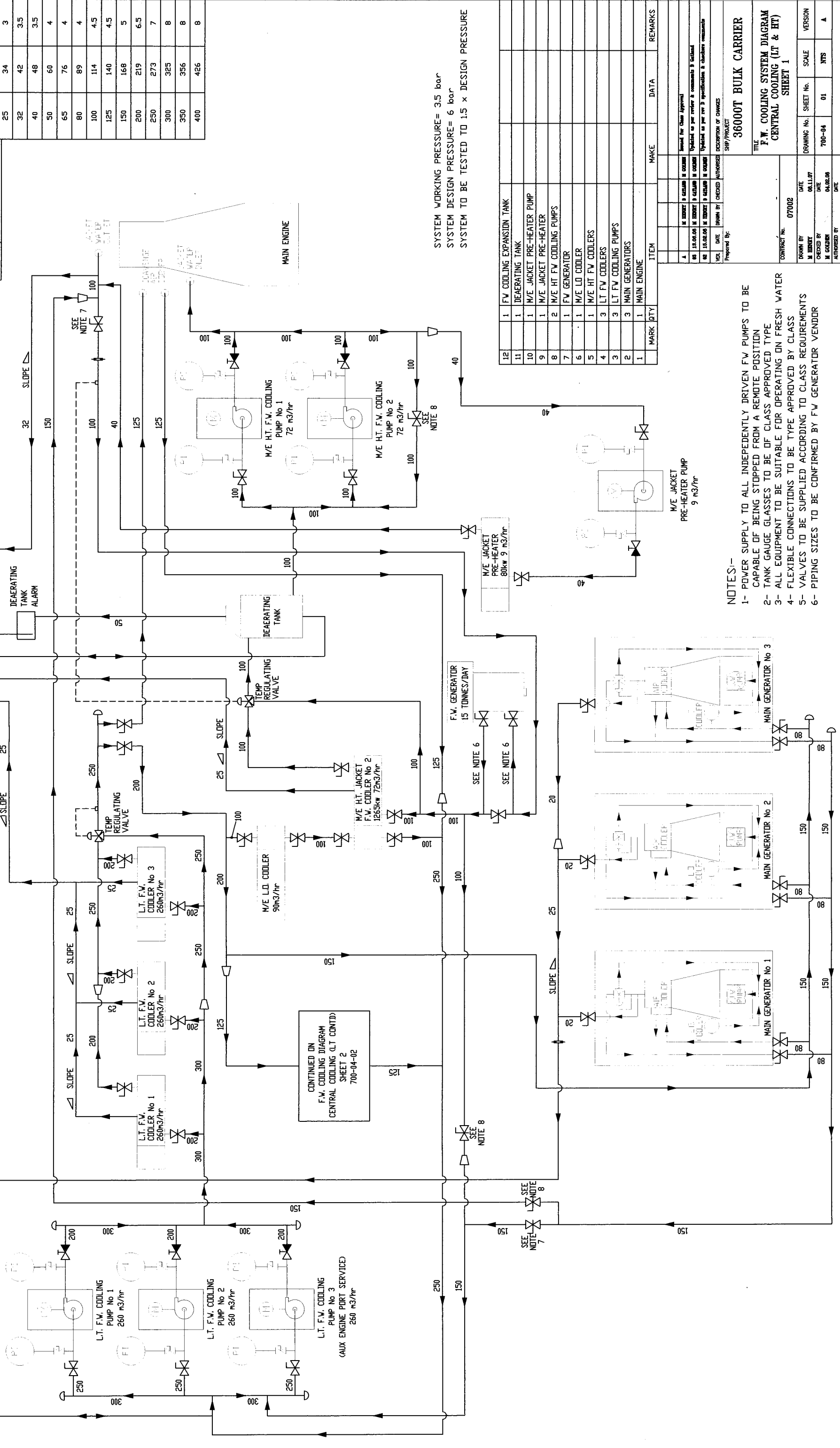
On inspection in dry dock, two sections of damage were found on the ship's hull, which have been identified on the shell expansion plan.

- The first was an indentation approximately 75mm deep extending approximately 700mm long x 700mm wide. Identified on the drawing as 'A'.
- The second was an indentation approximately 200mm deep extending approximately 1400mm long x 1400mm wide. Identified on the drawing as 'B'.

- (a) Using drawing references, identify the location of both areas of damage. (4)
- (b) State, with reasons, the sections requiring repair, describing all steel involved in the repair, including any specifications, along with any complications. (21)

(DRG. 001)

SYMBOLS		Material & size of Piping	
		Seamless Copper	
		Nominal Diameter (mm)	Wall Thickness (mm)
		8	1.2
		10	1.2
		12	2
		Galvanised Seamless Steel	
		15	3
		20	3
		25	3
		32	3.5
		40	3.5
		50	4
		65	4
		80	4
		100	4.5
		125	4.5
		150	5
		200	6.5
		250	7
		300	8
		350	8
		400	8



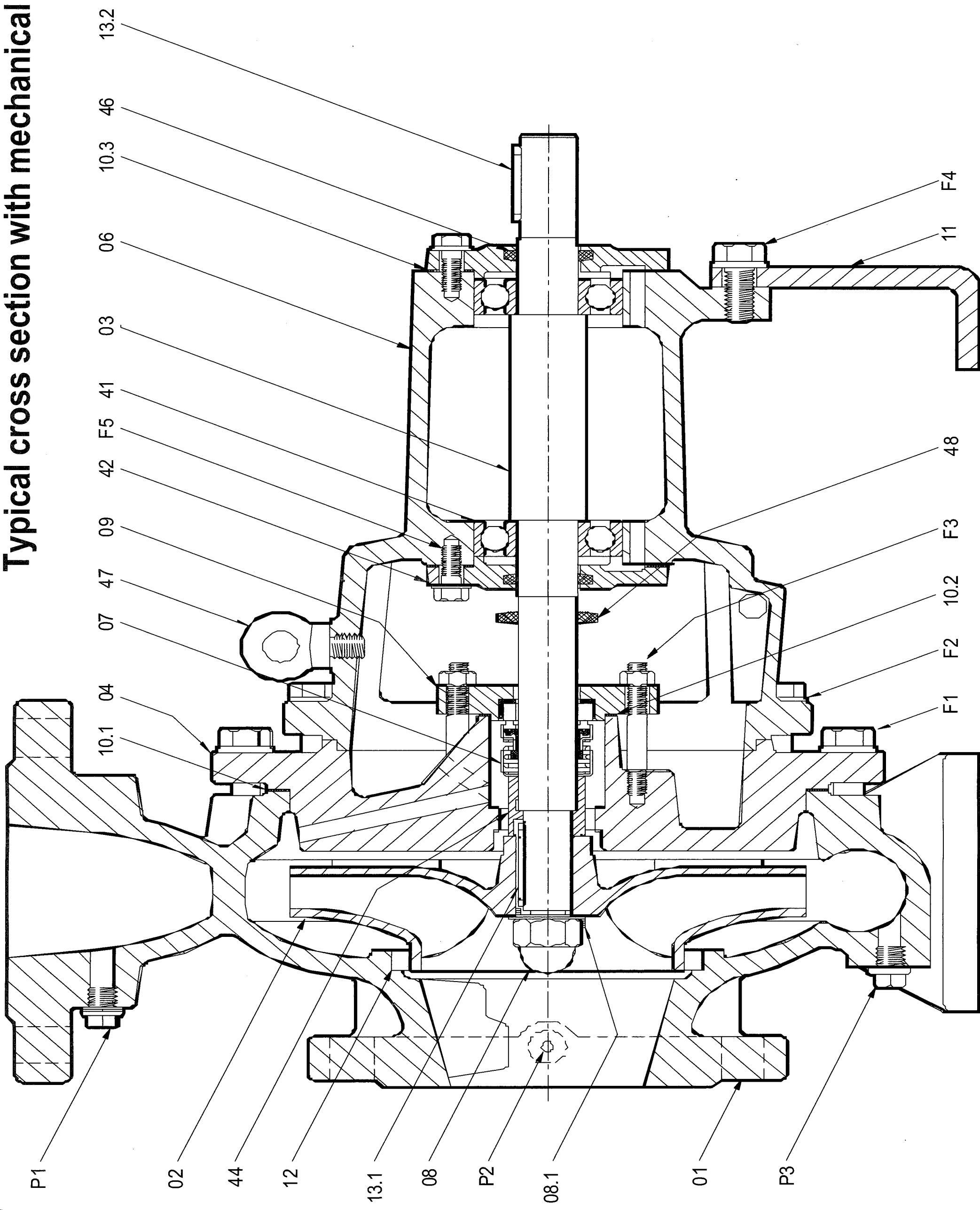
SYSTEM WORKING PRESSURE= 3.5 bar  
 SYSTEM DESIGN PRESSURE= 6 bar  
 SYSTEM TO BE TESTED TO 1.5 x DESIGN PRESSURE

MARK	QTY	ITEM	MAKE	DATA	REMARKS
12		1 F.W. COOLING EXPANSION TANK			
11		1 DEAERATING TANK			
10		1 M/E JACKET PRE-HEATER PUMP			
9		1 M/E JACKET PRE-HEATER			
8		2 M/E HT F.W. COOLING PUMPS			
7		1 F.W. GENERATOR			
6		1 M/E L.D. COOLER			
5		1 M/E HT F.W. COOLERS			
4		3 LT F.W. COOLERS			
3		3 LT F.W. COOLING PUMPS			
2		3 MAIN GENERATORS			
1		1 MAIN ENGINE			

SHIP/PROJECT		36000T BULK CARRIER	
TITLE			
F.W. COOLING SYSTEM DIAGRAM			
CENTRAL COOLING (LT & HT)			
CENTRAL SHEET 1			
CONTRACT No.	07002	DRAWING No.	700-04
DRAWN BY	M. SURESH	CHECKED BY	M. SURESH
DATE	08.11.07	DATE	04.08.08
APPROVED BY	J. RAO	DATE	08.07.08
VERSION		SCALE	
NTS	01	NTS	A
COURTESY IN VALUABLES			

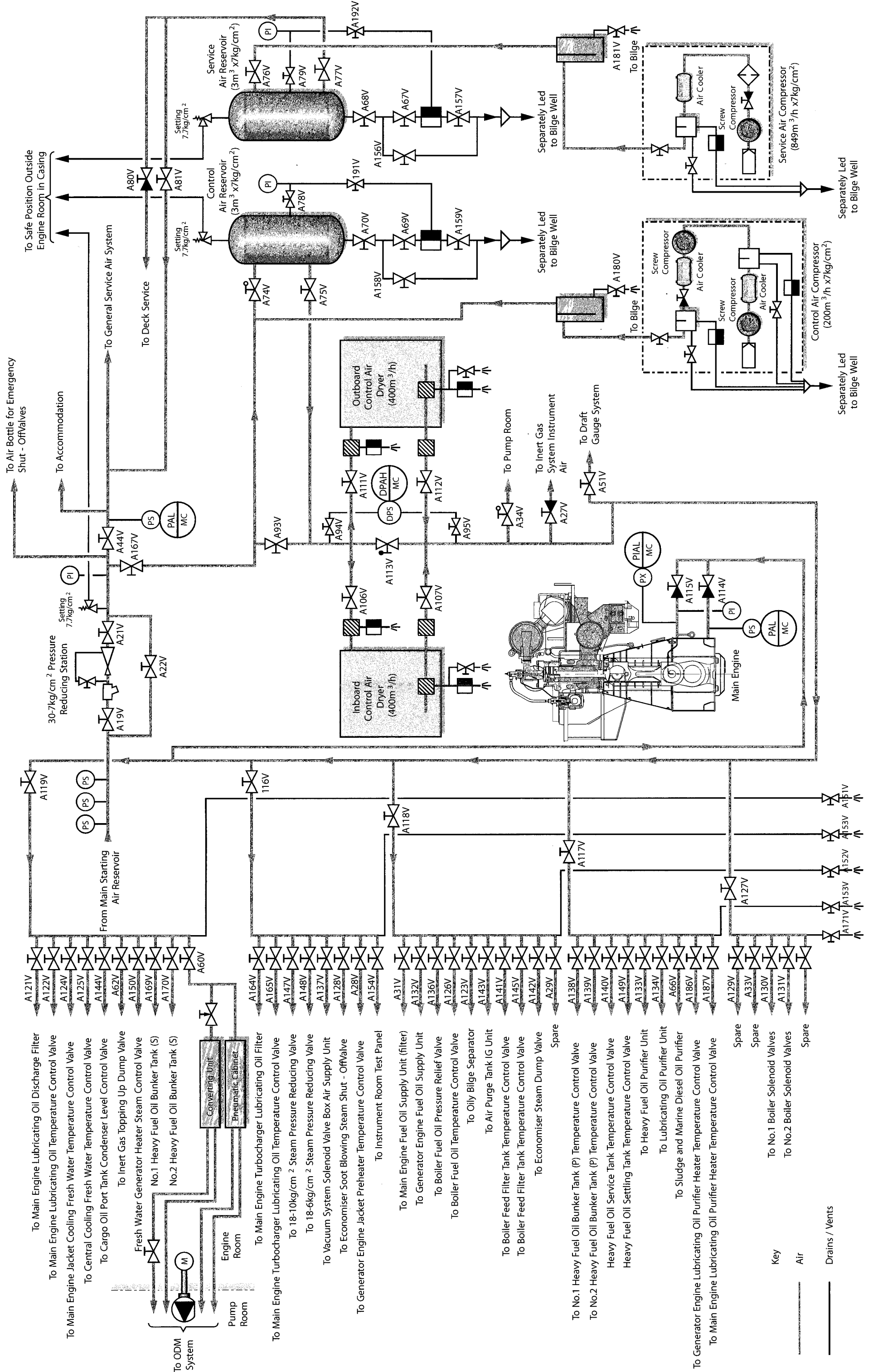
- NOTES:-
- 1- POWER SUPPLY TO ALL INDEPENDENTLY DRIVEN F.W. PUMPS TO BE CAPABLE OF BEING STOPPED FROM A REMOTE POSITION
  - 2- TANK GAUGE GLASSES TO BE OF CLASS APPROVED TYPE
  - 3- ALL EQUIPMENT TO BE SUITABLE FOR OPERATING ON FRESH WATER
  - 4- FLEXIBLE CONNECTIONS TO BE TYPE APPROVED BY CLASS
  - 5- VALVES TO BE SUPPLIED ACCORDING TO CLASS REQUIREMENTS
  - 6- PIPING SIZES TO BE CONFIRMED BY F.W. GENERATOR VENDOR

# Typical cross section with mechanical seal





(DRG 004)



Key  
Air  
Drains / Vents



