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, 13 DECEMBER 2017

1315 - 1615 hrs

Examination paper inserts:

DRG – 020
DRG – 021
DRG – 022
DRG – 030
DRG - 038

Notes for the guidance of candidates:

1. Non-programmable calculators may be used.

2. 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:

ENGINEERING, DRAWING AND SHIP SYSTEMS

Attempt ALL questions

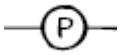
Marks for each part question are shown in brackets

Section A

1. Piping Systems - DRG. 020

   Describe the device, stating its functions for EACH of the following symbols:

   (a)  (2)

   (b) 

(2)

   (c)  (2)

   (d) 

(2)

   (e) 

(2)

2. Mechanical Assembly – DRG 021

   (a) State the device and describe the function of 503; (2)

   (b) State the device and describe the function of 235; (2)

   (c) State the device and describe the function of 020; (2)

   (d) Identify the main casing sections that make up the pump assembly. (4)

3. Ship's Construction Drawing – DRG 022

(a) State the frame numbers at which the fore and aft engine room bulkheads are located. (2)

(b) Identify, using frame numbers, the start of the flat bottom of the hull. (2)

(c) State the depth of the double bottom tanks in the engine room. (2)

(d) State the specification of the main plate sections used on the flat bottom of the hull ford between frame 40 and 54. (2)

(e) State the maximum sounding of the aft peak W.B. tank. (2)

4. Hydraulic and Pneumatic System Drawings – DRG 030

(a) Describe the following device, stating its function: (2)

(b) Describe the location of any pressure alarms on the control air system. (2)

(c) Detail the possible sources of supply for the control air system. (2)

(d) Whilst at sea, the control air pressure low alarm sounds. The fault identified is a leaking safety valve on the control air bottle. Detail the actions required to allow continuous operation of the propulsion plant, whilst repairs are carried out. (4)

5. Electrical Power Systems and Control Drawings – DRG 038

(a) Describe item 'A', identified on the drawing. (2)

(b) State the purpose of air circuit breakers B and C. (2)

(c) On the main and emergency switchboards, both 440 V and 220 V, name the distribution breakers that should remain closed during normal operation, and those that should remain open. (6)

Section B

6. Drawing 022.

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

(a) The first section, 'A', was found to be 300 mm deep.

(i) Using drawing references, identify the location and approximate dimensions of the damaged section. (5)

(ii) State what steels are involved in the repairs, and what complications are evident from the drawing (10)

(b) The second section, 'B', was found to be 200 mm deep.

(i) Using drawing references, identify the location and approximate dimensions of the damaged section. (5)

(ii) State what steels are involved in the repairs, and what complications are evident from the drawing. (5)

7. Drawing 020.

(a) Describe the flow path and valve configuration required to enable all generators to run on HFO. (15)

(b) Describe the procedure, including flow path and change of valve configuration, required to change over No.2 generator to MDO, when all generators are currently set up to run on HFO. (10)

SCOTTISH QUALIFICATIONS AUTHORITY
MARKERS REPORT FORM

SUBJECT: 040-36

DATE: 20-12-2017

General Comments on Examination Paper

Candidates should take care to ensure their answers are legible, or they may miss out on valuable marks. If a candidate wishes 95% of a page to be ignored by scoring out from top to bottom with several lines, (one is sufficient), to ensure the remaining couple of lines of undeleted script are included in the assessed answer, the presentation would be greatly improved if the remaining small amount of text is rewritten in a properly composed answer, starting on another page. The time in this exam is required to study the drawings, the text required to answer the questions should not prove too onerous, or take too much time.

General Comments of Specific Examination Questions

Q1. A straight forward question, well answered by most candidates.

Q2. This was a simple drawing, however several candidates could not identify the devices or their function. In part 'd' the question asked to identify the casing sections that make up the pump assembly, so to identify the shaft, bearings, impeller etc. was not what was requested, and simply to write down all the part numbers identified on the drawing in the belief that the casing sections must be in there somewhere, will not get the required marks.

Q3. Some candidates still struggle with shell expansion drawings, with some not attempting this question. The fact that the same drawing was used in section 'B' caused a problem for these candidates to gain sufficient marks to pass the exam. Those that had studied shell expansions, did reasonably well.

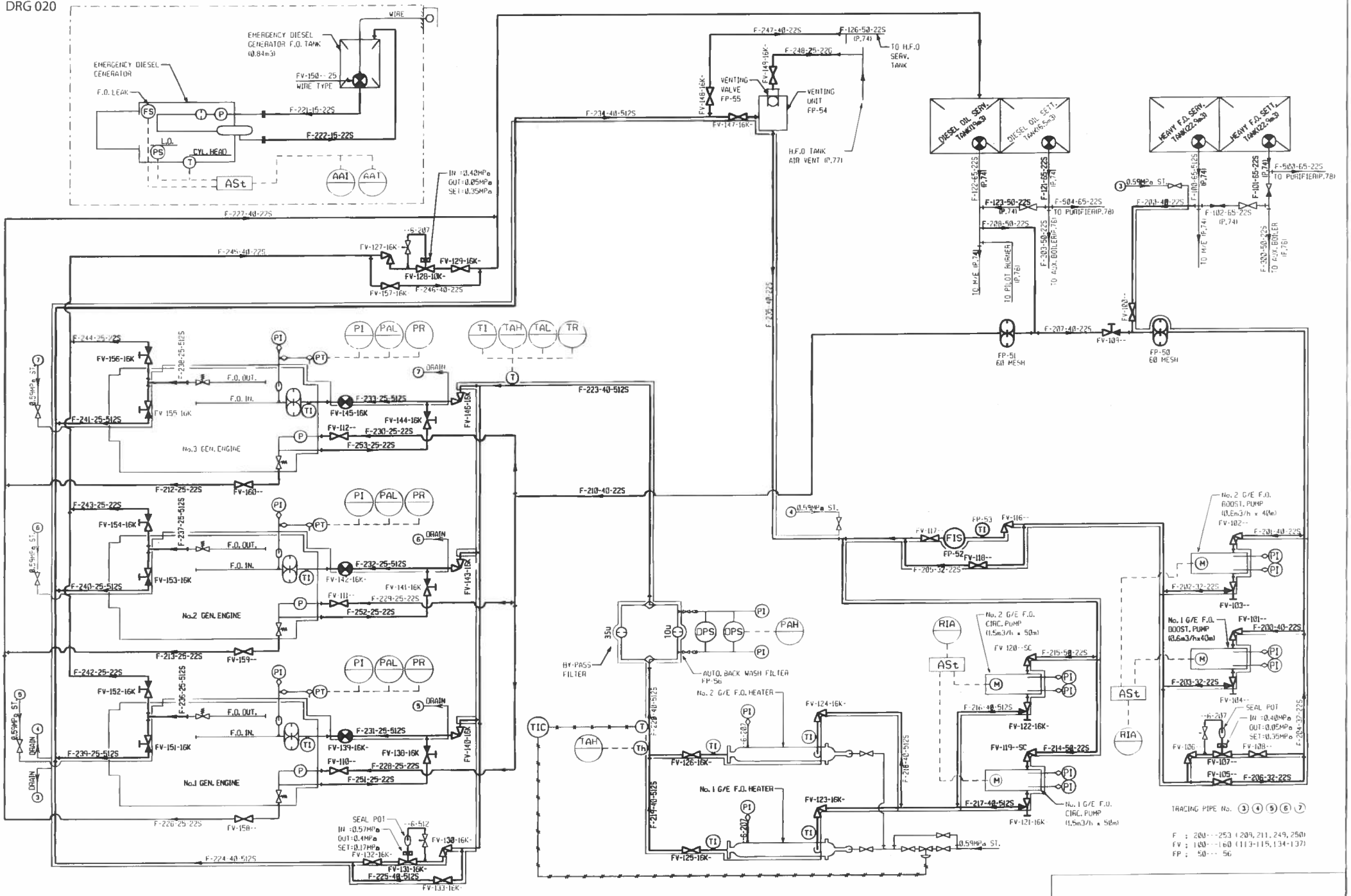
Q4. A straight forward question, well answered by most candidates.

Q5. Most candidates got reasonable marks for this question, however there was little structure to most answers for section 'C', with some candidates unable to complete it.

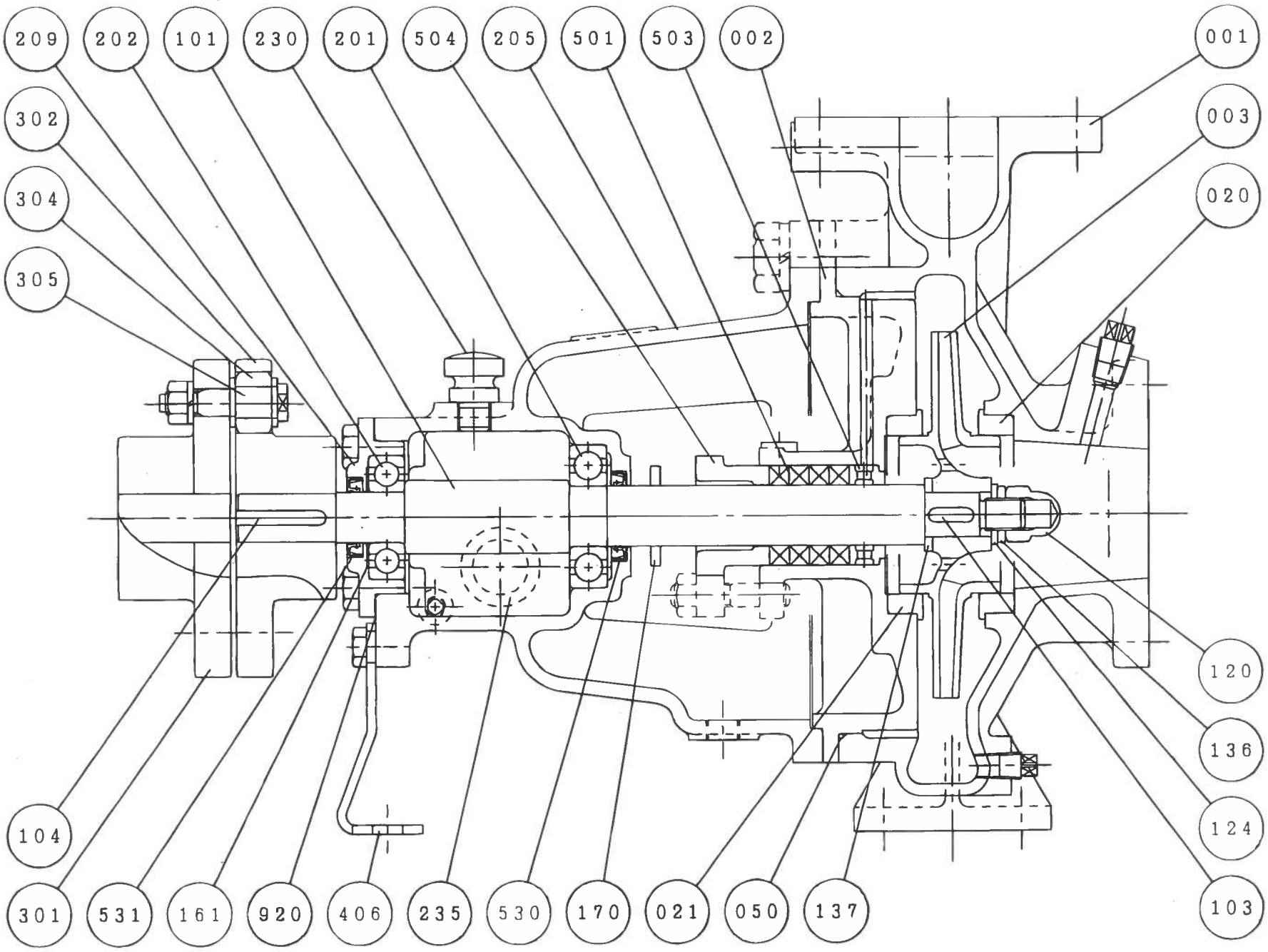
Q6. The candidates who struggled with this drawing in section 'A', obviously struggled with this question also, however the remainder answered it reasonably well. The approximate size of the area of damage was generally judged incorrectly, and the required forming of the plate sections was ignored by many.

Q7. The fuel oil system from tank to the generators was understood by most candidates, however the flow through the generator was confused by several, with many not mentioning the pressure regulating systems. In part 'b' many candidates closed the HFO inlet before opening the MDO, with a few closing both permanently, stating that the MDO went straight out via the pressure regulating valve. Several candidates merely stated a new valve configuration and did not give the change-over procedure requested in the question.

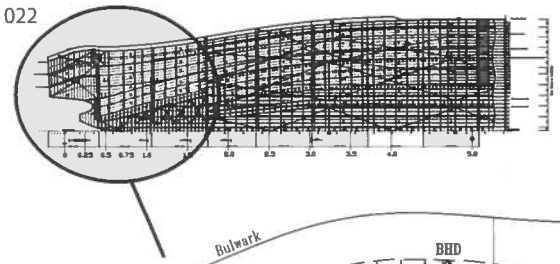
DRG 020


EMERGENCY DIESEL GENERATOR F.O. TANK (0.84m3)
EMERGENCY DIESEL GENERATOR
F.O. LEAK
FV-150--25 WIRE TYPE
WIRE
F-221-15-22S
F-222-15-22S
L.O.
CYL. HEAD
ASt
AAI
AAT
IN =0.40MPa
OUT=0.05MPa
SET=0.35MPa
F-227-40-22S
F-245-40-22S
FV-127-16K-
FV-128-10K-
FV-129-16K-
FV-157-16K
F-246-40-22S
F-247-40-22S
F-126-50-22S (P.74)
TO H.F.O SERV. TANK
F-248-25-22S
VENTING VALVE FP-55
VENTING UNIT FP-54
H.F.O TANK AIR VENT (P.77)
F-234-40-512S
FV-146-16K-
FV-147-16K-
FV-149-16K-
DIESEL OIL SERV. TANK(1.5m3)
DIESEL OIL SETT. TANK(6.5m3)
HEAVY F.O. SERV. TANK(22.0m3)
HEAVY F.O. SETT. TANK(22.0m3)
F-122-65-22S (P.74)
F-121-65-22S (P.74)
F-123-50-22S (P.74)
F-504-65-22S TO PURIFIER(P.78)
F-200-50-22S
TO M/E (P.74)
TO PILOT MANIFOLD (P.76)
F-303-50-22S TO AUX. BOILER(P.76)
0.59MPa ST.
F-200-40-22S
F-102-65-22S (P.74)
F-100-65-22S (P.74)
F-101-65-22S (P.74)
F-503-65-22S TO PURIFIER(P.78)
F-303-50-22S TO AUX. BOILER (P.76)
F-235-40-22S
FV-103--
FP-51 60 MESH
FP-50 60 MESH
F-207-40-22S
PI PAL PR
TI TAH TAL TR
F-244-25-22S
FV-156-16K
F-238-25-512S
F.O. OUT.
F.O. IN.
FV 155 16K
F-241-25-512S
F-233-25-512S
FV-145-16K
FV-144-16K
FV-112--
F-230-25-22S
F-253-25-22S
No.3 GEN. ENGINE
F-212-25-22S
FV-160--
F-223-40-512S
F-210-40-22S
F-243-25-22S
FV-154-16K
F-237-25-512S
F-240-25-512S
FV-153-16K
F-232-25-512S
FV-142-16K-
FV-141-16K
FV-111--
F-229-25-22S
F-252-25-22S
No.2 GEN. ENGINE
F-213-25-22S
FV-159--
F-242-25-22S
FV-152-16K
F-236-25-512S
F-239-25-512S
FV-151-16K
F-231-25-512S
FV-139-16K-
FV-138-16K
FV-110--
F-220-25-22S
F-251-25-22S
No.1 GEN. ENGINE
F-226-25-22S
FV-158--
SEAL POT
IN =0.57MPa
OUT=0.4MPa
SET=0.17MPa
-6-512
FV-132-16K-
FV-130-16K-
FV-131-16K-
F-225-40-512S
FV-133-16K-
F-224-40-512S
FV-143-16K
FV-140-16K
FV-144-16K
FV-146-16K
FV-117
FIS
FP-53
FV-116--
FP-52
FV-118--
F-205-32-22S
0.59MPa ST.
BY-PASS FILTER
35u
10u
DPS
PAH
AUTO. BACK WASH FILTER FP-56
No.2 G/E F.O. HEATER
No.1 G/E F.O. HEATER
TIC
TAH
FV-126-16K-
FV-125-16K-
FV-124-16K-
FV-123-16K-
F-208-40-512S
F-209-40-512S
F-217-40-512S
RIA
ASt
No.2 G/E F.O. CIRC. PUMP (1.5m3/h x 50m)
FV 120--SC
F-215-50-22S
F-216-40-512S
FV-122-16K-
FV-119--SC
F-214-50-22S
No.1 G/E F.O. CIRC. PUMP (1.5m3/h x 50m)
FV-121-16K
No.2 G/E F.O. BOOST. PUMP (0.6m3/hx40m)
FV-102--
F-201-40-22S
FV-103--
F-202-32-22S
No.1 G/E F.O. BOOST. PUMP (0.6m3/hx40m)
FV-101--
F-200-40-22S
F-203-32-22S
FV-104--
SEAL POT
IN =0.40MPa
OUT=0.05MPa
SET=0.35MPa
-6-217
FV-106
FV-108--
FV-107--
FV-105--
F-206-32-22S
F-204-32-22S
TRACING PIPE No. (3) (4) (5) (6) (7)
F : 200---253 (209, 211, 249, 250)
FV : 100---160 (113-115, 134-137)
FP : 50--- 56

DRG 021

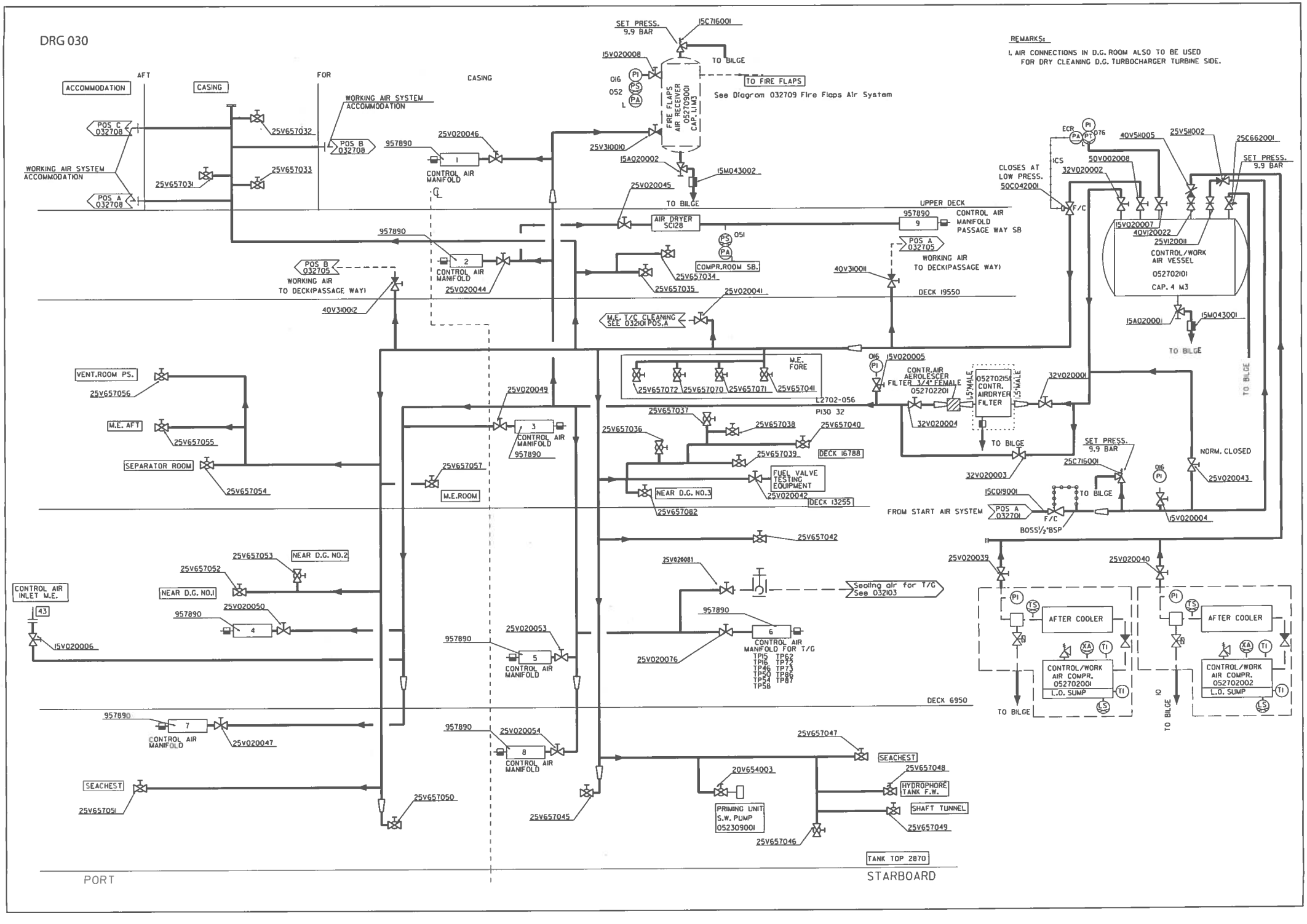

209
202
101
230
201
504
205
501
503
002
001
003
020
302
304
305
120
136
124
103
104
301
531
161
920
406
235
530
170
021
050
137

DRG 022

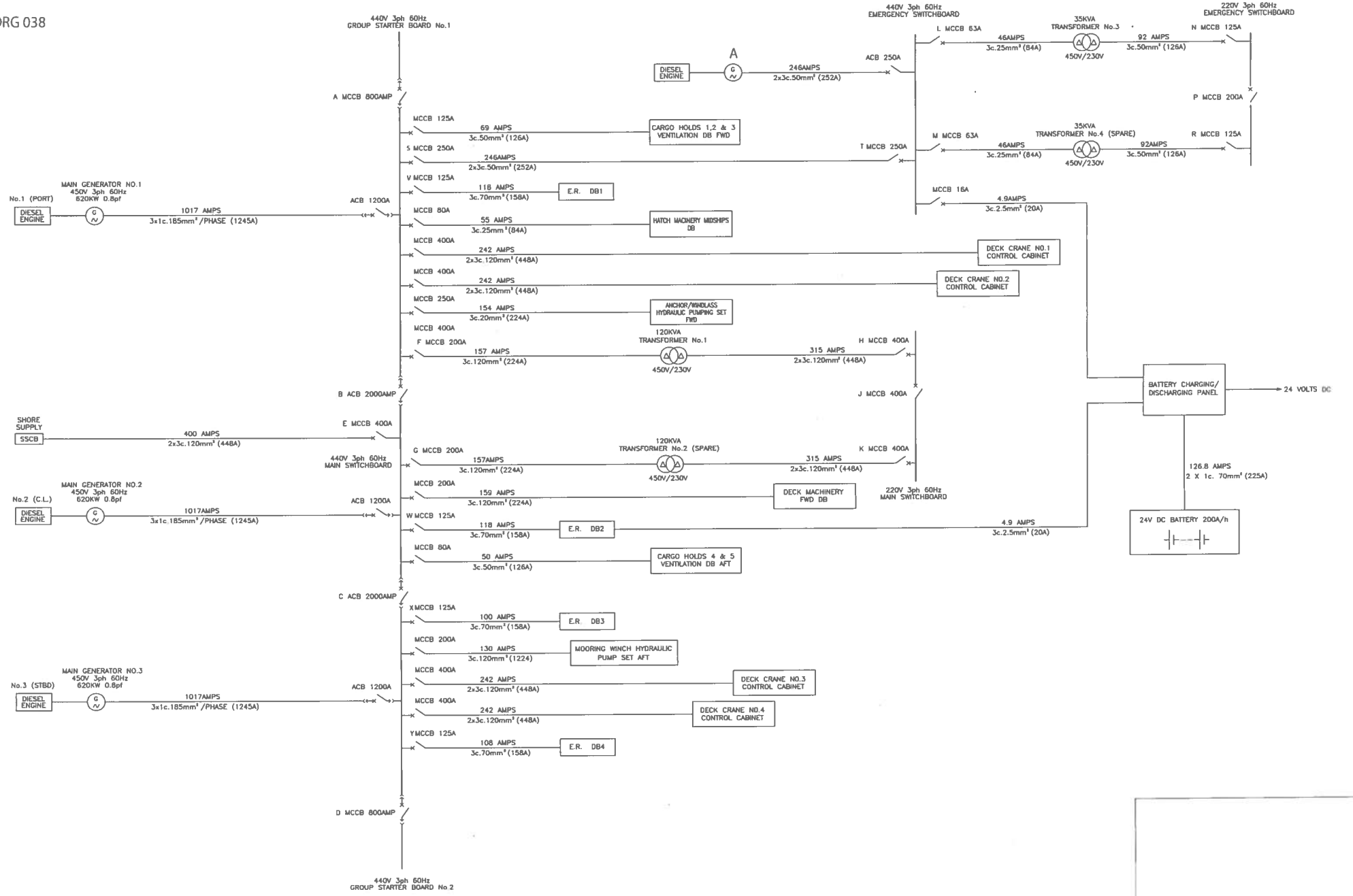


Bulwark
Upper Deck
BHD
Upper Deck
S.G. Flat 13400 A.B.
9900 A.B. Stringer
Bracking
F.P. Tk.
p&s
Sanitary F.W. Tank p&s
S.G. Flat
9900 A.B. Stringer
After Peak W.B. Tank
Upper E.R. Flat 11850 A.B
Lower E.R. Flat 7300 a.B.
W.B. TANK
L25 Side Stringer
L24
L23
L22 4960 A.B. Top of Double Bottom Wing Tanks
L21
L20
L19
L18
L8
L7
L6
L4
L3
L2
L1
Flat of Bottom
W.T. Girder 600
E.R. Tank Top 2000 A.B
Sea Wall
D.B. Tank p&s Bilge Water
D.B. Tank Diesel Oil p&s
Grey Water Storage Tank
Pot. Water Tk.
Fresh Water P.
D.B. F.O. Drain Tk.
Heavy Oil Tk.
A
B
D.B
BASELINE
A.P.
Scantling length 173.000 metres
0.1L
0.15L
UNIT 1 = 10834
UNIT 2 = 11200
UNIT 3 = 12000
UNIT 4 = 10400
0
0.25
0.5
0.75
1.0
1.5
2.0

DRG 030


REMARKS:
1. AIR CONNECTIONS IN D.G. ROOM ALSO TO BE USED FOR DRY CLEANING D.G. TURBOCHARGER TURBINE SIDE.
ACCOMMODATION
CASING
AFT
FOR
WORKING AIR SYSTEM ACCOMMODATION
POS C 032708
POS B 032708
POS A 032708
25V657032
25V657033
25V657031
957890
25V020046
CONTROL AIR MANIFOLD
SET PRESS. 9.9 BAR
15C716001
TO BILGE
15V020008
016
052
FIRE FLAPS AIR RECEIVER 052709001 CAP. 1.1M3
TO FIRE FLAPS
See Diagram 032709 Fire Flaps Air System
25V310010
15A020002
15M043002
25V020045
UPPER DECK
AIR DRYER SCI28
051
COMPR.ROOM SB.
25V657034
25V657035
25V020044
CONTROL AIR MANIFOLD PASSAGE WAY SB
POS A 032705
WORKING AIR TO DECK(PASSAGE WAY)
40V310011
DECK 19550
POS B 032705
WORKING AIR TO DECK(PASSAGE WAY)
40V310012
M.E. T/C CLEANING SEE 032101 POS.A
25V020041
ECR
076
40V5H005
25V5H002
25C662001
SET PRESS. 9.9 BAR
CLOSES AT LOW PRESS.
50C042001
50V002008
32V020002
15V020007
40V120022
25V120011
CONTROL/WORK AIR VESSEL 052702101 CAP. 4 M3
15A020001
15M043001
TO BILGE
VENT.ROOM PS.
25V657056
M.E. AFT
25V657055
SEPARATOR ROOM
25V657054
M.E.ROOM
25V657057
25V020049
3
CONTROL AIR MANIFOLD
957890
M.E. FORE
25V657072
25V657070
25V657071
25V657041
016
15V020005
CONTR.AIR AEROLESCER FILTER 3/4" FEMALE 052702201
052702151 CONTR. AIRDRYER FILTER
1/2"MALE
32V020001
L2702-056
PI30 32
32V020004
25V657037
25V657038
25V657040
25V657036
25V657039
DECK 16788
FUEL VALVE TESTING EQUIPMENT
NEAR D.G. NO.3
25V020042
25V657082
DECK 13255
TO BILGE
SET PRESS. 9.9 BAR
25C716001
32V020003
NORM. CLOSED
25V020043
15C019001
FROM START AIR SYSTEM
POS A 032701
F/C
BOSS½"BSP
15V020004
25V657042
25V020039
25V020040
CONTROL AIR INLET M.E.
43
15V020006
25V657053
NEAR D.G. NO.2
25V657052
NEAR D.G. NO.1
957890
25V020050
4
25V020081
Sealing air for T/C See 032103
957890
6
CONTROL AIR MANIFOLD FOR T/C
TP15 TP62
TP16 TP73
TP46 TP75
TP50 TP86
TP54 TP87
TP58
25V020076
AFTER COOLER
CONTROL/WORK AIR COMPR. 052702001
L.O. SUMP
CONTROL/WORK AIR COMPR. 052702002
L.O. SUMP
TO BILGE
957890
5
CONTROL AIR MANIFOLD
25V020053
957890
7
CONTROL AIR MANIFOLD
25V020047
957890
8
CONTROL AIR MANIFOLD
25V020054
DECK 6950
SEACHEST
25V657051
25V657050
25V657045
20V654003
PRIMING UNIT S.W. PUMP 052309001
25V657047
SEACHEST
25V657048
HYDROPHORE TANK F.W.
SHAFT TUNNEL
25V657049
25V657046
TANK TOP 2870
PORT
STARBOARD

DRG 038


440V 3ph 60Hz
GROUP STARTER BOARD No.1
440V 3ph 60Hz
EMERGENCY SWITCHBOARD
220V 3ph 60Hz
EMERGENCY SWITCHBOARD
35KVA
TRANSFORMER No.3
450V/230V
35KVA
TRANSFORMER No.4 (SPARE)
450V/230V
120KVA
TRANSFORMER No.1
450V/230V
120KVA
TRANSFORMER No.2 (SPARE)
450V/230V
A
DIESEL ENGINE
246AMPS
2x3c.50mm² (252A)
ACB 250A
L MCCB 63A
46AMPS
3c.25mm² (84A)
92 AMPS
3c.50mm² (126A)
N MCCB 125A
P MCCB 200A
M MCCB 63A
46AMPS
3c.25mm² (84A)
92AMPS
3c.50mm² (126A)
R MCCB 125A
T MCCB 250A
A MCCB 800AMP
MCCB 125A
69 AMPS
3c.50mm² (126A)
CARGO HOLDS 1,2 & 3
VENTILATION DB FWD
S MCCB 250A
246AMPS
2x3c.50mm² (252A)
V MCCB 125A
118 AMPS
3c.70mm² (158A)
E.R. DB1
MCCB 16A
4.9AMPS
3c.2.5mm² (20A)
MAIN GENERATOR NO.1
450V 3ph 60Hz
620KW 0.8pf
No.1 (PORT)
DIESEL ENGINE
1017 AMPS
3x1c.185mm² /PHASE (1245A)
ACB 1200A
MCCB 80A
55 AMPS
3c.25mm² (84A)
HATCH MACHINERY MIDSHIPS
DB
MCCB 400A
242 AMPS
2x3c.120mm² (448A)
DECK CRANE NO.1
CONTROL CABINET
MCCB 400A
242 AMPS
2x3c.120mm² (448A)
DECK CRANE NO.2
CONTROL CABINET
MCCB 250A
154 AMPS
3c.20mm² (224A)
ANCHOR/WINDLASS
HYDRAULIC PUMPING SET
FWD
MCCB 400A
F MCCB 200A
157 AMPS
3c.120mm² (224A)
315 AMPS
2x3c.120mm² (448A)
H MCCB 400A
J MCCB 400A
B ACB 2000AMP
BATTERY CHARGING/
DISCHARGING PANEL
24 VOLTS DC
SHORE
SUPPLY
SSCB
400 AMPS
2x3c.120mm² (448A)
E MCCB 400A
440V 3ph 60Hz
MAIN SWITCHBOARD
G MCCB 200A
157AMPS
3c.120mm² (224A)
315 AMPS
2x3c.120mm² (448A)
K MCCB 400A
220V 3ph 60Hz
MAIN SWITCHBOARD
126.8 AMPS
2 X 1c. 70mm² (225A)
MAIN GENERATOR NO.2
450V 3ph 60Hz
620KW 0.8pf
No.2 (C.L.)
DIESEL ENGINE
1017AMPS
3x1c.185mm² /PHASE (1245A)
ACB 1200A
MCCB 200A
159 AMPS
3c.120mm² (224A)
DECK MACHINERY
FWD DB
24V DC BATTERY 200A/h
W MCCB 125A
118 AMPS
3c.70mm² (158A)
E.R. DB2
4.9 AMPS
3c.2.5mm² (20A)
MCCB 80A
50 AMPS
3c.50mm² (126A)
CARGO HOLDS 4 & 5
VENTILATION DB AFT
C ACB 2000AMP
XMCCB 125A
100 AMPS
3c.70mm² (158A)
E.R. DB3
MCCB 200A
130 AMPS
3c.120mm² (1224)
MOORING WINCH HYDRAULIC
PUMP SET AFT
MAIN GENERATOR NO.3
450V 3ph 60Hz
620KW 0.8pf
No.3 (STBD)
DIESEL ENGINE
1017AMPS
3x1c.185mm² /PHASE (1245A)
ACB 1200A
MCCB 400A
242 AMPS
2x3c.120mm² (448A)
DECK CRANE NO.3
CONTROL CABINET
MCCB 400A
242 AMPS
2x3c.120mm² (448A)
DECK CRANE NO.4
CONTROL CABINET
YMCCB 125A
108 AMPS
3c.70mm² (158A)
E.R. DB4
D MCCB 800AMP
440V 3ph 60Hz
GROUP STARTER BOARD No.2

CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY –
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MARITIME AND COASTGUARD AGENCY

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

040-36 – ENGINEERING, SYSTEMS AND SHIP'S DRAWINGS

WEDNESDAY, 18 OCTOBER 2017

1315 - 1615 hrs

Examination paper inserts:

DRG 006
DRG 007
DRG 009
DRG 008
DRG 005

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. 006

   (a) Explain the purpose of item *A* identified on the drawing, stating what is specified about its physical location. (2)

   (b) Explain the meaning of the following symbol, 

   (2)

   (c) Describe the following device, stating its purpose.  (2)

   (d) Whist the vessel is on passage with all engines on HFO, the main engine begins to surge due to fuel starvation.

   State, with reasons, what item may be of concern and what action is required. (4)

2. Mechanical Assembly - DRG. 007

   (a) Describe the type of drive connected to the pump. (2)

   (b) Explain the function of item 210. (2)

   (c) Describe the device and function of assembly 704. (2)

   (d) Describe the procedure for setting up the drive mechanism after the motor has been overhauled. (4)

3. Ship's Construction Drawing - DRG. 009

(a) State the difference between the girders at 6,000 and 8,000 off centre line compared to the other girders, explaining why they are different. (2)

(b) State the extent of the camber on the main deck and at what distance from the centre line it starts. (2)

(c) State the specification of the side longitudinal stiffeners in way of the shear strake. (2)

(d) State the specification of the plate used for deck plating in way of the shear strake. (2)

(e) State the thickness plate used for the tank tops. (2)

4. Hydraulic and Pneumatic System Drawings - DGR. 008

(a) Describe the device and its function.

(2)

(b) State the purpose of valve 10. (2)

(c) Describe in the dual system shown the sequence of events that occur if one side, when in service, develops a leak, including how the isolation valves operate. (6)

5. Electrical Power Systems and Control Drawings - DRG.005

(a) State the purpose of the circuit shown. (2)

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

(i) KM2 (2)

(ii) KM1 (2)

(iii) RL1 (2)

(iv) S2 (2)

Section B

6. Mechanical Assembly Drawing – DRG. 007

The illustrated pump runs, the piston rod can be seen to be reciprocating, but the pump fails to pump fluid.

Describe the inspection procedure required to check the components that may be at fault, including replacement of piston seal rings and liner. (25)

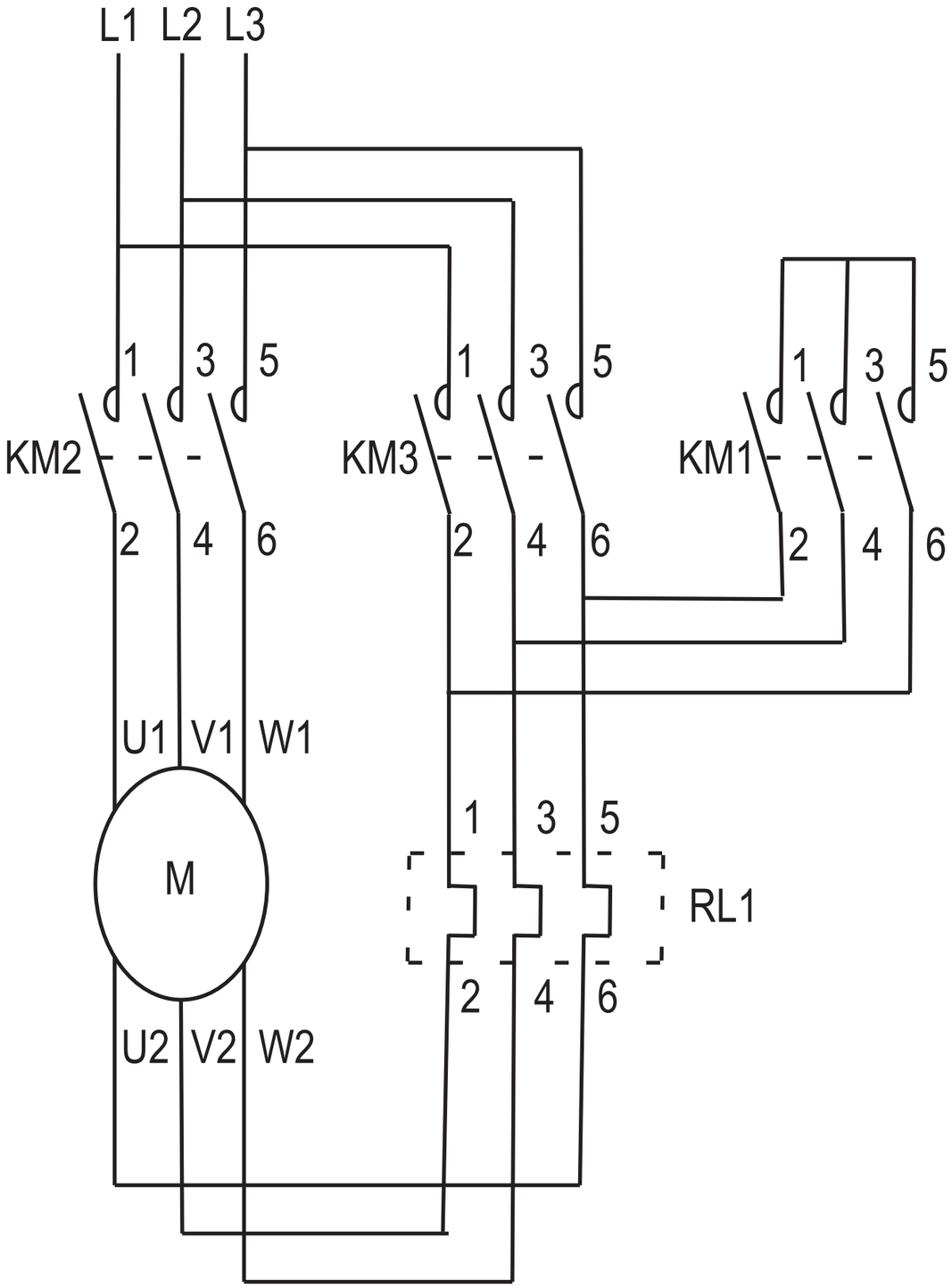
7. Electrical Power Systems and Control Drawings – DRG. 005

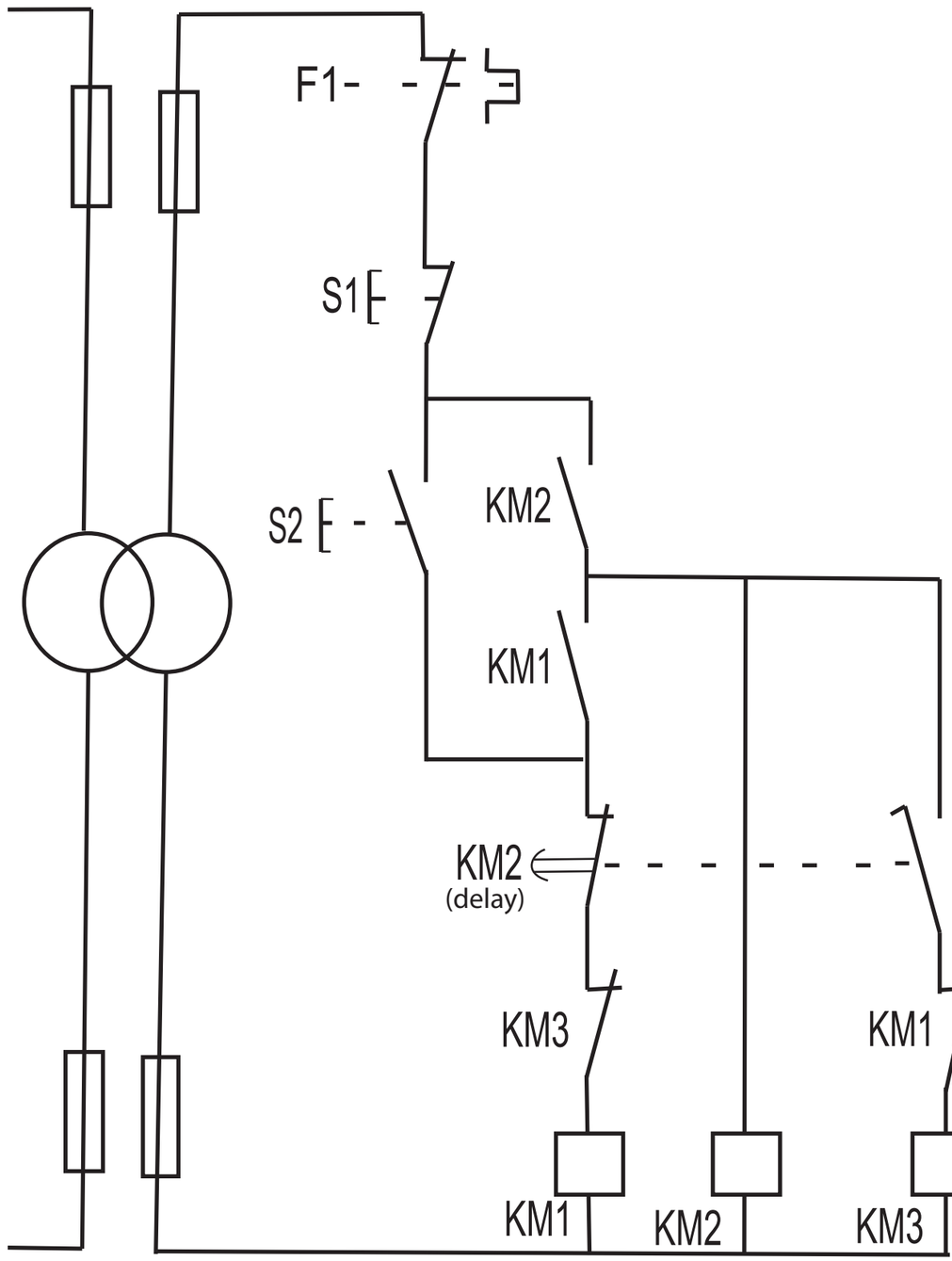
The illustrated starter has correct voltage and frequency to main and auxiliary circuits. When the start button is operated a single contactor is heard to operate, but the motor does not turn. When the start button is released, a contactor is heard to move again.

(a) State which contactor operated and which one should have operated. (6)

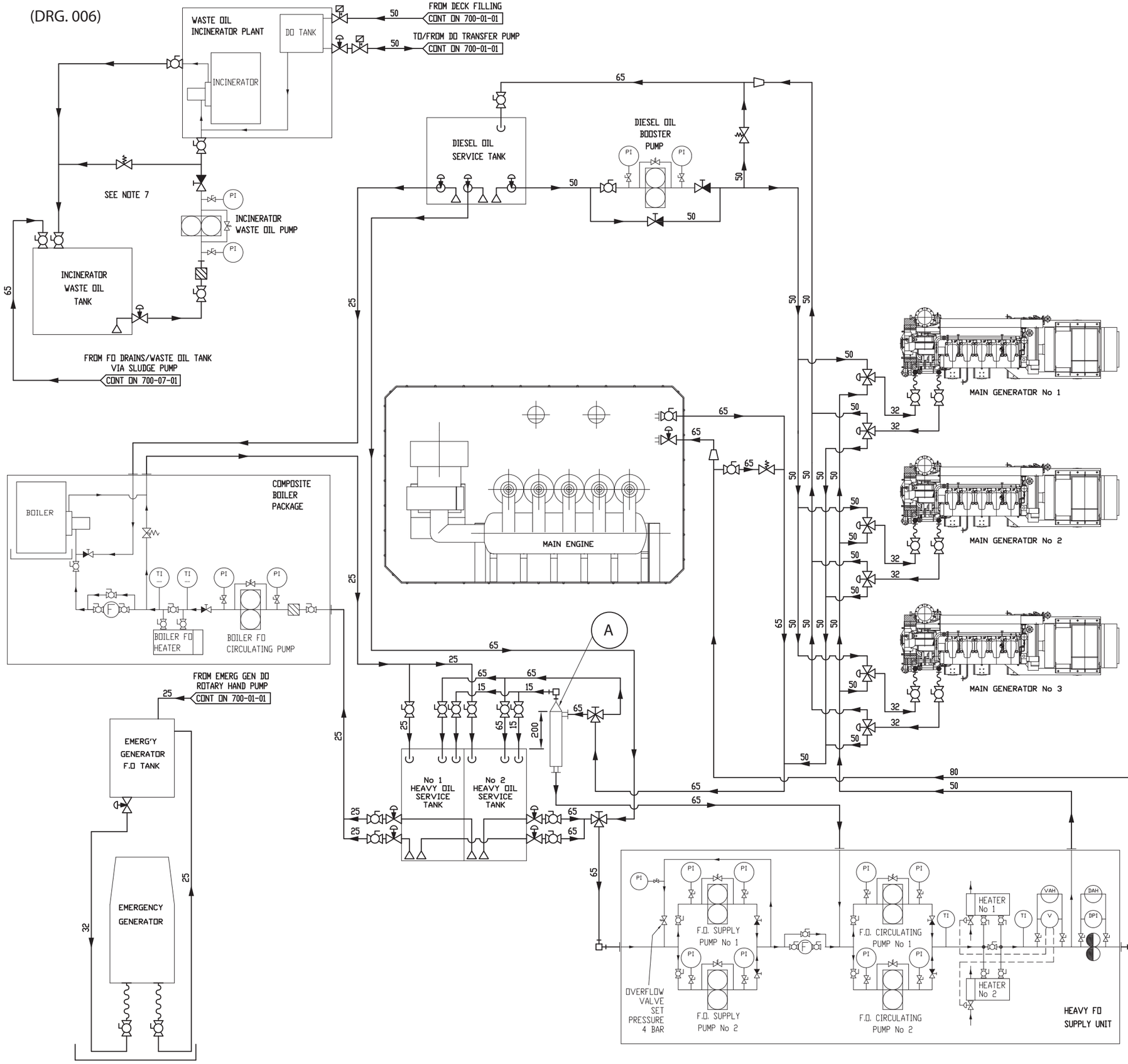
(b) Explain in detail the location and nature of possible faults. (19)

(DRG. 005)


L1 L2 L3
1 3 5
KM2
2 4 6
KM3
KM1
U1 V1 W1
M
RL1
U2 V2 W2


F1
S1
S2
KM2
KM1
KM2
(delay)
KM3
KM1
KM1
KM2
KM3

(DRG. 006)



Material & size of Piping		
Seamless Copper		
Nominal Diameter (mm)	Outside Diameter (mm)	Wall Thickness (mm)
n/a	8	1.2
n/a	10	1.2
n/a	12	2
Seamless Steel		
Nominal Diameter (mm)	Outside Diameter (mm)	Wall Thickness (mm)
15	22	3
20	27	3
25	34	3.5
32	42	4
40	48	4
50	60	5
65	76	5
80	89	5.5
100	114	6
125	140	7
150	168	7
200	219	9
250	273	9
300	325	10
350	356	10
400	426	10

SYMBOLS

NOTES:-

1- POWER SUPPLY TO ALL INDEPEDENTLY DRIVEN FO PUMPS TO BE CAPABLE OF BEING STOPPED FROM A REMOTE POSITION
2- F.O PUMPS TO BE FITTED WITH RELIEF VALVE IN CLOSE CIRCUIT.
3- TANK GAUGE GLASSES TO BE OF CLASS APPROVED TYPE
4- ALL EQUIPMENT TO BE SUITABLE FOR OPERATING ON DIESEL OIL FUEL
5- FLEXIBLE CONNECTIONS TO BE TYPE APPROVED BY CLASS
6- VALVES TO BE SUPPLIED ACCORDING TO CLASS REQUIREMENTS
7- PIPE SIZES AS PER INCINERATOR PLANT MAKERS RECOMMENDATION.

SYSTEM WORKING PRESSURE= 10 bar
SYSTEM DESIGN PRESSURE= 12 bar
SYSTEM TO BE TESTED TO 1.5 x DESIGN PRESSURE

	MARK	QTY	ITEM	MAKE	DATA	REMARKS
13		1	EMERG GEN FO TANK			
12		1	INCINERATOR WASTE OIL TANK			
11		1	No 2 HO SERVICE TANK			BUILT IN
10		1	No 1 HO SERVICE TANK			BUILT IN
9		1	DIESEL OIL SERVICE TANK			BUILT IN
8		1	COMPOSITE BOILER PACKAGE			
7		1	INCINERATOR WASTE OIL PUMP			
6		1	WASTE OIL INCINERATOR PLANT			
5		1	EMERGENCY GENERATOR			
4		1	DIESEL OIL BOOSTER PUMP			
3		1	HEAVY F.O. SUPPLY UNIT			
2		3	DIESEL GENERATORS			
1		1	MAIN ENGINE			

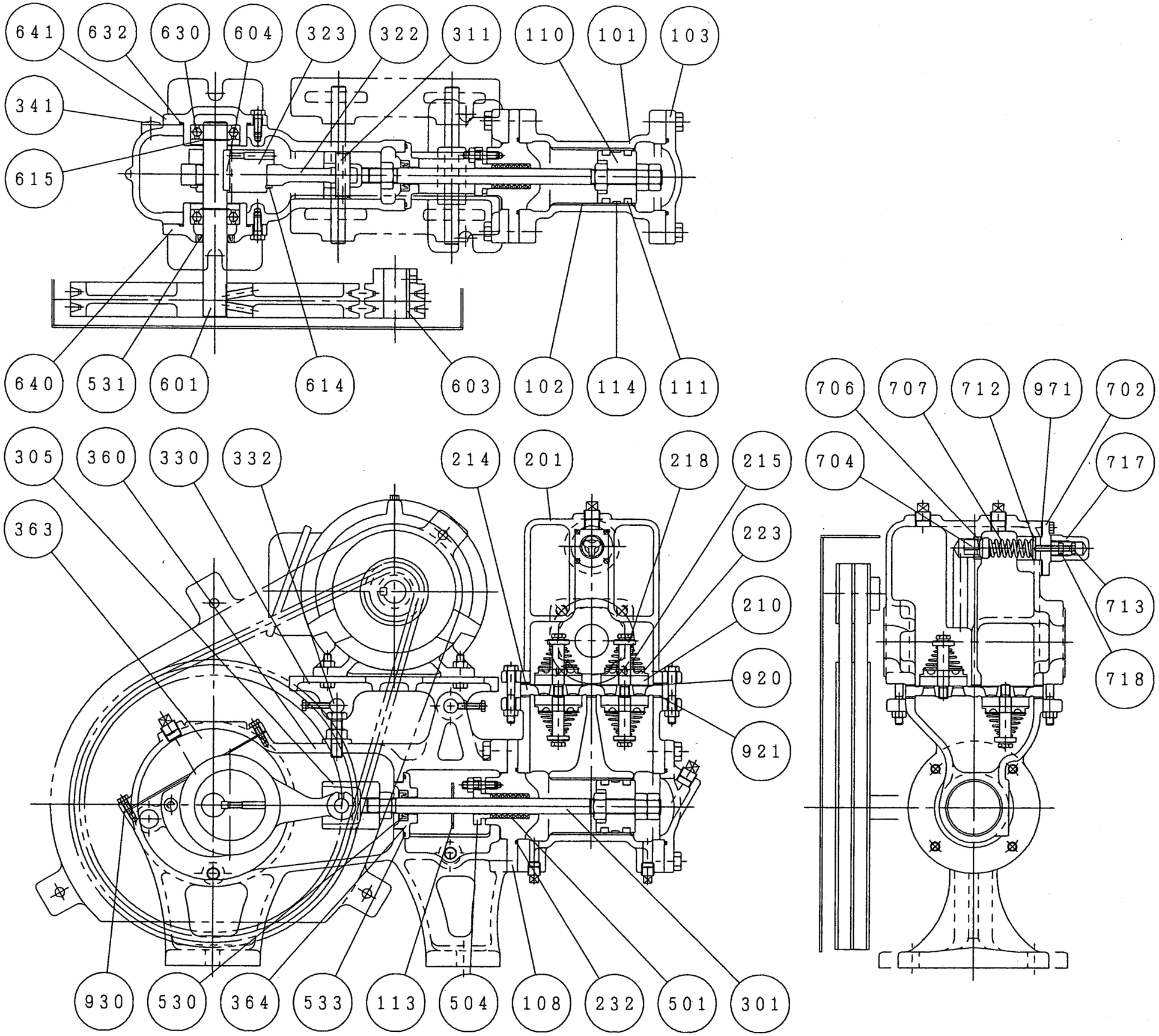
VER.	
A	
05	
04	
03	
02	

TITLE
FUEL SYSTEM DIAGRAM FUEL OIL SUPPLY

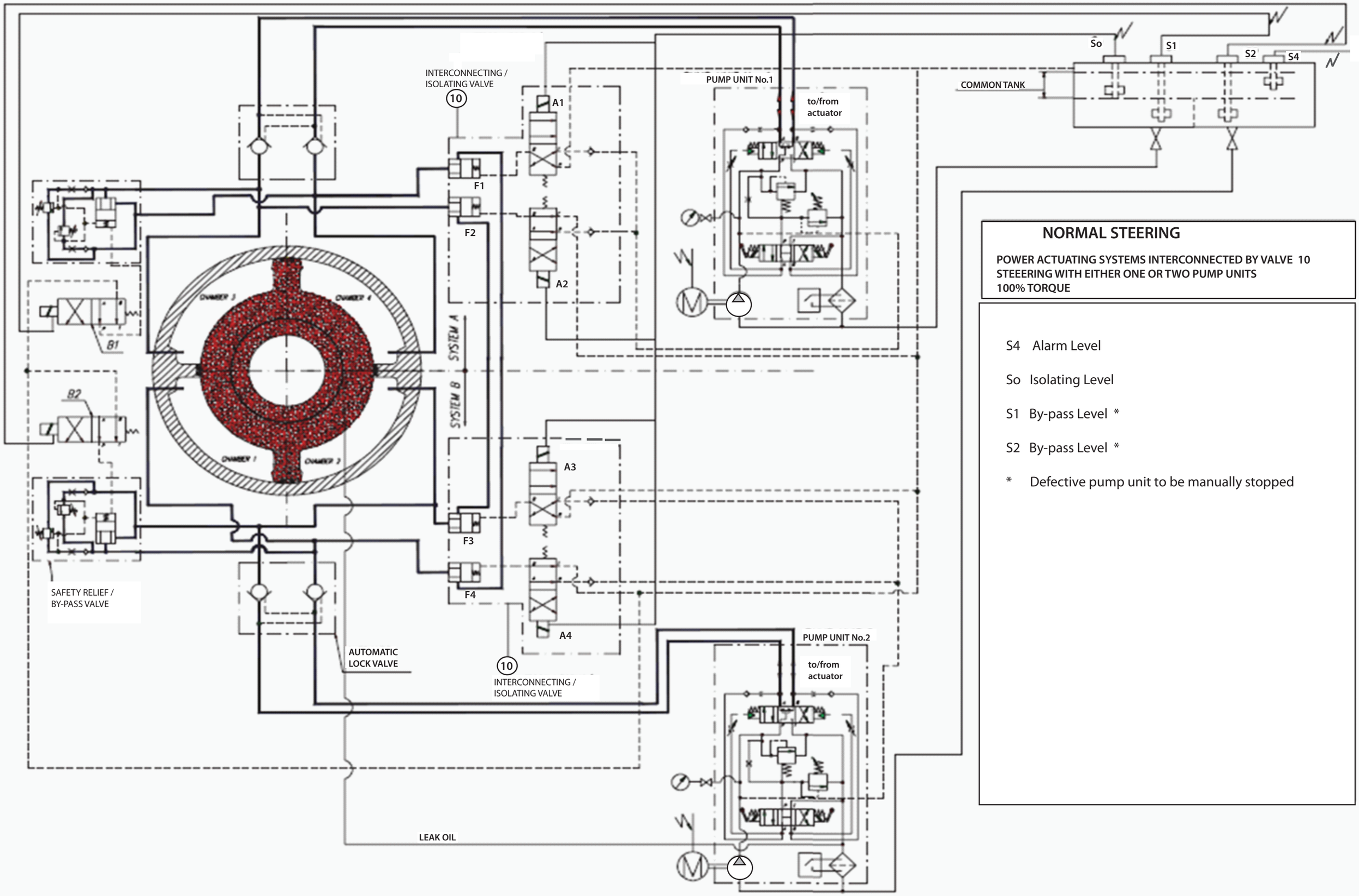
DRAWING No.	SHEET No.	SCALE	VERSION
700-01	02	NTS	A

PAPER SIZE - A1
DIMENSIONS IN MILLIMETRES

(DRG. 007)


641
632
630
604
323
322
311
110
101
103
341
615
640
531
601
614
603
102
114
111
706
707
712
971
702
305
360
330
332
214
201
218
215
704
717
363
223
210
920
921
713
718
930
530
364
533
113
504
108
232
501
301

DRG. 008



NORMAL STEERING

POWER ACTUATING SYSTEMS INTERCONNECTED BY VALVE 10
STEEERING WITH EITHER ONE OR TWO PUMP UNITS
100% TORQUE

S4 Alarm Level

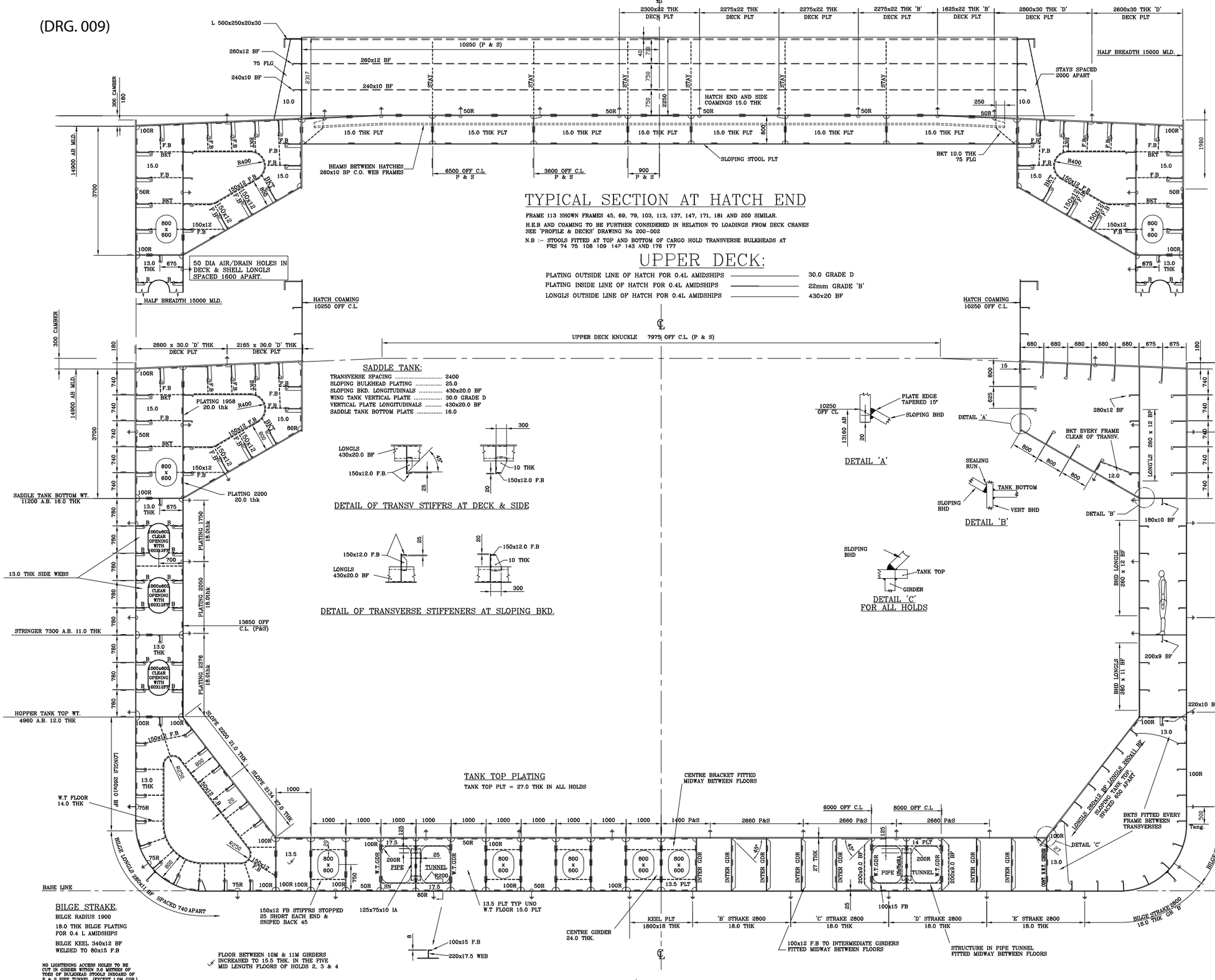
So Isolating Level

S1 By-pass Level *

S2 By-pass Level *

* Defective pump unit to be manually stopped

(DRG. 009)



TYPICAL SECTION AT HATCH END

FRAME 113 SHOWN FRAMES 45, 69, 79, 103, 113, 137, 147, 171, 181 AND 200 SIMILAR.

H.E.B AND COAMING TO BE FURTHER CONSIDERED IN RELATION TO LOADINGS FROM DECK CRANES SEE 'PROFILE & DECKS' DRAWING No 200-002

N.B :- STOOLS FITTED AT TOP AND BOTTOM OF CARGO HOLD TRANSVERSE BULKHEADS AT FRS 74 75 108 109 142 143 AND 176 177

UPPER DECK:

PLATING OUTSIDE LINE OF HATCH FOR 0.4L AMIDSHIPS	30.0 GRADE D
PLATING INSIDE LINE OF HATCH FOR 0.4L AMIDSHIPS	22mm GRADE 'B'
LONGLS OUTSIDE LINE OF HATCH FOR 0.4L AMIDSHIPS	430x20 BF

EQUIPMENT NUMERAL		
HULL	173.000 x 4.400	= 761.2
LOWER BR. DECKHOUSE AFT	6.400 x 2.800	= 17.9
LOWER BR. DECKHOUSE FWD.	15.200 x 2.800	= 42.6
BRIDGE DECKHOUSE AFT	6.400 x 2.500	= 16.0
BRIDGE DECKHOUSE FWD.	15.200 x 2.500	= 38.0
UPPER BR. DECHOUSE	15.200 x 2.500	= 38.0
NAV. BRIDGE DECKHOUSE	15.200 x 2.500	= 38.0
WHEELHOUSE	13.850 x 3.700	= 51.2
FORECASTLE	14.300 x 2.500	= 35.8
CRANEHOUSES	4 x 3.200 x 3.300	= 42.2
HATCH COAMINGS (2-5 HOLDS)	4 x 1.750 x 19.200	= 134.4
HATCH COAMING (No 1 HOLD)	1.750 x 15.200	= 26.6
TOTAL AREA		= 1241.9
EQUIP No. = DISP$^{\frac{2}{3}}$ + 2 B. H. + A/10		
= 43912$^{\frac{2}{3}}$ + 2 x30.000x17.2 + 1242/10		
= 1245 + 1032 + 124		
NUMERAL = 2401 LETTER = ✈ (RANGE = 2380 TO 2529)		
2 STOCKLESS BOWER ANCHORS 7350kgs. EACH 605M STUD LINK CHAIN CABLE 66mm DIA. (S.Q. GRADE U3)		

DESIGN LOADINGS

WEATHER DECK :- OUTSIDE LINE OF HATCHES SUITABLE FOR 2.50 T/M2
INSIDE LINE OF HATCHES SUITABLE FOR 2.50 T/M2
HATCH COVERS :- SUITABLE FOR 1.75 T/M2
HOLD BOTTOM :- HOLDS Nos.1 – 5 SUITABLE FOR 20.00 T/M2

HOLD	LENGTH (M)	CAPACITY 100% (M3)	HOMOGENEOUS		ALTERNATIVE HOLDS 1, 3 & 5			
			TONNES	S.G.	TONNES	S.G.	TONNES	S.G.
1	24.000	6426	4762	0.741	9282	1.8	8378	3.0
2	27.200	9680	7173	0.741	–	–	–	–
3	27.200	9815	7273	0.741	12540	1.8	12796	3.0
4	27.200	9810	7269	0.741	–	–	–	–
5	27.200	9384	6954	0.741	11608	1.8	12235	3.0
TOTALS		45115	33431		33430	–	33409	

HOLD	LENGTH (M)	CAPACITY 100% (M3)	ALTERNATIVE HOLDS 1, 2 4, & 5			
			TONNES	S.G.	TONNES	S.G.
1	24.000	6426	6111	1.8	6086	3.0
2	27.200	9680	9376	1.8	9167	3.0
3	27.200	9815				–
4	27.200	9810	9376	1.8	9290	3.0
5	27.200	9384	8567	1.8	8687	3.0
TOTALS		45115	33430		33430	

LONGITUDINAL STRENGTH

SCANTLINGS ARE TO BE SUITABLE FOR UNRESTRICTED SEA-GOING SERVICE AND FOR THE MAXIMUM PERMISSIBLE SWBM AND SHEAR FORCE VALUES GIVEN IN THE TABLE BELOW.

THESE VALUES HAVE BEEN DETERMINED FROM A COMPREHENSIVE RANGE OF OPERATING LOADING CONDITIONS AND ALL REQUIRED STATUTORY LOADING CONDITIONS FOR THE VESSEL

FRACTION OF RULE LENGTH	DISTANCE FROM AP (Metres)	DESIGN SWBM POSITIVE (kNm)	DESIGN SWBM NEGATIVE (kNm)	DESIGN SF POSITIVE (kN)	DESIGN SF NEGATIVE (kN)
0.00	2.000	171000	-197000	3217	-3217
0.05	10.650	290286	-334423	17133	-17133
0.10	19.300	409573	-471847	31049	-31049
0.15	27.950	528859	-609270	58880	-58880
0.20	36.600	648145	-746694	58880	-58880
0.25	45.250	767431	-884117	58880	-58880
0.30	53.900	855000	-985000	58880	-58880
0.35	62.550	855000	-985000	51840	-51840
0.40	71.200	855000	-985000	44800	-44800
0.45	79.850	855000	-985000	44800	-44800
0.50	88.500	855000	-985000	44800	-44800
0.55	97.150	855000	-985000	44800	-44800
0.60	105.800	855000	-985000	44800	-44800
0.65	114.450	855000	-985000	51705	-51705
0.70	123.100	821176	-946033	58611	-58611
0.75	131.750	712813	-821194	58611	-58611
0.80	140.400	604451	-696355	58611	-58611
0.85	149.050	496088	-571516	58611	-58611
0.90	157.700	387725	-446678	39074	-39074
0.95	166.350	279363	-321839	19537	-19537
1.00	175.000	171000	-197000	0	0

MAIN PARTICULARS

LENGTH B.P.	175.000 mtrs.
BREADTH MLD.	30.000 mtrs.
DEPTH MLD.	14.900 mtrs.
DRAUGHT EXTREME	10.518 mtrs.
LENGTH ON SUMMER L.W.L.	178.200 mtrs.
LENGTH FOR SCANT.	173.000 mtrs.

LLOYDS ✠ 100 A1, Bulk Carrier, CSR, ESP, BC-A, GRAB(25), (maximum cargo density 3.0 t/m3 ; holds 2 & 4 OR hold 3 may be empty), ✠LMC, UMS, SCM, EP

SCANTLINGS SUITABLE FOR A SUMMER DRAUGHT OF 10.500 mtrs TOP OF KEEL, GIVING A MOULDED DISPLACEMENT OF 43912 TONNES.

$$Cb\ Mld. = \frac{43912}{173.000 \times 30.000 \times 10.500 \times 1.025} = 0.7862$$

SERVICE SPEED = 14.5 KNOTS

MINIMUM SCANTLINGS REQUIRED

VER.	DATE	DRAWN BY	CHECKED	AUTHORISED	DESCRIPTION OF CHANGES
G					HATCH COAMING THICKNESS AMENDED HATCH COAMING STIFFENERS AMENDED
F					No 3 F.O. INNER BOTTOM TANK REMOVED. UPDATE HATCH COAMING T.T. THICKNESS PLATES. UPDATE B.K.TABLE
E					SOME SCANTLINGS CHANGED
D					EXTENSION OF LONGL BHD INTO SADDLE TANK, NEW SWBM & SF, NEW BOLD CAPACITIES
C					LONGL BHD MOVED TO 13650 OFF C.L. – SIDE & BOTTOM ACCESS OPENINGS CHANGED
B					CHANGED CLASS.SERVE'S AND BOLD LOADINGS UPDATED SOME MINOR STRUCTURAL DETAILS MODIFIED

Prepared By:

CONTRACT No.

DRAWN RY DATE

CHECKED BY DATE

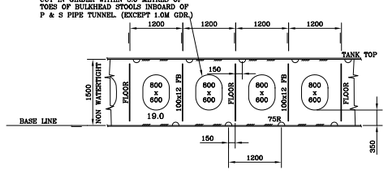
AUTHORISED BY DATE

SHIP/PROJECT
36000T Bulk carrier

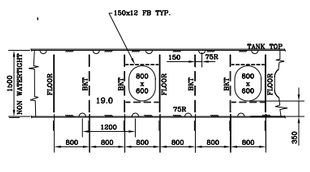
TITLE
MIDSHIP SECTION
I.W.O. No. 3 HOLD

DRAWING No.	SHEET No.	SCALE	VERSION
200-01	01	1 : 50	G

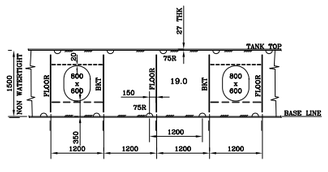
PAPER SIZE – A0
DIMENSIONS IN MILLIMETRES



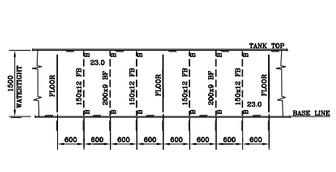
ELEVN. OF INTERMEDIATE GIRDER
TYPICALLY 19.0 THK BELOW T.T.



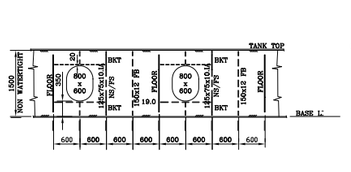
ELEVN. OF OUTBOARD GIRDER
11000 OFF C.L P & S



ELEVATION OF C.L GIRDER



ELEV. OF GIRDER 6000 OFF C.L.
GIRDER 8000 OFF C.L SIMILAR



ELEV. OF GIRDER 7000 OFF C.L.

SCOTTISH QUALIFICATIONS AUTHORITY
MARKERS REPORT FORM

SUBJECT: 040-36

DATE: 18-10-2017

General Comments on Examination Paper

Candidates continue to give generic answers, rather than looking at the drawings for specific solutions to the questions posed.

General Comments of Specific Examination Questions

Q1. Many candidates confirmed their understanding of the question, reiterating that all engines were on HFO and only the main engine was surging, but then went on to state generic causes such as water in the fuel, low service tank level, service tank suction valve closed, supply pump failure etc.? Look at the drawing to identify what affects only the main engine?

Q2. Only a limited number of candidates mentioned aligning the pulleys and fewer still described a process of alignment. Tensioning of the drive belts was mentioned, but only a few described the correct procedure.

Q3. Well answered by most candidates.

Q4. Only a few candidates attempted to describe how the isolation valves operate, with many choosing to merely quote the single failure criteria and what the system should do. The drawing stated what the system would do, it's how it's achieved that's more relevant.

Q5. A significant number of candidates did not understand the purpose of the circuit, wrongly believing that the circuit is designed to increase the starting current and torque to induce rotation? The remainder of the question was straight forward and well answered.

Q6. Many candidates merely stated faults that could cause the pump not to operate correctly and listed items that could be checked, but did not supply any procedure for how to check the items they listed. The question requested a procedure for checking all the components that may cause the fault, including the piston and liner, but many candidates chose to only address the piston and liner and then proceeded to supply an over complicated, incorrect dismantling of the crank arrangement, to gain access to the piston. The drawing provided a much simpler solution.

Q7. Many candidates did not understand how the starter operated and therefore could not correctly identify possible faults in the circuit. The starting procedure they quoted was for a different starter, clearly demonstrating an inability to read the drawing.

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, 19 JULY 2017

1315 - 1615 hrs

Examination paper inserts:

DRG – 015
DRG – 014
DGR – 013
DRG – 019
DRG - 012

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

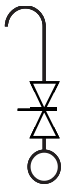
Attempt ALL questions

Marks for each part question are shown in brackets

Section A

1. Piping Systems - DRG. 015

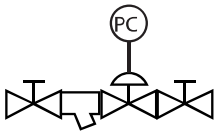
   (a) Describe the following device, stating its function. (2)



   (b) Describe the following device, stating its function at the feed pump. (2)

   (c) Describe how the temperature of the boiler circulating pumps is controlled. (2)

   (d) Describe the following device, stating its function. (2)



   (e) Describe the function of the economiser feed pump. (2)

2. Mechanical Assembly – DRG 014

   (a) Describe how the impeller is attached to the shaft. (2)

   (b) Explain the function of item 20. (2)

   (c) On the side elevation shown, state what sides the suction and discharge are on. (2)

   (d) Explain the function of item 530. (2)

   (e) Explain the purpose of item 180. (2)

[OVER

3. Ship's Construction Drawing – DRG 013

(a) State the precise location of No.4 WBT bottom plug. (2)

(b) State the total number of bottom plugs. (2)

(c) State what S.C. are. They are located between frames 40-42, port and stb. (2)

(d) State between what frame numbers the void space around the pump room runs. (2)

(e) Discuss, with reasons, what areas you would avoid placing support blocks, when the vessel is in dry dock. (2)

4. Hydraulic and Pneumatic System Drawings – DRG. 019

(a) State what station currently has control of the main engine, and identify where on the drawing this is evident. (2)

(b) State what items 7 and 88 are, explaining their function. (2)

(c) State what item 127 is, explaining its function. (2)

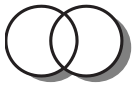
(d) Detail any drawing references that may help you physically identify the location of the ahead, astern, start and stop, remote control solenoid valves. (2)

(e) State what item 30 is, explaining its function. (2)

5. Electrical Power Systems and Control Drawings – DRG 012

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

(i) (2)



(ii) (2)

(b) Describe the device and its function for both the emergency switchboard and the main switchboard 220 V feeder panel breakers. (2)

- - - - - - - - - - - - - - - - - - -

(c) State the purpose of having two transformers feeding MSB feeder panel. (2)

(d) Describe the Main/Emergency Board Interconnector. (2)

Section B

6. Hydraulic and Pneumatic Systems - DRG 019

The main air start automatic valve, does not return to the closed position on completion of the starting sequence, but remains open, and slowly returns to the closed position over a period of time.

(a) State the item numbers of the components in the system that may cause the fault. (8)

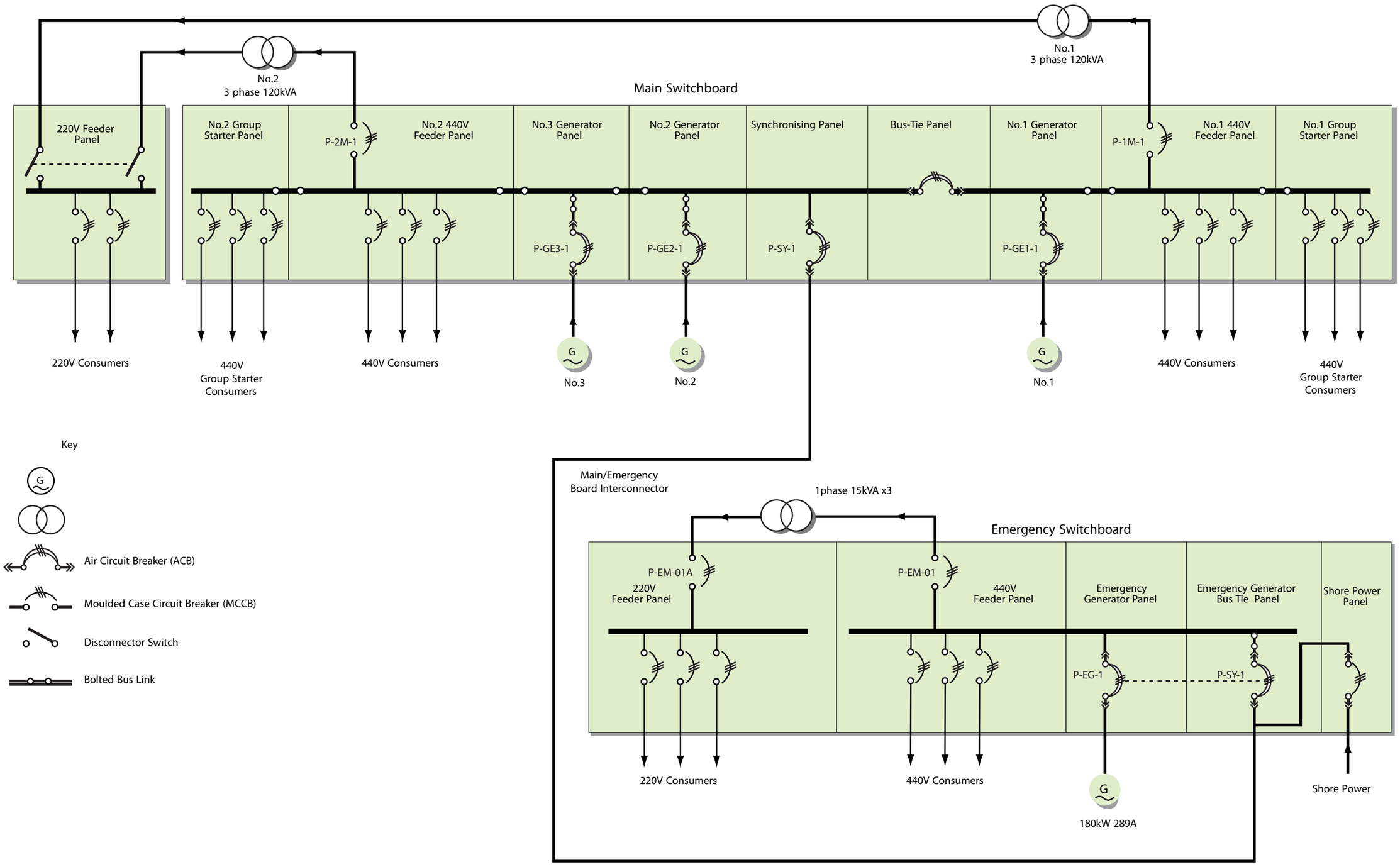
(b) Describe the operation of control for the automatic valve. (10)

(c) Explain the possible faults that may cause the control failure, stating why this is of concern. (7)

7. Mechanical Assembly - DRG 014

Describe the procedure for replacing the impeller wear rings on the illustrated pump. (25)

(drg. 012)



Key

G

Air Circuit Breaker (ACB)

Moulded Case Circuit Breaker (MCCB)

Disconnector Switch

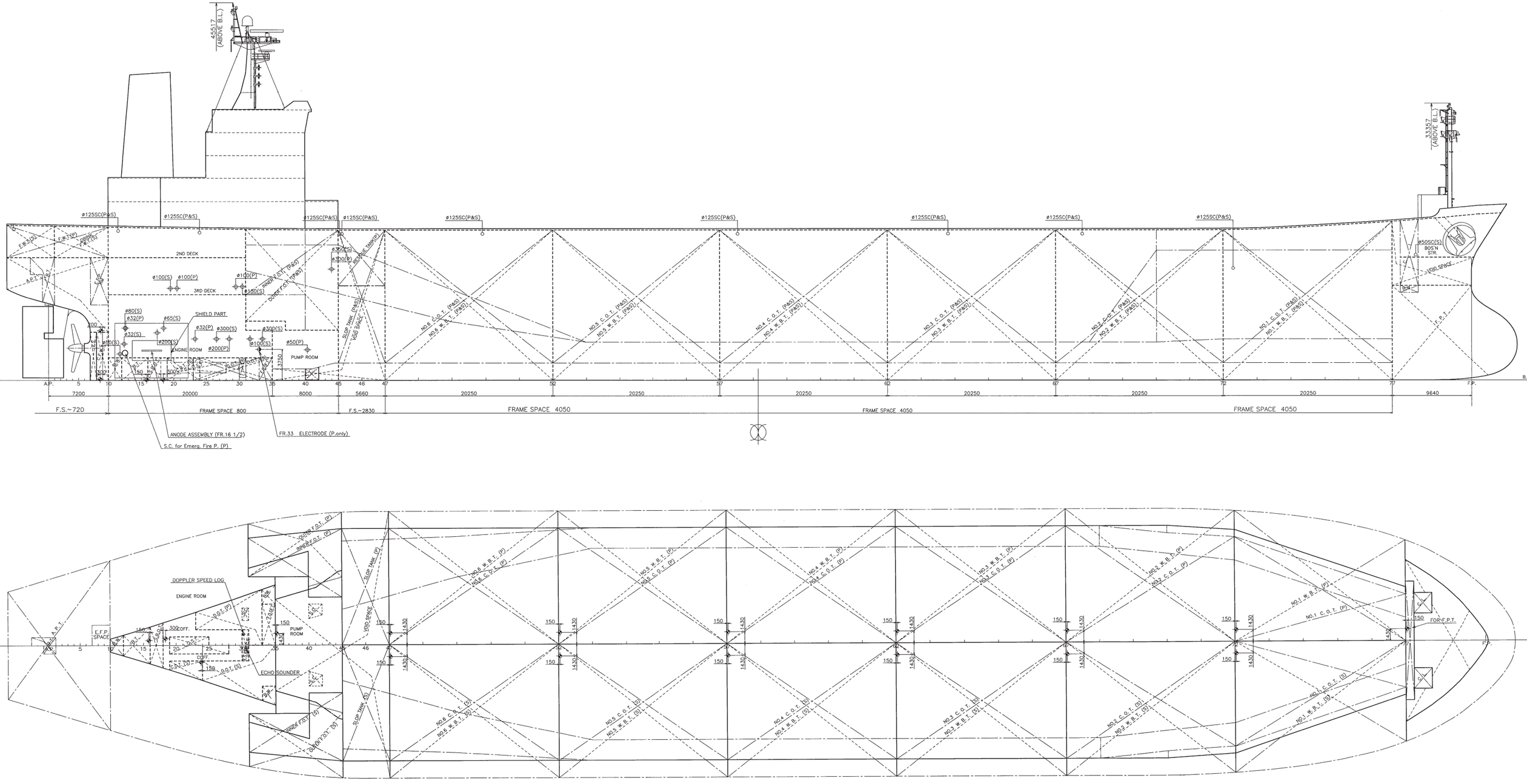
Bolted Bus Link

(DRG. 013)

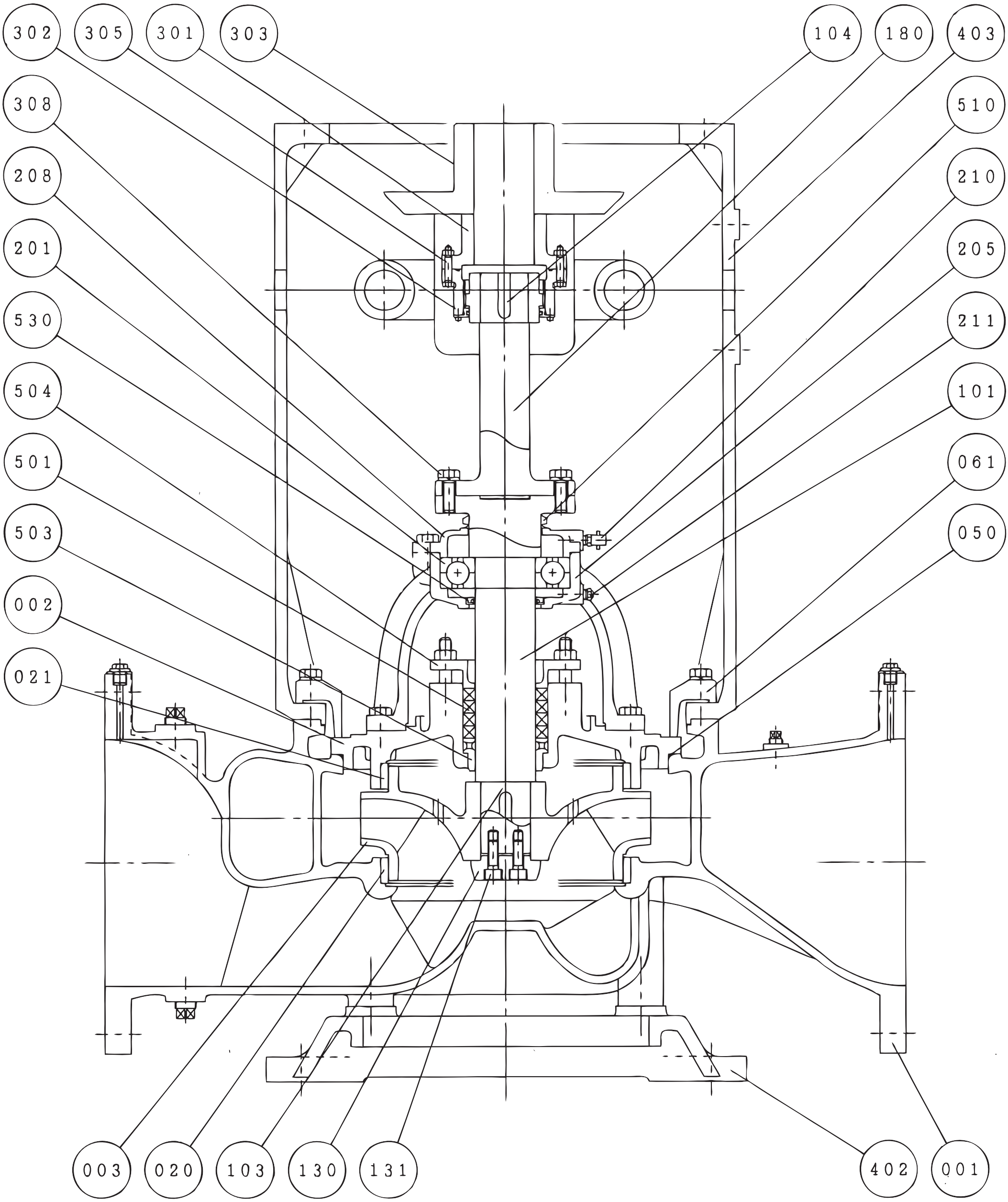
ZINC ANODE IN SEA CHEST			
FR.NO.	SUDE	SIZE	QUAN.
40 – 42	S	300x150x20	6
40 – 42	P	300x150x20	6
31 – 32	S	300x150x20	3
30 – 31	P	300x150x20	6
12 – 13 (EMERG.FIRE PUMP S.C.)	P	300x150x20	1

SYMBOL AND NOTES

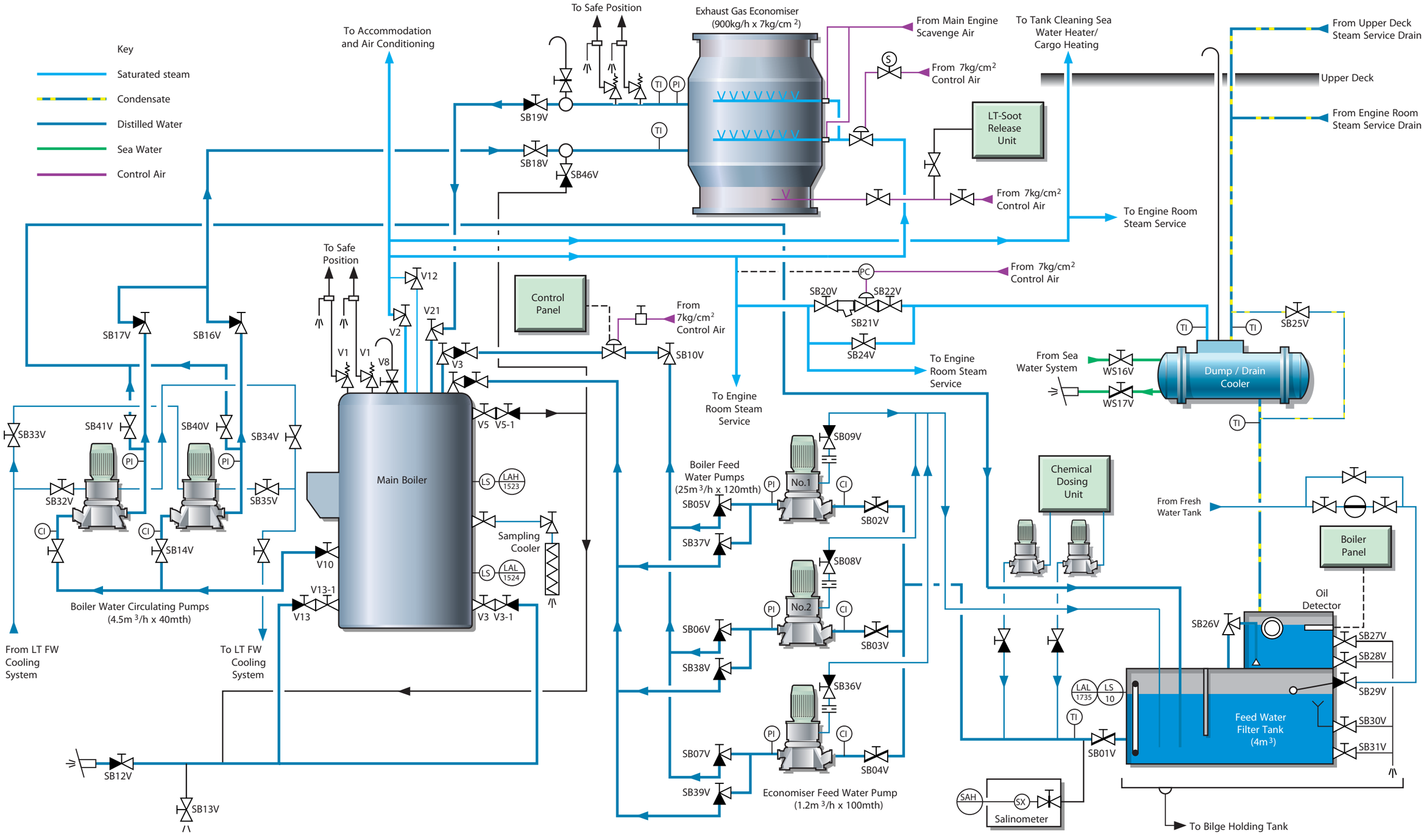
- MARK SHOW BOTTOM PLUG
- O.B.D.V. : OVER BOARD DISCHARGE VALVE
- SC. : SCUPPER
- ELECTRODE



(drg. 014)


302
305
301
303
104
180
403
308
510
208
210
201
205
530
211
504
101
501
061
503
050
002
021
003
020
103
130
131
402
001

(DRG. 015)


Key
Saturated steam
Condensate
Distilled Water
Sea Water
Control Air
To Accommodation and Air Conditioning
To Safe Position
Exhaust Gas Economiser (900kg/h x 7kg/cm 2)
From Main Engine Scavenge Air
From 7kg/cm2 Control Air
To Tank Cleaning Sea Water Heater/ Cargo Heating
From Upper Deck Steam Service Drain
Upper Deck
From Engine Room Steam Service Drain
LT-Soot Release Unit
From 7kg/cm2 Control Air
To Engine Room Steam Service
SB19V
SB18V
SB46V
TI
PI
S
To Safe Position
V12
V21
V2
V1
V8
V3
V5
V5-1
Control Panel
From 7kg/cm2 Control Air
SB10V
PC
From 7kg/cm2 Control Air
SB20V
SB22V
SB21V
SB24V
SB25V
To Engine Room Steam Service
From Sea Water System
WS16V
WS17V
Dump / Drain Cooler
SB17V
SB16V
SB41V
SB40V
SB34V
SB33V
SB32V
SB35V
SB14V
Main Boiler
LS
LAH 1523
Sampling Cooler
LAL 1524
V10
V13-1
V13
V3
V3-1
Boiler Water Circulating Pumps (4.5m 3/h x 40mth)
From LT FW Cooling System
To LT FW Cooling System
SB12V
SB13V
To Engine Room Steam Service
Boiler Feed Water Pumps (25m 3/h x 120mth)
No.1
No.2
SB09V
SB05V
SB02V
SB37V
SB08V
SB06V
SB03V
SB38V
SB36V
SB07V
SB04V
SB39V
Economiser Feed Water Pump (1.2m 3/h x 100mth)
Chemical Dosing Unit
From Fresh Water Tank
Boiler Panel
Oil Detector
SB26V
SB27V
SB28V
SB29V
SB30V
SB31V
LAL 1735
LS 10
Feed Water Filter Tank (4m 3)
SB01V
SAH
SX
Salinometer
To Bilge Holding Tank

DRG. 019

WHEEL HOUSE(W/H)

CONTROL ROOM(C/R)

ENGINE (ENG)

TELEGRAPH TRANSMITTER PANEL

BRIDGE CONTROL UNIT

SPEED SET
STOP
START
AS
AH

W/H C/R (80)

REVERSING LINE (REV)

AH STOP AS (70) (70)

STARTING LINE (STT)

(64)

START STOP (180)

MAIN CONTROL UNIT

TIMER

(170) RELAY PANEL

AH AS START STOP

SPEED SETTING LINE (SPD)

RHO (60) (58)
RHOA (61)
(62) POT

C/R DISPLAY

GOVERNOR CONTROL CIRCUIT

SERVO PANEL

VIT POSITIONER (52)

P/I CONVERTOR (43)

SCAV. AIR

EMERGENCY CONSOLE

LIP (49)

(42) GOVERNOR

AIR SOURCE (AIR)

CONTROL AIR LINE (0.69MPa)
STARTING AIR LINE (2.94MPa)
ELECTRIC LINE
LAN CABLE

E/S EMERGENCY PANEL

REMOTE EMERGENCY (100)

0.69MPa (AS) 15 (16) E F G (15) 15 15 20L (125)

0.69MPa 25A (AD) (1) 20 (14)

PCA-2 (17)

PAL

(22) 20 40L (20)

(9) BLOW (21) (126)

(139)

(4) CAPP

PAL PI PAL PR

(138) PEXA

TO PILOT VALVE FOR PRESS. LUBRICATION SYSTEM

(150) EXHAUST VALVE AIR SPRING

SAFETY DEVICE (SAF)

UNIT BOX(U/B)

PIP (104)

PIE (106)

EST (127)

PLUG (124) (129) (STEEL PIPE) ø10

FUEL PUMP

ON ↔ OFF (115) LTG (116)

TURNING GEAR

VAH (86)

VAS (88)

VSTT (90)

MONO BLOCK

(84) VSTP

(102) STOP

(97) EHO

(101) START (103)

(29) P2 P1

AH AS (105)

(107)

(30) P2 P1

(31) (36) P2 P1

(32) (23)

DISTRIBUTOR
PDAS PDAH
(56) (55) (57)

(10) (11)

AH AS

ø10 ø10

(6) (13) (8) (7)

ROLLER GUIDE

FUEL CAM

PLUG (25) (46) PFZ (111)

(27) LSVS (112) LSVB (113) (190)

3.0MPa

(114) (118)

(26) (117)

DISTRIBUTOR

START AIR VALVE

(44) AH (38) (40) AS (54) (53)

(51)

SCOTTISH QUALIFICATIONS AUTHORITY
MARKERS REPORT FORM
PART I

SUBJECT: 040-36

DATE: 19-07-2017

General Comments on Examination Paper

A procedure must have a sequence of actions in an order that is achievable, and when item numbers are evident on the drawing they should be included in the procedure to avoid any element of doubt or confusion. Good understanding can usually be demonstrated by simple explanations rather than highly complex ones, however an answer that totals 6 lines for 25 marks is not going to provide sufficient information.

General Comments of Specific Examination Questions

Q1. There was general confusion over when the smaller feed pump would be used, with many candidates stating it would be used 'at sea', to supply the economiser, when the vessel would be using less steam? This is not correct on many levels and the drawing clearly shows this not to be correct.

Q2. It is of concern that a significant number of candidates could not identify the suction and discharge sides of a centrifugal pump. Only a few candidates included axial and radial locating of the impeller to the shaft.

Q3. Well answered by most candidates.

Q4. Well answered by most candidates.

Q5. Several candidates stated that the interlock between the bus tie and emergency generator supply breaker, was to ensure that they both closed at the same time, and opened at the same time? Unfortunately their wording left no room for grammatical error in what was meant?

Q6. Many items that candidates clearly identified as integral to the operational control of the air automatic valve were not included in the initial list of items that may cause the stated fault?

Q7. Several candidates only replaced one wear ring, when there are two, with a few removing the impeller without first gaining access. Some replaced both wear rings without removing either the impeller or casing cover?

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)

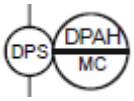
   (e) State what the hull plate thickness is at the sheer strake. (2)

[OVER

4. Hydraulic and Pneumatic System Drawings – DRG - 004

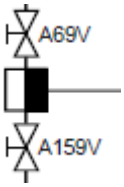
(a) Describe EACH of the following devices, stating the function of EACH:

(i)



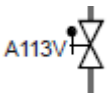
(2)

(ii)



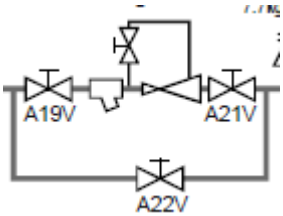
(2)

(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)

SCOTTISH QUALIFICATIONS AUTHORITY

MARKERS REPORT FORM

SUBJECT: 040-36

DATE: 29-03-2017

General Comments on Examination Paper

This is not an engineering knowledge exam. The answers required are on the drawing, so candidates should relate their answers to the drawing, and not quote 'normal procedures' or 'safety routines', which don't relate to the question being asked. More time should be spent reading and understanding the drawing, before answering the question.

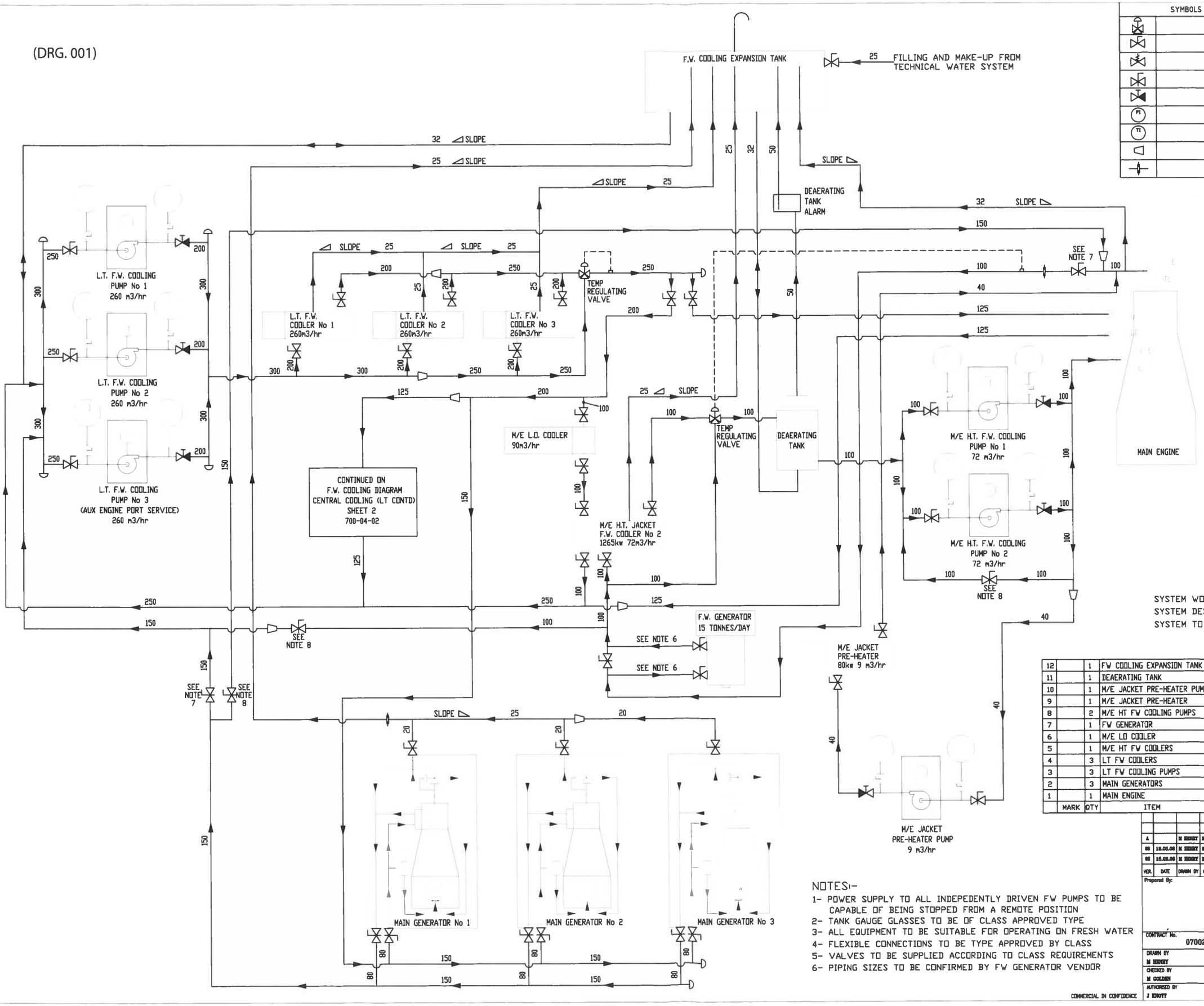
General Comments of Specific Examination Questions

Q1. Candidates struggled with the concept that there was more than one option for maintaining the main engine in a warm condition in port, therefor struggled to explain any preferred option.

Q2. Few candidates could identify any casing sections beyond 'volute', regardless of terminology.

Q3. Several candidates did not attempt this question, indicating they had not seen a shell expansion plan before, despite it being part of the syllabus.

(DRG. 001)



SYMBOLS	

Material & size of Piping		
Seamless Copper		
Nominal Diameter (mm)	Outside Diameter (mm)	Wall Thickness (mm)
n/a	8	1.2
n/a	10	1.2
n/a	12	2
Galvanised Seamless Steel		
Nominal Diameter (mm)	Outside Diameter (mm)	Wall Thickness (mm)
15	22	3
20	27	3
25	34	3
32	42	3.5
40	48	3.5
50	60	4
65	76	4
80	89	4
100	114	4.5
125	140	4.5
150	168	5
200	219	6.5
250	273	7
300	325	8
350	356	8
400	426	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	FW 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 FW COOLING PUMPS			
7		1	FW GENERATOR			
6		1	M/E LO COOLER			
5		1	M/E HT FW COOLERS			
4		3	LT FW COOLERS			
3		3	LT FW COOLING PUMPS			
2		3	MAIN GENERATORS			
1		1	MAIN ENGINE			

NOTES:-
1- POWER SUPPLY TO ALL INDEPEDENTLY DRIVEN FW 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 FW GENERATOR VENDOR

VER.	DATE	DRAWN BY	CHECKED	AUTHORISED	DESCRIPTION OF CHANGES
A		M HENRY	D GATLAND	M GOLDEN	Issued for Class Approval
00	18.06.08	M HENRY	D GATLAND	M GOLDEN	Updated as per review & comments D Gatland
00	16.08.08	M HENRY	D GATLAND	M GOLDEN	Updated as per rev D specification & shipbuilders comments

Prepared By:

SHIP/PROJECT
36000T BULK CARRIER

TITLE
F.W. COOLING SYSTEM DIAGRAM CENTRAL COOLING (LT & HT) SHEET 1

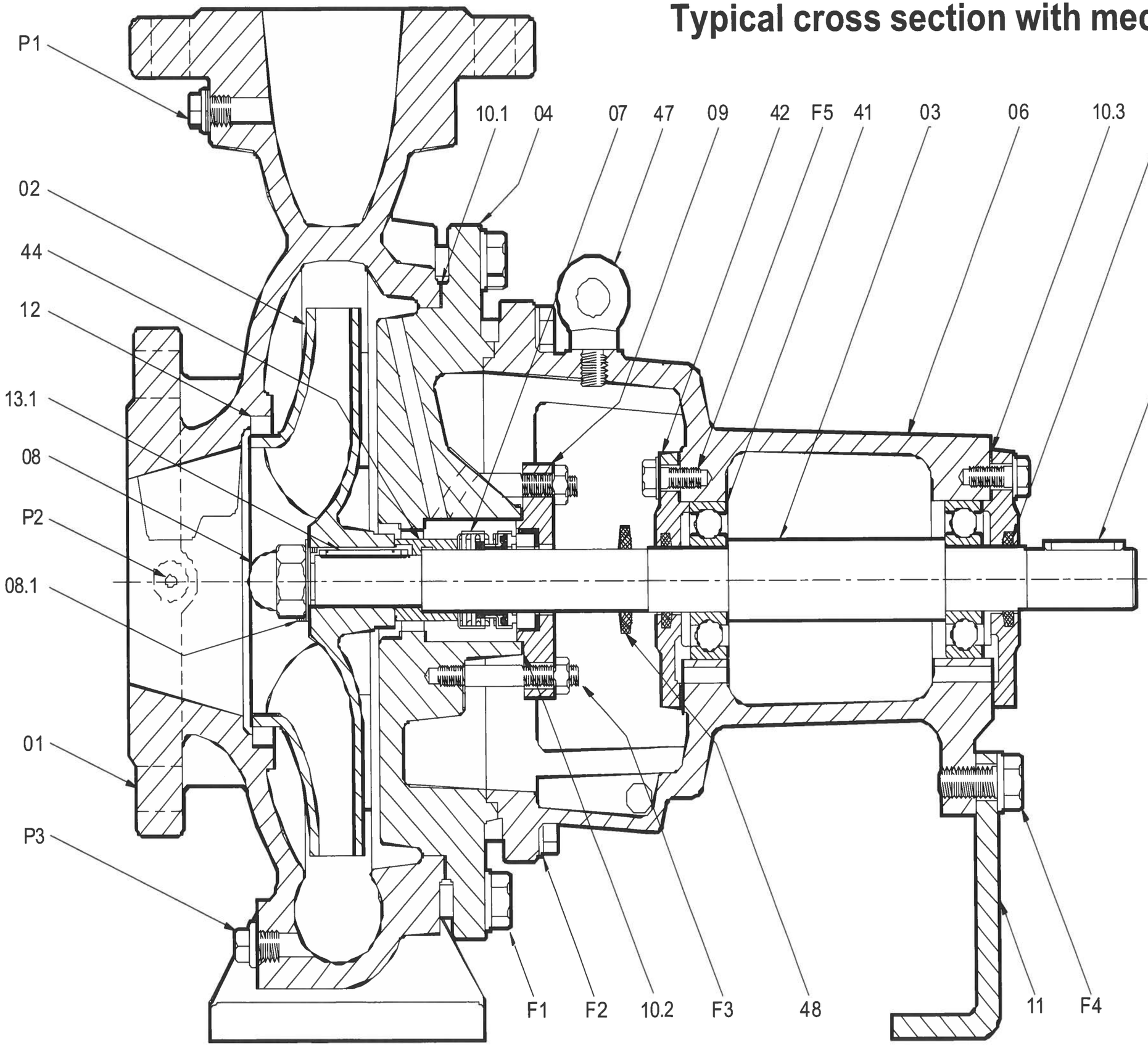
CONTRACT No.	DRAWING No.	SHEET No.	SCALE	VERSION
07002	700-04	01	NTS	A

DRAWN BY	DATE
M HENRY	08.11.07
CHECKED BY	DATE
M GOLDEN	04.08.08
AUTHORISED BY	DATE
J KNOTT	08.07.08

DIMENSIONS IN MILLIMETRES

(DRG. 002)

Typical cross section with mechanical seal



DRG.003

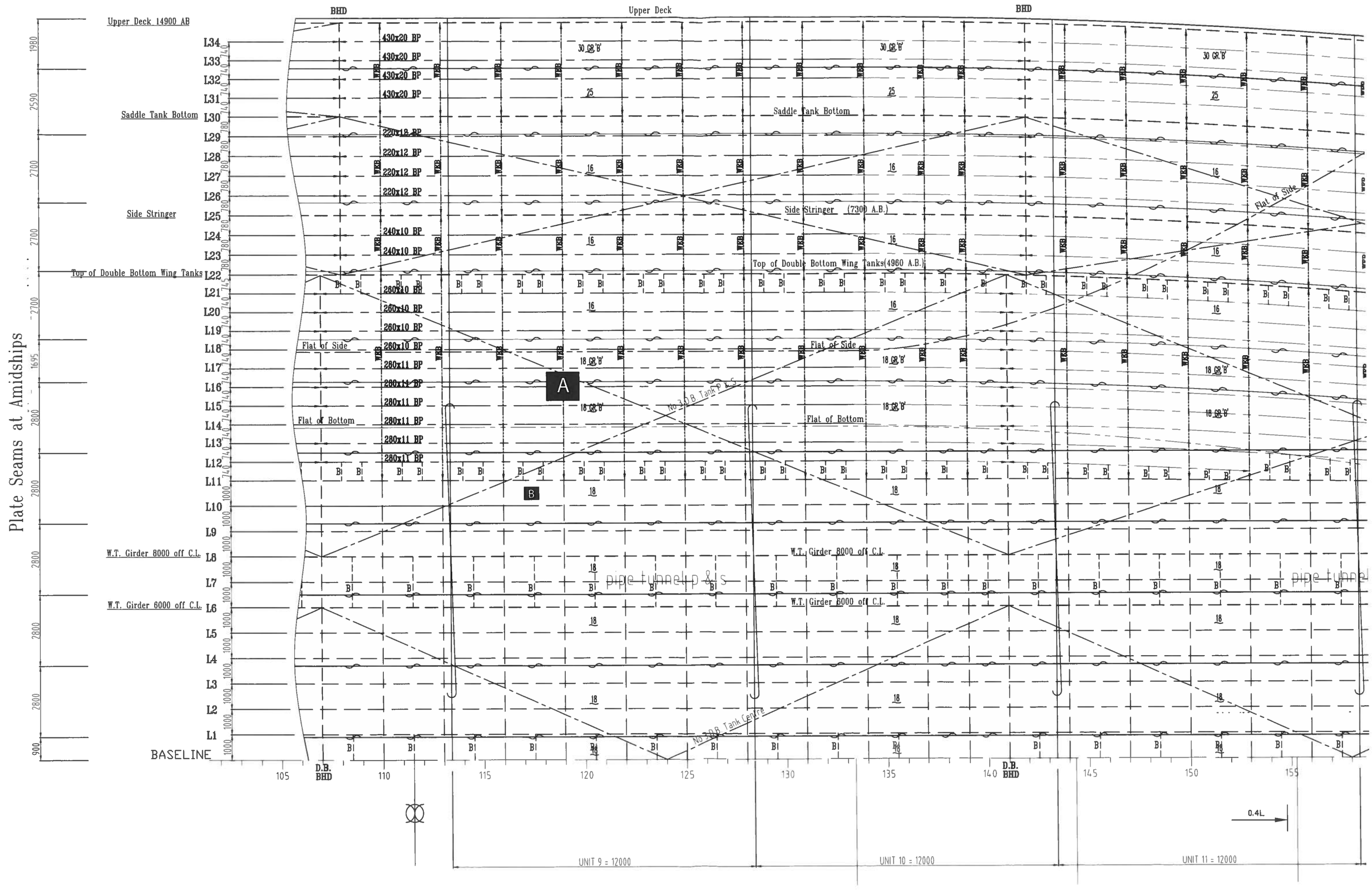
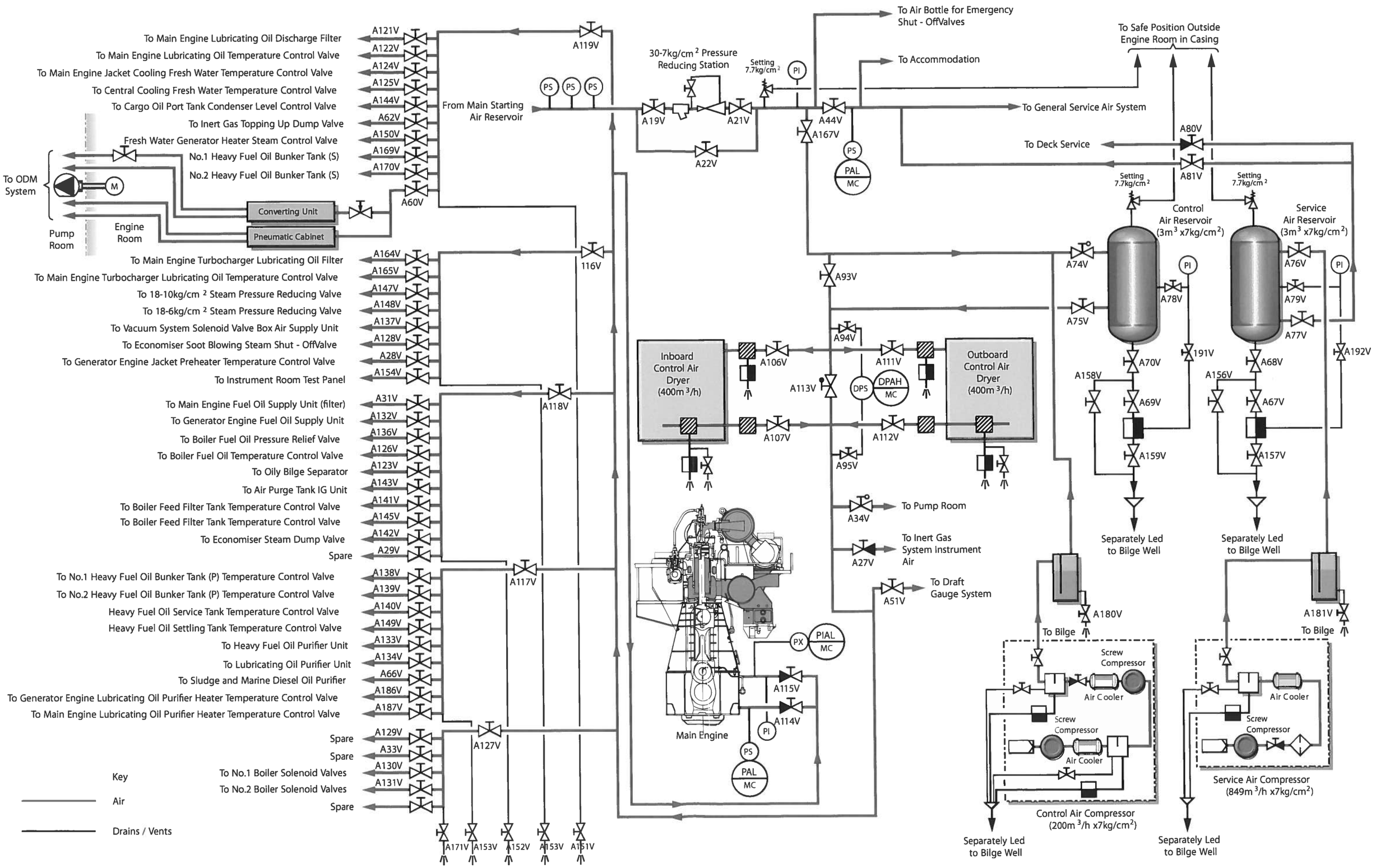
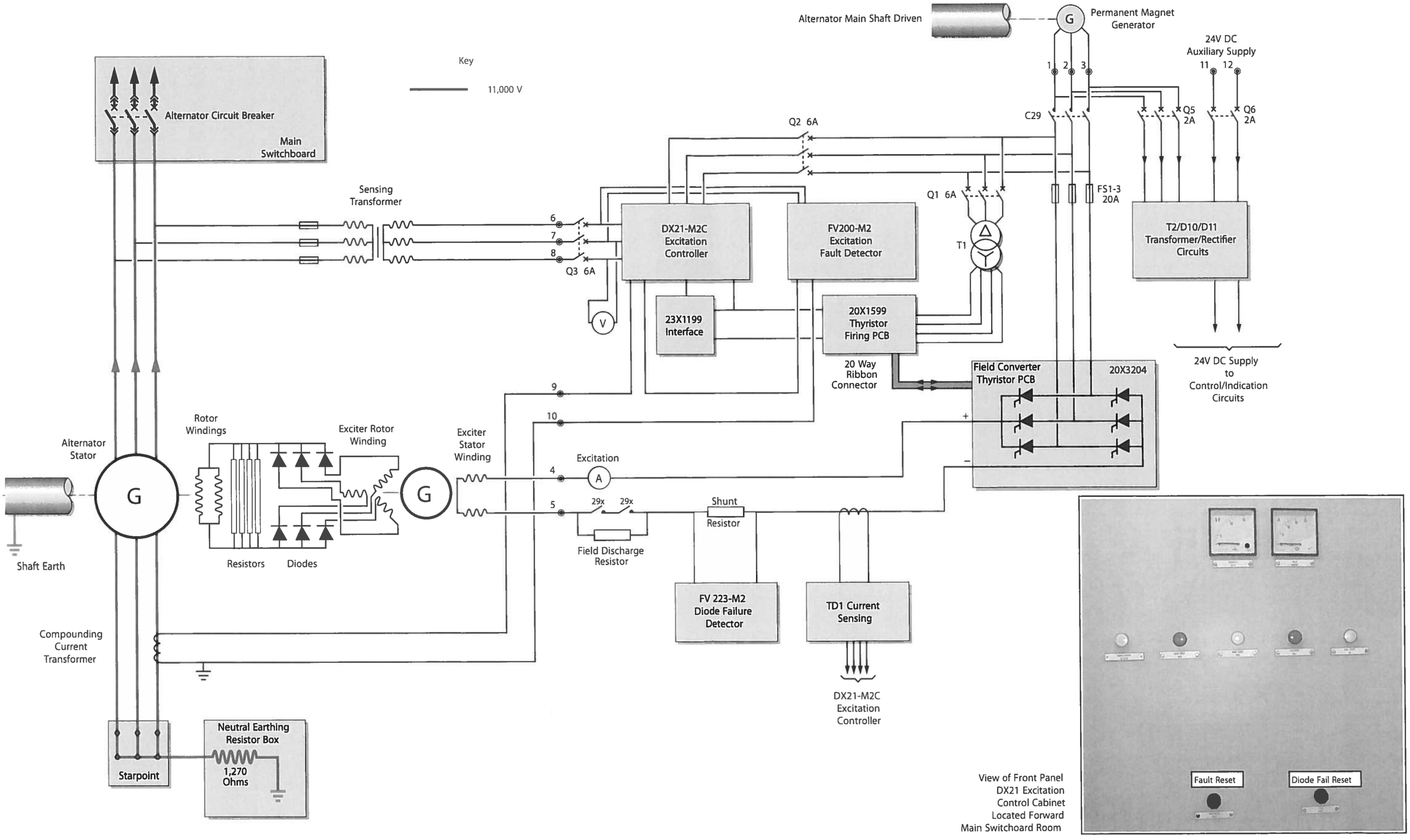


Plate Seams at Amidships
BHD
Upper Deck
BHD
Upper Deck 14900 AB
Saddle Tank Bottom
Side Stringer
Top of Double Bottom Wing Tanks
Flat of Side
Flat of Bottom
W.T. Girder 8000 off C.L.
W.T. Girder 6000 off C.L.
BASELINE
L34
L33
L32
L31
L30
L29
L28
L27
L26
L25
L24
L23
L22
L21
L20
L19
L18
L17
L16
L15
L14
L13
L12
L11
L10
L9
L8
L7
L6
L5
L4
L3
L2
L1
430x20 BP
220x12 BP
240x10 BP
260x10 BP
280x11 BP
30 GR 'B'
25
16
18 GR 'B'
18
Side Stringer (7300 A.B.)
Top of Double Bottom Wing Tanks(4960 A.B.)
No 3 D.B. Tank P.S.
No 3 D.B. Tank Centre
A
B
pipe tunnel
pipe tunnel
105
D.B. BHD
110
115
120
125
130
135
140
D.B. BHD
145
150
155
0.4L
UNIT 9 = 12000
UNIT 10 = 12000
UNIT 11 = 12000

(DRG 004)


To Main Engine Lubricating Oil Discharge Filter
To Main Engine Lubricating Oil Temperature Control Valve
To Main Engine Jacket Cooling Fresh Water Temperature Control Valve
To Central Cooling Fresh Water Temperature Control Valve
To Cargo Oil Port Tank Condenser Level Control Valve
To Inert Gas Topping Up Dump Valve
Fresh Water Generator Heater Steam Control Valve
No.1 Heavy Fuel Oil Bunker Tank (S)
No.2 Heavy Fuel Oil Bunker Tank (S)
A121V
A122V
A124V
A125V
A144V
A62V
A150V
A169V
A170V
A60V
To ODM System
M
Converting Unit
Pneumatic Cabinet
Pump Room
Engine Room
From Main Starting Air Reservoir
A119V
PS
PS
PS
30-7kg/cm 2 Pressure Reducing Station
Setting 7.7kg/cm 2
PI
A19V
A21V
A22V
A44V
A167V
PS
PAL
MC
To Air Bottle for Emergency Shut - OffValves
To Accommodation
To Safe Position Outside Engine Room in Casing
To General Service Air System
To Deck Service
A80V
A81V
Setting 7.7kg/cm 2
Setting 7.7kg/cm 2
Control Air Reservoir (3m 3 x7kg/cm 2)
Service Air Reservoir (3m 3 x7kg/cm 2)
A74V
A75V
A78V
PI
A76V
A79V
A77V
PI
A192V
A191V
A70V
A69V
A159V
A68V
A67V
A157V
A158V
A156V
To Main Engine Turbocharger Lubricating Oil Filter
To Main Engine Turbocharger Lubricating Oil Temperature Control Valve
To 18-10kg/cm 2 Steam Pressure Reducing Valve
To 18-6kg/cm 2 Steam Pressure Reducing Valve
To Vacuum System Solenoid Valve Box Air Supply Unit
To Economiser Soot Blowing Steam Shut - OffValve
To Generator Engine Jacket Preheater Temperature Control Valve
To Instrument Room Test Panel
A164V
A165V
A147V
A148V
A137V
A128V
A28V
A154V
116V
A93V
A94V
A106V
A111V
A113V
DPS
DPAH
MC
Inboard Control Air Dryer (400m 3/h)
Outboard Control Air Dryer (400m 3/h)
A107V
A112V
A95V
To Main Engine Fuel Oil Supply Unit (filter)
To Generator Engine Fuel Oil Supply Unit
To Boiler Fuel Oil Pressure Relief Valve
To Boiler Fuel Oil Temperature Control Valve
To Oily Bilge Separator
To Air Purge Tank IG Unit
To Boiler Feed Filter Tank Temperature Control Valve
To Boiler Feed Filter Tank Temperature Control Valve
To Economiser Steam Dump Valve
Spare
A31V
A132V
A136V
A126V
A123V
A143V
A141V
A145V
A142V
A29V
A118V
A34V
To Pump Room
A27V
To Inert Gas System Instrument Air
A51V
To Draft Gauge System
To No.1 Heavy Fuel Oil Bunker Tank (P) Temperature Control Valve
To No.2 Heavy Fuel Oil Bunker Tank (P) Temperature Control Valve
Heavy Fuel Oil Service Tank Temperature Control Valve
Heavy Fuel Oil Settling Tank Temperature Control Valve
To Heavy Fuel Oil Purifier Unit
To Lubricating Oil Purifier Unit
To Sludge and Marine Diesel Oil Purifier
To Generator Engine Lubricating Oil Purifier Heater Temperature Control Valve
To Main Engine Lubricating Oil Purifier Heater Temperature Control Valve
A138V
A139V
A140V
A149V
A133V
A134V
A66V
A186V
A187V
A117V
Main Engine
PX
PIAL
MC
A115V
A114V
PI
PS
PAL
MC
Spare
Spare
To No.1 Boiler Solenoid Valves
To No.2 Boiler Solenoid Valves
Spare
A129V
A33V
A130V
A131V
A127V
A171V
A153V
A152V
A153V
A151V
Key
Air
Drains / Vents
A180V
A181V
To Bilge
To Bilge
Screw Compressor
Air Cooler
Screw Compressor
Air Cooler
Control Air Compressor (200m 3/h x7kg/cm 2)
Screw Compressor
Air Cooler
Service Air Compressor (849m 3/h x7kg/cm 2)
Separately Led to Bilge Well
Separately Led to Bilge Well
Separately Led to Bilge Well
Separately Led to Bilge Well

(drg. 011)



View of Front Panel
DX21 Excitation
Control Cabinet
Located Forward
Main Switchboard Room

SCOTTISH QUALIFICATIONS AUTHORITY
MARKERS REPORT FORM

SUBJECT: 040-36

DATE: 29-03-2017

General Comments on Examination Paper

This is not an engineering knowledge exam. The answers required are on the drawing, so candidates should relate their answers to the drawing, and not quote 'normal procedures' or 'safety routines', which don't relate to the question being asked. More time should be spent reading and understanding the drawing, before answering the question.

General Comments of Specific Examination Questions

Q1. Candidates struggled with the concept that there was more than one option for maintaining the main engine in a warm condition in port, therefor struggled to explain any preferred option.

Q2. Few candidates could identify any casing sections beyond 'volute', regardless of terminology.

Q3. Several candidates did not attempt this question, indicating they had not seen a shell expansion plan before, despite it being part of the syllabus.

Q4. Well answered by most candidates.

Q5. Well answered by most candidates.

Q6. Disappointing that no candidates could demonstrate an understanding of the direction of flow when using generator jacket outlet water, to maintain the main engine in a warm condition when in port. Some ignored the question and simply stated that a pre-heat pump is used, (for 10 marks?), with some stating the pre-heat pump is used in conjunction with the main jacket water pumps? This demonstrates a serious inability to read the drawing. The question requested 'flow paths' to demonstrate an understanding of the drawing.

Q7. There was a wide variation in answers, between those that has seen a shell expansion before and those that obviously had not. The complications in the repairs should be taken from the drawing, not the procedure or safety aspects involved in undertaking the repair.