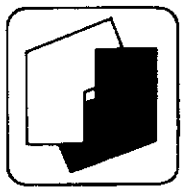
elf aquitaine norge a/s

FRIGG FIELD

TP1

VOL 1

OPERATIONS MANUAL



Norsk Hydro | statoil | TOTAL

RECORD OF AMENDMENTS

Issue No	Dated	Amended by (Signature)	Date
	3 AUGUST 1984	T. HANAKAM	03/03-85

FRIGG FIELD

PLATFORM TP1

VOLUME 1 OPERATIONS MANUAL

CONTENTS

This is a management document and is the principal document submitted for certification. It contains a summary description of the structure, production utilities and safety systems for guidance and reference at management levels.

It is also intended to serve the additional purpose of providing the operators with operating philosophies and data, and a summary of machinery systems' layouts and platform safety.

PIPING/FLOW SYMBOLS

GATE VALVE

NEEDLE VALVE

BALL VALVE

ROTARY PLUG OR BALL VALVE

CHECK VALVE

HAND CONTROL VALVE

ANGLE VALVE

THREE-WAY VALVE

DIAPHRAGM-OPERATED CONTROL VALVE

SOLENOID-OPERATED VALVE WITH RESET

SELF ACTUATING CONTROL VALVE

PRESSURE SAFETY RELIEF VALVE

FAIL SAFE OPEN

PRESSURE AND VACUUM RELIEF MANHOLE COVER

PRESSURE AND VACUUM RELIEF VALVE

'Y' TYPE STRAINER

PILOT OPERATED PRESSURE SAFETY VALVE

OPEN DRAIN

OR FILTER

CAP

HOSE CONNECTION

BLIND FLANGE

TRAP OR DRAINER

FLEXIBLE HOSE

BLIND AND SPACER

BURSTING DISC

SHELL AND TUBE HEAT EXCHANGER

ELECTRIC MOTOR-DRIVEN CENTRIFUGAL PUMP

RECIPROCATING PUMP

TURBINE OR PROPELLER TYPE PRIMARY ELEMENT

DUTY SELECTOR SWITCH

MOTOR-DRIVE FORCED DRAUGHT HEAT EXCHANGER

PUSHBUTTON

SUBMERGED PUMP

MAIN FLOW FIRE AND DIRECTION

SECONDARY FLOW LINE AND DIRECTION

FLOW LINE JOINING

FLOW LINES CROSSING

INTRUMENT PNEUMATIC LINE

INSTRUMENT ELECTRICAL LINE

FLOW ABBREVIATIONS

ESDV	EMERGENCY SHUTDOWN VALVE	LCV	LEVEL CONTROL VALVE
FCV	FLOW CONTROL VALVE	LV	LEVEL VALVE
HCV	HAND CONTROL VALVE		
HV	HYDRAULIC VALVE		

INSTRUMENT SYMBOLS

LOCAL MOUNTED INSTRUMENT

LOCAL PANEL MOUNTED INSTRUMENT

FRC FLOW RECORDING CONTROLLER

FT FLOW TRANSMITTER

LC LEVEL CONTROLLER

LG LEVEL GAUGE

LSHH LEVEL SWITCH HIGH/HIGH

LSL LEVEL SWITCH LOW

LSLL LEVEL SWITCH LOW/LOW

PdI PRESSURE DIFFERENTIAL INDICATOR

PC PRESSURE CONTROLLER

PI PRESSURE INDICATOR

PR PRESSURE RECORDER

PT PRESSURE TRANSMITTER

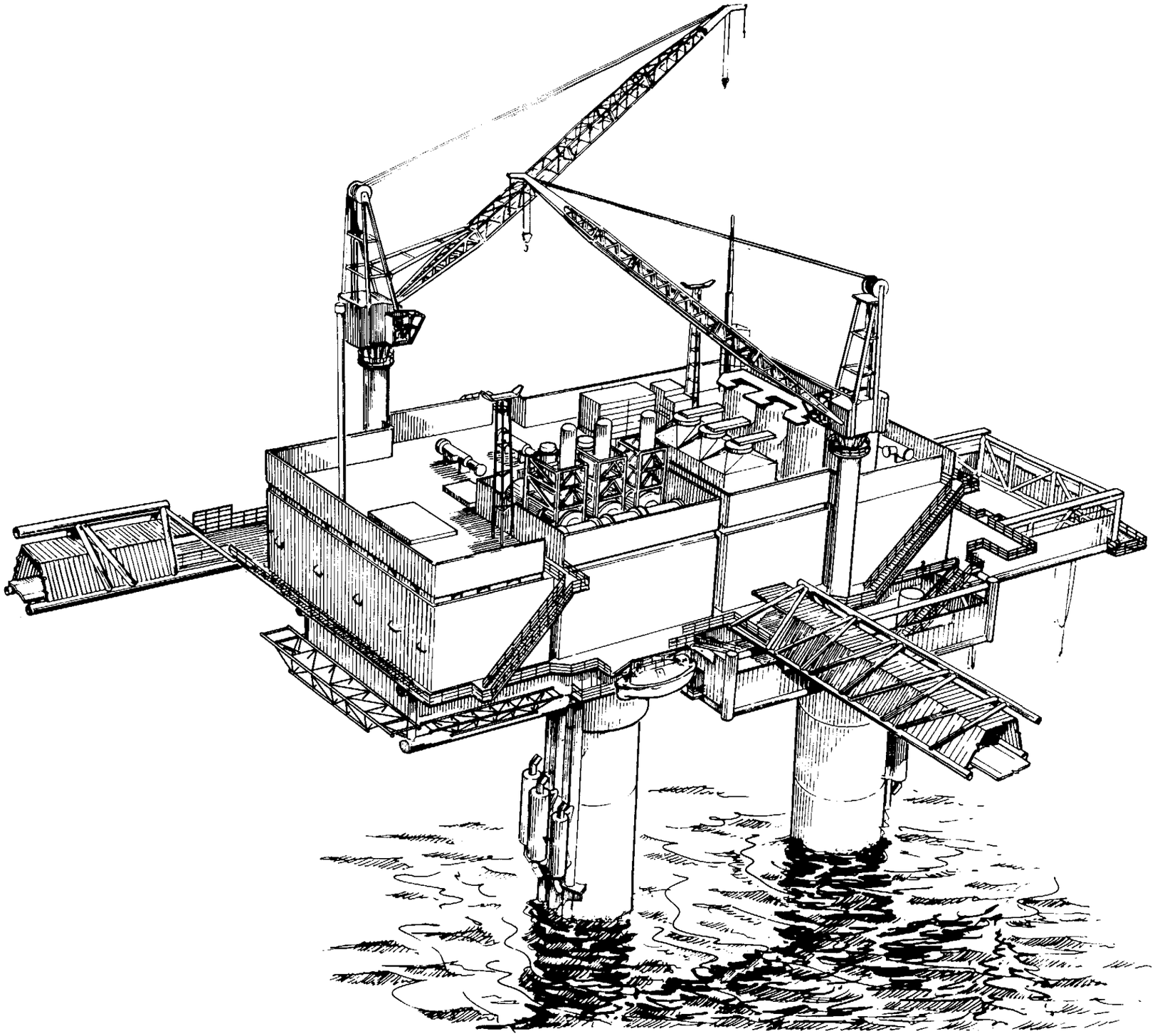
TT TEMPERATURE TRANSMITTER

TRC TEMPERATURE RECORDER CONTROLLER

DT DENSITY TRANSMITTER

ISSUE 3 AUGUST 1984

GLOSSARY OF SYMBOLS



ISSUE 3 AUGUST 1984

FRONTISPIECE

CHAPTER 1

INTRODUCTION

CONTENTS

DIAGRAMS

FRIGG FIELD - LOCATION

1 GENERAL

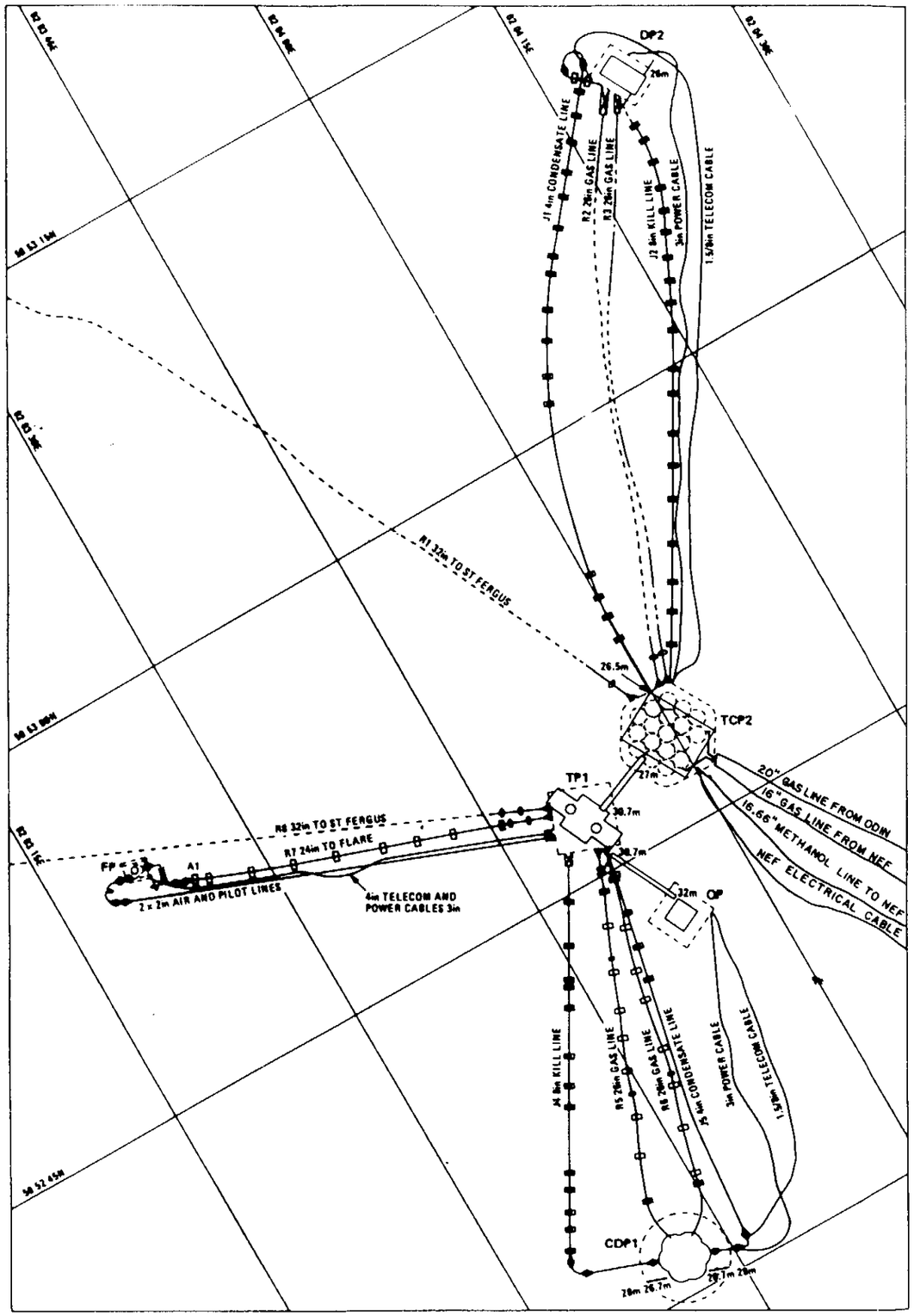
The Frigg Field is natural gas field which straddles the line between the Norwegian and UK Sectors of the North Sea continental shelf, in blocks 25/1 and 10/1, between 59 Degrees 48' and 60 Degrees 00' North and between 01 Degrees 97' and 02 Degrees 15' East (European datum 1960). It lies some 190km from the Norwegian coast and 370km from the Scottish coast. The location of the field and field layout is shown on Diagram 1.1.
The North East Frigg, satellite field, is located in block 25/2 some 18km from Frigg centre.

2 PLATFORMS

There are six platforms, four located in the UK Sector and two in the Norwegian Sector.

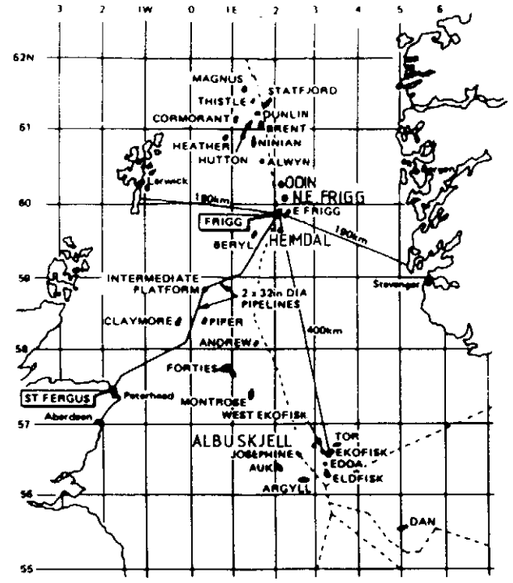
3 INTERCONNECTED FIELDS

Odin - 30/10



NOTE

RIP RAP EXTENDS FROM TP1 TO CONCRETE BLOCK A1 ON R7 24in FLARE LINE



PLATFORM CO-ORDINATES			
STRUCTURE	GEOGRAPHICAL CO-ORDINATES	UTM CO-ORDINATES	TRUE ORIENTATION
DP1 MAST	58° 52' 46" 718 N 02° 04' 48" 756 E	6 638 334.38 N 448 505.95 E	—
DP2	58° 53' 18" 875 N 02° 04' 28" 804 E	6 639 248 80 N 448 888 80 E	332° 52' 12"
TP1½	58° 52' 47" 276 N 02° 03' 51" 386 E	6 638 549 74 N 447 816 36 E	336° 20' 28"
TCP2	58° 52' 48" 446 N 02° 03' 59" 536 E	6 638 584 14 N 447 743 92 E	331° 03' 06"
OP	58° 52' 42" 421 N 02° 03' 53" 825 E	6 638 388 88 N 447 862 50 E	334° 17' 43"
CDP1	58° 52' 31" 388 N 02° 03' 41" 745 E	6 638 080 30 N 447 456 81 E	019° 37' 41"
FP	58° 52' 53" 519 N 02° 03' 21" 283 E	6 638 740 50 N 447 158 50 E	—

KEY

- UNBURIED LINE
- BURIED LINE OR LINE IN A TRENCH
- CONCRETE BLOCK (25t)
- CONCRETE BLOCK (10t)
- CONCRETE SADDLES
- GROUT BAG
- GROUT BAG NOT IN USE
- MATTRESS
- GREASE BOX
- SEAL PROTECTION
- SEAL PROTECTION WITH FLOW LIMITER
- SEAL PROTECTION WITH PERMANENT SEAL
- HYPERBARIC WELDING POSITION
- 28m CLEARANCE UNDER BRIDGE

ISSUE 3 AUGUST 1984

FRIGG FIELD - LOCATION

1.1

FRIGG FIELD - SUMMARY OF INSTALLATION

1 GENERAL

Gas produced from the Frigg Field is transported to a treatment terminal at St Fergus, Scotland, through two parallel 32in diameter pipelines. An intermediate Manifold and Compression Platform, MCP01, installed approximately midway between Frigg and St Fergus, will be used to increase pipeline capacity when future gas field adjoining Frigg are in production.

2 PLATFORMS

The function of each Frigg Field platform is as follows:

(a) CDP1 - is registered '10/1 - FRIGG - CDP1' as an offshore installation. It is a concrete structure standing in 97m of water, and is provided to drill and produce from 24 wells.

(b) DP2 - is registered '25/1 - FRIGG - DP2' as an offshore installation. It is an eight-legged steel lattice structure anchored by piles, and stands in 98m of water. It is provided to drill and produce from 24 wells.

(c) QP - is registered '10/1 - FRIGG - QP' as an offshore installation. It is a steel jacket-type structure of four tubular legs, and stands in 104m of water. It is equipped with living quarters capable of accommodating a maximum 120 personnel.

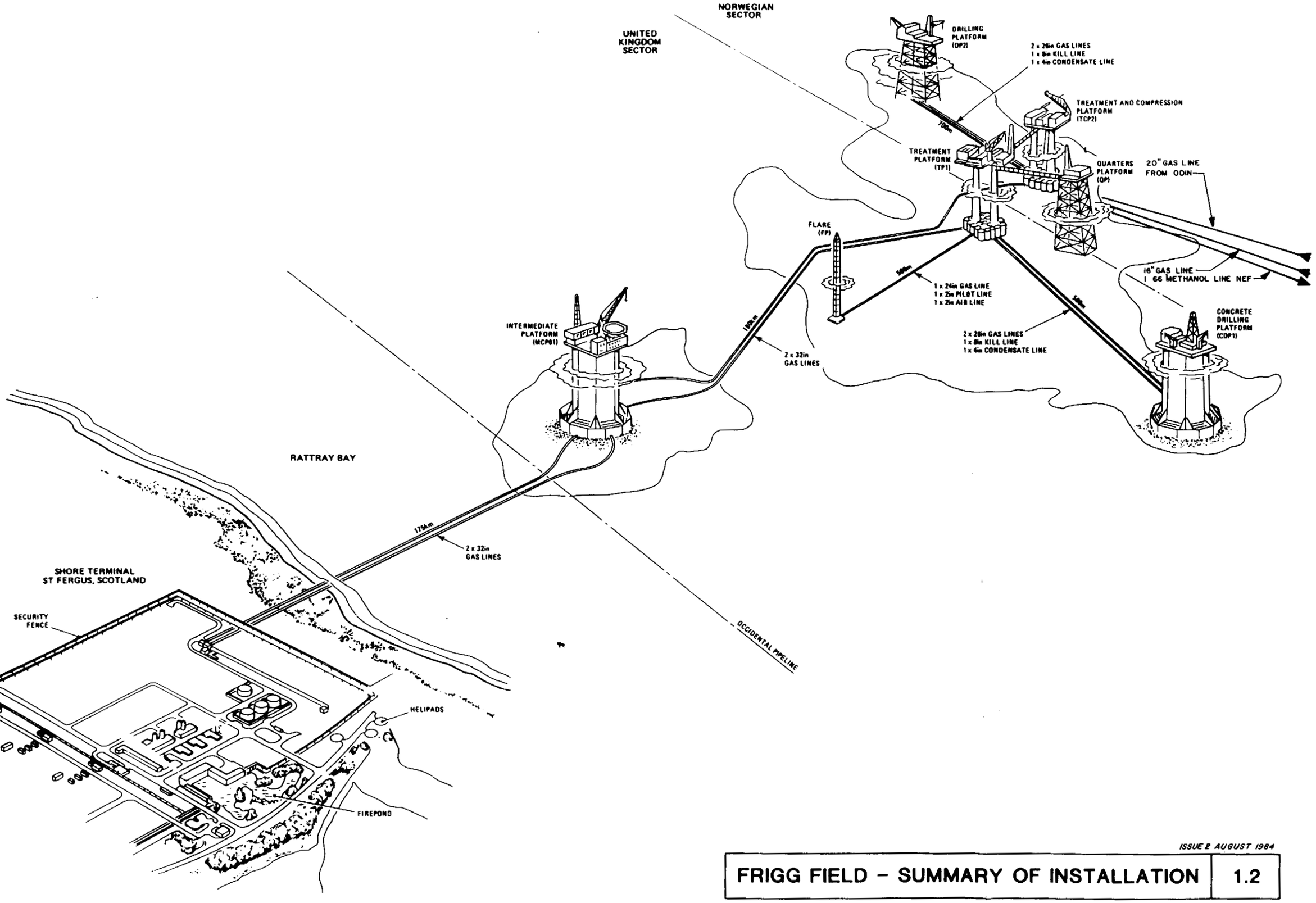
(d) TP1 - is registered '10/1 - FRIGG - TP1' as an offshore installation. It is a concrete structure with a parallel piped base surmounted by two columns supporting a steel deck, and stands in 103m of water. Gas produced by CDP1 is treated on this platform before being transported to the St Fergus terminal.

(e) TCP2 - is registered '25/1 -FRIGG - TCP2' as an offshore installation. It is a concrete structure with a hexagon caisson base surmounted by three columns supporting a steel deck, and stands in 103m of water. - Gas produced by DP2 and North East Frigg is treated and compressed on this platform before being transported to the St Fergus terminal. Gas produced from the Odin field is transported through this platform on its way to St Fergus terminal.

(f) FP - is registered '10/1 - FRIGG - FP' as an offshore installation. It is a steel articulated column with a concrete
ballast steel base, and stands in 106m of water. It is provided to depressurise TP1 and TCP2 process equipment in an emergency blowdown.

2.2 The three central platforms TP1, TCP2 and QP are linked by bridges. Drilling/production platforms CDP1 and DP2 are located a nominal 500m and 800m from their respective treatment platforms. The NEF control tower and subsea equipment some 18km north of Frigg.

2.3 Interconnected fields ODIN



ISSUE 2 AUGUST 1984

FRIGG FIELD – SUMMARY OF INSTALLATION	1.2

FRIGG FIELD - PROCESS FLOW

1 GENERAL

The Frigg Field installation produces, treats, meters and exports natural gas via an intermediate manifold booster platform to St Fergus terminal. At St Fergus the gas is further treated before it is distributed to consumers through the British Gas Council network.

2 DESCRIPTION

2.1 Gas produced from the 24 wells drilled from CDP1 passes through two 26 inch flow lines to TP1. The scrubber desanders intalled downstream of each wellhead on CDP1 are now bypassed, their use proving to be unnecessary. A maximum wellhead pressure of 172 barg and gas flow rate of 2.0 to 2.5 MMSCMD has been allowed for in the design of the scrubber desanders, valves and pipework.

2.2 Gas produced from the 23 wells drilled from DP2 passes through two 26 inch flow lines to TCP2. Scrubber desanders similar to those on CDP1 are installed, but now bypassed. One well on DP2 (well 22) is used for observation purposes, and methanolated water injection from NEF/ODIN.

2.3 Gas produced by NEF is transported to TCP2 through a 16" line for treatment and compression before being transported to St Fergus terminal. Gas produced by Odin is transported to TCP2 through a 20" line on its way to St Fergus terminal.

2.4 On TP1 the gas is treated to prevent water condensation and hydrate formation during its transportation to St Fergus. Three parallel treatment streams are installed; each designed for a maximum flow of 15 MMSCMD. Two streams are normally in operation with the third at standby. Each stream contains a separator, glycol contactor and glycol regeneration unit. Equipment is also installed for condensate treatment and fuel gas production.

2.5 The process equipment installed on TCP2 is similar to that on TP1 with the addition of gas compression equipment to boost gas pressure prior to dehydration and pipeline export to St Fergus. A 26 inch low pressure gas line from TP1 to TCP2 feeds TP1 gas to the compressor suction. A 24 inch high pressure gas line returns compressed gas from TCP2 to the TP1 dehydration system.

2.6 A 26 inch wet gas line between TP1 and TCP2 enable either treatment platform to process all or part of the gas from the other wellhead platform, should the need arise.

2.7 A 32 inch dry gas interconnection is provided between TP1 and TCP2. Thus after the gas has been metered it can be exported through the sub-sea line of either platform to St Fergus. This 32 inch line may also be used to equalize the pressure between the export lines if required.

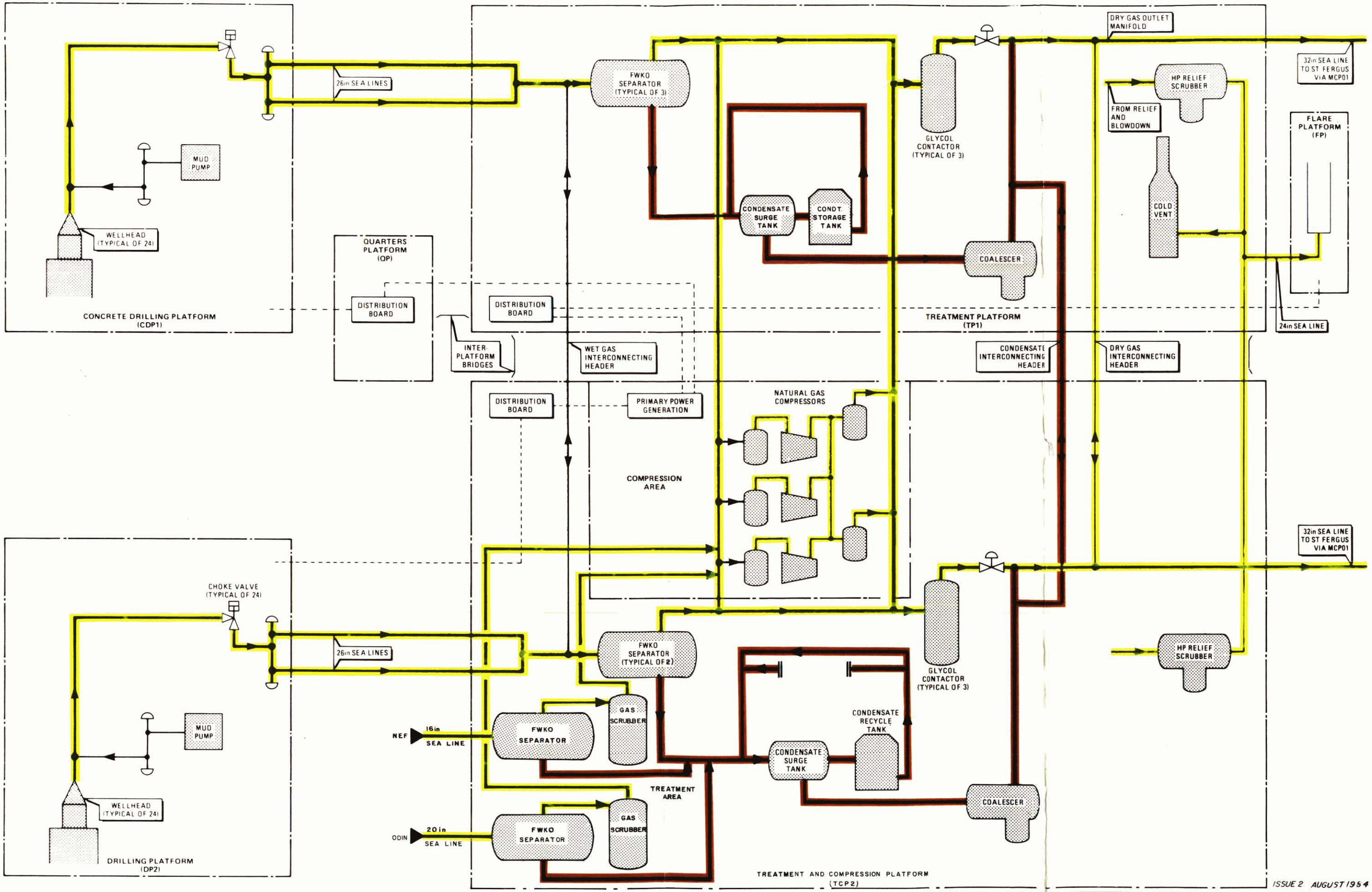
2.8 In an emergency gas can be flared through the flare platform (FP) at a very high rate to depressurize TP1 and/or TCP2. TP1 is connected to FP by a 24 inch sub-sea line; TP2 is connected into the start of the sea line on TP1 via the inter-platform bridge. FP is certified for a continuous flow rate of 10 MMSCMD with a maximum allowable short period flowrate of 34 MMSCMD. As the flaring of the gas only takes place as the result of an emergency or major process upset, FP normally operates as a cold flare. The ingress of air and hence the formation of an explosive mixture is prevented by sweeping the system with nitrogen at a continuous flowrate of 2400 SCMD. In the event of a failure of the nitrogen supply, fuel gas at a continuous rate of 18,000 SCMD may be used to sweep the system. A 20 inch diameter cold vent stack is provided on TP1 as a back-up to the main flare platform, but depressurization must be limited to 6 MMSCMD when this is in use.

2.9 Control and display devices for the Frigg Field process installation, NEF and Odin are contained on QP.

3 CONTROL

The determining factor in controlling process flow is the required pressure at the St Fergus terminal inlet. There are a number of variables such as the number of wells in use, the number of glycol units in use, the number of 26 inch lines used, the pressure required at St Fergus, the setting of the well chokes and the number and settings of the pressure control valves. These are taken into consideration by a computer which will indicate optimum settings for given parameters.

Case 2	
Data	
Gas flowrate in 32in line (MMSCMD)	5
Frigg inlet pressure in 32in line (bara)	90
St Fergus inlet pressure (bara)	59.1
Pressure drop control valves (bar)	20
Number of glycol units on flow	1
Number of 26in pipes on flow	1
Gas flowrate in one 26in line (MMSCMD)	5
Number of wells on flow	3
CDP1 Production Data	
Well flowrate (MMSCMD)	1.67
Wellhead pressure (bara)	168.3
Wellhead temperature (deg C)	49
CDP1 outlet pressure (bara)	113
CDP1 outlet temperature (deg C)	38
Wellhead choke 0/0 opening	21
26in Pipes Flow Data	
TP1 inlet pressure (bara)	110
TP1 inlet temperature (deg C)	10
Mean gas velocity (m/sec)	1.54
Water flowrate in pipe (m^3/d)	3.97
Condensate flowrate (m^3/d)	14.97
Hydrates formation conditions	--
Methanol injection rate (litres/MMSCMD)	720.38
Glycol Units Production Data	
Gas flowrate in one unit (MMSCMD)	5
Contactor operating pressure (bara)	110
Contactor operating temperature (deg C)	10
Maximum flowrate (MMSCMD)	13.52
Water to be removed (litres/MMSCMD)	98.8
Glycol circulation rate (litres/MMSCMD)	2470.11
Stripping gas flowrate (SCMH)	6.2
Air signal (lbf/in^2)	13
Per cent open, valve 1	62
Per cent open, valve 2	2
Per cent open, valve 3	0
Per cent open, valve 4	0
Output signal (lbf/in^2) on valve 1	21
Output signal (lbf/in^2) on valve 2	7
Output signal (lbf/in^2) on valve 3	6
Output signal (lbf/in^2) on valve 4	6



ISSUE 2 AUGUST 1984

FRIGG FIELD - PROCESS FLOW

1.3

FRIGG FIELD – PROCESS FLOW

1 GENERAL

The Frigg Field installation produces, treats, meters and exports natural gas via an intermediate manifold booster platform to St Fergus terminal. At St Fergus the gas is further treated before it is distributed to consumers through the British Gas Council network.

2 DESCRIPTION

2.1 Gas produced from the 24 wells drilled from CDP1 is first treated in scrubber desanders before passing through two 26in flow lines to TP1. Separator facilities for individual wellheads on CDP1 are designed for a maximum wellhead pressure of 170 bar and a gas flowrate of 2.0 to 2.5 MMSCMD.

2.2 Gas produced from the 24 wells drilled from DP2 is treated in separator facilities similar to those in CDP1 before it is led through two 26in lines to TCP2.

2.3 On TP1 the gas is treated to prevent water condensation and hydrate formation during its transportation to St Fergus. Three parallel treatment streams are installed; each is designed for a maximum flow of 15 MMSCMD. Two streams are normally in operation with the third at standby. Each stream contains a separator, a glycol contactor and a glycol regeneration unit. Equipment is also installed for condensate treatment and fuel gas production.

2.4 The process equipment installed on TCP2 is similar to that on TP1. However, provision has been made for the future installation of compression units for use as and when the decrease of wellhead pressures renders such action necessary.

2.5 A wet-gas line between TP1 and TCP2 enables either treatment platform to deal with all or part of the gas from the other's production platform should the need arise.

2.6 A dry-gas interconnection is provided between TP1 and TCP2. Thus, once gas has been metered it can be exported through the sea line of either platform.

2.7 In an emergency gas can be flared through FP at a very high rate in order to depressurise TP1 and/or TCP2. TP1 is connected to FP by a 24in sea line; TCP2 is connected into the origin of the sea line on TP1 via the inter-platform bridge. The maximum flowrate is estimated to be 30 to 34 MMSCMD. FP normally operates as a cold flare. The ingress of air and hence the formation of an explosive mixture is prevented by sweeping the system with fuel gas at a continuous rate of 18 000m^3/d for the two stacks. A 20in diameter cold vent stack is provided on TP1 as a 'back-up' to the main flare platform. The cold vent stack will become operational on failure of the existing FP flare system.

2.8 Control and display devices for the whole Frigg Field installation are contained in QP.

3 CONTROL

The determining factor in controlling process flow is the required pressure at the St Fergus terminal inlet. There are a number of variables such as the number of wells in use, the number of glycol units in use, the number of 26in lines in use, the pressure required at St Fergus, the setting of the well chokes and the number and settings of the pressure control valves. These are taken into consideration by a computer which will indicate optimum settings for given parameters.

Two hypothetical cases are given below, Case 1 for a fairly high demand and Case 2 for a low demand.

Case 1

Data

Gas flowrate in 32in line (MMSCMD)	20
Frigg inlet pressure in 32in line (bara)	140
St Fergus inlet pressure (bara)	85.7
Pressure drop in control valves (bar)	5
Number of glycol units on flow	3
Number of 26in pipes on flow	1
Gas flowrate in one 26in line (MMSCMD)	20
Number of wells on flow	10

CDP1 Production Data

Well flowrate (MMSCMD)	2
Wellhead pressure (bara)	166.7
Wellhead temperature (deg C)	50
CDP1 outlet pressure (bara)	146.6
CDP1 outlet temperature (deg C)	46
Wellhead choke 0/0 opening	40

26in Pipes Flow Data

TP1 inlet pressure (bara)	145
TP1 inlet temperature (deg C)	29
Mean gas velocity m/sec	4.97
Water flowrate in pipe (m^3/d)	11.67
Condensate flowrate (m^3/d)	28.74

Glycol Units Production Data

Gas flowrate in one unit (SCMD)	6.67
Contactor operating pressure (bara)	145
Contactor operating temperature (deg C)	29
Maximum flowrate (MMSCMD)	16.2
Water to be removed (litres/MMSCMD)	343.8
Glycol circulation rate (litres/MMSCMD)	8594.84
Stripping gas flowrate (SCMH)	21.4
Air signal (lbf/in^2)	16
Per cent open, valve 1	83
Per cent open, valve 2	23
Per cent open, valve 3	3
Per cent open, valve 4	0
Output signal (lbf/in^2) on valve 1	26
Output signal (lbf/in^2) on valve 2	12
Output signal (lbf/in^2) on valve 3	7
Output signal (lbf/in^2) on valve 4	6

CHAPTER 2

PLATFORM STRUCTURE

CONTENTS

DIAGRAMS

PLATFORM CONSTRUCTION

1 GENERAL

Treatment Platform No 1 (TP1) is a concrete gravity structure supporting facilities for gas dehydration and treatment. The primary structure was designed by the Sea Tank Company in France and constructed by Sir Robert McAlpine Ltd at Ardyne Point in Scotland. The secondary structure and support frame were designed by McDermott-Hudson, London. The secondary structure was built by Mercantile Marine Engineering and Graving Docks, Antwerp, and the support frame by Construction Metallique de Provence at Dunkerque.

2 DESIGN CRITERIA

2.1 Summary

The platform has been designed in accordance with the requirements of the Department of Energy, bearing in mind the environmental conditions detailed in Section 2.2 and taking into consideration certain other factors such as those briefly described below.

2.2 Soil Foundation

Information on the foundation was based upon the interpretation of soil data reported by the Norwegian Geotechnical Institute in their report dated December 12, 1973.

2.3 Wave and Current Forces

2.3.1 Wave theory; Stokes 5th Order. The current velocity was added vectorially to the wave particle velocity before the total force was computed using the Morison O'Brien formula. Wind, wave and current were assumed to act in the same direction.

2.3.2 Boat shock was also considered in terms of a 2500-ton supply ship striking columns at speeds of up to 3 knots.

2.3.3 No allowance was made for marine growth.

ENVIRONMENTAL DESIGN CRITERIA

SOIL PROFILE

Tabulated below is the soil profile as defined by samples taken from boring B6A in TP1 location.

Depth Below Seabed (m)	Soil Description	Water Content (%)	$CaCO_3$ Content (%)
0 to 8	Brownish grey to grey; fine-to-medium-sand with shell fragments; some gravel.	19 to 25	3.2 at 1m
8 to 12	Thin layer of fine sand. Brownish grey clay followed by a thin layer of sand and gravel.	16 to 28	19.7 at 9m
12 to 16	Brownish grey medium sand.	16 to 25	
16 to 19.5	Thin layers of brownish grey clay and fine sand.	23 to 29	
19.5 to 24	Brownish grey clay with pockets of silt and fine sand.	26 to 31	14.6 at 23m
24 to 33	Several layers of brownish grey sandy silt, fine silty sand and silty clay.	11 to 21	7.4 at 29m
33 to 45	Dark grey sandy clay with pockets of fine sand and layers of silt.	11 to 28	1.4 at 34m
45 to 76	Dark grey hard clay.	18 to 23	2.1 at 46m

WIND

		BETWEEN LAT AND +10m	ABOVE +10m (VARIATIONS)
MAXIMUM SUSTAINED WIND (ONE MINUTE)	10 YEAR STORM CONDITIONS	V_{10} = 50m/s	(z IN METRES) $V_z^2 = Ch.V_{10}^2$ $Ch = \frac{z+18}{z-60}$ V_z = VELOCITY AT ELEVATION z V_{10} = VELOCITY AT ELEVATION 10m
	OPERATING CONDITIONS	35m/s	AS ABOVE
MAXIMUM GUST WIND (THREE SECONDS)	10 YEAR STORM CONDITIONS	62.5m/s	AS ABOVE

RAINFALL

YEARLY AVERAGE	MAX 24 HOUR FALL	YEARLY AVERAGE RAINY DAYS
990mm	86mm	195 DAYS

TEMPERATURE

MAXIMUM SUMMER	MINIMUM WINTER
32°C	−15°C

BAROMETRIC PRESSURE AT SEA LEVEL

MONTHLY AVERAGE	
DECEMBER 753mm Hg	JUNE 761mm Hg

AMBIENT AIR (SALIFEROUS)

– RELATIVE HUMIDITY 79% to 90%

SURFACE SEA WATER MAXIMUM	SURFACE SEA WATER MINIMUM
17°C	1°C

SEA

MAXIMUM TIDE AND STORM ELEVATIONS
STORM AND OPERATING CONDITIONS
1.6m ABOVE LAT

WAVE HEIGHT	
STORM CONDITIONS	OPERATING CONDITIONS
29m	17.4m

WAVE FREQUENCY	
STORM CONDITIONS	OPERATING CONDITIONS
15s	12s

STORM SURGE	
STORM CONDITIONS	OPERATING CONDITIONS
0.6m	0.3m

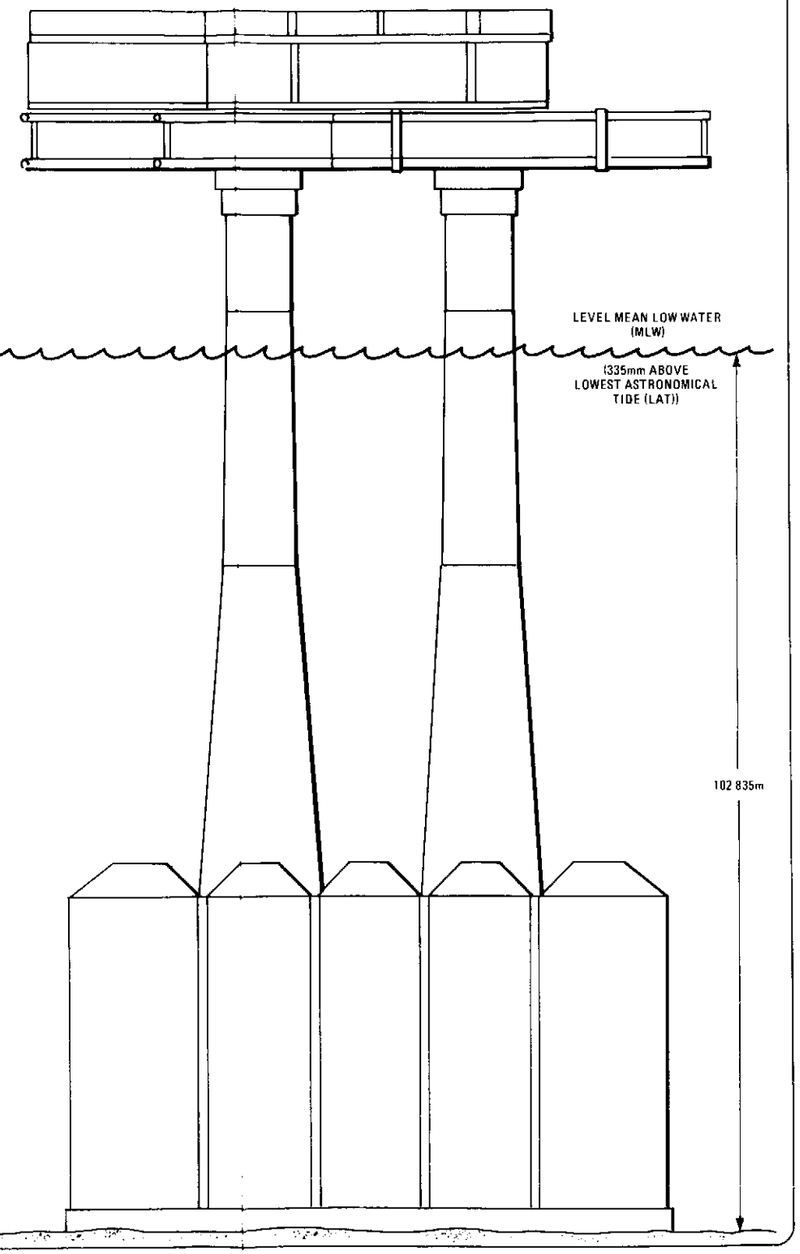
SURFACE CURRENT	
STORM CONDITIONS	OPERATING CONDITIONS
1.35m/s	1m/s

LINEAR VARIATION

SEABED +30m CURRENT	
STORM CONDITIONS	OPERATING CONDITIONS
0.70m/s	0.58m/s

LINEAR VARIATION

SEABED CURRENT	
STORM CONDITIONS	OPERATING CONDITIONS
0.30m/s	0.30m/s



GEOTECHNICAL AND STRUCTURAL INSTRUMENTATION

1 GENERAL

1.1 Instrumentation is installed to measure and record the environmental conditions of the platform, and the effects of the environment on the platform structure as follows:

(a) Wave height and period.

(b) Dynamic response.

(c) Wind speed.

1.2 Platform tilt and vertical settlement are measured optically from QP.

2 WAVE HEIGHT

Measurement of wave height and period is achieved by measuring the time taken between the transmission of a signal and the reception of the echo of the signal reflected from the water surface.

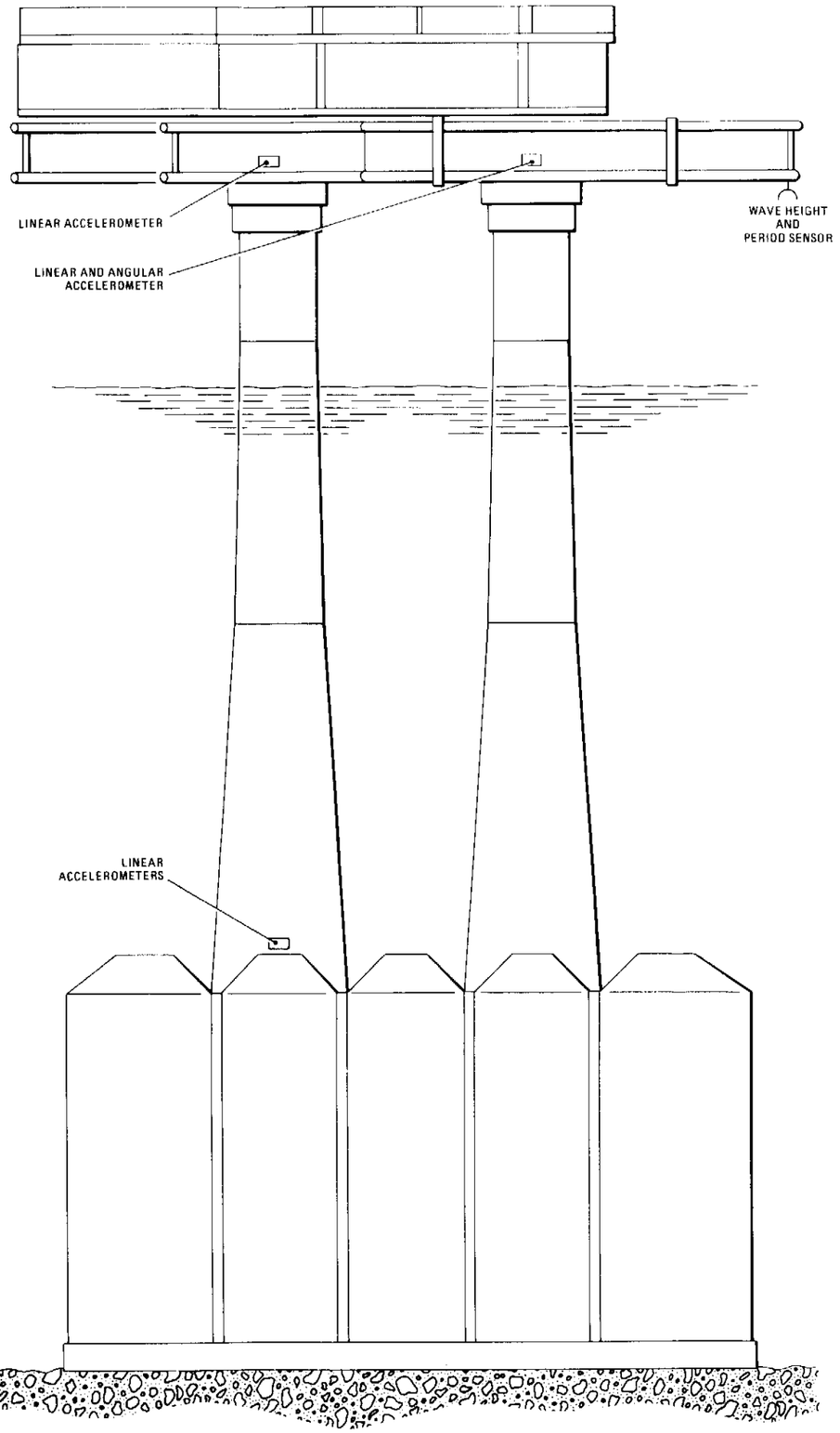
3 DYNAMIC RESPONSE

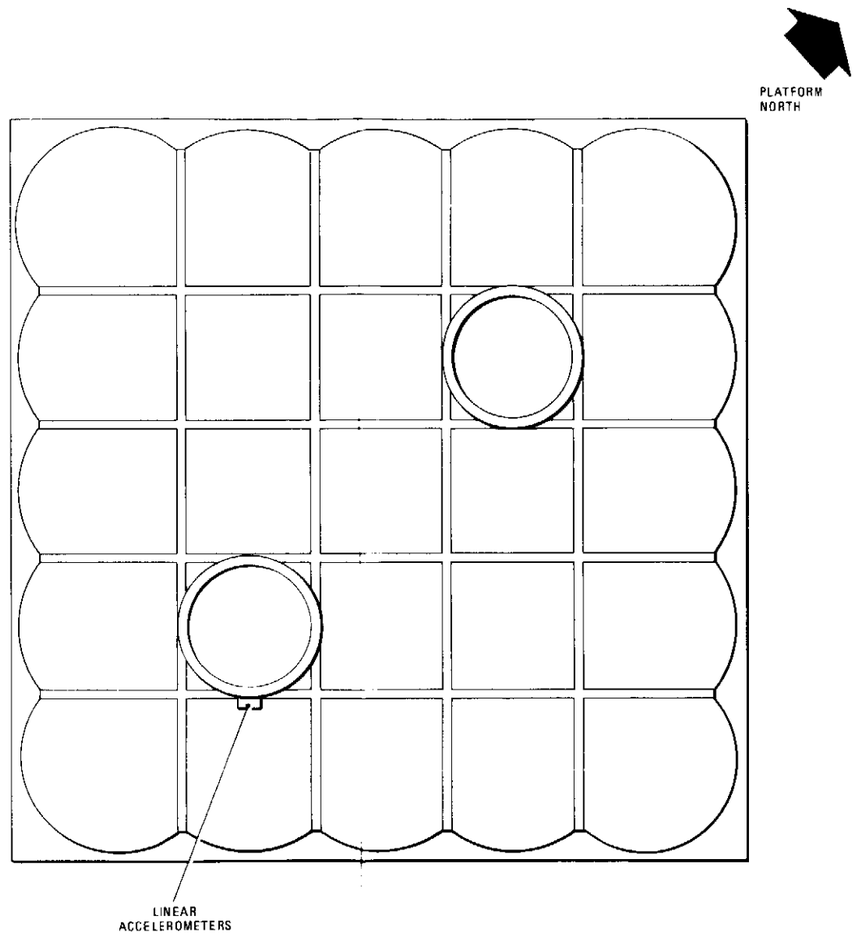
3.1 To monitor base and deck motion, accelerometers are fitted to columns C1 and C2 at deck level and the caisson roof at elevation –60.000m.

3.2 Four accelerometers are fitted to each column, two measuring rotational and two measuring linear motions. The two accelerometers fitted at caisson roof level inside column C1 measure linear motion only.

4 WIND SPEED

A portable anemometer with a direction indicator is located in Interface Room No 1. When required for use the instrument is positioned near pedestal crane M7 and the wind speed and direction read directly from dial indicators.


LINEAR ACCELEROMETER
LINEAR AND ANGULAR ACCELEROMETER
WAVE HEIGHT AND PERIOD SENSOR
LINEAR ACCELEROMETERS


PLATFORM NORTH
LINEAR ACCELEROMETERS

PRIMARY STRUCTURE

1 GENERAL

1.1 Platform TP1, standing in 103m of water, is a concrete gravity structure comprising a skirt, base, caisson and two deck support columns.

1.2 The area of the base slab is 5184m^2. Voids between the base and the seabed are filled with grout.

1.3 Skirt walls, 2m deep, are provided along grid lines 1, 3, 4, 6, A, C, D and F. These skirt walls taper from 900mm at the base slab to 300mm at the tip. Penetration of the seabed by the skirt walls provides protection against scour resulting from movement of water induced by wave effects. Further protection against scour is provided by bags of gravel surrounding the base slab.

1.4 The caisson is formed by a series of vertical concrete walls set in the base slab and crossing each other at right angles to form 25 cells. These walls are built on grid lines 1 to 6 and A to F. Cells C1 and C2 form the bases of the deck support columns, the remaining cells being enclosed by the caisson roof.

1.5 To provide extra ballast the base is covered with concrete up to elevation –97.000m in all the cells.

1.6 The columns are pilings of tapered and cylindrical shell elements of a thickness varying from 0.800m at roof level (elevation –65.000m) to 0.400m at deck level (elevation +19.000m).

1.7 At elevation –65.000m their external diameter is 13.800m tapering to 8.800m at elevation –24.500m; the wall thickness is a constant 0.800m. The columns then taper to 8.000m external diameter at elevation +3.000m, while the wall thickness decreases to 0.400m. From elevation +5.000m to +16.000m, each column is formed from a constant cylinder and is completed by a top collar 0.860m thick, having an external diameter of 8.920m. The top collars are thickened to provide a greater bearing surface for the transition places between the columns and the support frame.

1.8 Risers, vent lines, immersion monitoring pipes and instrumentation piping are led up the inside of the columns to the deck. They are secured to the walls by means of sockets, pad-eyes and bracing.

1.9 The secondary structure is connected to the tops of the support columns by steel transition caps (tie-in cans) bolted to the concrete structure by prestressing bolts.

1.10 The caisson and support columns are filled with sea water up to sea level. This water acts as ballast and ensures that no pressure differential exists between the inside of the structure and the surrounding sea.

2 COLUMN WATER CIRCULATION

2.1 Heating of water in the support columns due to hot gases in the risers is controlled by a water circulation system. The design allows for a temperature differential of 12°C between the water in the column and the surrounding sea.

2.2 Cold water is admitted to the columns via 8in lines at elevation –6.000m, and via gate valves to diffuser outlets at elevation –98.75m.

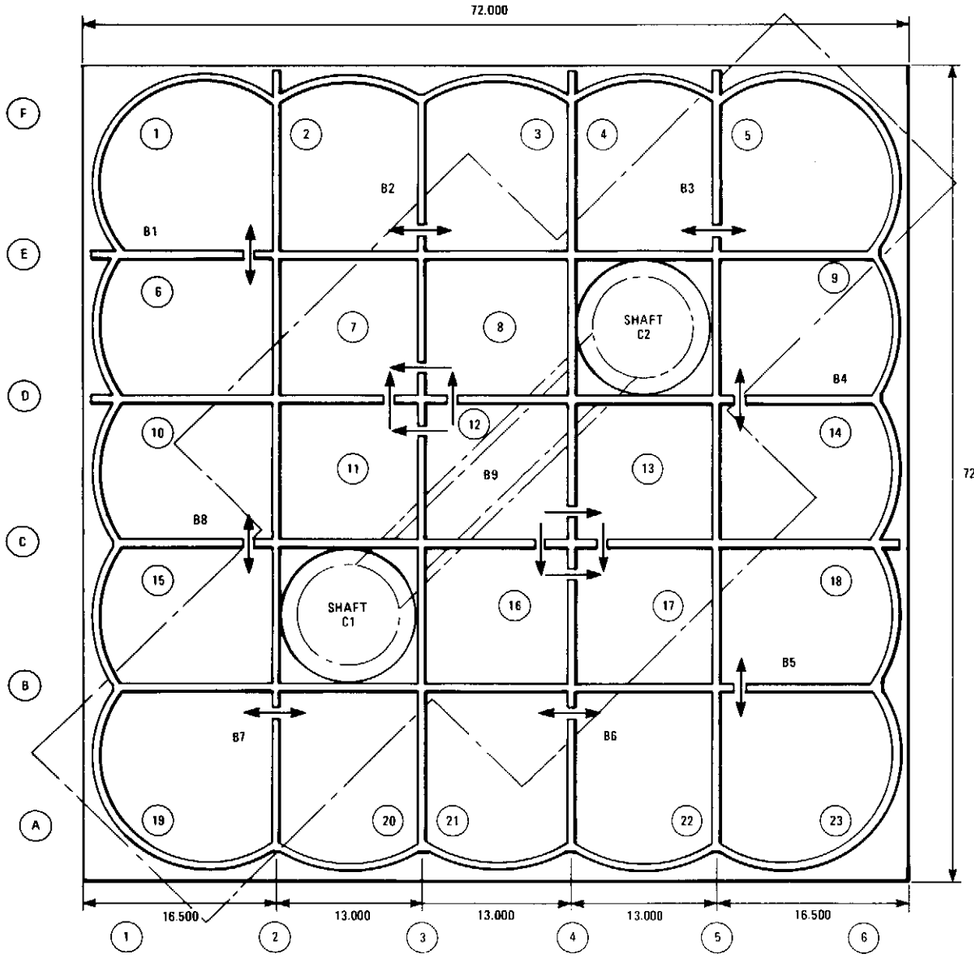
2.3 Hot water is discharged overboard as required by two manually operated electrically driven submersible pumps.

3 COLUMN DEWATERING

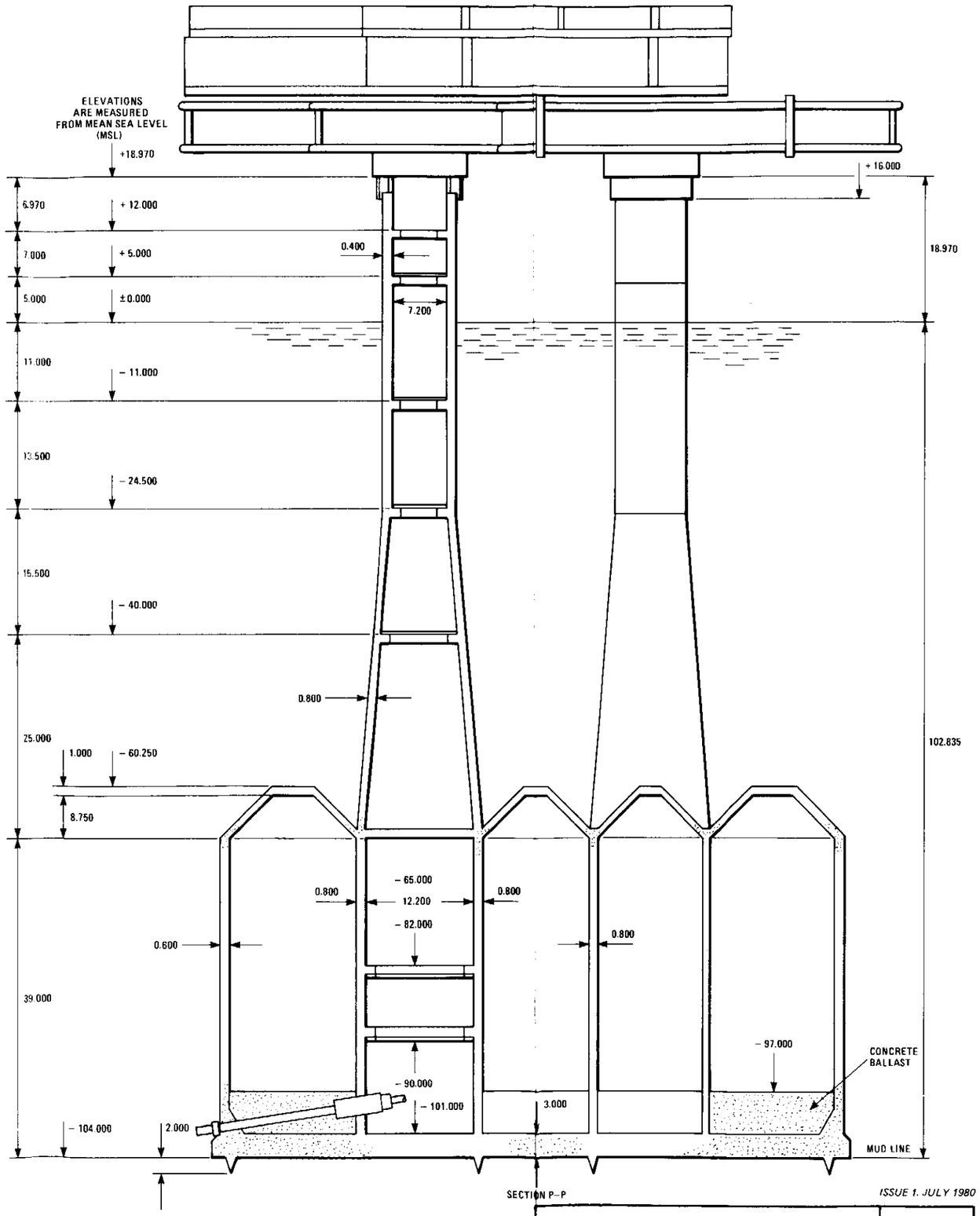
3.1 The platform normally works with the two columns full of water, but it will be necessary to dewater from time to time for maintenance and inspection purposes.

3.2 To accomplish dewatering the minipacker seals at the riser inlets are inflated with nitrogen, the water inlet valves are closed and the water pumped overboard by two manually operated, electrically driven pumps installed at the base of each column.

END



PLAN VIEW OF CAISSON



ISSUE 1. JULY 1980

SECONDARY STRUCTURE

1 GENERAL

1.1 The main deck structure (steel support frame) is of the tubular truss type. The main trusses, SC and SB, are 6,5m deep and span 93m on the north-south axis of the platform. The width of the structure is 22m, the 'wings' giving a maximum width of 44m between axes S3 and S4. The main trusses are supported on two 5.5m diameter tubes cantilevered from the steel extension of the support columns.

1.2 The central main structual member in the column/deck frame is used as a storage tank. The tank is divided into three sections giving storage facilities for methanol, diesel oil and glycol.

1.3 Skid beams welded to the top chord of the main trusses are used to support the production modules.

1.4 The production decks or pancakes are supported on brackets welded to the lower chord of the main and transverse trusses.

1.5 The Cellar Deck (Lower Deck) level is at elevation +23.000m and the Module Deck (Upper Deck) is mounted on the upper chord of the deck truss at elevation +28.500m.

1.6 The Cellar Deck is divided into zones numbered 06 to 13, and the Lower and Upper decks are divided into zones numbered 01 to 05.

1.7 Bridges connecting TP1 with QP and TCP2 have their landings built into the decks of Zones 05 and 03 respectively.

1.8 The pedestals for cranes M7 and M8 are intergal parts of the modules forming the south-west and north-east corners respectively of Zones 04 and 03.

1.9 A pancake named Module 23 is situated on the upper chord of the deck trusses just above column C2.

2 PRODUCTION ZONES

The main items of equipment or systems within each Zone are given below.

2.1 Cellar Deck

Zone 06 - Air Conditioning Room, Instrument Interface Rooms 1 and 2, Switchboard and Switchgear Rooms, Transformer Room.

Zone 07 - Firepump House and utilities pumps.

Zone 08 - Workshops and waste treatment unit.

Zone 09 - Condensate and glycol pumps.

Zone 09 and 10 - Bulk storage of glycol, methanol and diesel fuel.

Zone 10 - Mud, methanol and diesel fuel pumps. Flare scrubber and cement surge tank.

Zone 11 - Mud system air compressors and nitrogen unit.

Zone 12 — Firepump House.

Zone 13 — Condensate burner booms.

2.2 Lower Deck

Zone 01 — Condensate and fuel gas systems and crane pedestal No 1.

Zone 02 — Free water knockout separators.

Zone 03 — Glycol contactors.

Zone 04 — Glycol regenerators and crane pedestal No 2.

Zone 05 — Electrical generators.

2.3 Upper Deck

Zone 01 — Mud system, pig receivers, pig launchers, pedestal No 1 and cold vent stack.

Zone 02 — Hydraulic unit and separator valves.

Zone 03 — Glycol system.

Zone 04 — Pig receivers and glycol reboilers.

Zone 05 — LP vent stack, lub oil cooler and inlet and exhaust ducts.

3 DECK LOADING PLAN

3.1 Definition

3.1.1 Dead load

Weight of structure inclusive of cladding etc in the module and the dry weight of the known equipment in the structure.

3.1.2 Variable Load

Variable part of the equipment load inside the structure. This includes water oil glycol methanol etc inside the equipment.

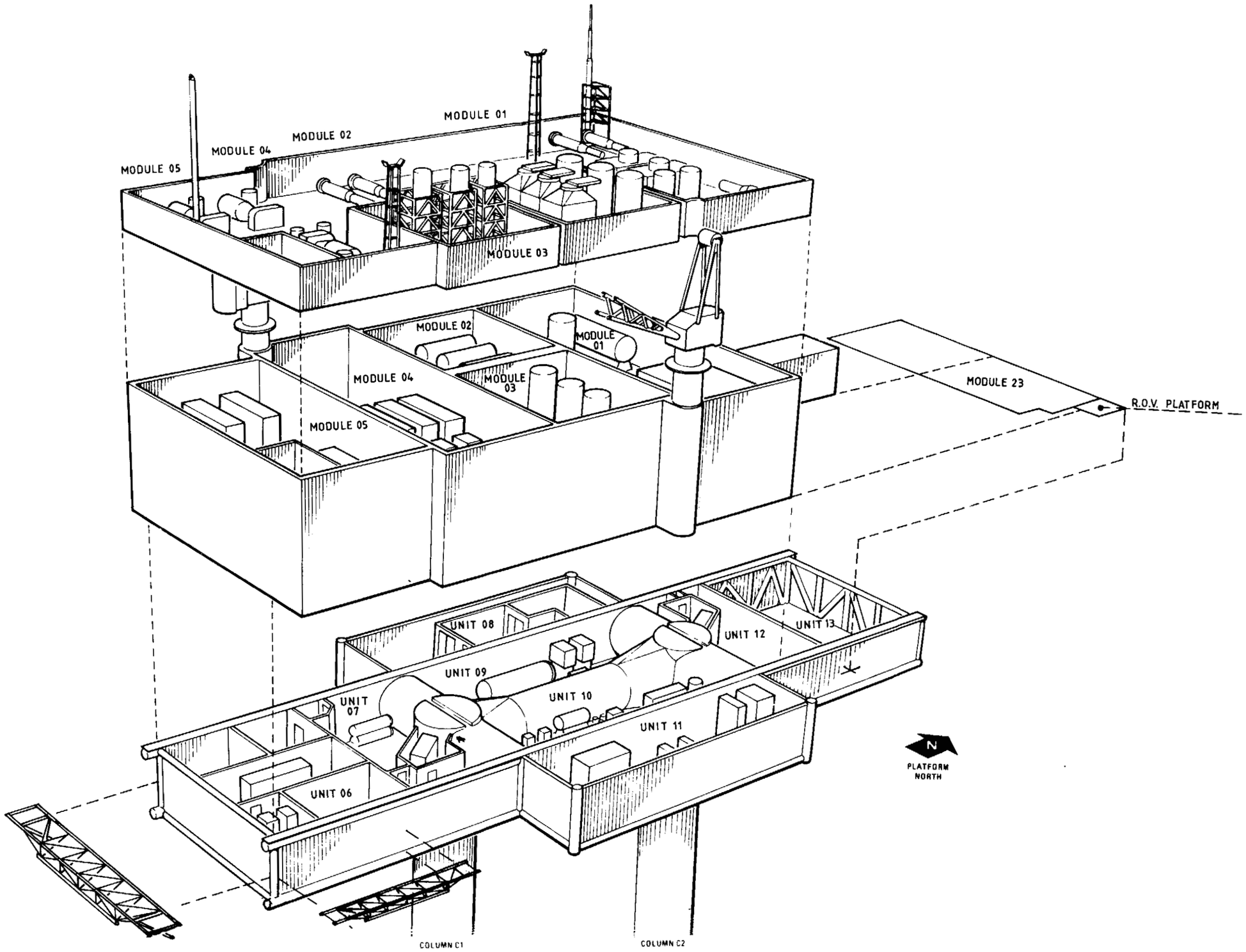
3.1.3 Live Load

It includes allowance for change in equipment or use of extra loads caused by unspecified storage, any extra load imposed by ice and snow, water or people moving machinery etc. Live load is considered to act on large areas uncovered by equipment.

3.2 Table of Loads

Module	Dead Load KN	Variable Load KN	Live Load KN	Total KN
01	3582	5789	6145	15516
02	4134	2799	1068	8001
03	8557	1535	2563	12655
04	5642	1544	2674	9860
05	3035	2906	1148	7089
06	2114		35	2149
07	1887		4	1891
08	2505		13	2518
09	423		1842	2265
10	418		1517	1935
11	1967	-	-	1967
12	1233		4	1237
13	881	-	-	881
MK60 CRANE1	405	-	294	699
MK60 PEDESTAL	133	-	-	133
MK60 CRANE 2	405	-	294	699
MK60 PEDESTAL	133	-	-	133
BRIDGE TO QP	1068	-	-	1068
BRIDGE TO TCP2	1388	-	-	1388
SUPPORT FRAME	15579	-	-	15579
PIPING (NOT MODULES)	-	890	-	890
PERIPHERAL PIPING	-	125	-	125
SUB TOTAL	46904	15588	17601	
	8580			
GRAND TOTAL D+L+V	88673KN			

Note. For modules: 06,07,08,09.10 and 12 the table does not allow for split loads in dead and live loads. The sum of these undistributed loads is indicated below the sums of the dead and live loads and must not be forgotten in the total sum.



ISSUE 2 AUGUST 1984

SECONDARY STRUCTURE	2.5

RISERS AND FLOWLINES

1 GENERAL

1.1 Subsea flowlines and their associated risers and 'J' tubes are provided to:

(a) Import wet gas and condensate from CDP1.

(b) Export dry gas to St Fergus, gas and air to FP and mud to CDP1 well kill system.

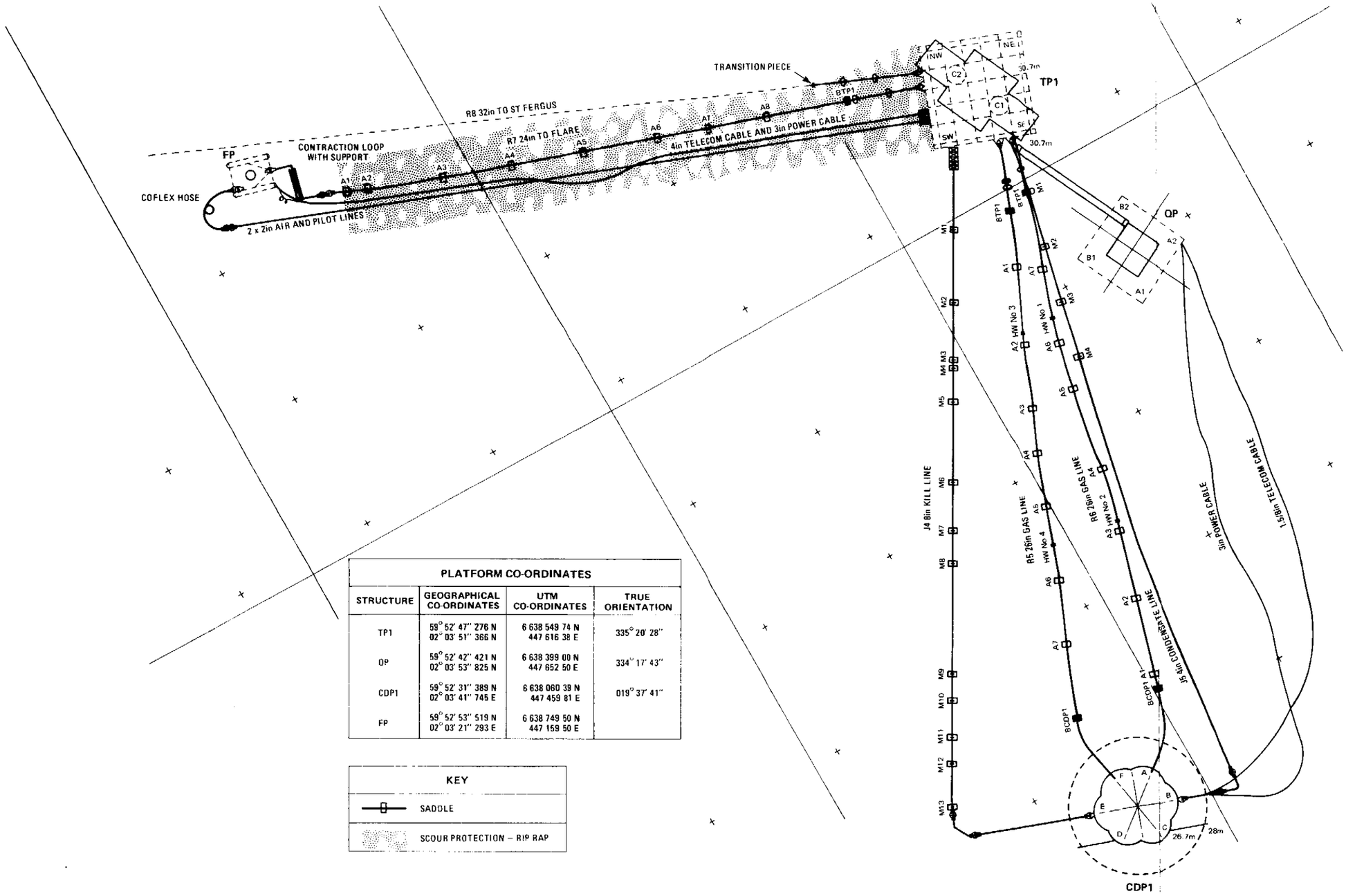
1.2 The risers enter the platform through inflatable seals located in the caisson and support column walls. The risers and 'J' tubes are routed up the inside of the support columns to the process areas.

1.3 Subsea flowline routes and their associated risers and 'J' tubes are shown in the following table:

Tag Number	Riser Dia (in)	Flowline Dia (in)	Line Content	Column Number	Line Route
R1	32	–	Gas	2	Not used
R1X	32	–	Gas	2	Not used
R2	24	–	Gas	2	Not used
R2X	24	–	Gas	2	Not used
R3	26	–	Gas	1	Not used
R4	26	–	Gas	1	Not used
R5	26	26	Wet gas	1	CDP1 to TP1
R6	26	26	Wet gas	1	CDP1 to TP1
R7	24	24	Gas	2	TP1 to FP
R8	32	32	Dry gas	2	TP1 to MCP01
J1	18	–	Two power cables	1	
J2	10.75	–	Empty		
J3	10.75	2 2	Fuel gas Air	1	TP1 to FP
J4	18	8	Kill Line	2	TP1 to CDP1
J5	10.75	4	Condensate	1	CDP1 to TP1

1.4 The flowlines are retained in their positions by saddles.

1.5 Flowlines between TP1 and FP are protected against scour by a thick layer of rip-rap.



PLATFORM CO-ORDINATES			
STRUCTURE	GEOGRAPHICAL CO-ORDINATES	UTM CO-ORDINATES	TRUE ORIENTATION
TP1	59° 52' 47" 276 N 02° 03' 51" 366 N	6 638 549 74 N 447 616 38 E	335° 20' 28"
QP	59° 52' 42" 421 N 02° 03' 53" 825 N	6 638 399 00 N 447 652 50 E	334° 17' 43"
CDP1	59° 52' 31" 389 N 02° 03' 41" 745 E	6 638 060 39 N 447 459 81 E	019° 37' 41"
FP	59° 52' 53" 519 N 02° 03' 21" 293 E	6 638 749 50 N 447 159 50 E	

KEY	
	SADDLE
	SCOUR PROTECTION – RIP RAP

MATERIALS AND CONSTRUCTION

1 GENERAL

The following materials are used in the platform structure:

(a) Concrete – grade C50 to CP110 specification.

(b) Structural steel used for load-carrying members – SHSS20, SHSS40 and ST–52–3M to DIN 17100.

(c) Non-structural mild steel for module guides, walkway supports etc – MS–ST–37 to DIN 17100.

2 CONTRACTORS

2.1 The primary structure was designed by the Sea Tank Company, France, and constructed at Ardyne Point in Scotland by Sir Robert McAlpine Ltd.

2.2 The structural support frame was designed by McDermott-Hudson Engineering, London, and fabricated by Construction Metallique de Provence at Dunkerque, France.

2.3 The main contractor for design and fabrication of the secondary structure was McDermott-Hudson Engineering, London. Fabrication was carried out mainly at Mercantile Marine Engineering and Graving Docks, Antwerp.

2.4 The cold vent stack was designed by Aker Engineering A.S.

3 DESIGN CODES

The platform complies with the following codes and regulations:

American Petroleum Institute – API–RP2A.

American National Standards Institute – ANSI–A58 (Loads Only).

American National Standards Institute – ANSI–B31,3 (Piping).

American Society of Mechanical Engineers – ASME, Section VIII, Pressure Vessel Design Standard.

American Welding Society – Structural Welding D.11, Code 1977.

British Standards Institution – BS 1515.

British Standards Institution – BS 5405.

British Standards Institution – BS 5345.

Department of Energy – Offshore Installations – Guidance on Design and Construction.

Department of Trade, Marine Division – Continental Shelf Act 1964.

Department of Trade – Markings of Offshore Structures, 1976.

Det norske Veritas – Rules for Fixed Offshore Structures, 1974.

Elf Norge – Fabrication Specification 1052 – No 3/155, Rev 2/JPS February 1974, and No 2110–50–1 for Class EC.

Institute of Electrical and Electronic Engineers – Recommended Practice for Electrical Power Distribution for Industrial Plants Std 141 – 1976.

Institute of Electrical and Electronic Engineers – Recommended Practice for Grounding of Industrial and Commercial Power Systems, Std 142 – 1972.

Institute of Petroleum – Code of Safe Practice Electrical – Part 1, 1965.

International Convention for Safety of Life at Sea – 1960.

International Telecommunication Union – Radio Regulations.

Norwegian Coast Directorate – Regulations for Marking of Production Platforms.

Norwegian Petroleum Directorate Regulations – Norwegian Standards – NS 3472.

Statutory Instruments 1976 – No 1019 The Offshore Installations (Operational Safety, Health and Welfare) Regulations, 1976.

United Kingdom Home Office Specification – S.

4 PAINTS AND COATINGS

4.1 All surface preparation and coating on the platform complies with the following codes:

Swedish Standard SIS.05.5900 – Pictorial Surface Preparation Standards for Painting Steel Surfaces 1977.

Surface Finish of Blast Cleaned Steel for Painting – BS 4232 – 1967.

European Scale of Degree of Rusting for Anti-corrosive Paints – Stockholm – 1961.

SSPC – Surface Preparation Specification, VIS1.

Elf Norge – Frigg Field 'Painting Specification for Steel Structures' DEP 1052 No 3 – 169, Rev 1 – March 1974.

Elf – RE Standard Specification P7, Coating for Marine Structures' DGEP 01.E.90 No 2 – 530, Rev 0 – September 1972.

Secco 'Standard Specification for Application of Coating on Steel Parts', Secco A922 HZ/Mg – April 1974.

4.2 All structural and support steelwork, and external surfaces in the tidal range and splash zone are painted with red antifouling paint as follows:

1 coat primer	– 75 microns
2 tie coats	– 100 microns each
2 antifouling coats	– 40 microns each

4.3 External surfaces in the Emerged Zone are painted pearl grey (Signalec colour code GR4) as follows:

1 coat primer	– 75 microns
2 tie coats	– 25 and 100 microns
1 top coat	– 50 microns

4.4 High temperature surfaces (+110°C to +400°C) are painted silver as follows:

1 coat primer	— 50 microns
2 tie coats	— 25 microns each
2 top coats	— 25 microns each

4.5 Non-skid surfaces are painted pearl grey (Signalec colour code GR4) as follows:

1 coat primer	— 75 microns
2 tie coats	— 100 microns each
1 top coat	— 75 microns

Before the second tie coat dries, internal surfaces are sprinkled with 0.1mm to 0.5mm inert grit; external surfaces are sprinkled with 0.5mm to 2mm inert grit.

4.6 Galvanised surfaces are etched and degreased and painted in accordance with the above specifications.

5 PIPELINE IDENTIFICATION SYSTEM

Pipeline systems are identified by coloured arrows superimposed on coloured bands located at convenient intervals. Flow direction is shown by the arrows which also have the pipeline contents stencilled on them in black letters.

ELF NORGE A/S
PIPELINE IDENTIFICATION COLOUR CODE
FRIGG FIELD

COLOUR CODE	PIPE CONTENT	COLOUR CODE	PIPE CONTENT
	SEA WATER		METHANOL
	FRESH WATER		GLYCOL
	FIREWATER		INHIBITOR
	SEWAGE AND DRAIN		CHEMICALS
	DIESEL OIL		CO_2 AND HALON
	LUB OIL		WET GAS
	HYDRAULIC OIL		DRY GAS
	CONDENSATE		HP RELIEF GAS
	STEAM		LP RELIEF GAS
	COMPRESSED AIR		FUEL GAS
	INSTRUMENT AIR		HP MUD
	VENTILATION PRESSURISATION AND AIR CONDITIONING		LP MUD

CATHODIC PROTECTION

1 GENERAL

1.1 To prevent corrosion by galvanic action, sacrificial ALHG anodes are located at strategic points around the structure.

1.2 A monitoring system is installed to keep the levels of protection of the various pipes and risers under constant review.

2 DESIGN CRITERIA

The criteria for system design and installation were as follows:

Life requirement	– 20 years
Current requirement for bare steel	– 108mA/m^2
Current requirement of steel reinforcement in concrete structure (TP1 & CDP1) per steel reinforcement surface	– 1.0mA/m^2
Assumed bare steel area of pipeline	– 2.5%
Sacrificial anodes to US mil Spec A–1800 I.H assumed consumption rate	– 11.2kg/year

3 REFERENCE ELECTRODES

3.1 Extra pure zinc electrodes used for reference purposes are installed in each column at elevation –64.386m and –24.500m.

3.2 Cables from each electrode are routed to junction boxes at the top of each column.

4 BONDING

Bonding cables are installed between the tunnels and the risers to ensure continuity.

5 MONITORING PANEL

5.1 The monitoring panel, located in the Interface Room in Zone 06 is connected to the junction boxes at the top of each column by multicore cables.

5.2 The following equipment is mounted on the panel and is used for taking the routine readings:

(a) Digital voltmeter.

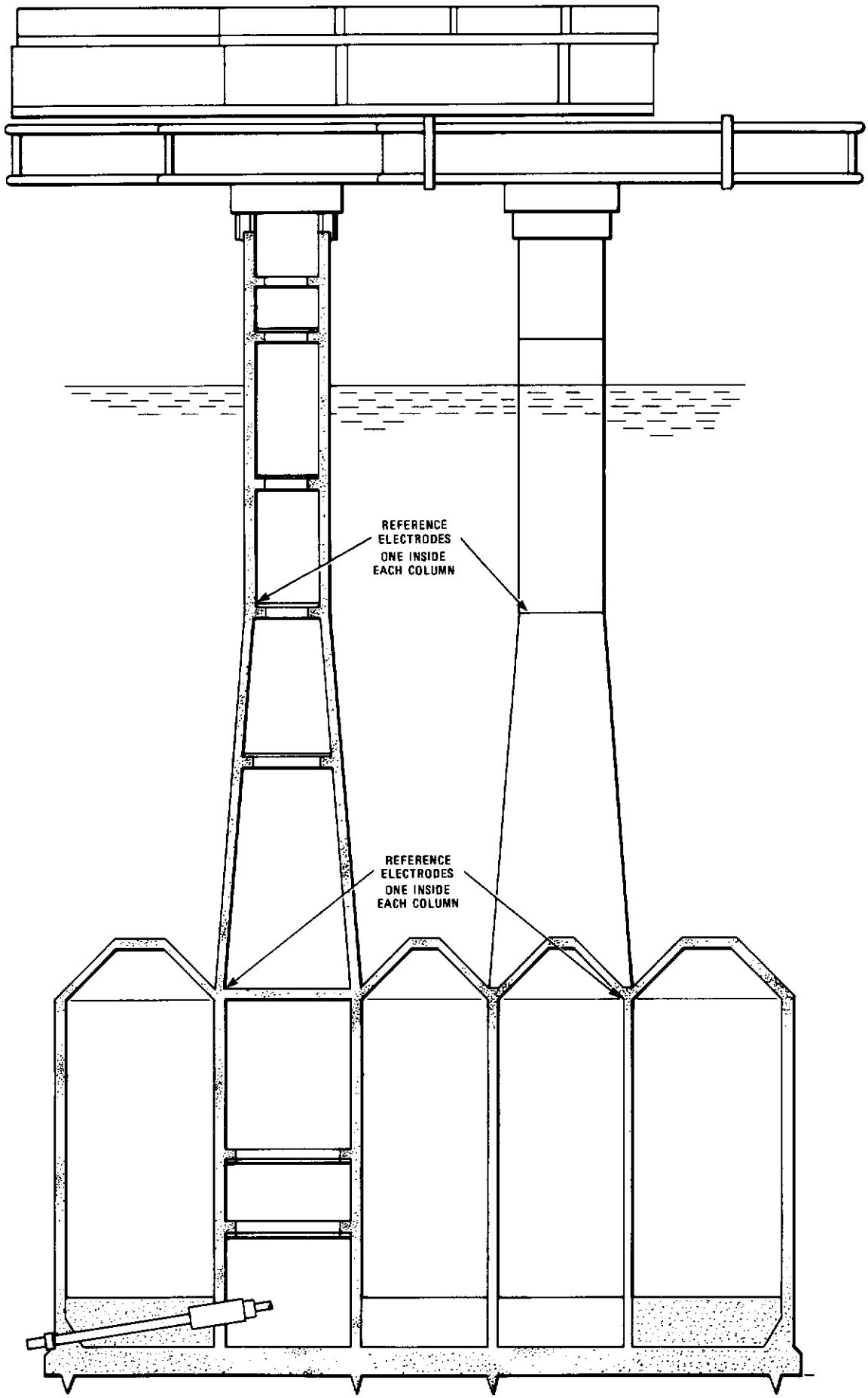
(b) Micro selector switches.

(c) On/Off switch.

(d) POWER ON indicator lamp.

5.3 By pressing one button for the reference electrodes or reinforcing bars, and one button for the pipelines, 'J' tubes or tunnel sleeves, a reading will be shown on the digital voltmeter. These readings (taken over a period) will show any changes in the potential levels.

5.4 The selector switches are electrically interlocked to prevent two switches in the same bank being operated at the same time.



ISSUE 1. JULY 1980

CATHODIC PROTECTION | 2.8

CHAPTER 3

EQUIPMENT LOCATION

CONTENTS

DIAGRAMS

EQUIPMENT LOCATION-CELLAR DECK LEVEL

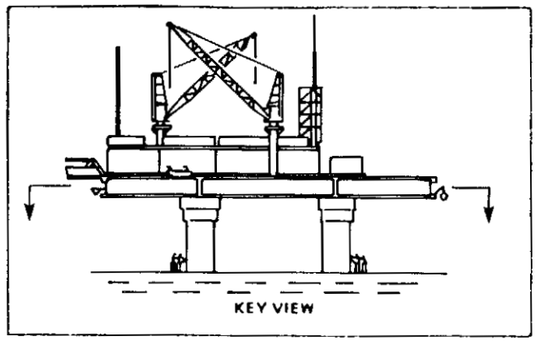
Equipent No	Description	Zone
M18A & B	5-ton hoist	08
M20A & B	10-ton hoist	07,12
M21	5-ton hoist	09
M23A & B	5-ton hoist	07,12
M24A & B	7 1/2-ton hoist	07,12
M25A & B	Emergency start nitrogen bottles	07,12
P1A & B	Condensate booster pumps	09
P2A & B	Condensate return pumps	09
P3	Sump pump	07
Q19	Nitrogen HP compressor	10
P5	Mud water pump	07
P6A & B	Firewater pumps	07,12
P7	Washdown pump	07
P8A & B	Diesel pumps	10
P9A & B	Slops oil pumps	09
P12A & B	Methanol metering pumps	10
P13A & B	Glycol fill pumps	09
P17A & B	Methanol transfer pumps	10
P18A & B	Diesel oil pump	10
Q4	Halon bottles	06
Q5	Instrument and utility air compressor package	11
Q16	Nitrogen unit	11
SP35A & B	Diesel oil coalescer	10
SP39A & B	Diesel oil filter	10
V4	Coalescer	09
V5	Oil skimmer	09
V7	LP vent scrubber	08
V9	Glycol storage tank	09,10
V10	Diesel storage tank	09,10
V11A & B	Firewater diesel day tanks	07,12
V13	Sump caisson	07
V21	Diesel filter	10
V23	Methanol storage tank	09,10
V24	HP flare scrubber	10
V29A & B	Condensate pulsation dampeners	09
V30A & B	Slops oil pulsation dampeners	09
V32A & B	Methanol pulsation dampeners	10
V35A & B	Air start vessel	07,12

EQUIPMENT LOCATION – LOWER LEVEL

Equipment No	Description	Zone
E3	Fuel gas exchanger	01
M7	Crane pedestal No 2	04
M8	Crane pedestal No 1	01
M19A & B	2-ton hoist	05
M22A & B	10-ton hoist	05
P15A & B	Condensate recycle pump	01
P19A & B	Main diesel oil fuel pump	05
Q1A, B & C	Glycol regeneration unit	04
Q4	Halon bottles	05
TA1, 2 & 3	Generator package unit	05
V1A, B & C	FWKO separators	02
V2A, B & C	Contactors	03
V3	Condensate surge tank	01
V6	Fuel gas separator	01
V31	Glycol charcoal filter	04
V33	Condensate storage tank	01
No 5	Lifeboat	05
No 6	Lifeboat	04

EQUIPMENT LOCATION – UPPER LEVEL

Equipment No	Description	Zone
E2A, B & C	Glycol air coolers	03
M1	Pig receiver	04
M2	Pig receiver	04
M3	Pig launcher	01
M4	Pig receiver	01
M5	Pig receiver	01
M7	Crane pedestal No 2	04
M8	Crane pedestal No 1	01
Q1A, B & C	Glycol reboilers	04
Q7	Central hydraulic unit	02
Q8	Remote control station for pigs	01
SP24	LP vent stack	05
SP44	Cold vent stack	01
V2A, B & C	Glycol contactors	03
V8A	Mud mix tank	01



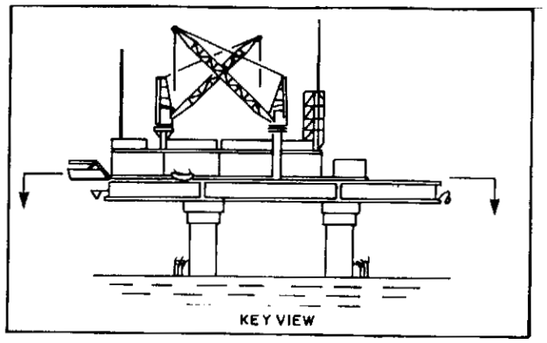
PLATFORM NORTH N

OIL STORAGE
M18A
WORKSHOP
MONORAIL
STORAGE AREA
M18B
MONORAIL
V7
UNIT 08
WALKWAY No 1
WALKWAY No 2
P3A P3B
V30A
V30B
P2A
P2B
M21
V29A
V29B
M25A
FIREWATER 1 HOUSING
PSA V11A
M20A
M24A
M35A
AIR CONDITIONING ROOM
INSTRUMENT INTERFACE ROOM No 1
V5
UNIT 07
UNIT 09
P1B
P13B
P13A
V4
55kV SWITCHBOARD
P7
V13
P3
M23B
P5
M24B
M20B
COLUMN 1
V23
V10
V9
COLUMN 2
FUTURE COMPRESSOR UTILITIES PACKAGE
M23A
M35B
LIFEBOAT No 7
UNIT 06
SWITCHGEAR ROOM
V24
P8B
P8A
V21
Q19
V32B
V32A
P17A
P17B
SP35A
SP39A
P18A
P18B
SP35B
SP39B
P12B
UNIT 12
UNIT 13
TRANSFORMER ROOM
INSTRUMENT INTERFACE ROOM No 2
FIREWATER PUMP HOUSING
M25B
P9B V11B
UNIT 10
PIPERACK TO OP BRIDGE
WALKWAY No 3
WALKWAY No 4
Q5
UNIT 11
Q16

ISSUE 4 AUGUST 1984

EQUIPMENT LOCATION
Cellar Deck Level

3.1.1



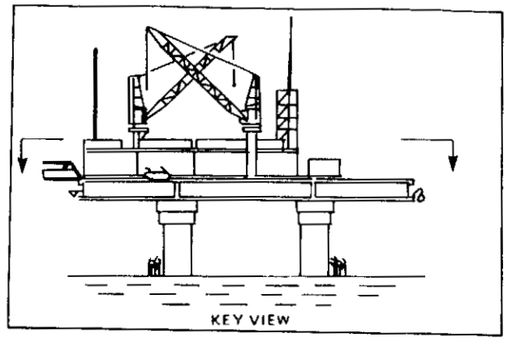
PLATFORM NORTH N

LIFEBOAT NO. 5
M7 PEDESTAL
METHANOL STORAGE PLATFORM
HOSE STORAGE PLATFORM
BRIGDE TO Q.P.
P19B
P19A
M19A
TA-2
TA-1
M22A
M22B
CALIBRATION CONTAINER
Q15
MODULE 04
V1A
MODULE 02
V1B
V1C
P15A
P15B
V33
V3
V8
B3
MODULE 01
HATCH WAY
V31
HATCHWAY
MODULE 23
BATTERY ROOM
MODULE 05
TA-3
M19B
04
G1A (V-17A)
G1B (-17B)
G1C (V-17C)
V-14A
V-14B
V-14C
MAJOR ACCESS WAY TO Q.P OR TCP2
V2A
V2B
V2C
MODULE 03
CONTACTOR VALVE MANIFOLDS
M8 PEDESTAL
ROV PLAT-FORM
METHANOL STORAGE AND HOSE LOADING PLATFORM
LIFEBOAT NO. 6
BRIDGE TO TCP2

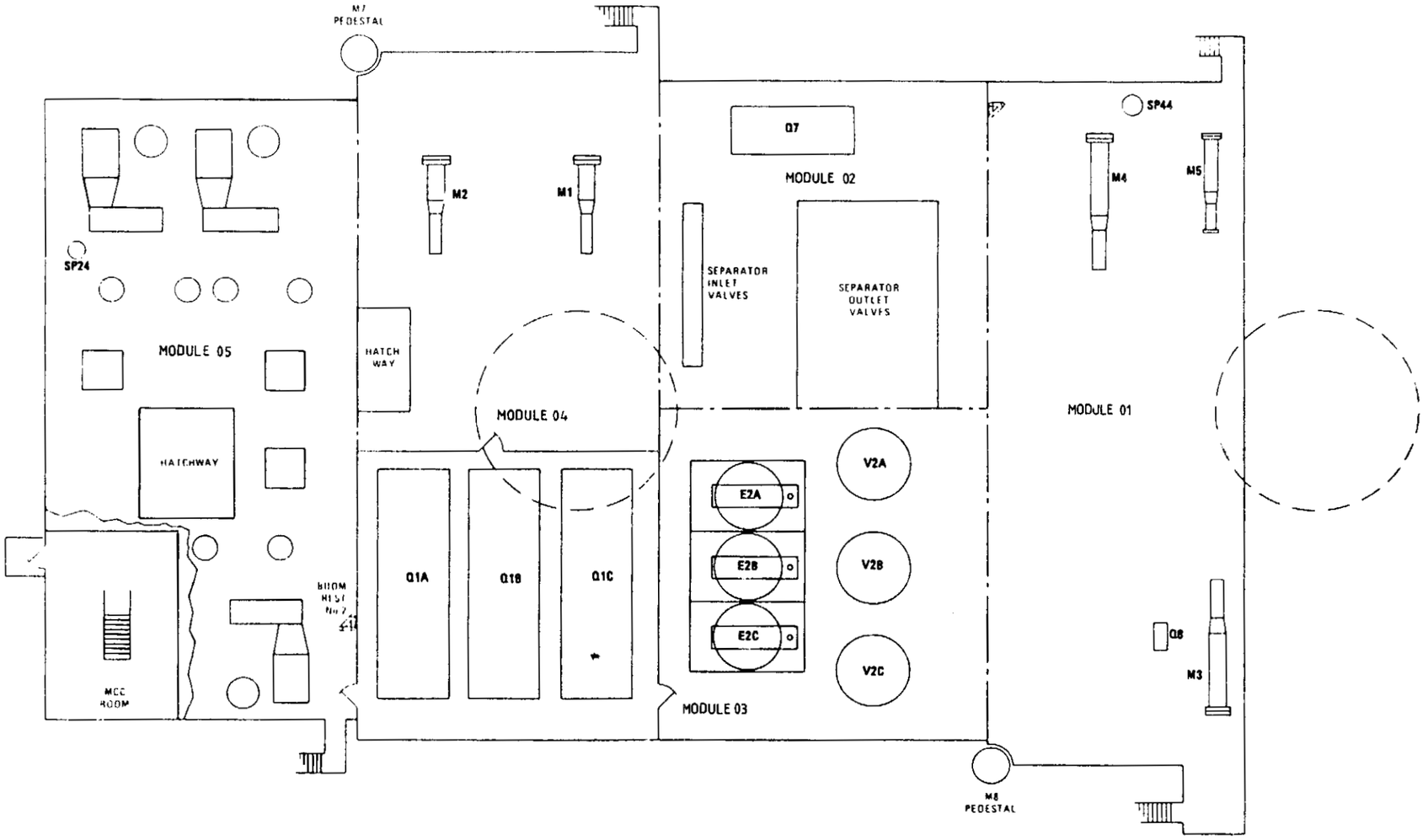
ISSUE 4 AUGUST 1984

EQUIPMENT LOCATION
Lower Level

3.1.2



PLATFORM NORTH



ISSUE 4 AUGUST 1984

EQUIPMENT LOCATION
Upper Level

3.1.3

CHAPTER 4

PRODUCTION FACILITIES

CONTENTS

DIAGRAMS

PROCESS FLOW

1 GENERAL

1.1 Wet gas from CDP1 enters the platform via two 26in sea lines into a 26in manifold; a pig receiver is fitted at the termination of each line. From the manifold the gas discharges into three process streams, of which two are normally operating with the third on standby.

1.2 A process stream comprises a free water knockout (FWKO) separator, a glycol contactor, a metering facility and four flow control valves. Free liquid is removed in the FWKO separator and the gas is then dried to the required water dewpoint in the contactor. The gas is discharged from the stream via the metering facility and the flow control valves.

1.3 Provision is made to feed the gas from the FWKO separators to TCP2 Compression facilities and to return the high pressure gas to the contactors for drying, metering and export.

1.4 Dry gas from the process streams is gathered in the 32in sales gas header and is then transmitted to St.Fergus Gas Terminal via a 32in sea line incorporating a pig laucher.

1.5 Condensate recovered on CDP1 is transmitted to the platform via the 26in sea lines. Condensate recovered on TP1 is injected into the 32in sea line for recovery at St.Fergus.

1.6 Water recovered during gas drying is released as vapour during glycol regeneration; that recovered during condensate drying is disposed of via the Draining System.

TCP2
COMPRESSION
FACILITIES
TO
FROM
HV V1A-3
HV V1A-4
HV V1A-1
FROM GLYCOL PUMPS
GLYCOL CONTACTOR V2A
LC V2A-4
LCV V2A-4
TO GLYCOL REBOILER
FEV 2A-2
FCV V2A-2A
FCV V2A-2B
FCV V2A-2C
FCV V2A-2D
FLOW METERING AND CONTROL
HV V2A-2
INTERCONNECTION WITH TCP2
HV V2A-1
FROM STREAM 2
HV 2B-1
FROM STREAM 3
HV 2C-1
32in SALES GAS HEADER
FWKO SEPARATOR V1A
LC V1A-1
LCV V1A-1X
FROM STREAMS 2 & 3
HV M4-5
HV M4-3
HV M4-1
ESDV M4-1
HV M4-2
PIG RECEIVING TRAP M4
HV M5-5
HV M5-3
HV M5-1
ESDV M5-1
HV M5-2
PIG RECEIVING TRAP M5
PSV V2A-8/11
TO HP RELIEF SYSTEM
HV M3-1
HV M3-3
SCRAPER PIG LAUNCHER M3
HV M3-2
32in SEALINE TO ST FERGUS SCOTLAND
INTER-CONNECTION WITH TCP2
FT V4-1
HV M1-5
HV M1-1
HV M1-3
26in SEA LINE FROM COP1
HV M1-2
SPHERICAL PIG RECEIVER M1
HV M1-6
TO STREAM 2
HV M1-4
HV M2-6
INTER CONNECTION WITH TCP2
HV M2-4
HV M2-5
HV M2-1
HV M2-3
26in SEA LINE FROM COP1
HV M2-2
SPHERICAL PIG RECEIVER M2
TO STREAM 3
TO FLARE
PCV V3-3
PC V3-3
LCV V3-10
LC V3-10
CONDENSATE STORAGE TANK V33
CONDENSATE RECYCLE PUMP P15
M
CONDENSATE SURGE TANK V3
LC V3-2
LC V3-5
LCV V3-2
CONDENSATE BOOSTER PUMP P1 (NORMALLY BY-PASSED)
COALESCER V4
LC V4-2
CONDENSATE RETURN PUMP P2
LCV V3-5
LCV V4-2
LP VENT
PCV V5-8
FROM GLYCOL CONDENSATE SEPARATORS
OIL SKIMMER V5
LC V5-7
SLOPS OIL PUMP P9
TO DRAIN
LCV V5-7

ISSUE 4 AUGUST 1984

PROCESS FLOW	4.1

GAS IMPORT

1 GENERAL

Wet gas from CDP1 enters the platform via two 26in sea lines into a 26in manifold; a pig receiver is fitted at the termination of each line. From the manifold the gas discharges into three process streams, of which two are normally operating with the third on standby.

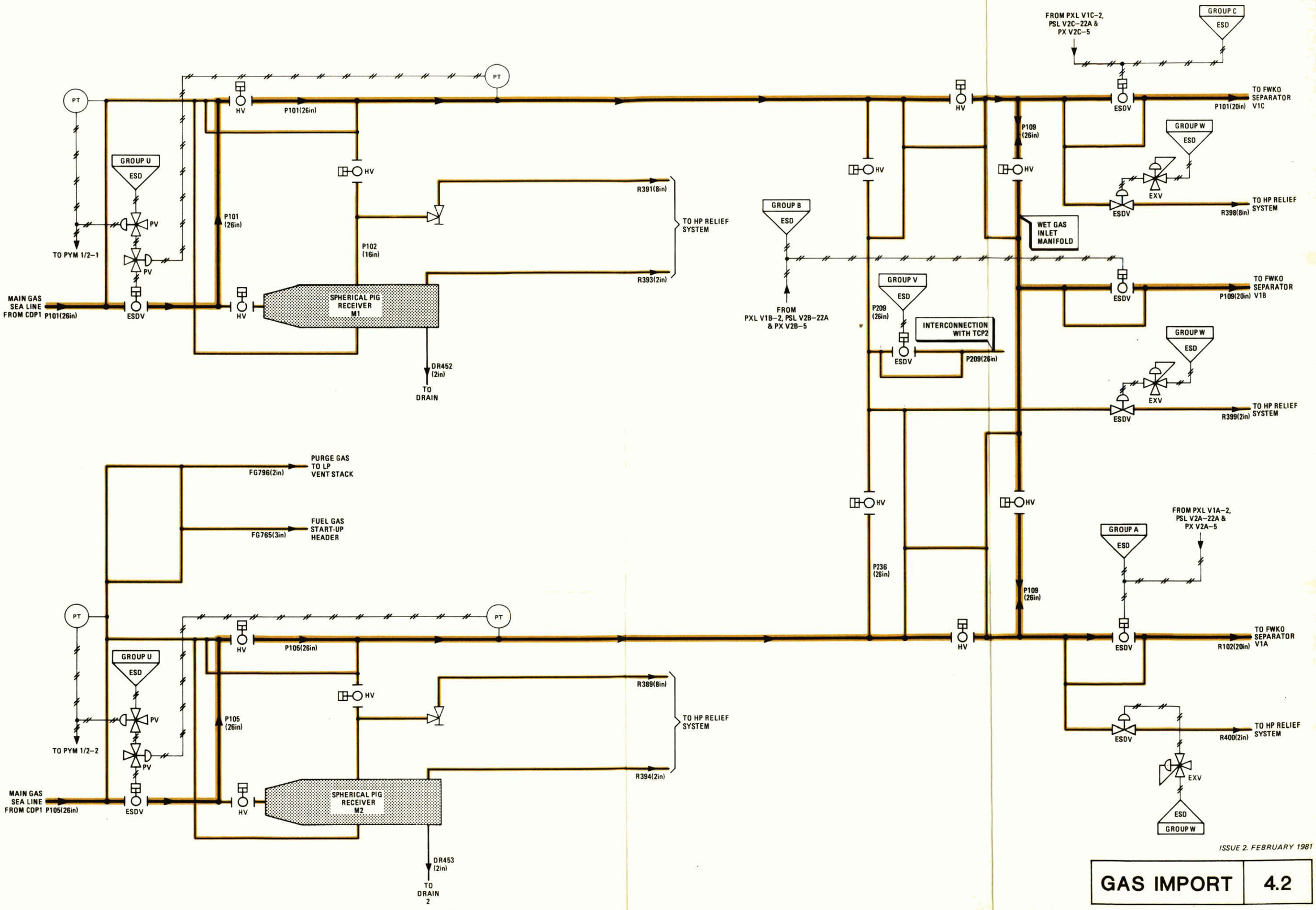
2 DESCRIPTION

2.1 Each 26in sea line is rated to deliver 15 MMSCMD of gas from one 12-well cluster on CDP1. The sea line terminates in a pig receiver, M1 or M2, which is normally off-stream. Locally operated hydraulic valves, at the receiver inlet and outlet and in the bypass line, enable the gas to be diverted through the receiver during pigging. A flow tee incorporating a grid is fitted at the bypass offtake to ensure that the pig cannot enter the bypass line.

2.2 From the sea lines the gas is discharged into a 26in manifold, from which it is led into the three process streams via 20in lines. Locally operated hydraulic valves, in each inlet and outlet line and in the manifold between the streams, permits isolation as required to suit operating conditions.

2.3 An interconnecting line incorporating locally operated hydraulic valves is provided between TCP2 and the two manifold inlet lines, so that wet gas from CDP1 can be processed on TCP2, or wet gas from DP2 can be processed on TP1.

2.4 Emergency shutdown (ESD) block valves are incorporated in the two 26in inlet lines, the inlet line to each process stream, and the interconnecting line to TCP2. ESD blowdown valves are connected to Streams A and C inlet lines upstream of the block valves and to the TCP2 interconnecting line.



ISSUE 2. FEBRUARY 1981

GAS IMPORT	4.2

GAS SEPARATION AND DRYING

1 GENERAL

Each process stream comprises a free water knockout (FWKO) separator, a glycol contactor, a metering facility and four flow control valves. Free liquid is removed in the FWKO separator and the gas is then dried to the required water dewpoint in the contactor. The gas is discharged from the stream via the metering facility and the flow control valves.

2 DESCRIPTION

2.1 FWKO Separators V1A, B and C.

2.1.1 Each separator has a maximum allowable working pressure of 172 barg and is rated to receive the flow from one sea line. Entrained liquid is knocked out in the vessel and is let down under level control to the condensate system. These vessels are provided with two liquid outlets, 2in and 10in, but the liquid flowrate is low and regular enough to pass through the 2in line. The 10in outlet is permanently blanked.

2.1.2 The pressure relief valves are rated at 172 barg and are sized to protect the vessels in case of fire.

2.1.3 Provision is made to feed the gas from each separator to TCP2 compression facilities via a locally operated hydraulic valve and a common header. Similar facilities are provided to return the high pressure gas from TCP2 compression into each glycol contactor inlet line.

2.1.4 An ESD block valve is installed in each separator gas outlet line, in each of the two liquid lines from the separator, and in each of the two headers connected to TCP2. The separator may be depressurised in an emergency via an ESD blowdown valve connected to the top of the vessel.

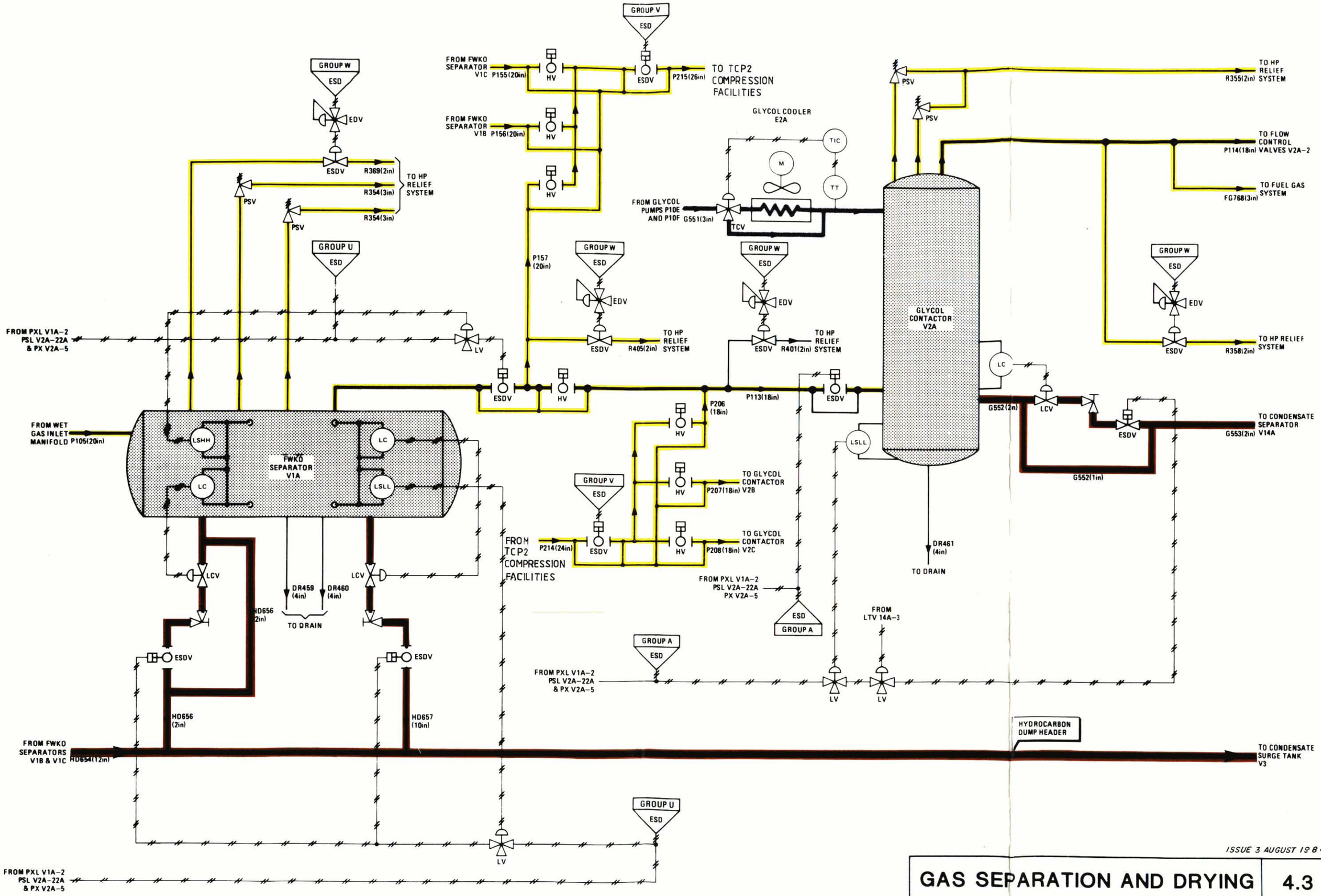
2.2 Glycol Contactor V2A, B and C

2.2.1 From the FWKO separator or TCP2 Compression facilities the gas enters the glycol contactor and passes upwards through eight 'bubble cap' trays. The gas is discharged from the top of the vessel via an 18in line.

2.2.2 Lean glycol from the reboiler is pumped into the contactor near the top and flows down over the bubble cap trays, absorbing any water vapour by intimate contact with the gas. From the base of the vessel, the rich glycol is let down under level control to return to the reboiler. Choke valves in the glycol oulet lines restrict the flow should the level control valves open fully.

2.2.3 V2 is rated at maximum wellhead pressure (172 barg at 50 Degrees C) and is provided with two pressure safety valves set at 172 barg for fire safety purposes. Emergency shutdown isolation is provided by ESD block valves in the gas inlet line, in the glycol outlet line, and in the gas outlet line downstream of the metering facilities and the flow control valves. One ESDV blowdown valve is connected to the gas outlet line to depressurise the glycol contactor plus the metering facilities; another is connected to the gas inlet line upstream of the ESDV block valve for decompression of the line from V1 to V2.

END


GROUP W
ESD
EDV
ESDV
R369(2in)
R354(3in)
R354(3in)
TO HP RELIEF SYSTEM
PSV
PSV
GROUP U
ESD
FROM PXL V1A-2 PSL V2A-22A & PX V2A-5
LV
FROM WET GAS INLET MANIFOLD P105(20in)
LSHH
LC
LC
LSLL
FWKO SEPARATOR V1A
LCV
LCV
DR459 (4in)
DR460 (4in)
TO DRAIN
HD656 (2in)
HD656 (2in)
HD657 (10in)
ESDV
ESDV
FROM FWKO SEPARATORS V1B & V1C HD654(12in)
GROUP U
ESD
LV
FROM PXL V1A-2 PSL V2A-22A & PX V2A-5
GROUP V
ESD
FROM FWKO SEPARATOR V1C P155(20in)
HV
ESDV
P215(26in)
TO TCP2 COMPRESSION FACILITIES
FROM FWKO SEPARATOR V1B P156(20in)
HV
HV
P157 (20in)
GROUP W
ESD
EDV
ESDV
R405(2in)
TO HP RELIEF SYSTEM
ESDV
HV
P206 (18in)
HV
GROUP V
ESD
FROM TCP2 COMPRESSION FACILITIES
P214(24in)
ESDV
HV
TO GLYCOL CONTACTOR P207(18in) V2B
HV
TO GLYCOL CONTACTOR P208(18in) V2C
GLYCOL COOLER E2A
TIC
M
TT
FROM GLYCOL PUMPS P10E AND P10F G551(3in)
TCV
GROUP W
ESD
EDV
ESDV
R401(2in)
TO HP RELIEF SYSTEM
P113(18in)
ESDV
GLYCOL CONTACTOR V2A
PSV
PSV
TO HP RELIEF SYSTEM R355(2in)
TO FLOW CONTROL VALVES V2A-2 P114(18in)
TO FUEL GAS SYSTEM FG768(3in)
GROUP W
ESD
EDV
ESDV
TO HP RELIEF SYSTEM R358(2in)
LC
LCV
ESDV
G552(2in)
TO CONDENSATE SEPARATOR V14A G553(2in)
G552(1in)
LSLL
DR461 (4in)
TO DRAIN
FROM PXL V1A-2 PSL V2A-22A PX V2A-5
ESD
GROUP A
FROM LTV 14A-3
GROUP A
ESD
FROM PXL V1A-2 PSL V2A-22A & PX V2A-5
LV
LV
HYDROCARBON DUMP HEADER
TO CONDENSATE SURGE TANK V3

SALES GAS METERING

1 GENERAL

1.1 Metering and sampling facilities on the platform enable the three gas treatment streams to be monitored continuously.

1.2 Dry gas from the glycol contactors flows through 18in lines P114, P115 and P116 to flow meters FE V2A-2, FE V2B-2 and FE V2C-2 respectively. Each flow meter is provided with two flow transmitters which send signals to flow recorders and the computer on TP1.

1.3 The 18in outlet line from each flow meter is connected to four 8in lines manifolded in parallel. Incorporated in each 8in line is an inlet valve, an outlet valve, a flow control valve and a silencer. The flow control valves open and close in response to signals from the computer on QP, and/or the associated flow meters.

1.4 To prevent hydrate formation, methanol injection facilities are provided upstream from each flow control valve.

1.5 The 18in lines from the flow control manifolds to the sales gas header each incorporate check valves and emergency shutdown valves.

2 DESCRIPTION - METERING MICROCOMPUTER SYSTEM

2.1.1 Field instrument input.

The field instruments are of electronic type and output signal will in general be a 4 - 20 mA signal. All the field instrument signals are going to the interface room.

2.1.2 Interface room equipment

Field instrument signals enter metering computer via the IS cubicle.
Each metering tube has dedicated a 869 R Stream Measurement Microcomputer (SMM). This computer registers the stream parameters: temperature, pressure, differential pressure and density. Each Stream Measurement Microcomputer communicates with two 869V Central Control Microcomputers (CCM) one of which is mounted on each of the treatment platforms TP1 and TCP2 (interface room).

2.1.3 Database Microcomputer on QP

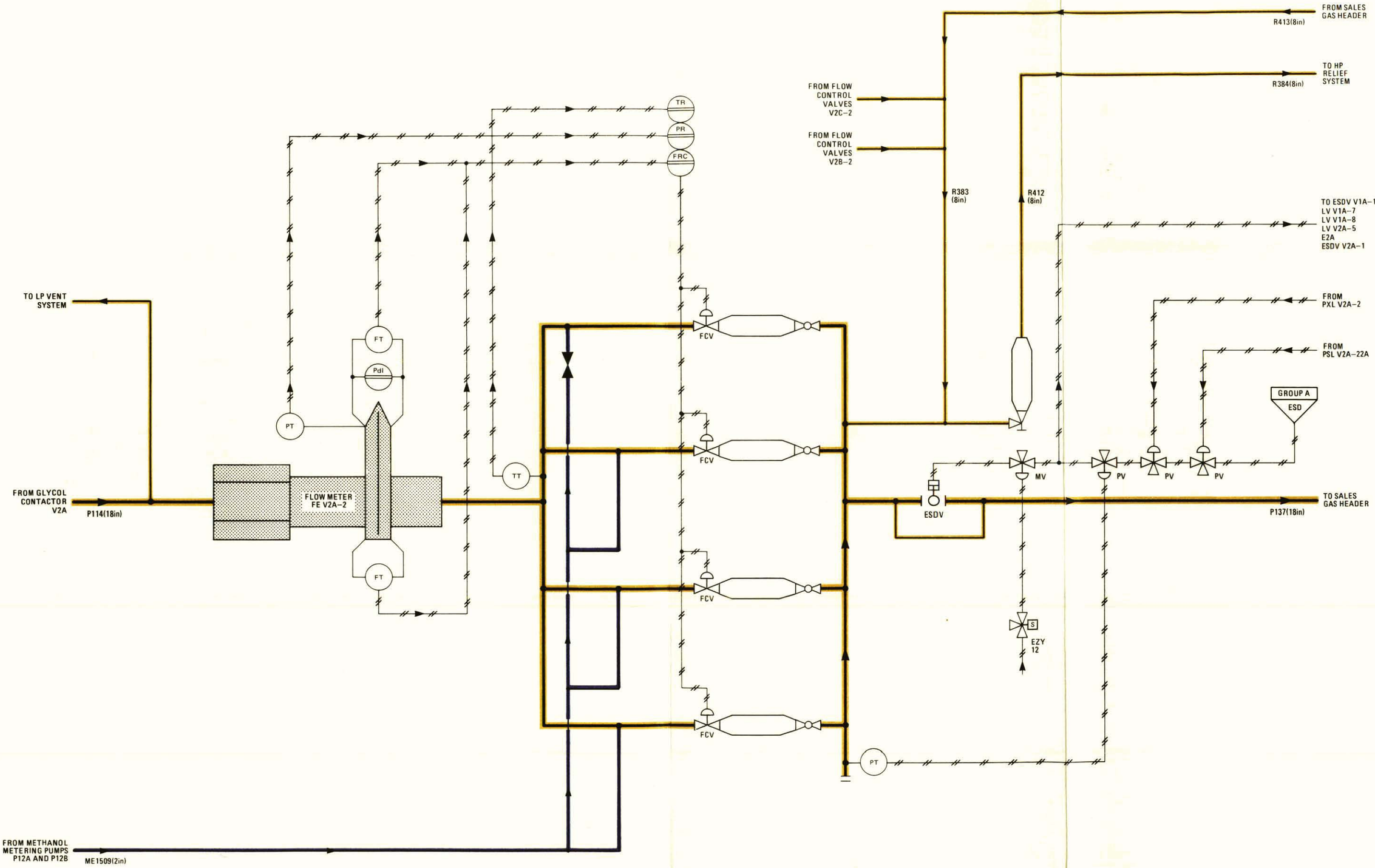
Each Central Control Microcomputer communicates with an 869V Database Microcomputer (DBM) located on the Quarter platform (QP control room)
A separate digital to analogue rack (DAC-rack) operating as a remote peripheral to the Database Microcomputer provide the analogue outputs for pen recorders.

2.1.4 Data transmitted to Central Control Microcomputers and Database Microcomputer.

Cables between the platforms are used to transmit and receive the metering signals.

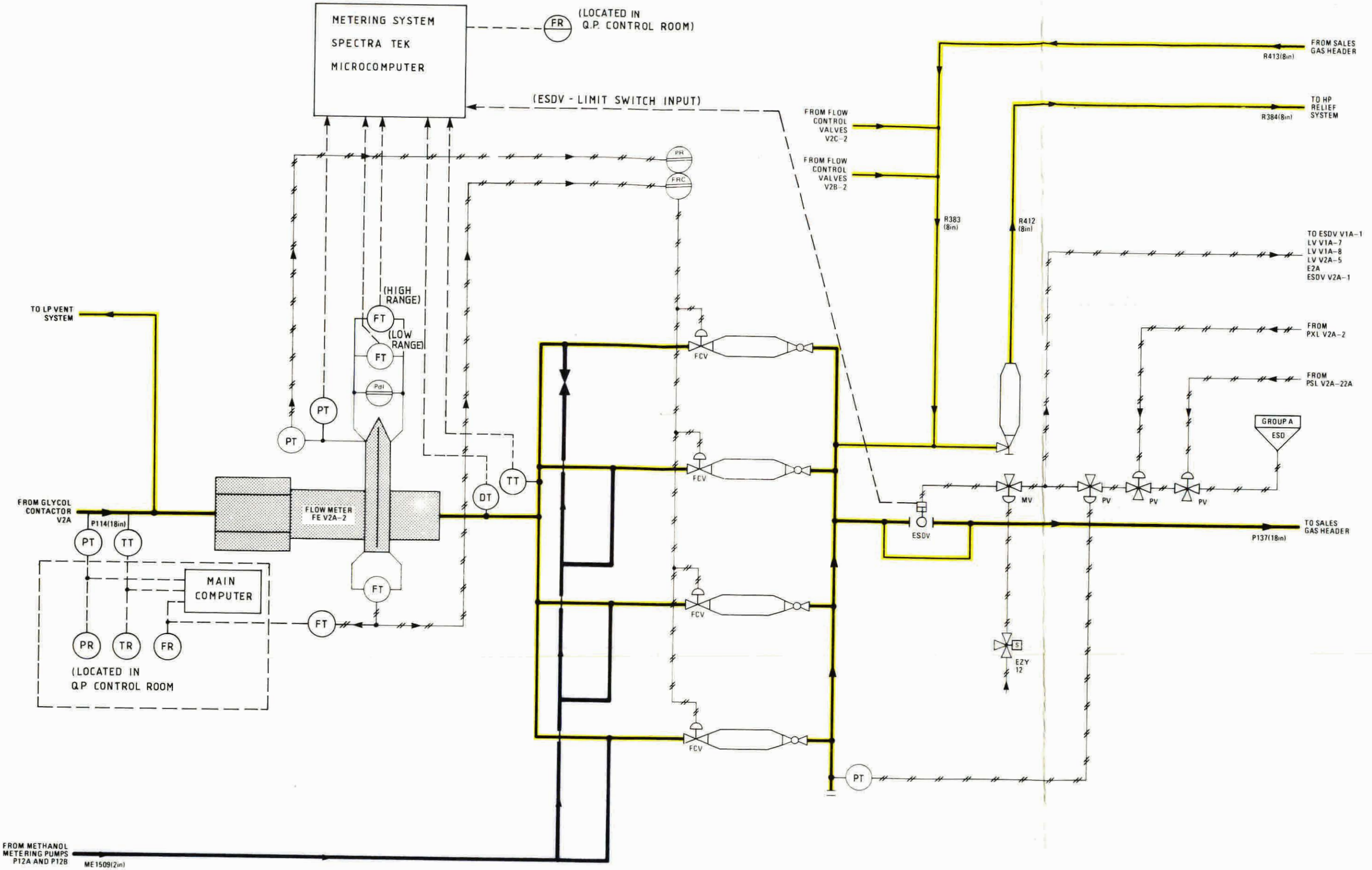
2.1.5 The main computer on QP control room.

In addition to the metering Microcomputer (Spectra-tek) stream parameters are also transmitted to the main computer on QP Control room via the telemetry equipment.



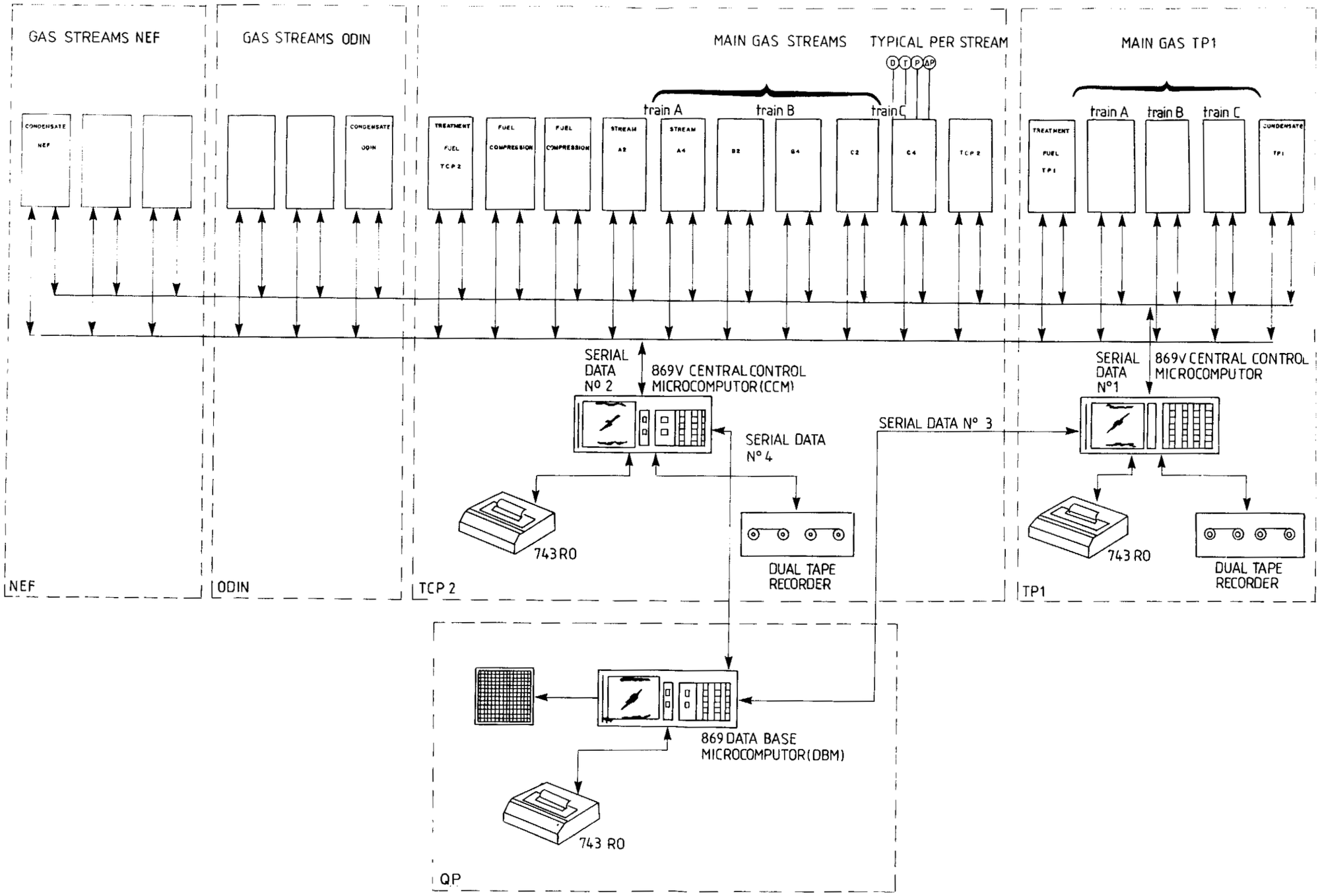
ISSUE 1. JULY 1980

SALES GAS METERING	4.4



ISSUE 2 AUGUST 1984

SALES GAS METERING	4.4.1



ISSUE 1 AUGUST 1984

SALE GAS METERING MICROCOMPUTER	4.4.2

CONDENSATE COLLECTION AND EXPORT

1 GENERAL

1.1 Liquid from the sea line and from the FWKO separator is led to condensate surge tank V3 via the 12in hydrocarbon dump header. PCV V3-8 installed in the header will close to isolate V3 from the liquid sources should the liquid level or pressure in V3 rise above preset limits. Downstream of the PCV the header receives liquid from condensate storage, condensate slops and from the level control valves downstream of the condensate return pumps.

1.2 Condensate from the surge tank normally by-passes the condensate booster pumps P1A and B and the coalscer V4, and feeds the suction of the condensate return pumps P2A and B. The condensate return pumps, one duty and one on stand-by, are operated by le.el switch controls on V3. They are positive displacement pumps each having a rated capacity of 20m 3/h at a differential pressure of 153 barg and driven by a 130kW electric motor. In view of the high discharge head of these pumps they are arranged to start and run up to speed against a low discharge head by a logic controller signalling control valves in the pump discharge pipework. During pump start, condensate is recycled back to V3 via LCV V3-5A and B.

1.3 The coalescer V4, which is normally by-passed, has a maximum allowable working pressure of 23.12 barg and is protected against over-pressure by two pressure relief valves installed in parallel relieving to the LP Vent System.

1.4 Flash gas from the condensate can be supplied either to the HP relief system, or to the fuel gas system. Condensate flowing from the FWKO separators has a low flowrate and a blanketing of the condensate surge tank is required to maintain the pressure inside the vessel.

1.5 Three flow meters monitor the condensate flow, two in parallel and one in series with them. The two in parallel are operated one duty and one standby; isolation is by hand valves selection of either duty taking input for totalisation and flow indication is entered by command (metering microcomputer) if the flowrate values from two meters deviate beyond a pre-set threshold an alarm is raised. Downstream of the flow meters the condensate pressure and temperature are measured. The computer registers the stream parameters (flow, pressure & temperature). The flow is recorded in QP Control room (flow recorder panel)

1.6 Condensate may be pumped to and from TCP2 via a 3in line installed downstream from the flow meters. An emergency shutdown valve isolates the interconnecting line in an emergency.

1.7 Condensate is injected into the 32in subsea gas line and recovered for further processing at St Fergus.

SALES GAS HEADER

1 GENERAL

1.1 Dry gas from the three gas treatment streams is discharged into 32in sales gas header P124. Each stream is isolated from the header by a locally operated hydraulic valve.

1.2 Instrumentation is provided to measure and record the pressure and temperature of the gas in the header. The pressure instrumentation also provides signals for high and low pressure alarms, and for the flow control computer and controllers. Two pressure transmitters are connected to the header to provide a fail-safe facility. Should there be a discrepancy between them, an alarm annunciates. A hand switch permits the selection of either transmitter to feed the computer and alarm circuits.

1.3 The header may be depressurised to the HP relief system via 2in line R404 and blowdown valve ESDV V2C–7.

1.4 Dry gas may be supplied to the Fuel Gas System via 3in line FG751 incorporating a check valve and a manually operated block valve.

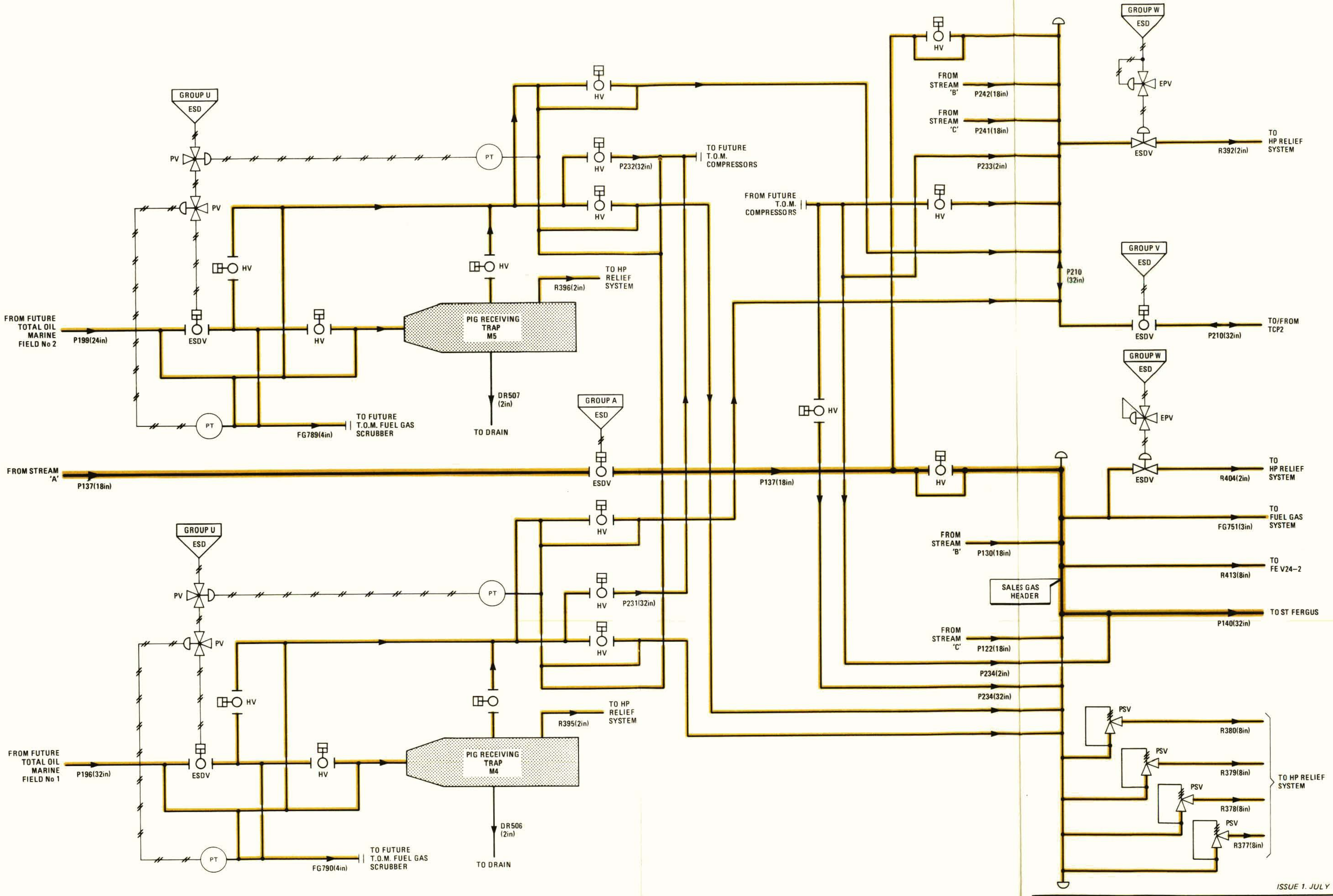
1.5 A second 32in header P210 is used to feed dry gas to or from TCP2. Each stream is connected to this header via a locally operated hand valve. The pressure instrumentation for this header is similar to that for the sales gas header.

1.6 Two pig receiving traps, M4 and M5, are installed on the platform for future use in conjunction with two future inlet lines, one 24in and one 32in, from Total Oil Marine gas fields No 1 and 2. The dry gas from each field can be fed together or separately into the sales gas header or the TCP2 dry gas interconnecting header, either directly or via future gas compressors.

1.7 The interconnecting header can be depressurised via blowdown valve ESDV V2C–6 to the HP relief system. Isolation of the header is achieved by closing ESDV TCP2–1.

1.8 The sales gas header is protected against overpressure by four pressure relief valves installed in parallel set at 156 bara. Each relief valve is fitted with position switches which initiate alarms in QP Control Room should a valve open.

1.9 Gas from the sales gas header is discharged to St Fergus via 32in subsea line P140.



ISSUE 1. JULY 1980

SALES GAS HEADER	4.5

SALES GAS EXPORT

1 GENERAL

1.1 Metered dry gas from the sales gas header is discharged via 32in subsea line P140.

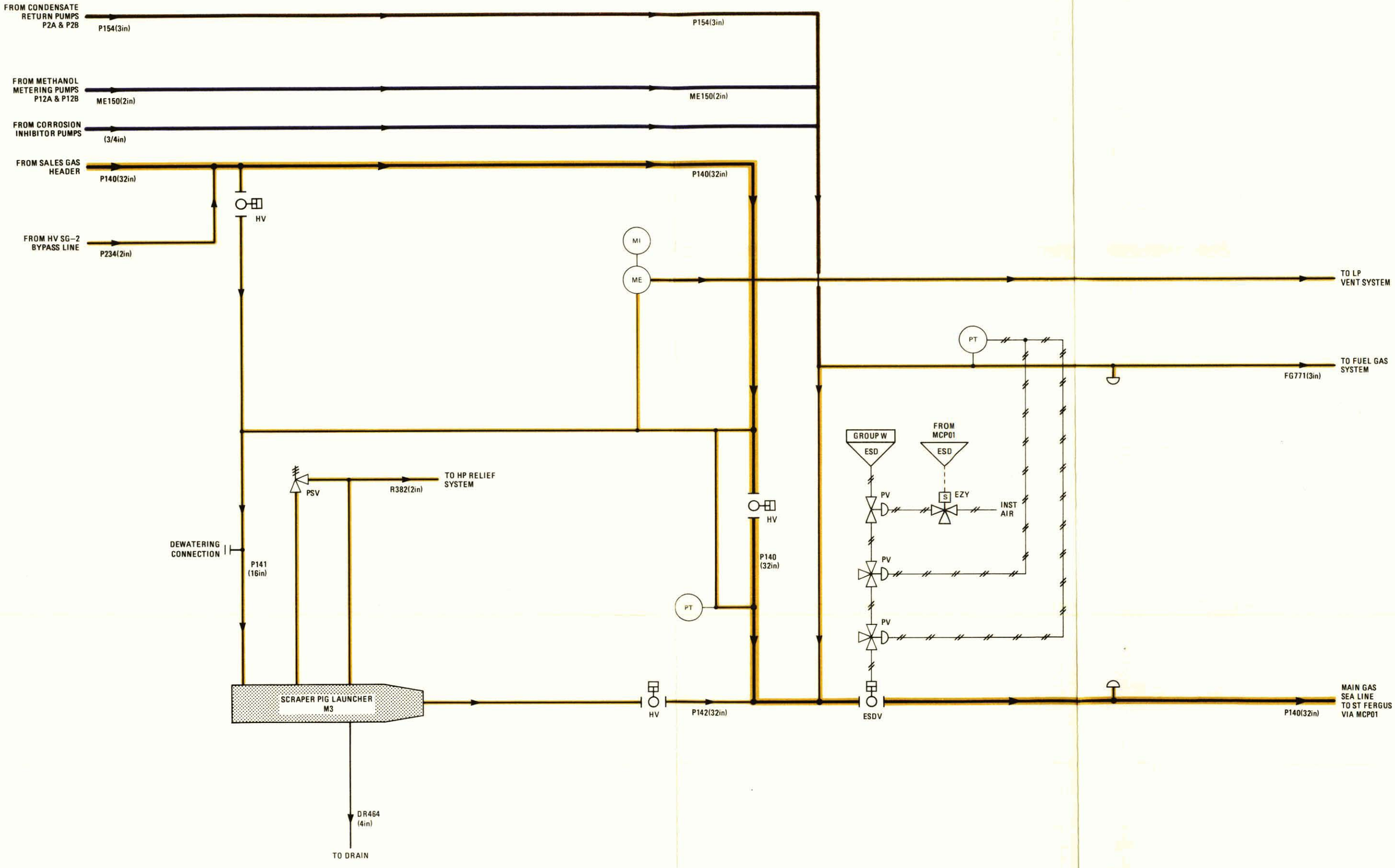
1.2 Scraper pig launcher M3 is installed at the inlet to the subsea line. Hydraulically operated valves HV M3–1, HV M3–2 and HV M3–3 are installed in the launcher inlet, outlet and bypass respectively. These valves are normally set to allow gas flow through the 32in launcher bypass.

1.3 Condensate is injected into the subsea line downstream of the pig launcher by condensate return pumps P2A and P2B via 3in line P154.

1.4 To prevent hydrate formation in the subsea line, a 2in methanol injection line ME150 is installed downstream of the pig launcher.

1.5 The platform can be isolated from the sea line by closing ESDV M3–1.

END



ISSUE 1. JULY 1980

SALES GAS EXPORT | 4.6

CONDENSATE COLLECTION

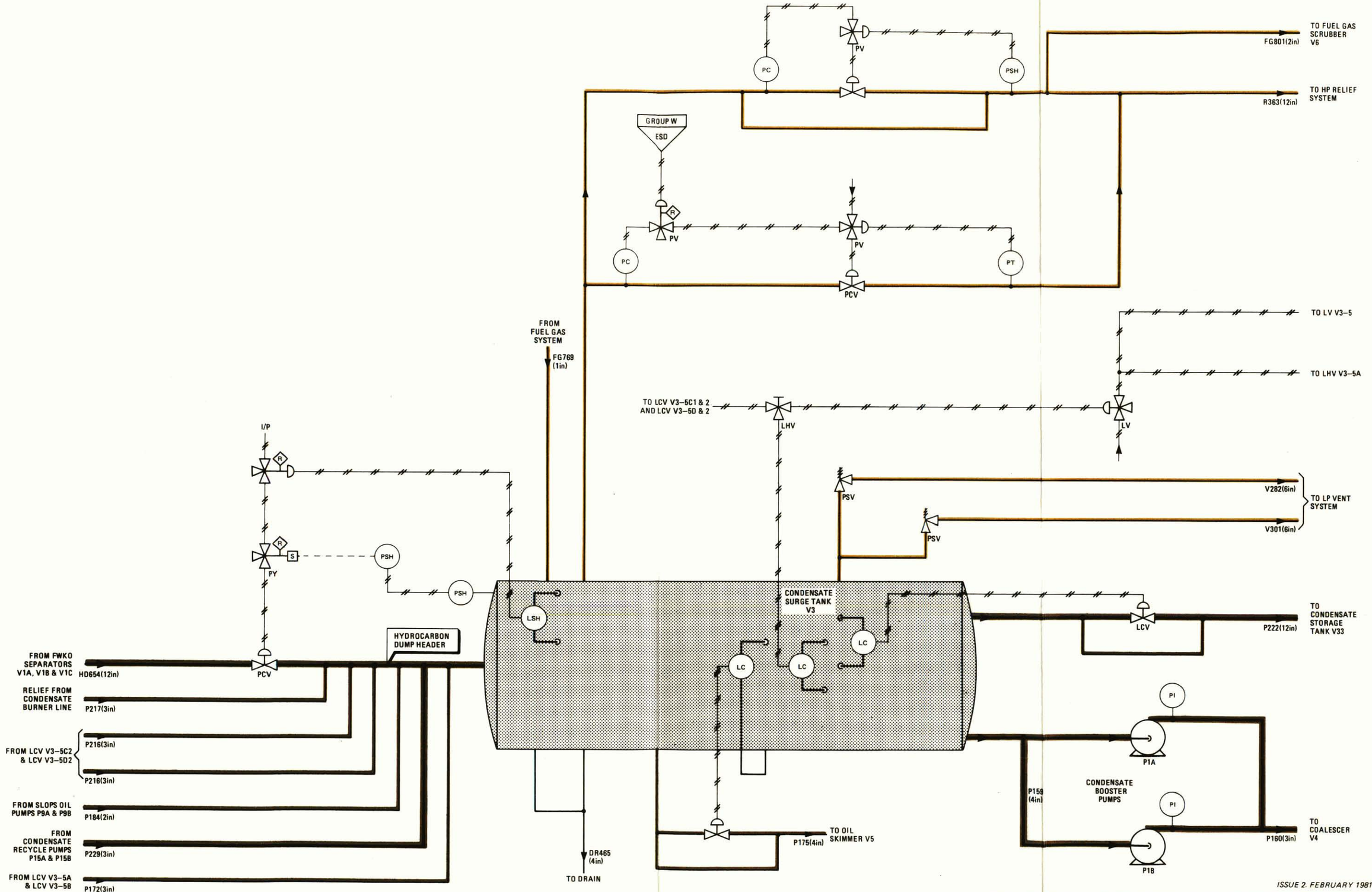
1 GENERAL

1.1 Liquid from the sea line and from the FWKO separators is led to condensate surge tank V3 via the 12in hydrocarbon dump header. PCV V3–8 installed in the header will close to isolate V3 from the liquid sources should the liquid level or pressure in V3 rise above preset limits. Downstream of the PCV the header receives liquid from condensate storage, condensate slops and from the level control valves downstream of the condensate return pumps.

1.2 Condensate from the surge tank is discharged to coalescer V4 by condensate booster pumps P1A and B. These are centrifugal pumps each rated to deliver $20m^3/h$ at a differential pressure of 3 bar and driven by a 7.5kW electric motor. They are normally selected to run one duty and one standby, the duty pump starting and stopping in response to level switches LSH V3–4 and LSL V3–6 in the surge tank. High pressure from the condensate return pumps, or high or low pressure in the sea line will also stop the pumps.

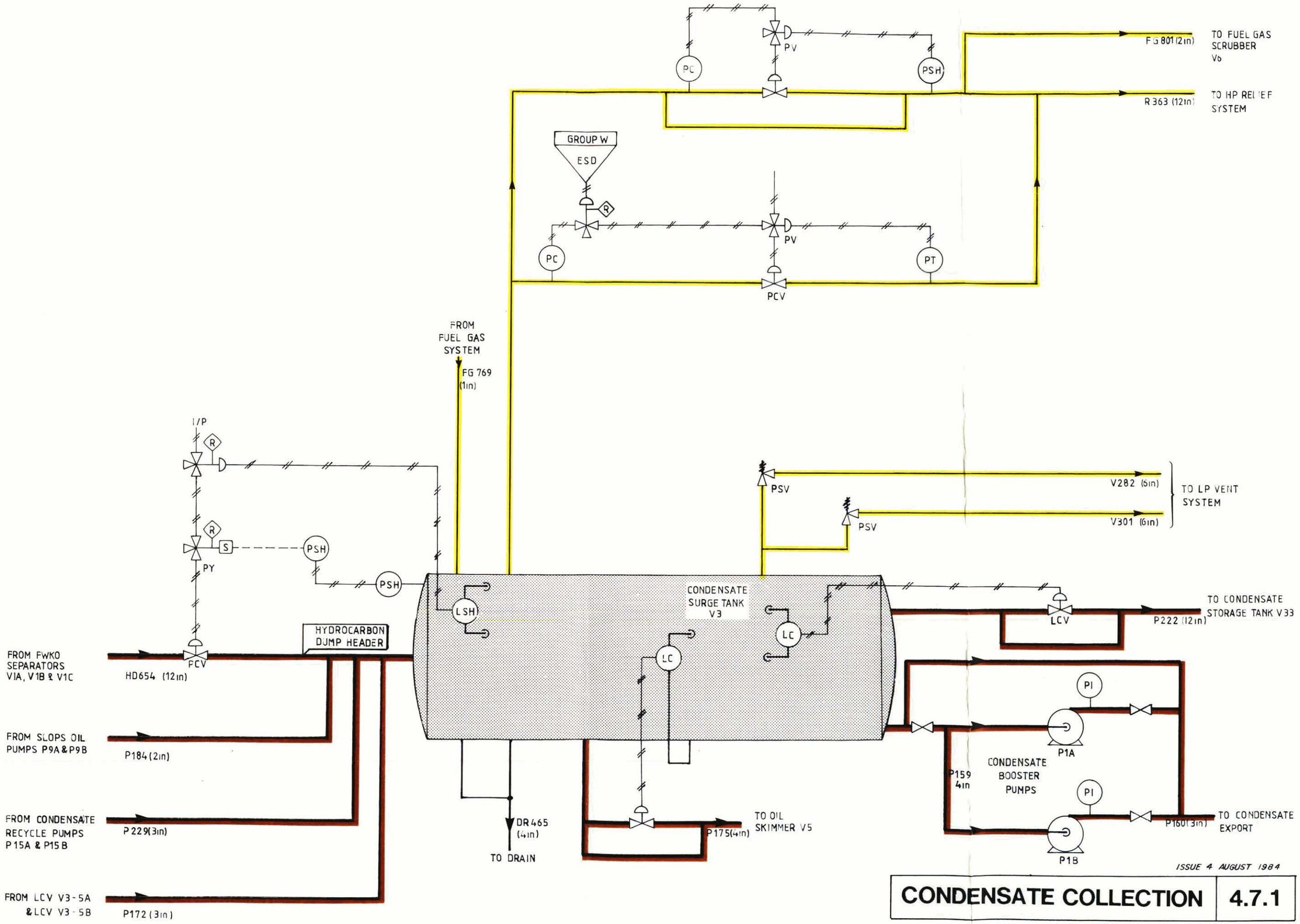
1.3 Should the condensate return system be unable to cope with the condensate flow, the excess is let down via LCV V3–10 to condensate storage tank V33. Water is let down from the base of V3 to oil skimmer V5 under the control of LCV V3–2.

1.4 Flash gas from the condensate can be supplied either to the HP relief system, or to the fuel gas system. Condensate flowing from the FWKO separators has a low flowrate and a blanketing of the condensate surge tank is required to maintain the pressure inside the vessel.



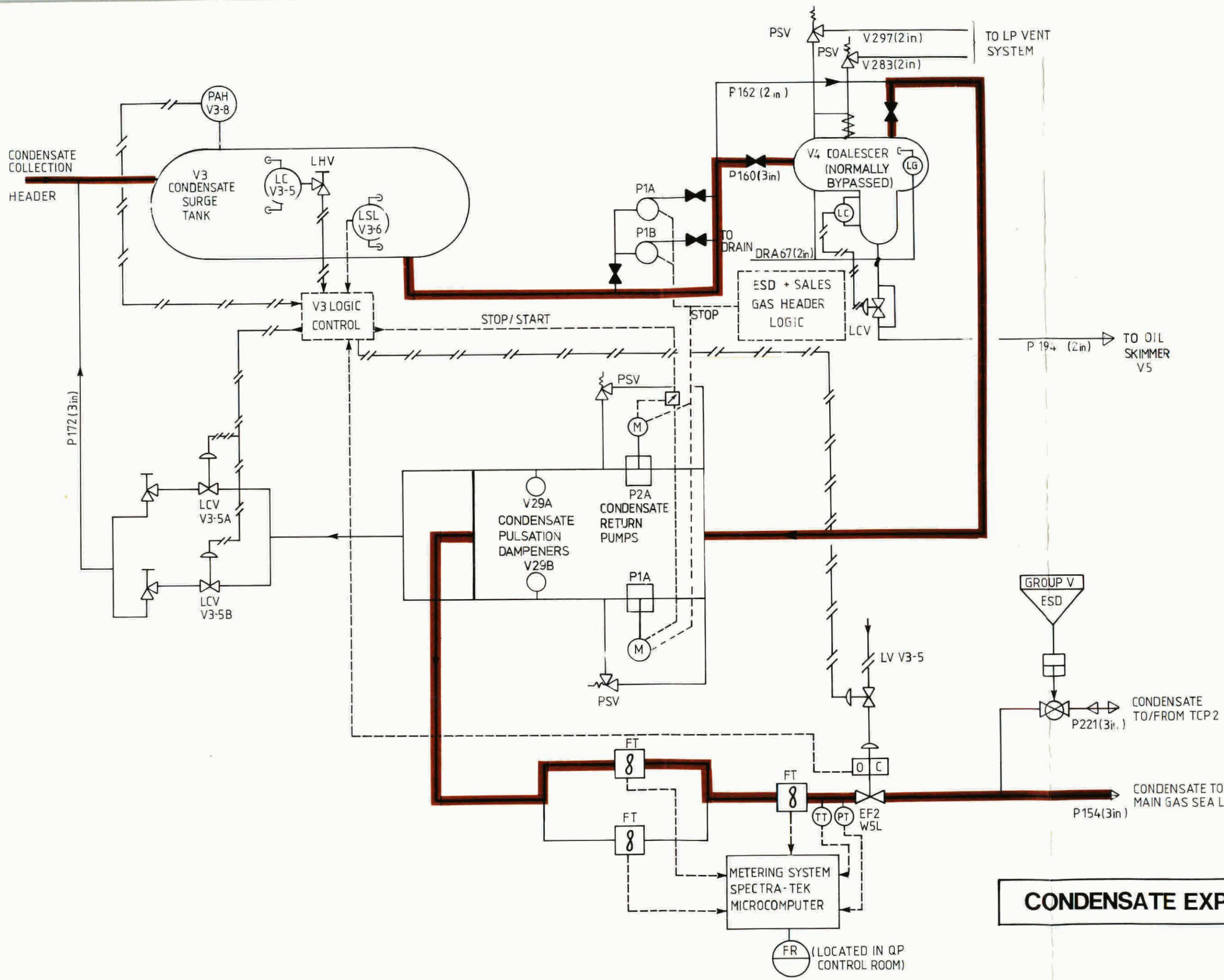
ISSUE 2. FEBRUARY 1981

CONDENSATE COLLECTION 4.7



ISSUE 4 AUGUST 1984

CONDENSATE COLLECTION | 4.7.1



ISSUE 2 AUGUST 1984

CONDENSATE EXPORT 4.7.2

CONDENSATE STORAGE

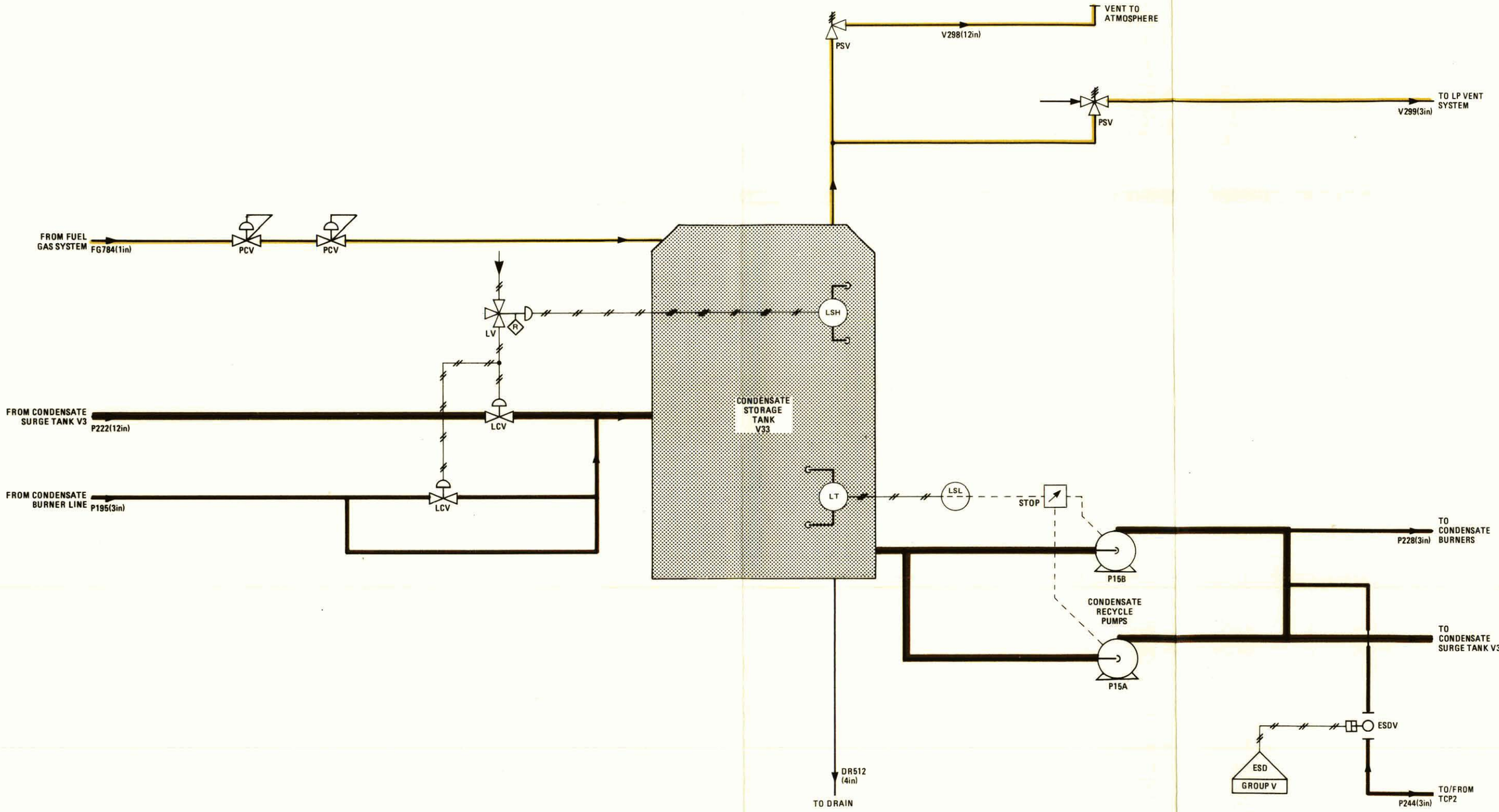
1 GENERAL

1.1 Excess condensate is stored in vessel V33 which has a capacity of 50m^3. The tank receives condensate from the surge tank. LCV V33-6A in the line closes to isolate the inlet should the level in the tank rise above the set-point of LSH V33-6A; this switch will also initiate an alarm on the mimic panel in the QP Control Room.

1.2 The condensate is returned to the surge tank by recycle pumps P15A and B. These are centrifugal pumps each rated to deliver 20m^3/h at a differential pressure of 19 bar and are driven by a 75kW electric motor. The pumps are normally operated one duty and one standby; with the duty pump started from a local pushbutton and stopping in response to LSL V33-4; this level switch also initiates an alarm on the mimic panel in QP Control Room.

1.3 A gas blanket is maintained in the vessel via a 1in tapping from the Fuel Gas System. Two pressure control valves in series reduce the pressure to 125mmWG in the tank. PSV V33-5 provides pressure/vacuum relief, and PSV V33-4 provides large-capacity pressure relief for fire safety purposes. The maximum allowable working pressure of condensate storage tank V33 is 0.27 barg.

1.4 Condensate may be pumped to and from TCP2 via a 3in line installed downstream from the pumps. An emergency shutdown valve isolates the interconnecting line in an emergency.



ISSUE 1. JULY 1980

CONDENSATE STORAGE	4.8

CONDENSATE SLOPS

1 GENERAL

1.1 Water drains from process vessels and sumps are routed to oil skimmer V5 located in Zone 09 on the Cellar Deck.

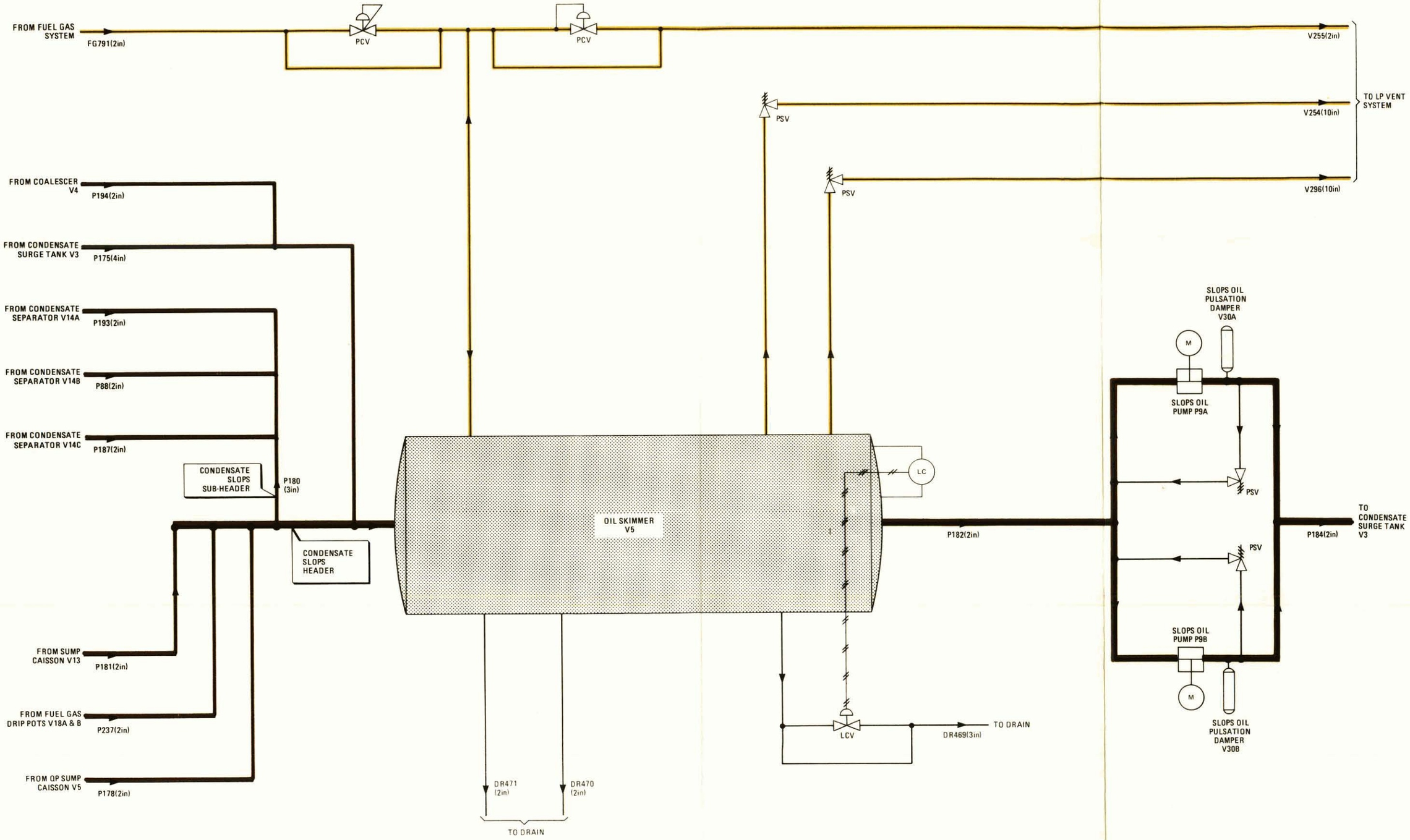
1.2 The oil skimmer is a horizontal three-phase separator in which oil and water are separated.

1.3 Water is let down from the base of V5 under level control to the Drainage System. High or low liquid levels initiate alarms on the mimic panel in QP Control Room.

1.4 A gas blanket is maintained in the oil skimmer via a 2in line from the Fuel Gas System, the incoming gas pressure being regulated at 2.4 bara. The oil skimmer is vented to the LP Vent System via a pressure control valve set at 2.39 bara to ensure a continuous flow of gas through the vessel.

1.5 V5 is protected against overpressure by two pressure relief valves installed in parallel and set at 3.38 bara.

1.6 Slops oil pumps P9A and B take their suction from the oil compartment in V5 and discharge to condensate surge tank V3. These are positive displacement type pumps operating in parallel each rated at $2.4m^3/h$ at a differential pressure of 19 bar and driven by 2.2kW electric motors. The pumps are normally operated one duty and one standby, the duty pump starting and stopping in response to level switches installed in the oil skimmer.



ISSUE 1. JULY 1980

CONDENSATE SLOPS	4.9

CONDENSATE EXPORT

1 GENERAL

1.1 Condensate discharged from booster pumps P1A and B flows through coalescer V4 where entrained water is knocked out and let down under level control to oil skimmer V5.

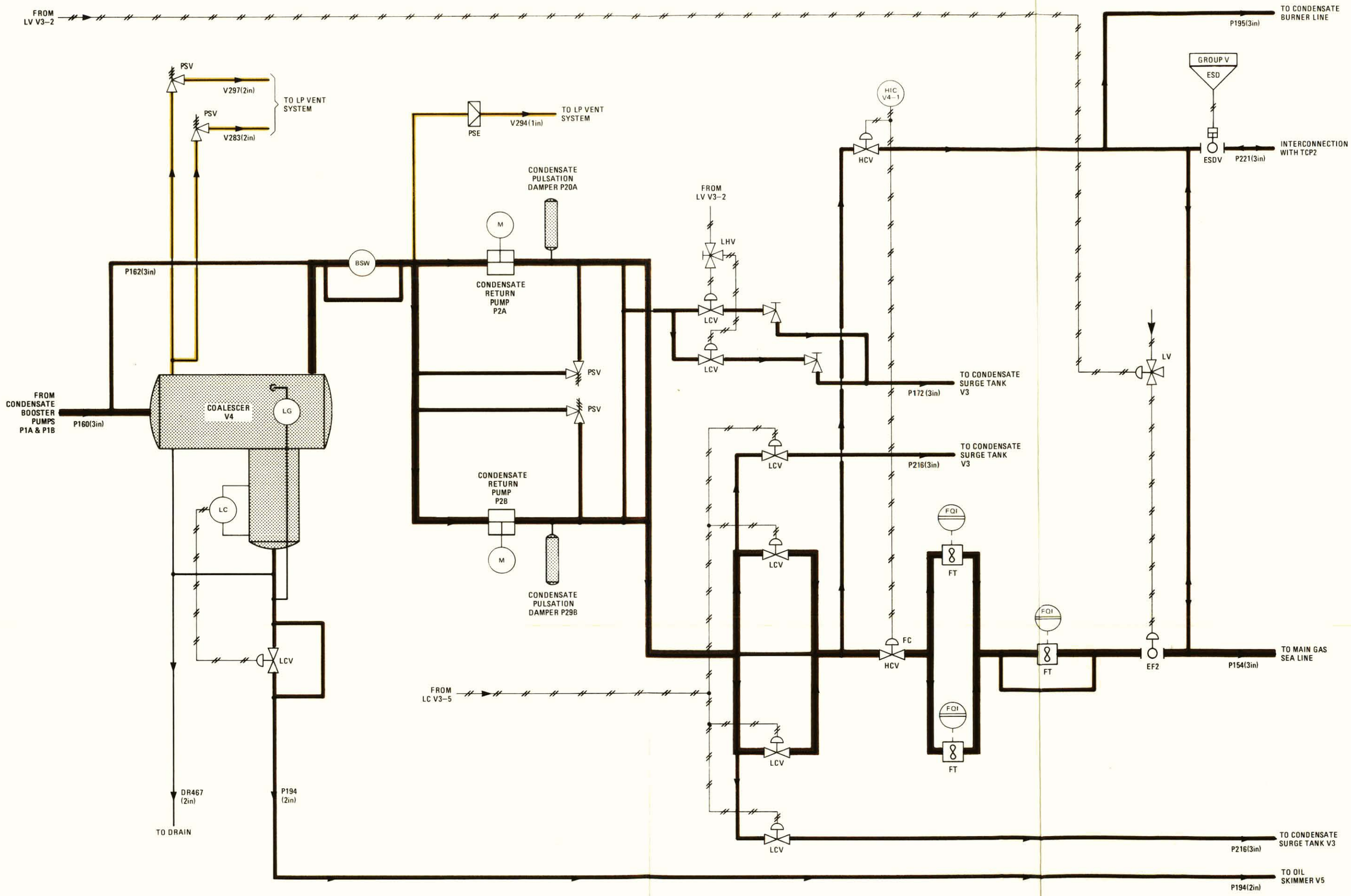
1.2 The coalescer has a maximum allowable working pressure of 23.12 barg and is protected against overpressure by two pressure relief valves installed in parallel relieving to the LP Vent System.

1.3 Two condensate return pumps, P2A and B, are provided to inject the condensate into the origin of the 32in sea line to St Fergus. These are positive displacement pumps each having a rated capacity of $20m^3/h$ at a differential pressure of 153 bar and driven by a 130kW electric motor. The pumps normally operate one duty and one standby, the duty pump starting and stopping in response to level switches installed in surge tank V3. They will also stop if the discharge pressure exceeds a preset limit.

1.4 Three flow meters monitor the condensate flow, two in parallel and one in series with them. The two in parallel are operated one duty and one standby; isolation is by hand valves and output selection is by a hand switch. The output from the two on-line meters is recorded locally and in QP Control Room, and is also fed into the computer. Downstream of the flow meters the condensate pressure and temperature are measured and locally recorded.

1.5 Condensate may be pumped to and from TCP2 via a 3in line installed downstream from the flow meters. An emergency shutdown valve isolates the interconnecting line in an emergency.

1.6 Condensate is injected into the 32in subsea gas line and recovered for further processing at St Fergus.



ISSUE 1. JULY 1980

CONDENSATE EXPORT | 4.10

CHAPTER 5

UTILITIES

CONTENTS

DIAGRAMS

POWER GENERATION AND INTER-PLATFORM ELECTRICAL CONNECTIONS

1 GENERAL

1.1 The Quarters and Treatment platforms QP, TP1 and TCP2 are joined by bridges which carry interconnecting cables. Submarine cables link QP, TP1 and TCP2 with platforms CDP1, DP2 and FP.

1.2 Under normal operating conditions power for the whole complex is generated at 5.5kV by large gas turbine-driven generators in TP1 augmented by smaller gas turbine-driven generators in TCP2, both groups feeding their respective 5.5kV switchboards. No power is used at 5.5kV however, as the Motor Control Centres on all the platforms are fed with 380V from 5500/380V transformers. Smaller diesel-driven generators on CDP1, DP2 and QP provide 380V standby supplies.

1.3 Interconnections between QP, TP1 and TCP2 form a 5.5kV ring main so that, in the event of one cable failing, power can be maintained to each switchboard. Supplies to CDP1 and DP2 are radial feeders from the ring main. Exceptionally, the Flare Platform (FP) is fed at 380V by a 4-wire submarine cable from TP1. Special arrangements are provided for isolating and earthing-down all interconnecting cables between platforms.

1.4 Central control of the electrical system on TP1, QP and TCP2 is exercised from the Electrical Control Room (MCC Room) in TP1.

2 DESCRIPTION

2.1 Generation

2.1.1 Power is generated at 5.5kV, 3-phase, 50Hz by three gas turbines driving 3.0MW_e (3.5MVA) generators TA1, TA2 and TA3 on TP1. These are augmented by three gas turbines driving 1.4MW_e (1.75MVA) generators TA4, TA5 and TA6 on TCP2.

2.1.2 The 5.5kV system is earthed through neutral earthing resistors, one for each main generator. The values of the resistors are as follows:

(a) Generators TA1, TA2 and TA3 – 17 ohm.

(b) Generators TA4, TA5 and TA6 – 34 ohm.

2.1.3 TA3, TA4, TA5 and TA6 are gas-fuelled only, whereas TA1 and TA2 are dual-fuelled, running on gas or diesel oil. These sets normally run on gas but will automatically change over to liquid fuel if the gas pressure falls below a predetermined level. In all cases reversion to gas is manual only.

2.1.4 Generator sets TA1, TA2 and TA3 are started by diesel engines through torque converters, the engines themselves being started electrically from local 24V batteries. Generator sets TA4, TA5 and TA6 are air-started from the plant air system.

2.2 Switchboards and Switchgear

2.2.1 The location of the 5.5kV switchboards making up the 5.5kV supply network are as follows:

(a) TP1 – Switchboard Room, Cellar Deck, Zone 06.

(b) TCP2 – Switchroom, Cellar Deck, Mezzanine.

(c) QP – Switchboard Room L26, Lower Level.

(d) CDP1 – Electrical Room, Module BR1.

(e) DP2 – Substation, Module 4, First Level.

2.2.2 The switchboards have a service rating of 800A and a designed symmetrical fault rating of 290MVA at 5.5kV; the actual fault level is about 120MVA.

2.2.3 The switchgear associated with switchboards CDP1 5500 and DP2 5500 consists of rotary switches. These are manually closed but electrically tripped. They are suitable for fault making but only load breaking; fuses in the outgoing circuits provide protection against through faults.

2.2.4 All circuit breakers on the boards are of the solenoid-operated air break type, fitted with protective relays. The tripping and closing coils operate on a 110V dc control supply from locally situated batteries and chargers. The designations and service ratings of the breakers are given in Diagram 5.1.

2.2.5 The only loads on the 5.5kV switchboards are the 5500/380V transformers supplying the 380V Motor Control Centres.

3 SYSTEM CONTROL

3.1 General

Overall control and monitoring of the electrical system for TP1, TCP2 and QP is carried out on TP1 from the Generator Control Desk and the Control Mimic situated in the Machinery Control Room on the Mezzanine level of Zone 05. Control and monitoring is described in the following paragraphs.

3.2 Generator Control Desks

The Generator Control Desk on TP1 is the principal position for controlling the three gas turbine-driven generators on TP1, the three gas turbine-driven generators on TCP2 and the two diesel-driven generators on QP. Control of the generator sets on TCP2 only can be exercised from a similar desk in the Electrical Control Room in Pancake 08 on TCP2, although the other generator sets are also monitored there.

3.3 Mimic Control Panels

3.3.1 The mimic control panels are wall-mounted and situated over the Generator Control Desk in both TP1 and TCP2.

3.3.2 On TP1 the panel remotely controls, by means of discrepancy switches, the 5.5kV supply switchgear on platforms TP1, TCP2 and QP. In the case of the 5.5kV rotary switches in CDP1 and DP2 the discrepancy devices serve only to indicate the switch position. The panel indicates, by means of lamps, which generators (gas turbine or diesel) are running, and an indication is given on wattmeters of the power delivered by each generator, the power passing along the ring main interconnectors and the power delivered to each main feeder transformer.

3.3.3 The panel on TCP2 remotely monitors, but does not control, the TCP2 5.5kV circuit breakers and all 5.5kV main switchgear on the other four platforms. The panel indicates, by means of lamps, which generators (gas turbine or diesel) are running on any of the platforms, and an indication is given on wattmeters of the power delivered by each generator in TCP2 only, the power passing along the ring main interconnectors from TCP2 and the power delivered to each main feeder transformer in TCP2 and to platform DP2.

3.3.4 The mimic panel on QP is for monitoring purposes only. It carries turbine circuit-breaker and transformer status indications for the whole complex.

3.3.5 Control facilities associated with the 380V part of the system are covered in Section 5.2.

3.3.6 The panel incorporates a Lamp Test facility.

3.4 5.5kV Switchgear

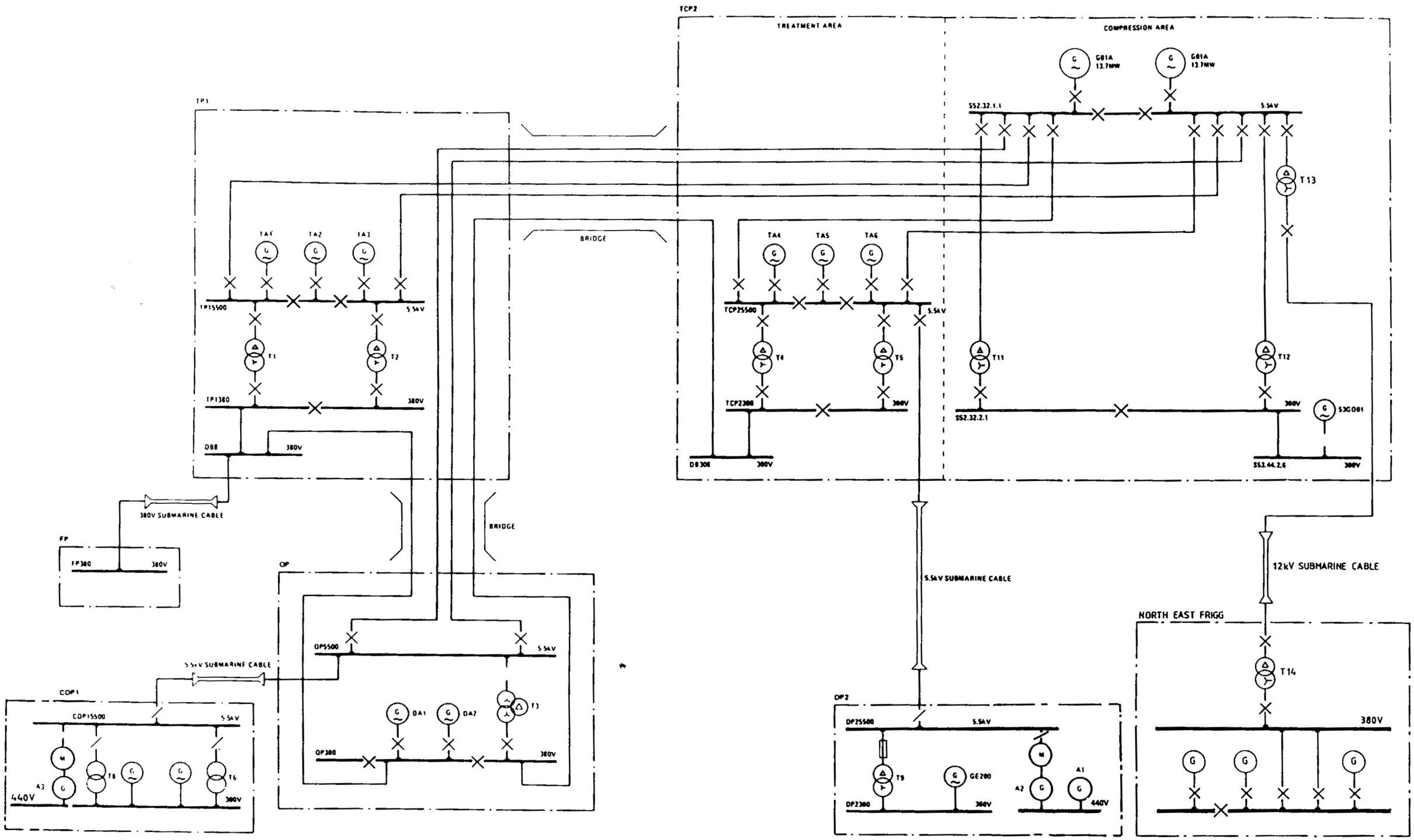
3.4.1 Provision is made for local control of the circuit breakers at the 5.5kV switchboards on TP1, TCP2 and QP; a Local/Remote selector switch and trip and close pushbuttons are provided on each breaker cubicle.

3.4.2 If there is a voltage on both sides of a bus-section breaker – or ring main breaker – it cannot be closed. Synchronising is provided only on the generator incomer circuit breakers and on the breakers at the TCP2 end of the TP1 to TCP2 ring main interconnector and the QP end of the TCP2 to QP interconnector. Synchronising of generator incomer breakers can be carried out either automatically (the normal method) or manually at the switchboard using a mobile synchronising trolley. Interconnector breakers can only be synchronised manually.

3.4.3 Interlocks are provided to lock out the circuit breaker and rotary switch at each end of the submarine interconnectors to CDP1 and DP2 when the cables are earthed. Conversely, the cable cannot be earthed when the associated breaker and switch are closed.

3.5 Shutdown

See Section 9.5.



ISSUE 4 AUGUST 1984

POWER GENERATION AND INTER-PLATFORM ELECTRICAL CONNECTIONS | 5.1

ELECTRICAL POWER GENERATION

1 GENERAL

For an overall description of power generation and high voltage distribution in the Frigg Field complex refer to Section 5.1.

2 DESCRIPTION

2.1 5.5 Kv Supplies

2.1.1 In the main supply for TP1 is drawn from TCP2 Compression with three back-up generators available on TP1. These feed a 5.5 kV switchboard (termed TP1 5500) consisting of 13 panels arranged as follows:

Section	Panel	Breaker	Service
A	1	ACB 105	800A Incomer feeder from TCP2-C
	2	ACB 108	200A Feeder breaker to transformer T1
	3	ACB 101	600A Incomer breaker from generator TA1
	4	—	AVR panel for generator TA1
B	5	ACB 106	800A Bus section breaker between section A and B
	6	ACB 102	600A Incomer breaker from generator TA2
	7	—	AVR panel for generator TA2 and auto-synchronizing unit
	8	ACB 110	400A Feeder breaker to 5.5kV Motor Control Centre (future use)
C	9	ACB 107	800A Bus section breaker between sections B and C
	10	ACB 103	600A Incomer breaker from generator TA3
	11	—	AVR panel for generator TA3
	12	ACB 109	299A Feeder breaker to transformer T2
	13	ACB 104	800A Incomer breaker from TCP2-C

2.1.2 A one line representation of the switchboard circuit is shown on diagram 5.2. The switchboard is located in the Switchgear Room on the Cellar Deck of Zone 06. The busbar is divided into three sections (A, B and C) by two bus section circuit breakers. One 3.5MVA, 5.5kV standby gas turbine generator is connected to each section of the busbar. Busbar section A and busbar section C are interconnected with busbar sections A and B respectively of the main 5.5kV switchboard on TCP2-C.

2.1.3 Busbar sections A and C each feed a 5500/380V transformer (T1 and T2) which in turn feed the Motor Control Centre. The transformers are located in the Transformer Room in Zone 6 of the Cellar Deck. Each is rated at 1000KVA and is delta/star connected and identical to those in TCP2, CDP1 and DP2. They are Pyrochlor (askarel) filled and hermetically sealed. Over-temperature protection is provided, and the neutrals are solidly earthed. An off-load tap changer permits adjustment of the primary winding turns in 2 1/2 per cent steps from −5 per cent to +5 per cent of nominal. Section B of the busbar has an outgoing supply not yet connected for a future 5.5kV Motor Control Centre.

2.1.4 All circuit breakers are of the air break type, solenoid operated and have a design breaking capacity of 290MVA rating which is adequate to deal with the system fault level of 81MVA. Each panel carries the necessary protection equipment for the circuit it controls.

2.2 380V Supplies

2.2.1 The output from transformer T1 and T2 is 380V, 3-phase, 4 wire to a 380V switchboard (termed TP1 380), also called the Motor Control Centre (MCC). This board is divided into two by a section switch, each transformer supplying one half through a 1600A incomer air-break circuit breaker. The design fault level of the MV board and switchgear is 500MVA to handle the combined output of the two transformers.

2.2.2 Numerous outgoing feeder panels from the two parts of the MCC switchboard A and B control the supplies to motors and distribution boards. Those controlling motors are provided with isolating switches, contactors and HRC back-up fuses; those feeding the distribution boards have in the main moulded case circuit breakers (MCCB's) and HRC back-up fuses.

2.2.3 Most of the distribution boards connected to the MCC switchboard are supplied at 380/220V 4-wire from MCC A or B. Their outputs are mainly 220V single-phase balanced between phases and the neutrals earthed, but there are also some 380V 3-phase outputs.

2.2.4 Additional outgoing circuits are provided by two extra MCC units, 380V MCC A Extension and 380V MCC B Extension; these are connected through to the busbars of TP1 380 MCC Section A and Section B respectively. Each Extension MCC is divided into two parts, one supplying essential loads, the other non-essential loads. The essential busbars of each Extension MCC have two alternative sources, either the normal supply from TP1 380V MCC via the non-essential busbars or a Black Start supply from Platform QP; the change over from the normal to Black Start is made by two circuit breakers interlocked so that one breaker only can be closed at one time.

2.2.5 The isolating switches are capable of breaking the full stalled current of the motor. The contactors provide normal overcurrent and undervoltage protection and remote-start switching, but as their fault capacity is well below the system's 500MVA, HRC back-up fuses are provided, and blow first if the fault current exceeds a contactor's capacity.

2.2.6 Fuses provide a similar back-up to the MCCBs. These breakers have a maximum breaking capacity of only 13MVA; the fuses deal with all fault currents between this and the design system limit of 50MVA.

2.2.7 Apart from feeding individual motors and heaters, the TP1 380 switchboard feeds a number of distribution boards. These include a Standby Supplies board, which is further described in Section 5.3.

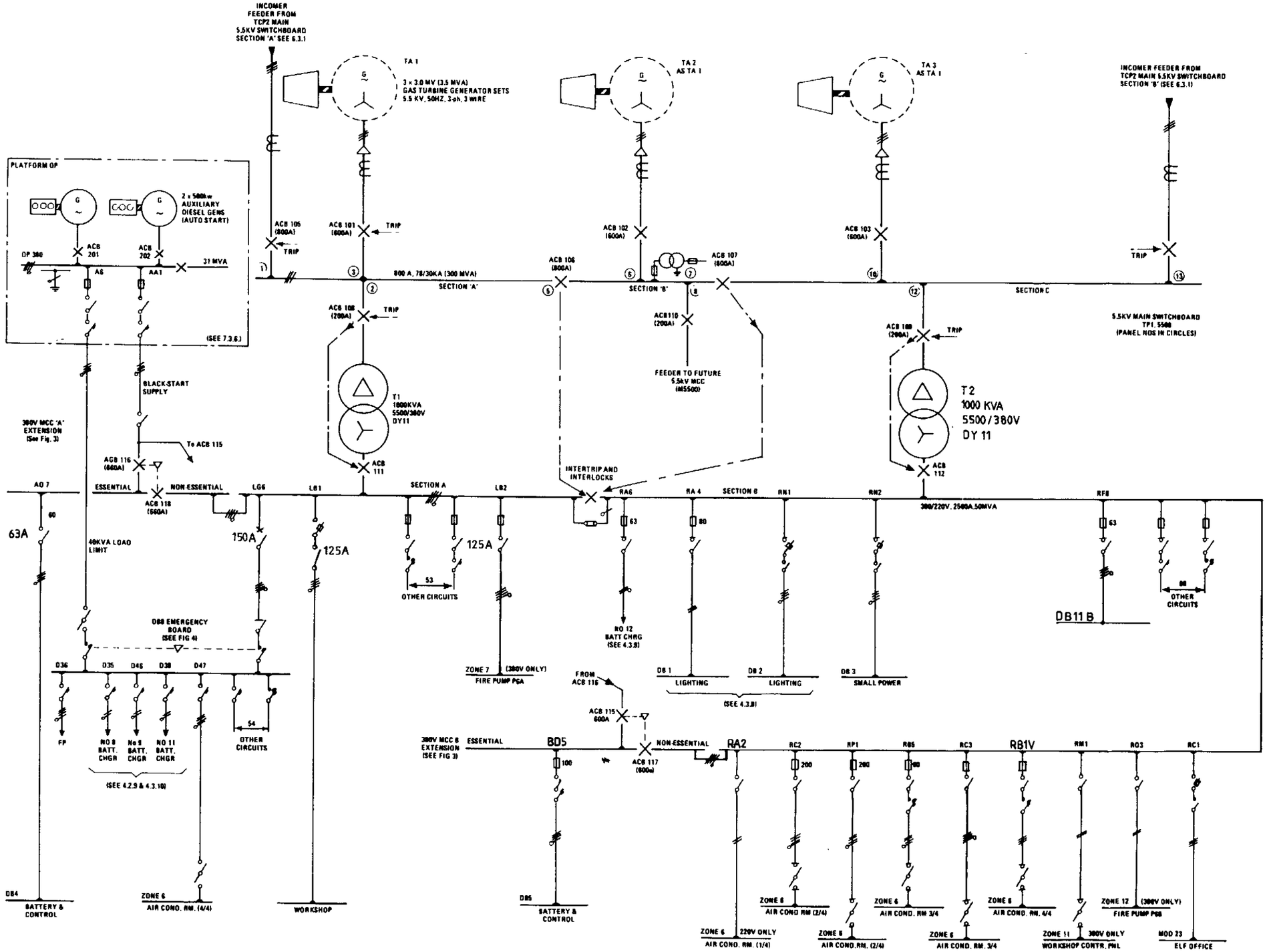
3 SYSTEM CONTROL

3.1 The 5.5kV switchboard is controlled as described in Section 5.1.

3.2 Switchboard TP1 380 (the Motor Control Centre) in the MCC Room, Zone 05 (mezzanine), is locally controlled.

4 CIRCUIT PROTECTION

Generator, busbar, feeder, transformer and load protection is provided by conventional means, with intertripping where necessary.


INCOMER FEEDER FROM TCP2 MAIN 5.5KV SWITCHBOARD SECTION 'A' SEE 6.3.1
TA 1
3 x 3.0 MV (3.5 MVA) GAS TURBINE GENERATOR SETS 5.5 KV, 50HZ, 3-ph, 3 WIRE
TA 2 AS TA 1
TA 3 AS TA 1
INCOMER FEEDER FROM TCP2 MAIN 5.5KV SWITCHBOARD SECTION 'B' (SEE 6.3.1)
PLATFORM QP
2 x 500kw AUXILIARY DIESEL GENS (AUTO START)
QP 380
ACB 201
ACB 202
AA1
31 MVA
(SEE 7.3.6)
ACB 105 (800A)
ACB 101 (600A)
TRIP
ACB 102 (600A)
ACB 103 (600A)
ACB 106 (800A)
ACB 107 (800A)
900 A, 78/30KA (300 MVA)
SECTION 'A'
SECTION 'B'
SECTION C
ACB 108 (200A)
ACB 110 (200A)
ACB 109 (200A)
5.5KV MAIN SWITCHBOARD TP1, 5500 (PANEL NOS IN CIRCLES)
FEEDER TO FUTURE 5.5kV MCC (MS500)
T1 1000KVA 5500/380V DY11
T2 1000 KVA 5500/380V DY 11
ACB 111
ACB 112
BLACK START SUPPLY
380V MCC 'A' EXTENSION (See Fig. 3)
To ACB 115
ACB 116 (660A)
ACB 118 (660A)
ESSENTIAL
NON-ESSENTIAL
INTERTRIP AND INTERLOCKS
SECTION A
SECTION B
300/220V, 2500A,50MVA
AD 7
63A
40KVA LOAD LIMIT
150A
125A
53
OTHER CIRCUITS
DB8 EMERGENCY BOARD (SEE FIG 4)
D36
D35
D45
D38
D47
54
FP
NO 8 BATT. CHGR
No 9 BATT. CHGR
NO 11 BATT. CHGR
(SEE 4.2.9 & 4.3.10)
DB4
BATTERY & CONTROL
ZONE 6
AIR COND. RM. (4/4)
WORKSHOP
ZONE 7 (380V ONLY)
FIRE PUMP PSA
NO 12 BATT CHRG (SEE 4.3.9)
DB 1
LIGHTING
DB 2
LIGHTING
DB 3
SMALL POWER
(SEE 4.3.8)
DB11B
OTHER CIRCUITS
FROM ACB 116
ACB 115 600A
380V MCC B EXTENSION (SEE FIG 3)
BD5
ACB 117 (800A)
DB5
BATTERY & CONTROL
RA2
RC2
RP1
RB5
RC3
RB1V
RM1
RO3
RC1
ZONE 6 220V ONLY
AIR COND. RM. (1/4)
ZONE 8
AIR COND RM (2/4)
ZONE 6
AIR COND. RM 3/4
ZONE 8
AIR COND. RM. 4/4
ZONE 12 (380V ONLY)
FIRE PUMP PSB
ZONE 11 380V ONLY
WORKSHOP CONTR. PNL
MOD 23
ELF OFFICE

STANDBY SUPPLIES

1 GENERAL

TP1 has no standby generators: in the event of a failure of main generation it is dependent upon standby supplies fed from QP.

2 DESCRIPTION

2.1 A limited standby 380V supply is automatically fed from Platform QP if the main generation should fail. The limit is 65kVA, and the supply is therefore confined to those services fed from TP1's Standby Distribution Board, DB8.

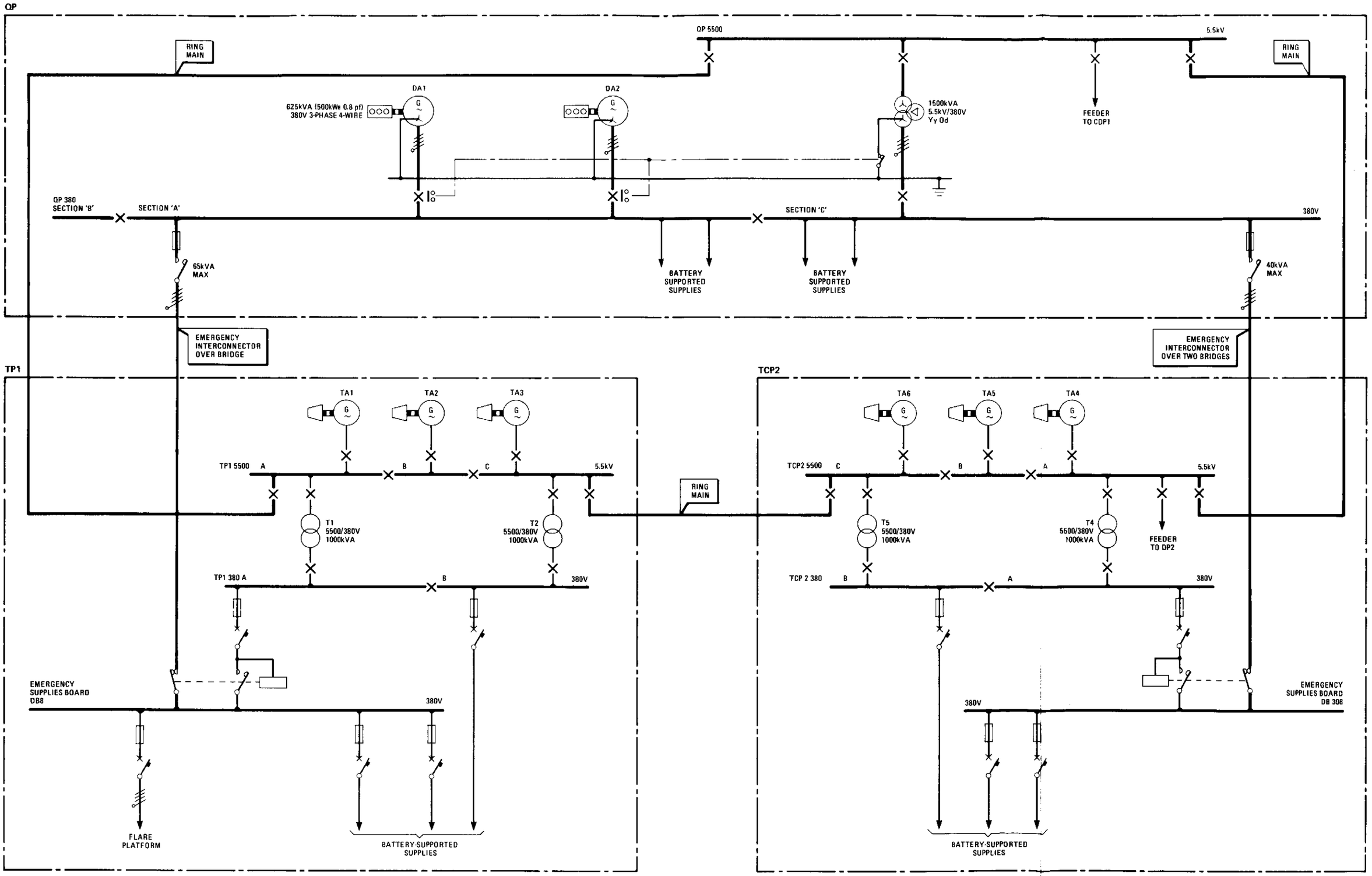
2.2 The arrangement is illustrated in Diagram 5.3 and shows the standby power supply inter-relationships of the three platforms, QP/TP1/TCP2.

2.3 During normal operation, distribution board DB8 (Standby Supplies) takes its input from the 380V Motor Control Centre TP1 380. The pressure of an input is monitored by a changeover contactor. If the normal input should fail, the contactor operates to select the alternative input from Motor Control Centre QP380 on Platform QP.

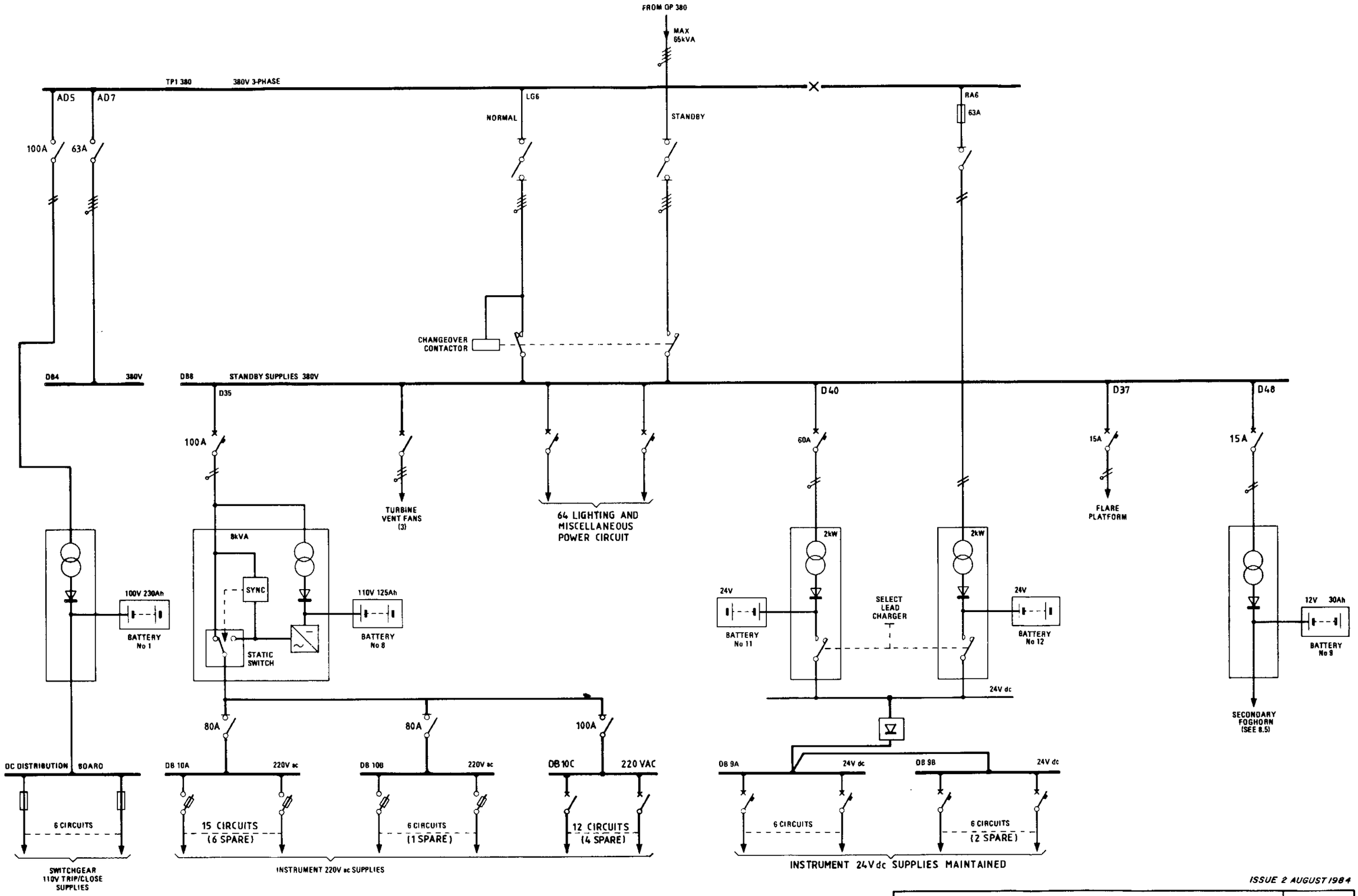
2.4 The alternative (standby) input from QP380 is always present at the changeover contactor as long as normal generation and distribution arrangements are in force, but the operation of the contactor prevents the inputs from being paralleled. When main generation fails, however, the alternative input from QP380 fails too, so that DB8 suffers a supply interruption until the QP standby generators have started. When this has occurred the standby supply to DB8 from QP380 is automatically connected.

2.5 Where such an interruption cannot be tolerated a battery-supported supply is provided.

2.6 This arrangement not only feeds the essential services in TP1, but also enables the TA1, TA2 and TA3 vent fans to be run when starting the first main gas turbine generator in a 'black' situation.



NOTE
REFERENCE SHOULD BE MADE TO SECTION 5.2 FOR DETAILS OF OTHER SERVICES SUPPLIED FROM TP1 380



ISSUE 2 AUGUST 1984

BATTERY-SUPPORTED SUPPLIES | 5.4

BATTERY-SUPPORTED SUPPLIES

1 GENERAL

1.1 Alternative supplies are provided on Platform TP1 for use in the event of a failure of the normal 5.5kV supply. These supplies are as follows:

Standby Supplies.
Battery-supported DC Supplies.
Battery-supported AC Supplies.

1.2 Battery-supported supplies are needed for any load that cannot tolerate a short interruption of its power supply. Loads that are essential to the safety of the platform, or to the restoration of normal supplies, and must therefore be able to survive a simultaneous failure of both main and secondary generation, also need a battery-supported supply.

1.3 Some maintained supplies are used under emergency conditions.

2 DESCRIPTION

2.1 Battery-supported DC Supplies – General

2.1.1 There are seven separate battery-supported dc supplies on TP1. Each is fed from the platform's ac distribution system via a transformer/rectifier.

2.1.2 Three of these supplies are special dedicated systems, one for each turbine, for diesel engine starting, turbine emergency lub oil pumps and turbine dc control cabinets. They are not dealt with in this Section, which is concerned only with the four dc supplies shown in Diagram 5.4. They are numbered after their battery numbers.

2.1.3 Under normal conditions each transformer/rectifier supplies the full dc load of its associated system while its standby battery floats across the dc output on a trickle charge. Upon failure of the ac input, or of the rectifier, the battery takes over the full dc load without interruption.

2.1.4 When the ac input is restored the transformer/rectifier takes over the load again. At the same time it recharges the battery, with a boost charge if necessary, to its full capacity.

3 PLATFORM CENTRAL DC SUPPLIES

3.1 Two separate dc systems are associated with the platform central 24V dc supplies. Their outputs are paralleled, and normally the two systems share the dc load, each carrying 50 per cent. If one system, or its supply, should fail, the other can carry the full 100 per cent load. If both ac inputs should fail, the batteries take over the dc load without interruption, sharing it equally. Either can carry the load alone if the other is out of service.

3.2 One system is supplied from the main MCC, TP1 380; the other is supplied from DB8 – standby distribution board – which is itself supported by the 380V ac standby supply from Platform QP.

3.3 When ac power is restored after a failure, system No 11 is automatically disconnected from the load and gives its battery a boost charge, while system No 12 takes over the load and trickle-charges its battery. The roles can be reversed by pressing the Select Load Charger pushbutton on transformer/rectifier No 12.

3.4 This action should be taken, in any event, after battery No 11 has been recharged while battery No 12 still needs a boost. The systems are interlocked so that the batteries cannot both be boosted at the same time.

4 BATTERY-SUPPORTED AC SUPPLIES

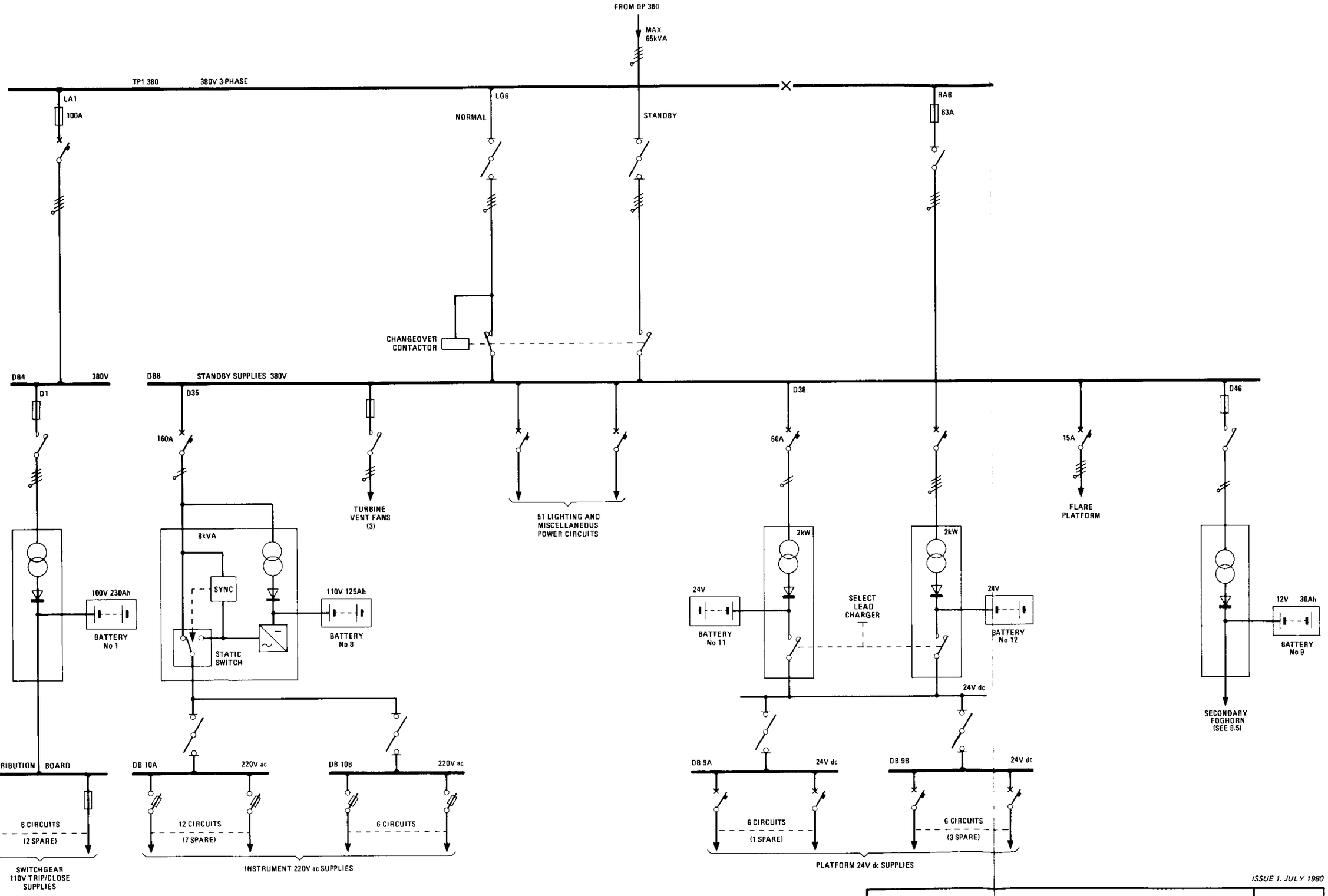
4.1 There are four separate battery-supported ac supplies on TP1. Each is supplied from the platform's ac distribution system via a transformer/rectifier followed by an inverter.

4.2 Three of these supplies are special dedicated systems for main gas turbine 230V ac control circuits, one for each gas turbine. They are not dealt with in this Section, which is concerned only with the remaining system. It is numbered after its battery number.

4.3 Under normal operating conditions a static switch connects a 220V ac single-phase supply from DB8 direct to the maintained ac distribution boards DB10A and DB10B. The same ac input from DB8 energises the transformer/rectifier/inverter and keeps the floating battery trickle-charged. Upon failure of the ac input the static switch automatically switches over to the inverter output, which is now maintained by the battery.

4.4 The changeover is controlled by a synchronising circuit which ensures that the inverter output is always synchronised with the normal supply. Changeover is therefore smooth and virtually uninterrupted.

4.5 When the ac input is restored the static switch reconnects the DB8 output direct to DB10A and DB10B, the changeover, as before, being controlled by the synchronising circuit. At the same time the transformer/rectifier reverts to charging the battery, if necessary at the boost rate. Reversion to trickle-charge is automatic.



ISSUE 1. JULY 1980

BATTERY-SUPPORTED SUPPLIES

5.4

GLYCOL REGENERATION

1 GENERAL

1.1 Rich glycol at V2 temperature is let down under level control from the bottom of glycol contactor V2A to condensate separator V14A.

1.2 In the condensate separator the glycol and entrained condensate separate out, the condensate being let down under level control to oil skimmer V5, and the rich glycol to glycol filter V15A.

1.3 After filtration in V15A, approximately 5 per cent of the glycol flow is diverted through charcoal filter V20A where dissolved hydrocarbons, fatty acid well inhibitors and glycol degradation compounds are removed.

1.4 Rich glycol from the filters enters reflux condenser E4A at a temperature of 49 Degrees C and leaves at a temperature of 79 Degrees C.

1.5 From the reflux condenser the rich glycol flows through the tube side of glycol heat exchangers E1A-2 and E1A-1. The rich glycol temperature is raised to 148 Degrees C by heat transfer from lean glycol passing through the shell side of the heat exchangers at a temperature of 204 Degrees C.

1.6 Rich glycol from the heat exchangers flows into stripping column V16A where it cascades over a series of bubble trays into glycol reboiler H1A. The glycol temperature in the reboiler is raised to 204 Degrees C and any entrained water boiled off. Stripping gas from the Fuel Gas System plus water vapour is passed upwards through the bubble trays and relieved to the LP Vent System. The lean glycol discharged from the reboiler is 98 per cent pure.

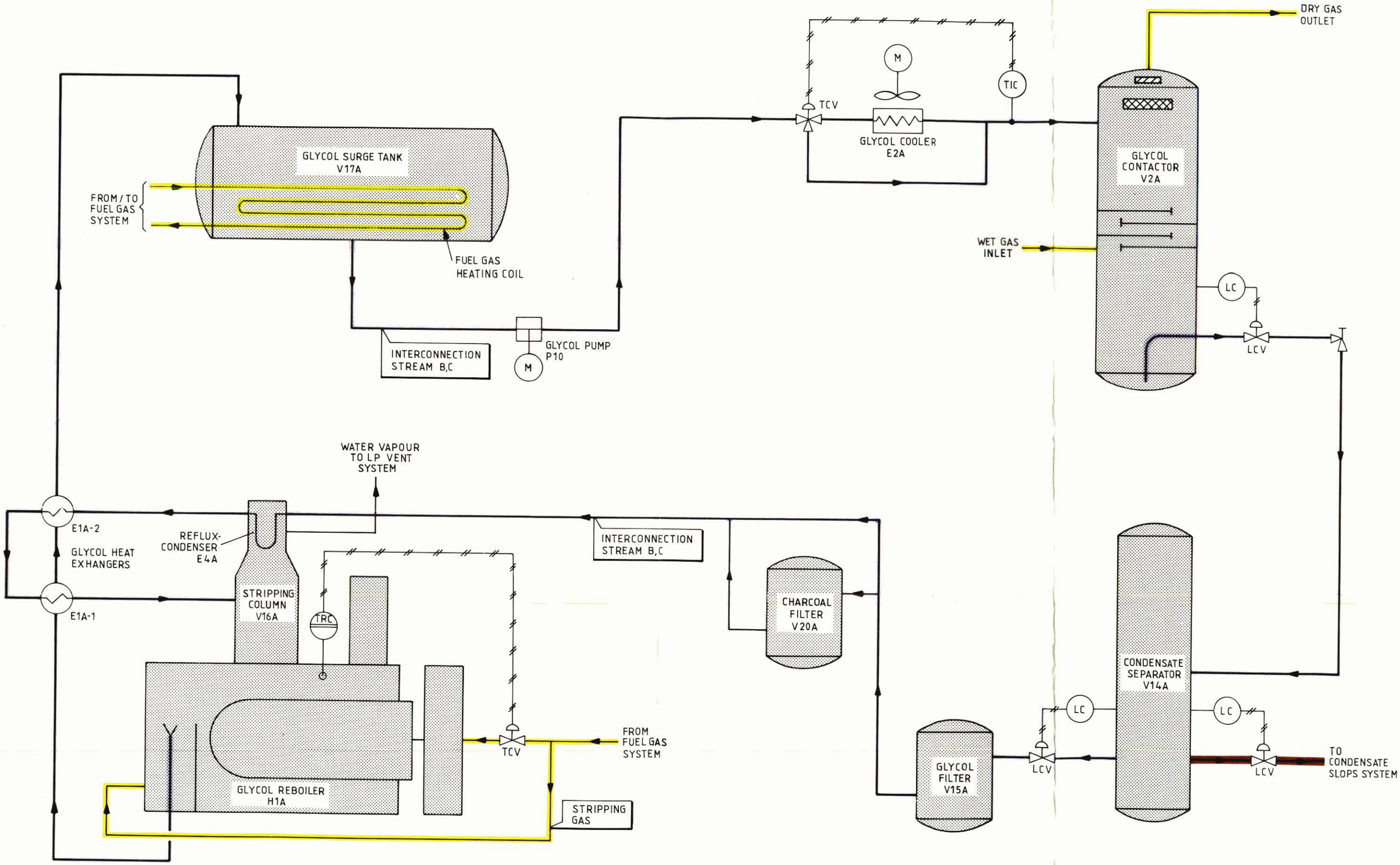
1.7 Hot lean glycol at a temperature of 204 Degrees C flows through the shell side of glycol heat exchangers E1A-1 and E1A-2 where it is cooled to 136 Degrees C.

1.8 From the heat exchangers the lean glycol flows into surge tank V17A. Electric heating pads activated by a temperature switch are installed around the base of the tank to maintain the glycol temperature at 24 Degrees C in the event of a shutdown.

1.9 Fuel gas is heated as it passes through a 4in coil in surge tank V17A on its way to the fuel gas supply header.

1.10 Glycol pump P10 takes suction from the surge tank and discharges at a rate of 255 litres/min to glycol cooler E2A where, after being cooled to 43 Degrees C, the lean glycol flows back into glycol contactor V2A.

1.11 The streams A, B and C are interconnected at the suction side of glycol pump P10 and at the outlet side of glycol filters to enable glycol to be regenerated at any reboiler.



ISSUE 2 AUGUST 1984

GLYCOL REGENERATION 5.5

BULK STORAGE OF GLYCOL

1 GENERAL

1.1 Glycol storage tank V9 forms part of the platform structure at Cellar Deck level and has a capacity of 140m^3. It is rated at a pressure of 1.08 bara at a temperature of 205°C. Protection from overpressure is provided by two pressure/ vacuum relief valves set to relieve at 79mmWG and 465mmWG.

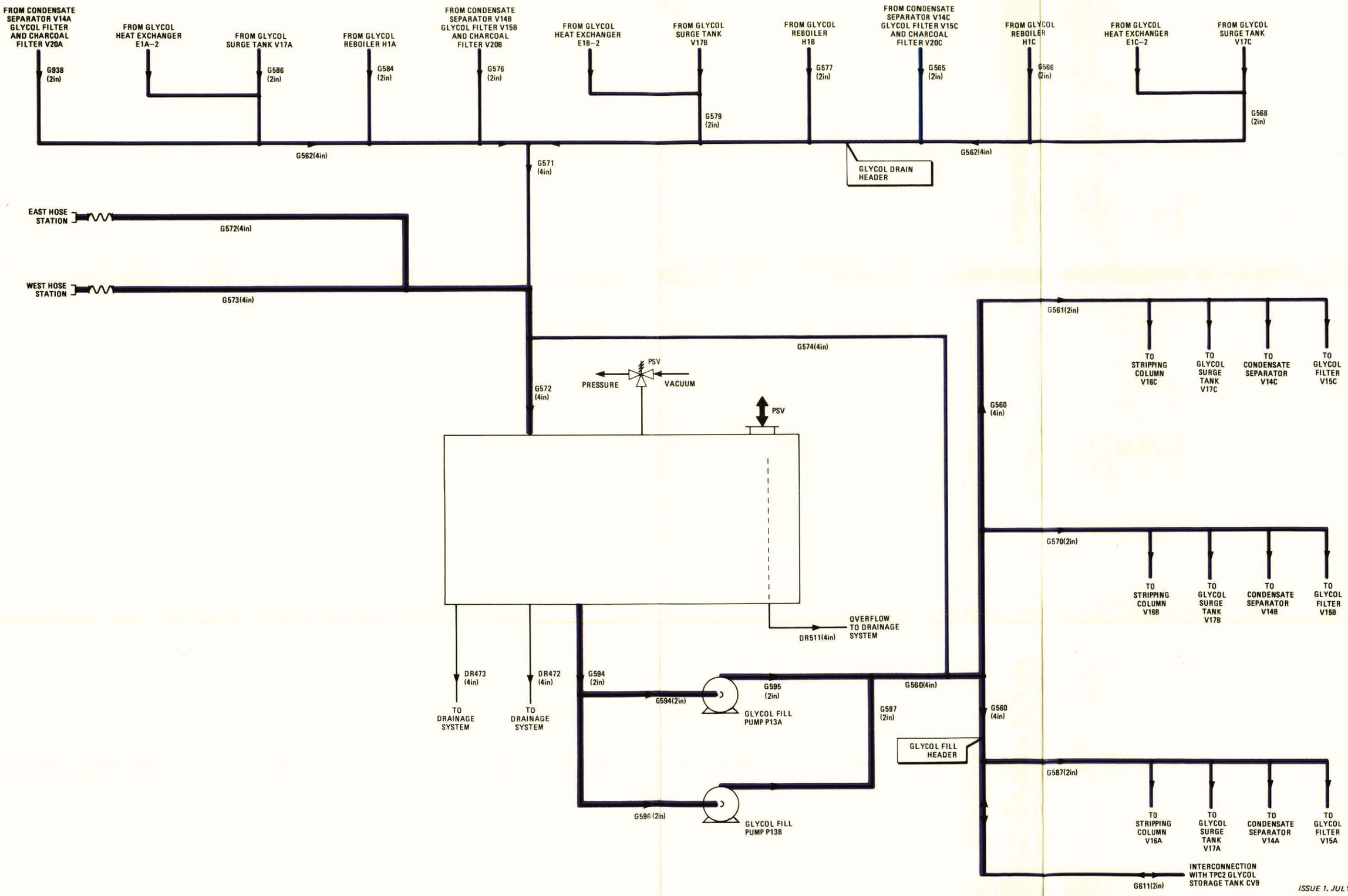
1.2 The tank may be filled from a supply boat via the east and west boat landings, from TCP2 glycol system or from the glycol drain header.

2 GLYCOL FILL PUMPS P13A AND B

2.1 Two centrifugal pumps, P13A and B, each rated at 113.6 litres/min at a discharge pressure of 3.08 bara and driven by 2.2kW electric motors are installed to transfer glycol from the storage tank to the streams.

2.2 The pumps are piped in parallel and are normally operated one duty and one standby, controlled from local pushbuttons. They discharge into the 4in glycol fill header from which a 2in fill line incorporating a flow meter is led to each stream.

2.3 Glycol is also pumped from the header to and from TCP2 via a 2in cross-connecting line.



ISSUE 1. JULY 1980

BULK STORAGE OF GLYCOL

5.6

LP VENT SYSTEM

1 GENERAL

Waste and relief gas from process equipments operating below 15 barg is discharged to atmosphere by the LP vent system.

2 LP VENT HEADER

2.1 The following equipment is vented into the 14in LP vent header:

Condensate surge tank V3 (two PSVs only, flash gas is directed to the HP relief system or to the fuel gas scrubber)
Coalescer V4 (two PSVs)
Oil skimmer V5 (blanketing gas and two PSVs)
Fuel gas scrubber V6 (two PSVs)
Condensate separators V14 (two PSVs)
Stripping columns V16 (water removed and stripping gas)
Glycol surge tanks V17 (blanketing gas)
Condensate storage tank V33 (one PSV)
Turbine blowdown systems
Moisture analysers

2.2 Where vessels are fitted with two relief valves in parallel, one valve is normally in service with its isolating valves CSO (car sealed open) and the other on standby with its isolating valves CSC (car sealed closed).

2.3 Gas is continuously vented from stripping columns V16A, B and C but turbine blowdown is initiated manually as required.

3 LP VENT SCRUBBER V7

3.1 Entrained liquids in the vented gases are collected in LP vent scrubber V7 located in Zone 08 on the Cellar Deck. The scrubber is designed for a maximum working pressure of 3.46 barg at a temperature of 100°C.

3.2 Liquids collected in the vent scrubber are let down under level control to the platform drain system; see Section 5.12.

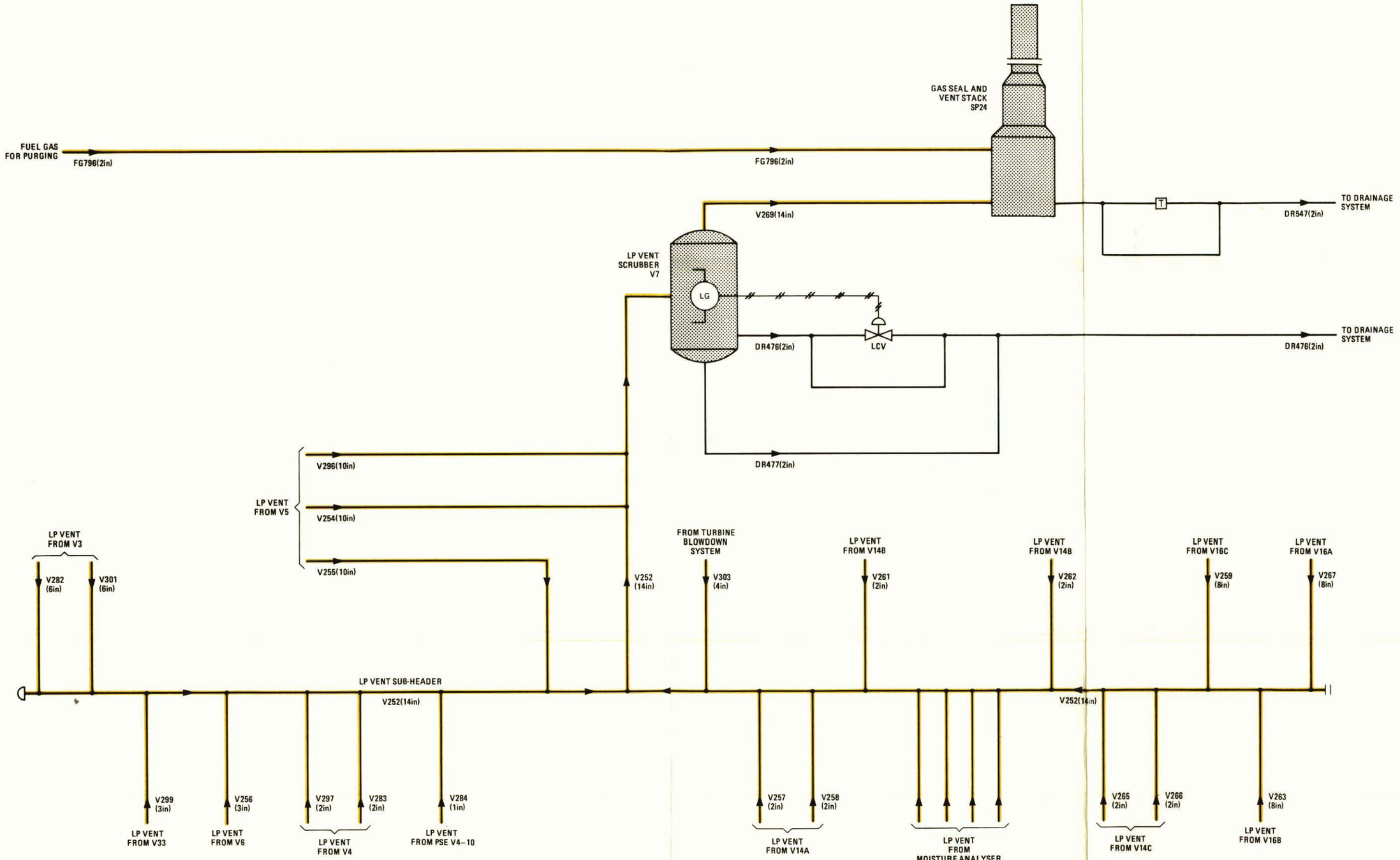
4 LP VENT STACK SP24

4.1 Gases from the vent scrubber flow via a 14in line to the LP vent stack located in Zone 05 on the Upper Deck.

4.2 The vent stack is 22.86m high and releases the gas to atmosphere.

4.3 To prevent the ingress of air a gas seal is fitted in the vent stack.

4.4 Provision is made for purging the vent stack via a 2in line from the wet gas inlet line.



ISSUE 1. JULY 1980

LP VENT SYSTEM 5.7

HP RELIEF SYSTEM

1 GENERAL

1.1 High pressure gas relieved from the various process vessels and associated pipework during normal operation or a blowdown is routed to the HP header.

1.2 Gases from the HP header pass through HP flare scrubber V24 where entrained liquids are removed and let down to the drain system.

1.3 From the HP flare scrubber the gas flows via a 24in subsea line to the Flare Platform (FP), or to the cold vent stack.

2 HP RELIEF

2.1 The high pressure process vessels and their associated lines can be blown down into the 20in HP relief header via emergency shutdown valves (ESDVs) or vented automatically through pressure relief valves.

2.2 The ESDVs may be opened individually by the operation of hand valves or collectively by a Group W Emergency Shutdown. These emergency shutdown valves fail open on loss of control air pressure.

2.3 The following vessels and associated lines may be blown down via ESDVs to the HP relief header:

Free water knockout separators V1A, B and C
Glycol contactors V2A, B and C
Pig receiver M1
Pig receiver M2
Sales gas header
Dry gas header to and from TCP2

2.4 The free water knockout separators and the glycol contactors are each fitted with two relief valves installed in parallel. One valve is set as duty with its isolating valves CSO (car sealed open) and the other valve set as standby with its isolating valves set CSC (car sealed closed).

2.5 Pig receivers M3, M4 and M5 and condensate surge tank V3 all relieve to the HP relief header through single relief valves.

2.6 The sales gas header is fitted with four relief valves PSV V2A–8, 9, 10 and 11. Three valves are in service with their isolating valves CSO and the fourth in reserve with its isolating valves set CSC.

3 HP FLARE SCRUBBER V24

3.1 The HP flare scrubber is a horizontal vessel located in Zone 10 on the Cellar Deck rated at a design pressure of 48.3 barg. All gases in the 20in HP Relief System pass through the flare scrubber before entering the 24in underwater flare line. The scrubber will remove any liquid that is being carried in the flare gas; this will help prevent any liquid spillover at the flare and keep condensate in the underwater flare line to a minimum.

3.2 Gas flowing into the first section of the vessel is directed by vanes onto an impingement baffle where any entrained liquid slugs are knocked out. The knocked-out liquid gravitates to the boot in the bottom of the vessel and is let down under level control to drain. In the second section of the vessel any entrained liquid droplets are knocked out and let down under level control to drain.

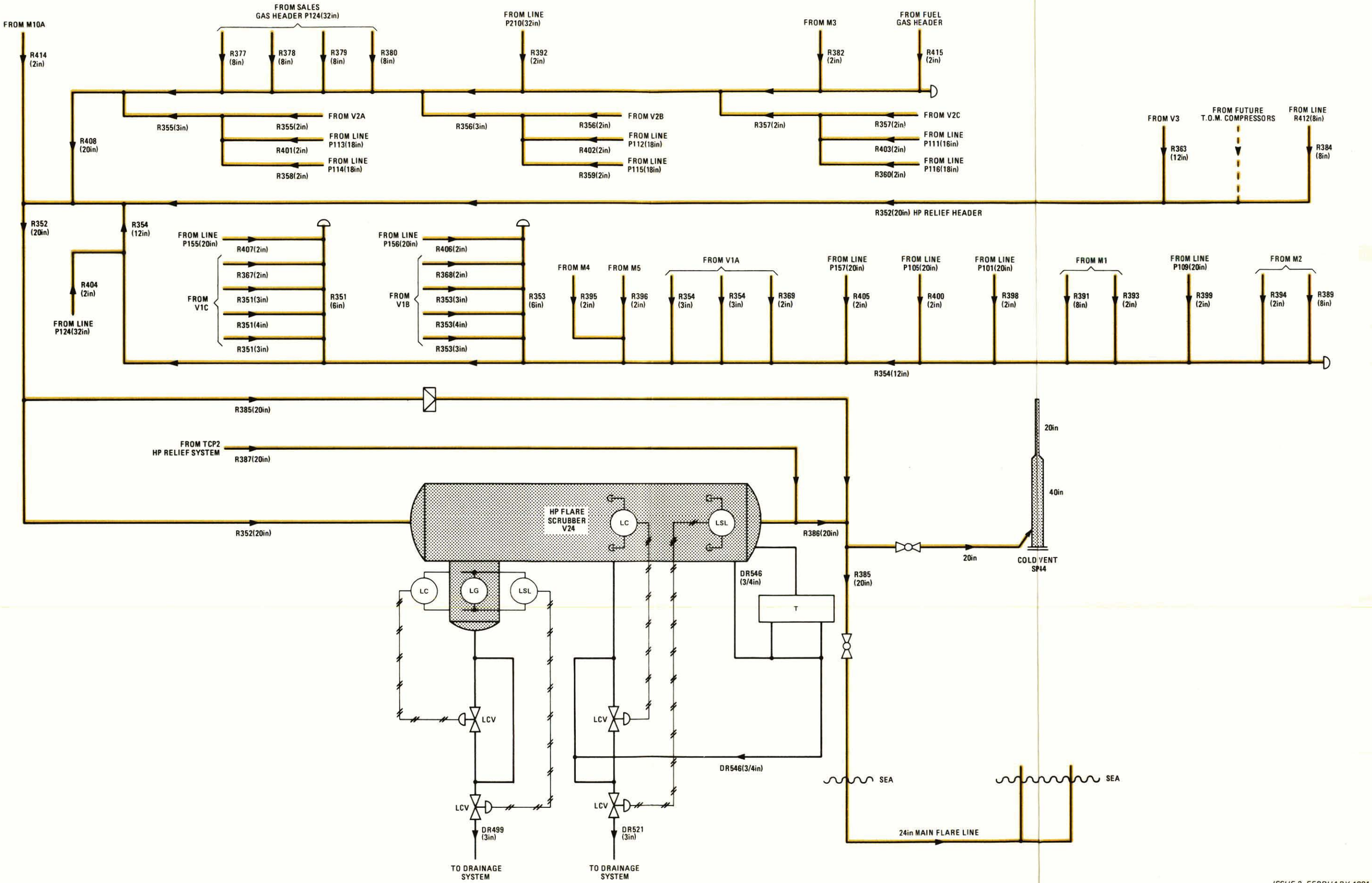
3.3 A 20in bypass is installed around the flare scrubber. This bypass is isolated by a bursting disc rated at a differential pressure of 19 bar at −54°C.

3.4 Gas discharged from the flare scrubber flows via a 24in subsea line to FP.

3.5 The gas flowrate to FP is continuously monitored by flow elements and transmitters installed in the flare scrubber discharge line. The produced data are transmitted to QP and recorded.

3.6 In the event of failure of the flare system on FP, gas from V24 is vented via cold vent stack SP44. The cold vent stack is a free-standing tower 35m high. The blowdown times using SP44 are 90 and 75 minutes for TCP2 and TP1 respectively.

END



ISSUE 2. FEBRUARY 1981

HP RELIEF SYSTEM

5.8

METHANOL STORAGE AND INJECTION

1 GENERAL

1.1 Methanol is stored on the platform in storage tank V23 located in the central support at Cellar Deck level. This tank has a capacity of 140m^3 and is rated for a maximum working pressure of 80mbar at 21°C.

1.2 The tank is filled from TCP2 via a 3in line, or from either of the 6m^3 capacity pods located at the loading areas in Zones 01 and 08.

1.3 Provision is made to inject methanol into gas lines just upstream of the 12 main flow control valves. Methanol may also be injected into the 3in condensate line just before it enters the sales gas line leaving the platform.

1.4 Methanol can be supplied to TCP2 using methanol transfer pumps P17A and B or it can be injected into the gas lines using methanol metering pumps P12A and B.

2 METHANOL TRANSFER PUMPS P17A AND B

2.1 Two centrifugal pumps, P17A and B, are provided to transfer methanol from TP1 to TCP2. Each pump is driven by a 3kW electric motor and has a capacity of 227 litres/min at a pressure of 3.1 barg.

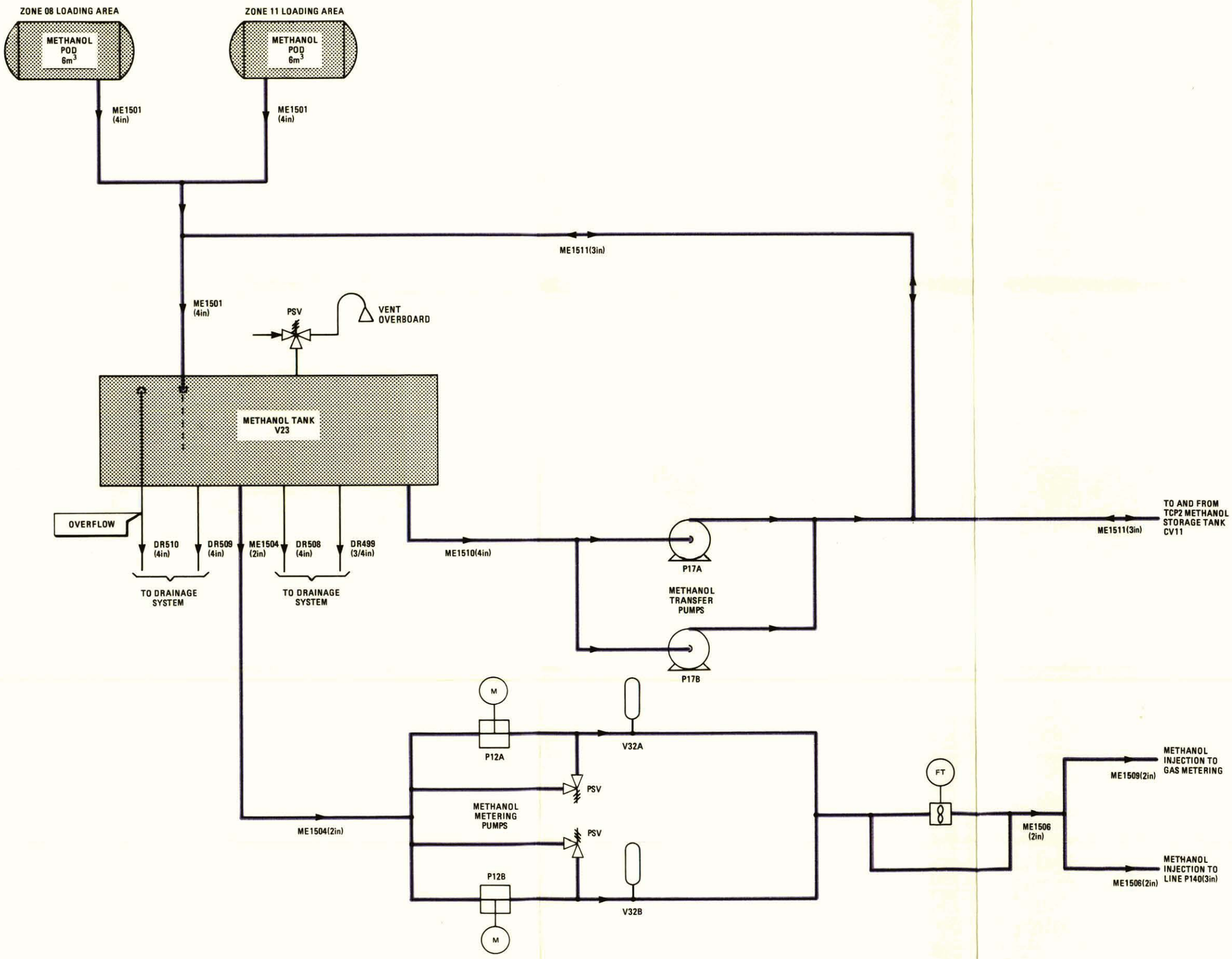
2.2 Both pumps take suction from methanol storage tank V23 through a common 4in line and discharge into a common 3in line which crosses the bridge to TCP2.

3 METHANOL METERING PUMPS P12A AND B

3.1 Two reciprocating pumps, P12A and B, take suction from the methanol storage tank via a common 2in line, and discharge via a flow meter into the gas lines. Each pump is driven by an 11.2kW electric motor and each has a capacity of 284 to 1000 litres/min at a pressure of 153 barg.

3.2 Installed in parallel, the pumps are normally set to operate with one pump duty and the other at standby.

3.3 Methanol is discharged from each pump via a pulsation dampener into a common 2in line, through a flow meter (which transmits data to a flow recorder in QP Control Room) to the injection points.



ISSUE 1. JULY 1980

METHANOL STORAGE AND INJECTION	5.9

CONDENSATE BURNING

1 GENERAL

1.1 A condensate burner mounted on a 13.86m boom installed at the northern corner of the Cellar Deck is used to burn off condensate from the 3in condensate header or condensate storage tank V33.

1.2 The burner is complete with gas pilot, igniter and cooling water screen.

1.3 Gas from the fuel gas header is supplied to the gas pilot via a 2in line.

1.4 Ignition for the gas pilot is effected by an electric spark plug controlled from the condensate ignition panel.

1.5 A continuous spray of sea water provides a water curtain around the burner to absorb a large proportion of the heat radiated by the flare. The spray requirement is 114m^3/h.

1.6 Sea water for the cooling water spray is supplied by water curtain pumps P16A and B.

2 WATER CURTAIN PUMPS P16A AND B

2.1 The water curtain pumps are of the vertical turbine type installed in stilling tubes in Zone 07 on the Cellar Deck.

2.2 Each pump is driven by a 75kW electric motor and rated at 136.2m^3/h at a pressure of 13.1 barg.

2.3 Installed in parallel, the pumps are normally operated with one duty and the other at standby.

2.4 The pumps are controlled manually from the condensate ignition control panel.

2.5 A 6in line from the pumps' common discharge line is connected to the firewater ring main to boost the firewater supply if required.

NORMAL LIGHTING

1 GENERAL

1.1 All lighting fittings operate at 220V single-phase derived between phase and neutral of 380V distribution boards fed from the platform's Motor Control Centre (MCC) TP1 380, as shown in Diagram 5.10.

1.2 Lighting systems are of the following three types:

(a) Normal lighting — Supplied from distribution board DB2", which is fed from TP1 380.

(b) Standby lighting — Supplied from distribution board DB8, which is fed from TP1 380 and has a standby input from platform QP (includes lifeboat and boat landing and floodlighting)

(c) Emergency — Supplied via DB1 and TP1 380. Certain selected fittings are provided with their own rechargeable back-up batteries and automatic changover facilities.

1.3 Building lighting and outside lighting are on separate circiuts.

1.4 It should be noted that all the lighting mentioned above is in use under normal operating conditions. If main generation should fail, only (c) is operative until the standby generators on Platform QP start and come on load. The lighting fed from DB8 '(b) above' then becomes available.

1.5 Normal lighting via DB2 '(a) above' is available only when the 5.5kV ring main is energised, ie when the TP1 or TCP2 main generators are running.

2 LIGHTING FITTINGS

2.1 For indoor use lighting fittings are of the twin 40W cold-cathode fluorescent tube type. For outdoor use both fluorescent and floodlight fittings are used. Incandescent lighting is included at walkways to provide light during loss of fluorescent lighting due to voltage dips. All fittings are enclosed for Zone 1 areas.

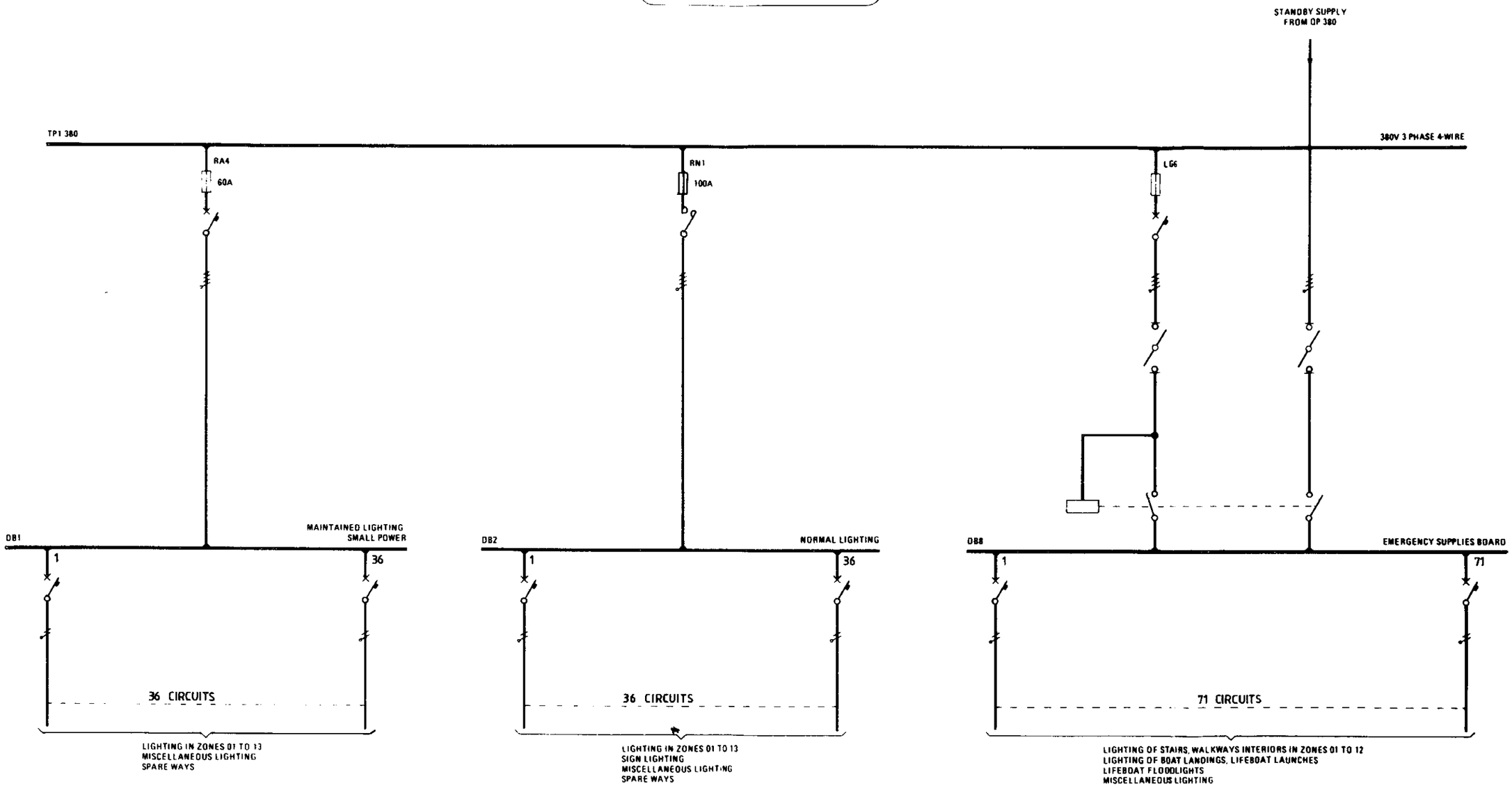
2.2 Refer to Section 9.14 for details of the Emergency Maintained fittings.

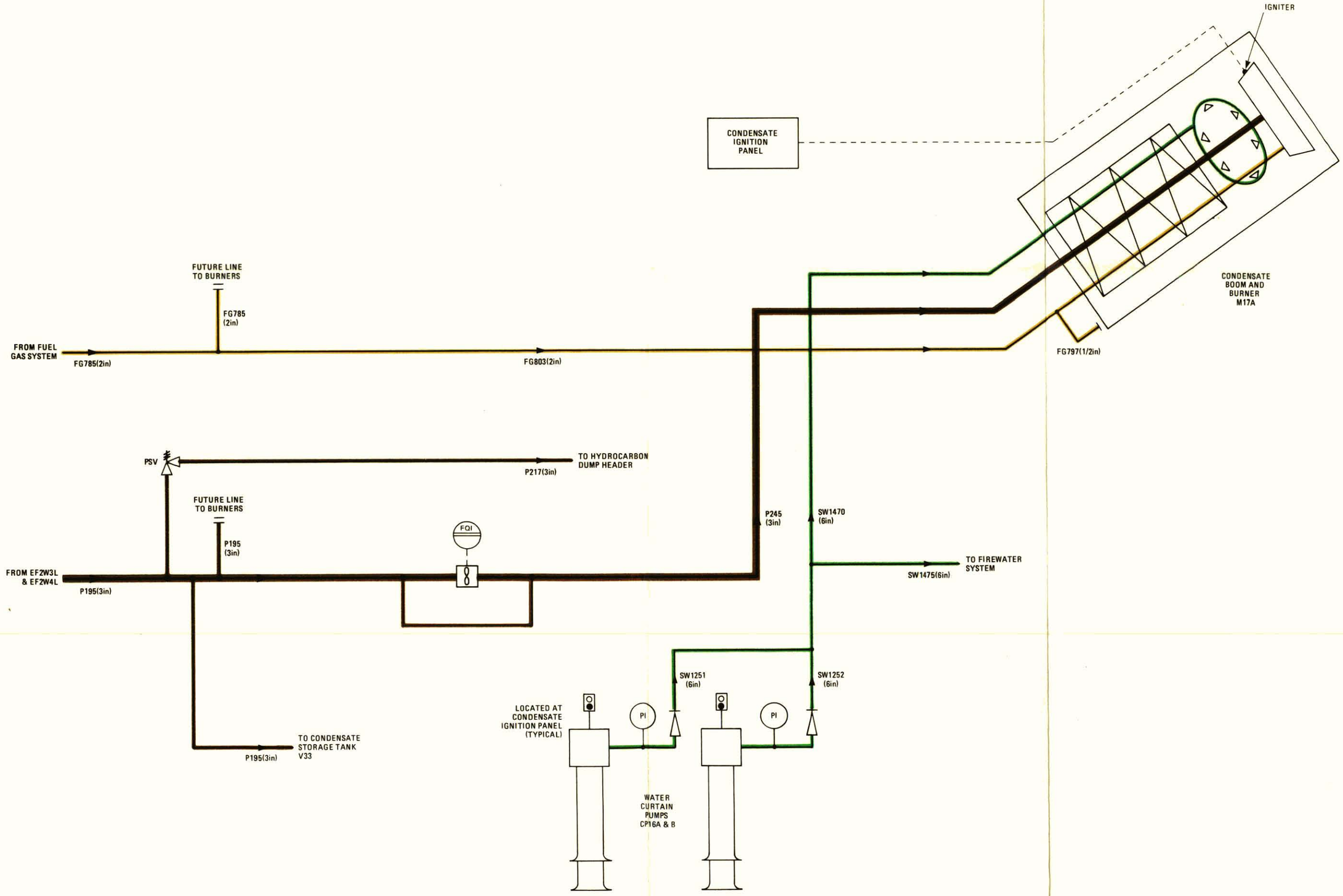
2.3 Lighting of certain external areas is by floodlight, those of most importance being fed from Standby Supplies Board DB8. The floodlights used are of three kinds:

250W mercury vapour,
500W tungsten-halogen,
2000W tungsten-halogen,

All the floodlights are weatherproof, but not all are explosion-proof, and these are therefore not used in hazardous areas.

NOTE
FOR FURTHER MENTION OF LIGHTING
FED FROM DB1 SEE SECTION 9.14





ISSUE 1. JULY 1980

CONDENSATE BURNING	5.10

WASHDOWN SYSTEM

1 GENERAL

1.1 The Washdown System is provided for deck washing etc, using sea water.

1.2 The washdown water ring main is normally pressurised by washdown pump P7.

2 WASHDOWN RING MAIN

2.1 The washdown ring main is a 4in line encircling the platform at Lower Deck level.

2.2 Eleven branch lines off the ring main serve 19 washdown hosereels.

2.3 Two cross-connections with the firewater ring main enable the Washdown System to be used as a secondary firefighting system, or allow the washdown ring main to be pressurised from the firewater system should the washdown pump fail.

3 WASHDOWN PUMP P7

3.1 Washdown pump P7 is a vertical centrifugal pump located in Zone 07 on the Cellar Deck.

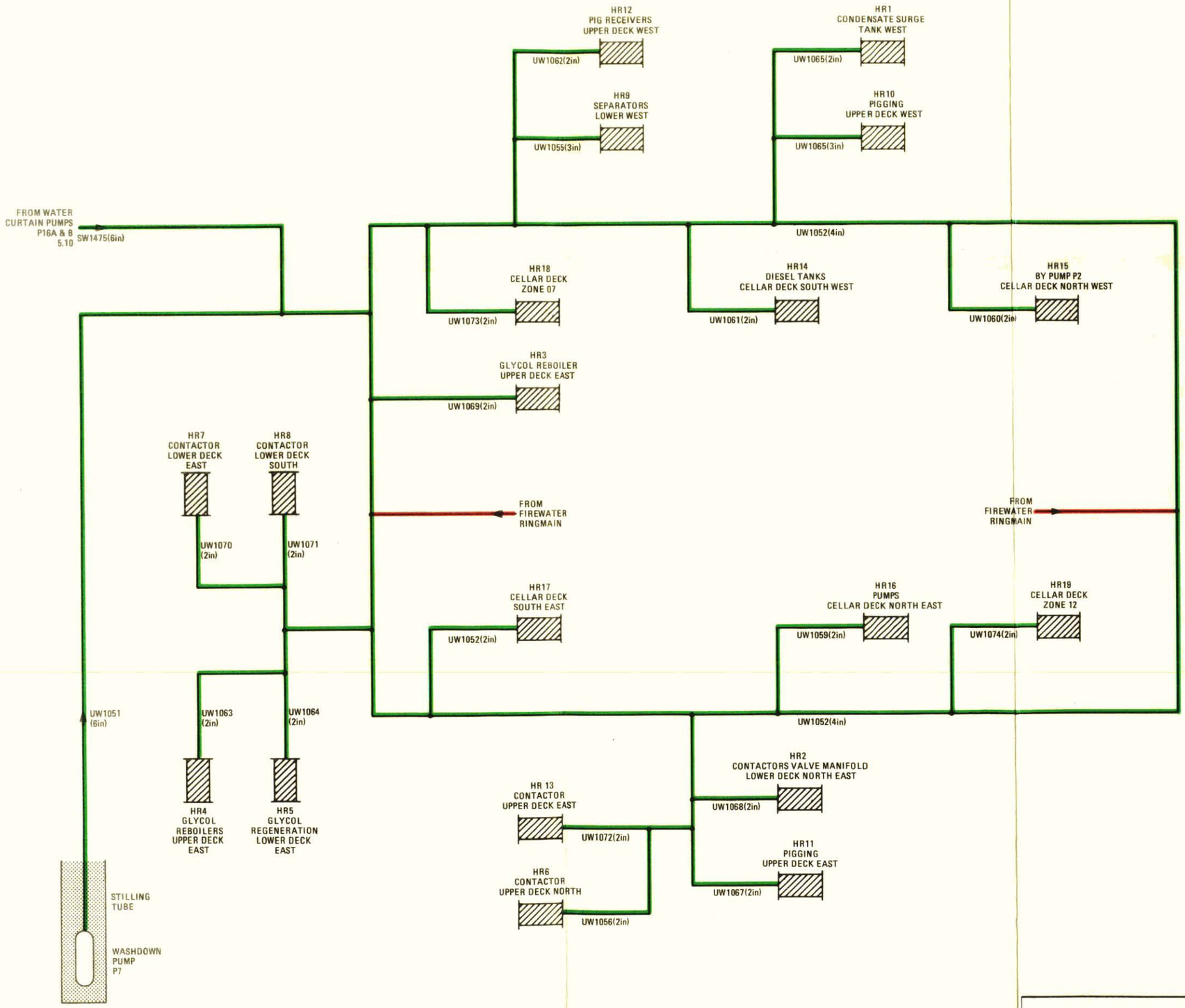
3.2 The pump is driven by an 89kW electric motor and is rated at 113.5m^3/h at a pressure of 8.6 barg.

3.3 The pump takes suction from a stilling tube and discharges through a 6in line to the washdown ring main.

3.4 The pump is manually operated from pushbuttons located at each hosereel station.

4 WASHDOWN HOSEREELS

Each hosereel comprises 31m of 1.1/2in hose terminating in a spray/jet/shut-off nozzle and is rated to deliver 379 litres/min at normal operating pressure.



ISSUE 1. JULY 1980

WASHDOWN SYSTEM	5.11

DRAINAGE SYSTEMS

1 GENERAL

1.1 Open and closed systems are provided both of which terminate in sump caisson V13.

1.2 Each zone is provided with an open drainage system generally consisting of drain gullies which discharge through seal boxes and manifolds into the 12in general drain header.

1.3 This main header discharges into the sump caisson via a check valve and water seal loop.

1.4 Process drainage flows into the 4in closed drain header which joins the general drain header downstream of the water seal.

1.5 Water from TP1 washbasins and treated effluent from sewage treatment plant Q13 are discharged overboard.

2 SUMP CAISSON V13

2.1 Sump caisson V13 is located in Zone 07 on the Cellar Deck and extends down to 34m below sea level. The bottom of the caisson is open to the sea.

2.2 Water and oil drainage separate out within the caisson – the oil floats to the top and the water is dispersed into the sea.

2.3 The oil/water interface level is indicated by the differential pressure between two bubbler tubes terminating at different levels within the caisson. The differential pressure between the two levels decreases as the interface level drops.

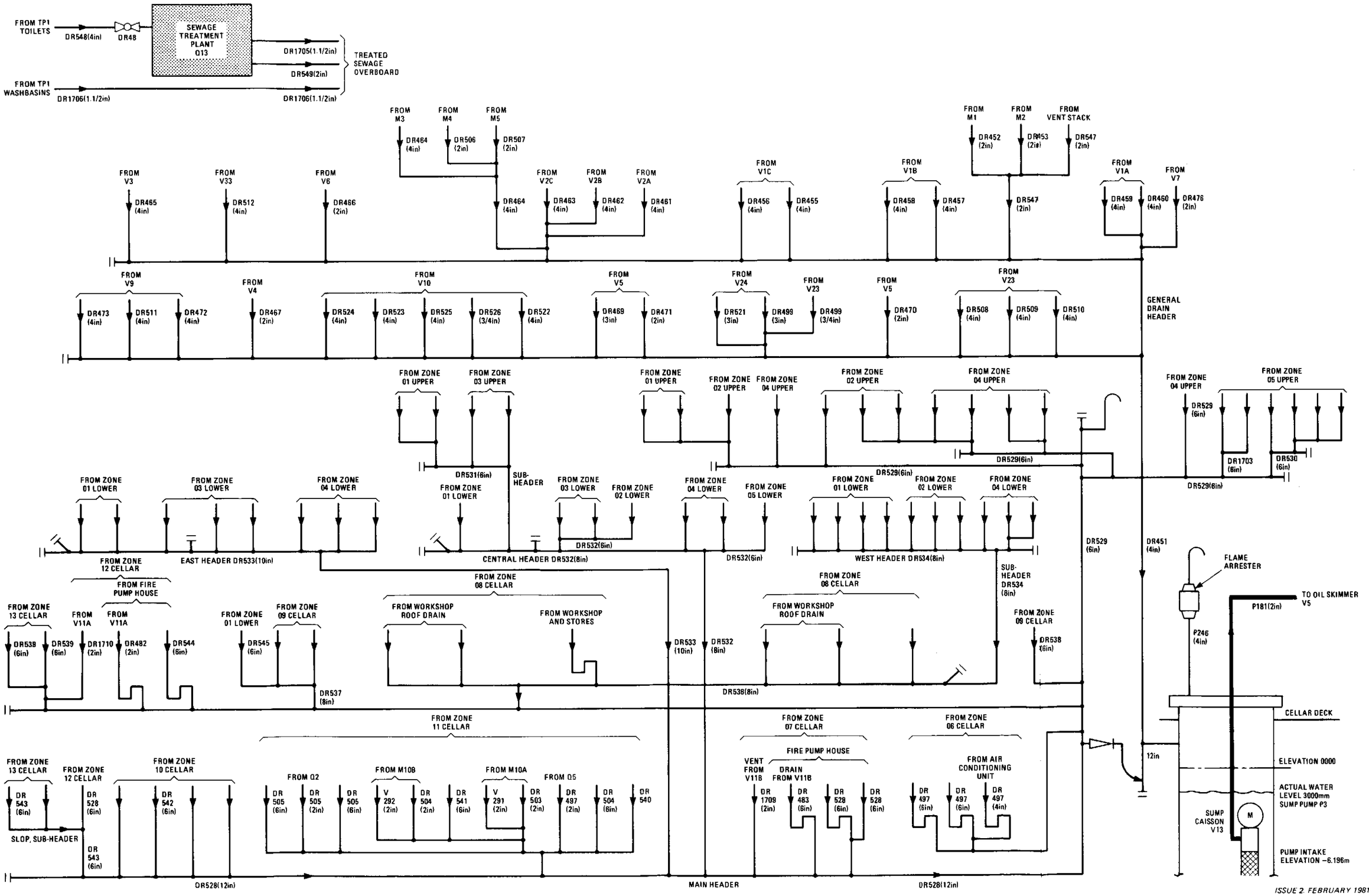
2.4 When sufficient oil has collected in the caisson, sump pump P3 is used to discharge it to oil skimmer V5.

3 SUMP PUMP P3

3.1 Sump pump P3 is a submersible type pump driven by a 3.75kW electric motor and is rated at 5.7m^3/h at a differential pressure of 5.7 bar.

3.2 The pump takes suction from within the caisson at elevation –6.196m and discharges via a 2in line to oil skimmer V5.

3.3 The pump is controlled from pushbuttons located near slops pumps P9A and B in Zone 09.



ISSUE 2. FEBRUARY 1981

DRAINAGE SYSTEMS 5.12

FUEL GAS SYSTEM

1 GENERAL

1.1 The main supply of fuel gas is taken from the 18in outlet lines from the glycol contactors.

1.2 Flash gas from condensate surge tank V3 can be used to supplement the fuel gas supply.

1.3 In the event of a platform shutdown, fuel gas to maintain the generators is obtained from the 32in sales gas header.

1.4 Fuel gas for platform start-up is taken from the 26in wet gas line from CDP1.

2 FUEL GAS HEAT EXCHANGER E3

2.1 Heat exchanger E3 is located in Zone 01 on the Lower Deck and rated as follows:

(a) Maximum shell side working pressure: 16.2 bar.

(b) Maximum tube side working pressure: 172 bar.

(c) Maximum rated duty: 203W.

2.2 The exchanger reduces the fuel gas inlet temperature to scrubber V6 from 30 to 15°C.

2.3 Supply gas passes through the tube side of E3 where it is cooled by fuel gas discharged from scrubber V6 passing through the shell side.

2.4 Flow through the exchanger is controlled by a three-way temperature control valve and bypass line. The exchanger may also be bypassed via a second 3in line and manually operated block valve.

3 FUEL GAS SCRUBBER V6

3.1 Fuel gas scrubber V6, located in Zone 01, on the Lower Deck operates at a pressure of 14 bar and at the design temperature for maximum liquid dropout (−23°C).

3.2 Gas flow into the scrubber is controlled by two pressure control valves installed in parallel and 100 per cent spare one for the other.

3.3 The vessel is protected against overpressurisation by two pressure relief valves installed in parallel, one set for duty with the isolating valves open (CSO) and the other as standby with its isolating valves closed (CSC). Each valve is set to relieve at 16.2 bar to the LP Vent System.

3.4 Liquids carried over by the fuel gas dropout in the scrubber and are let down under level control to the glycol slops header.

3.5 Fuel gas is discharged from the scrubber through a 4in line to the shell side of heat exchanger E3 where it acts as the cooling medium.

3.6 A valved bypass is installed around the shell side of the exchanger.

3.7 Gas flow from the heat exchanger is monitored and recorded. The gas next passes through the 4in cold fuel gas header to the cooling coils of glycol surge tanks V17A, B and C where it is heated.

4 DISTRIBUTION

4.1 Downstream of V17A, B and C valved offtakes are provided to supply gas for blanketing, stripping etc in the glycol surge tanks, condensate separators and glycol reboilers.

4.2 The remaining gas is led to the 4in fuel gas supply header for distribution to the following consumers:

(a) Turbine generators
(b) Condensate burners
(c) Flare platform
(d) Condensate storage tank V33
(e) Condensate surge tank V3
(f) Oil skimmer V5
(g) HP flare purge

5 DESCRIPTION - METERING MICROCOMPUTER SYSTEM

Fuel Gas metering:

The stream parameters (temperature, flow and pressure) are registered by the flow computer (spectra tek)
The flow is also recorded locally and in QP control room.

AIR SUPPLY

FROM V2A

P114(18in)

FROM V2B

P115(18in)

FG767 (3in)

FG768 (3in)

FG766(3in)

FROM V2C

P116(18in)

FG771 (3in)

FG751 (3in)

CONDENSATE TO SEA LINE

FG799 (3in)

ST FERGUS

P140(32in)

FG765(3in)

FG796 (2in)

TO LP VENT STACK

WET GAS FROM COP1

P105(26in)

TO RECEIVER M2

FG802 (3in)

SALES GAS HEADER

P124 (32in)

FG802(3in)

GROUP W ESD

TO HP RELIEF

R404(2in)

FG751(3in)

FCV

TCV

E3

SPECTRA TEK MICROCOMPUTER (METERING SYSTEM)

TT

PT

FI

FR

(LOCATED IN QP CONTROL ROOM

TO/FROM TCP2

FUTURE T.O.M. GENERATORS

FG773(4in)

FROM PCV V3-3

FG801(2in)

PCV

PC

PCV

PC

PCV

FG772(4in)

LP VENT

PSV

PSV

FUEL GAS SCRUBBER V6

LC

LCV

TO GLYCOL SLOPS HEADER

G606 (2in)

DR436 (2in)

FUEL GAS SUPPLY HEADER

FG778(4in)

TO HP FLARE LINE PURGE

FG800(2in)

TO COLD FUEL GAS LINE TO TCP2

FG785(2in)

TO CONDENSATE STORAGE TANK V33

FG784(2in)

TO FLARE SYSTEM

FG770(2in)

TO GAS TURBINE GENERATOR PACKAGE Q3

FG783(4in)

TO SURGE TANK V3

FG769(1in)

TO OIL SKIMMER V5

FG791(2in)

FG759 (4in)

TO GLYCOL REBOILER H1C

FG760(3in)

TO CONDENSATE SEPARATOR V14C

FG793(1in)

PCV

PCV

GLYCOL SURGE TANK V17C

FG777 (4in)

COLD FUEL GAS HEADER

FG776(4in)

FG780 (4in)

V17B AS FOR V17C

FG761(3in)

TO GLYCOL REBOILER H1B

FG794(1in)

TO CONDENSATE SEPARATOR V14B

FG779 (4in)

FG782 (4in)

V17A AS FOR V17C

FG762(3in)

TO GLYCOL REBOILER H1A

FG795(1in)

TO CONDENSATE SEPARATOR V14A

FG781 (4in)

ISSUE 2 AUGUST 1984

FUEL GAS SYSTEM	5.13

DIESEL FUEL SYSTEM

1 GENERAL

1.1 Diesel fuel is stored in bulk storage tank V10 located in the central support on the Cellar Deck between Zones 09 and 11.

1.2 The fuel is distributed to the various platform consumers by diesel pumps P8A and B.

2 DIESEL BULK STORAGE TANK V10

2.1 Diesel bulk storage tank V10 has a capacity of 390m^3 and is rated at a maximum working pressure of 1.08 bara.

2.2 The tank may be filled via 4in lines from either TCP2 or the boat landing stations in Zones 08 and 11 on the Lower Deck.

2.3 Indication of the tank contents are displayed at level gauges installed locally and at the diesel control panels on TCP2 and QP.

3 DIESEL PUMPS P8A and B

3.1 Diesel fuel is distributed by two centrifugal pumps P8A and B which take their suction from the bulk storage tank via a 2in line.

3.2 Each pump is driven by a 4.1kW electric motor and is rated at 6.8m^3/h at a pressure of 4.15 barg.

3.3 Installed in parallel, the pumps are normally operated as one duty and the other as standby.

3.4 The pumps are manually controlled from the diesel control panels on TP1, TCP2 and QP.

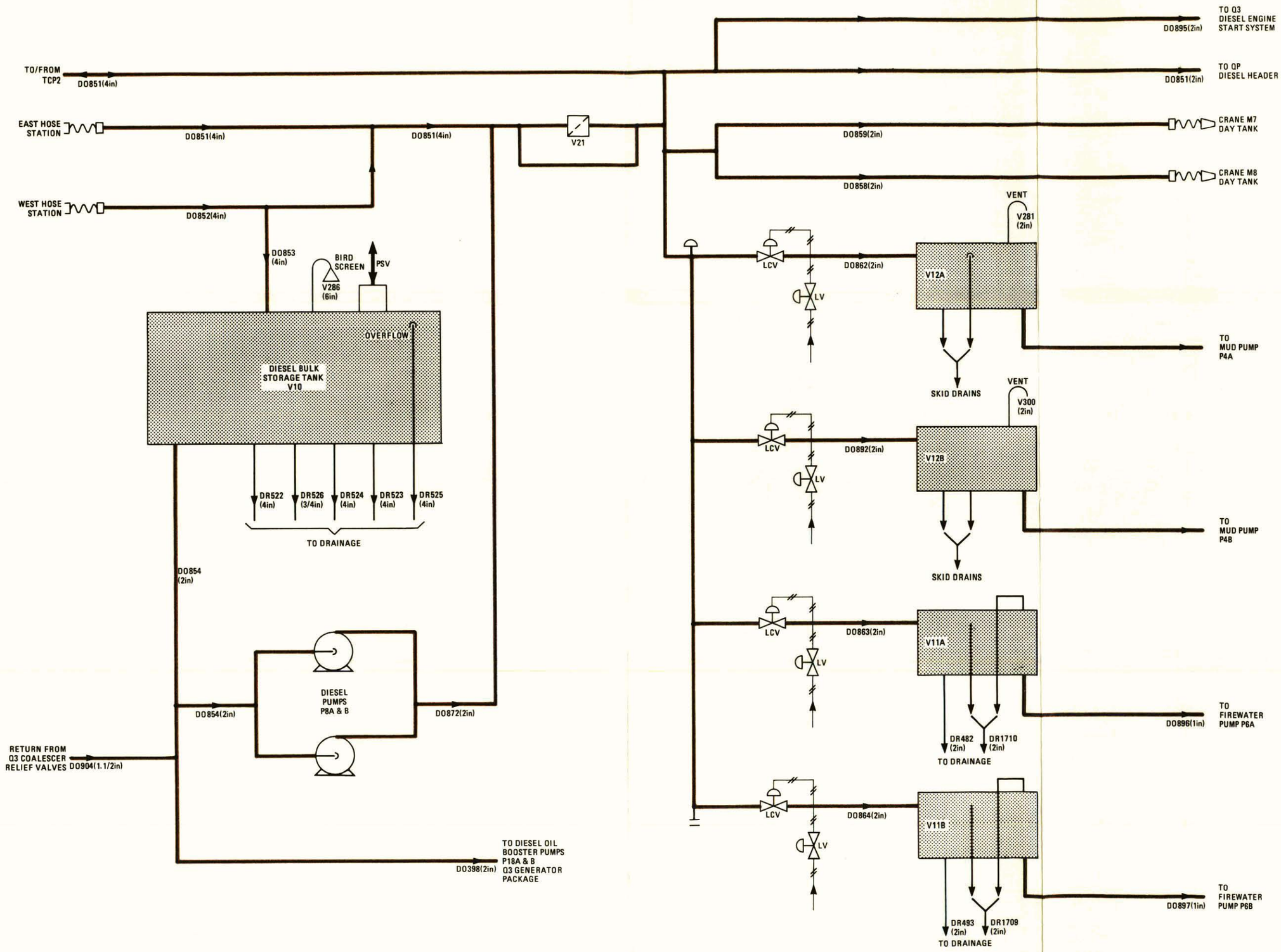
3.5 Diesel fuel is discharged from the pumps via a common 3in line to the 4in diesel header for distribution to the various platform consumers.

4 DISTRIBUTION

4.1 Diesel fuel from the 4in diesel header is distributed to consumers as follows:

Firewater pump P6A day tank V11A
Firewater pump P6B day tank V11B
Gas turbine diesel start system
Gas turbine booster pumps P18A and B
Crane M7 day tank
Crane M8 day tank
Quarters Platform
Treatment and Compression Platform No 2

4.2 With the exception of the lines to the remote platforms and the gas turbine package Q3, the first block valves to each user are located at a manifold installed near the local control panel. The local panel has indication of the level in the bulk storage tank and the four day tanks (V10, V11A, V11B, V12A and V12B) and receives high and low level alarm signals therefrom. Thus one man is able to control day tank filling from a central location.



ISSUE 1. JULY 1980

DIESEL FUEL SYSTEM | 5.14

COMPRESSED AIR

1 GENERAL

1.1 Two air compressors located in Zone 11 on the Cellar Deck deliver sufficient air to supply the pneumatic instruments, valves, air pumps and any other miscellaneous air-driven equipment on the platform.

1.2 Provision is made to enable Platforms TP1, TCP2 and QP to supply each other with compressed air if required.

2 COMPRESSORS

2.1 The compressors are driven by 75kW electric motors and each discharges 8.5 SCMM at a pressure of 10.34 barg. They can be selected to operate in the Automatic or the Manual mode. When in Auto, one compressor is duty and the other is at standby. The duty compressor runs continuously but unloads and loads in response to a pressure switch set at 10.34 barg rising (unload) and 8.95 barg falling (load). Should the duty compressor fail or should system pressure continue to fall, the standby compressor will cut in at 7.6 barg. It will cut out again at 10.34 barg.

2.2 When in Manual, only the selected compressor will run, either under the control of the pressure switch as in the Auto mode, or in response to locally mounted pushbuttons.

3 AIR RECEIVERS

Two air receivers provide surge capacity for the system. Each receiver is 1.372m in diameter, 2.286m high and has a design pressure of 11.38 barg. Any liquid fallout is released through a trap to the Drainage System.

4 DRYERS

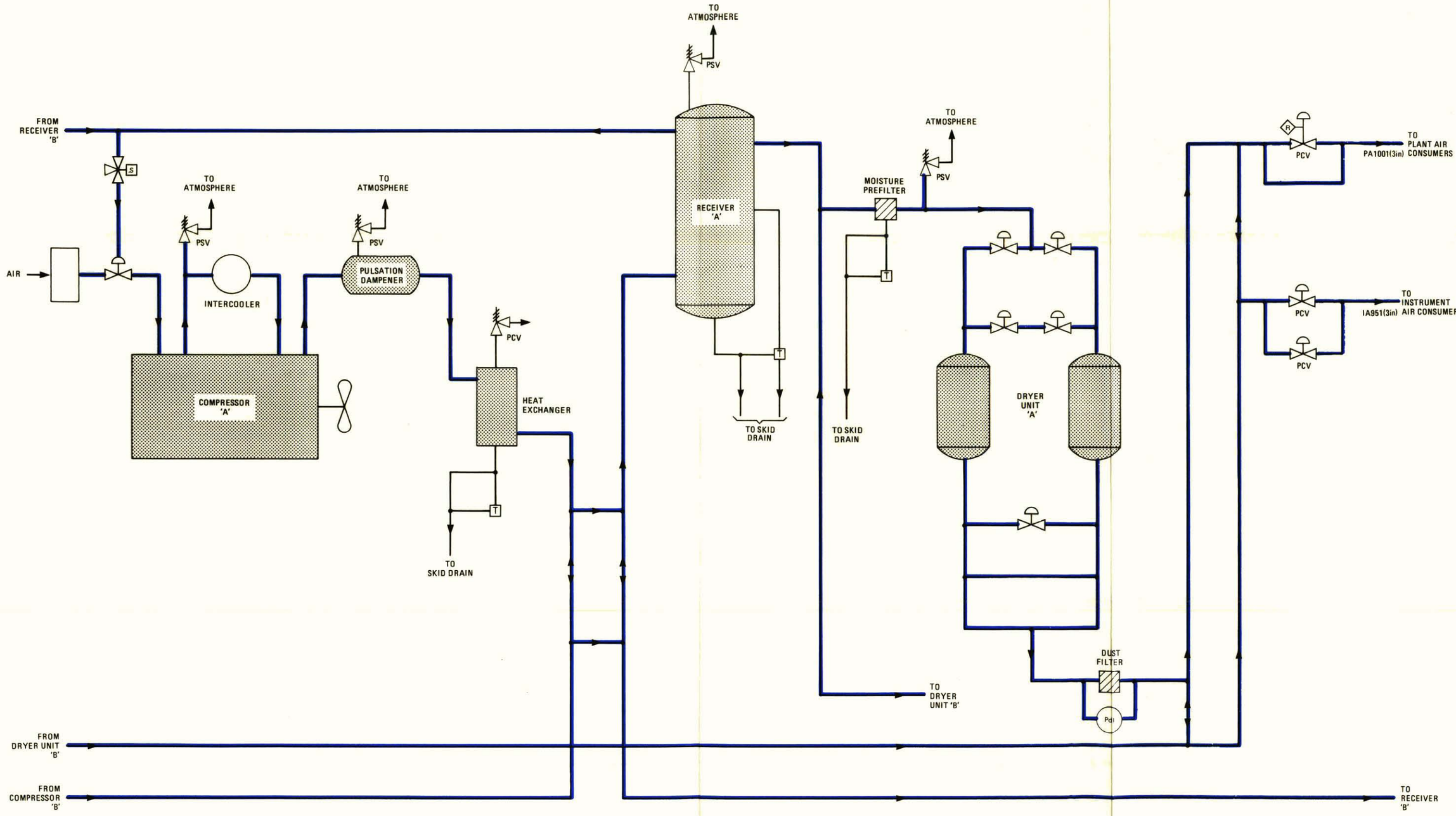
From the receivers air passes through a moisture prefilter to a silica type twin tower air dryer which works on a 10-minute cycle. While one tower is in use, the other is reactivated. During reactivation, a bleed of air passes over the absorbing material, picks up the previously absorbed water and drains it off to waste. After nine minutes, a timer operates a solenoid valve which allows the dryer to become repressurised before changeover. The air to be dried now passes through the freshly activated absorber, while the other commences the reactivation cycle. Each unit is rated for 17 SCMM with a design pressure of 11.38 barg and uses 2 SCM of air as a purge. They produce -40°C dewpoint air.

5 DISTRIBUTION

5.1 From the dryers the air passes through a pressure regulator set at 10 barg to supply the plant air header, or through a pressure regulator set at 5 barg to supply the instrument air ring main.

5.2 The plant air header has outlets for the various consumers on the platform. There is also a 2in offtake to supply air to QP and a 3in offtake to TCP2.

5.3 The instrument air ring main supplies pneumatic instruments throughout the platform and provides the power to drive the glycol injection pumps. Cross-connections can be made with QP through a 2in line and TCP2 through a 3in line.



ISSUE 1. JULY 1980

COMPRESSED AIR	5.15

VENTILATION SYSTEMS

1 GENERAL

1.1 The system is divided into a number of ventilation packages as follows:

(a) Q9 which serves Zones 05 and 06.

(b) Q11 which serves the Workshop and Stores Area Zone 08.

(c) Q12A and Q12B which supply Fire Pump Houses A and B in Zones 07 and 12 respectively.

1.2 The ventilation systems supply sufficient changes of air heated as required to pressurise and ventilate Safe areas within a Hazardous area.

2 DESCRIPTION – VENTILATION PACKAGE Q9

2.1 Summary

2.1.1 Zones 05 and 06 are served by air conditioning/ventilation package Q9, which comprises the following systems:

(a) Q9A which provides environmental heating and pressurisation to Zone 05 Battery Room.

(b) Q9B which provides ventilation/pressurisation and environmental heating to Zone 05 Generator Room, plus ventilation of the three generator acoustic enclosures.

(c) Q9C which provides ventilation/pressurisation to Zone 06 Transformer Room.

(d) Q9D air conditioning/pressurisation and heating installation serving Zone 05 Motor Control Centre and Cabling Room, plus Zone 06 Instrument Interface Rooms, Switchgear Room and Heating, Ventilation and Air Conditioning (HVAC) Room.

2.1.2 Operation of the air conditioning/ventilation/pressurisation package Q9 is through a central control panel, fitted with Master Start/Stop pushbuttons located in Zone 06 HVAC Plant Room. Q9 main fans and heaters are fed from a 380V 100A contactor located in the MCC into electrically separated control sections of the main control panel. The contactor is automatically tripped by the fire and gas detection systems, and requires manual resetting. Initiation of the control panel Master Start pushbuttons automatically activates selected 'duty' fan motors, electric heater batteries, the air conditioning compressor, condenser cooling fans, damper control motors and associated control systems.

2.1.3 An emergency Master Stop pushbutton (break-glass type) is located at the entrance to the HVAC Plant Room.

2.2 Q9A – Battery Room

2.2.1 Fresh air from a 'Safe' area is supplied to the Battery Room at a rate of 30 changes per hour. The air is filtered, monitored by a gas detector and heated by a thermostatically controlled 20kW electric heater battery. The heater battery is interlocked with supply fans to prevent heater battery operation without air flow. The heater battery is protected by an integral high limit cut-out thermostat.

2.2.2 Two axial flow supply fans, one duty and one standby, are located in the Generator Room. Each fan has a capacity of 0.528m^3/s and is directly driven by a 0.37kW electric motor. In the event of duty fan failure (including failure to start) the standby fan will be automatically started by changeover facilities working in conjunction with pressure switches which operate in response to suction and discharge pressure. Indication of standby fan operation is given at air conditioning unit Q9 local control panel and at the Quarters Platform ventilation annunciator panel.

2.2.3 Manually operated isolation dampers are provided in the fan inlet ducts, and servomotor-operated isolation dampers are provided in the fan outlet ducts. The servomotors are interlocked with the duty supply fan selector switch and automatic changeover switches. The fan discharge dampers are automatically positioned to suit the operational fan. Air is supplied to the Battery Room through a duct located at low level in the Battery Room wall. The duct is provided with a fire damper which is closed by a solenoid-operated release mechanism activated by a signal from the fire detection system.

2.2.4 Two axial flow extractor fans, one duty and one standby, are provided. Each fan has a capacity of 0.528m^3/s and is directly driven by a 0.12kW electric motor. In the event of fan failure (including failure to start) the standby fan will be automatically started by changeover facilities working in conjunction with the flow switches which operate in response to fan discharge pressure. Indication of standby fan operation is given at air conditioning unit Q9 local control panel and at the QP ventilation annunciator panel. The fans are provided with an emergency supply connected so that automatic switching will occur in the event of Q9 shutdown. This automatic switching will not occur if Q9 shutdown is initiated by Battery Room fire or gas detection.

2.2.5 Manually operated isolation dampers are provided in the fan inlet ducts and servomotor-operated isolation dampers are provided in the fan outlet ducts. The servomotors are interlocked with the duty supply fan selector switch and automatic changeover switches. The fan discharge dampers are automatically positioned to suit the operational fan.

2.2.6 Air is extracted from the Battery Room through two high level ducts located in the Battery Room roof. Both extract ducts are fitted with fire dampers which are closed by solenoid-operated release mechanisms activated by a signal from the fire detection system. The release arms incorporate a fusible link to provide fail-safe operation in the event of an in-duct fire.

2.2.7 A positive pressure of 5mmWG is maintained within the room, monitored by a differential switch set at 2.5mmWG. In the event of the pressure falling below this set-point, the 380V MCC contactor is tripped, and an alarm will be initiated at the annunciator panel in HVAC Plant Room and also at the QP annunciator panel. A 2-minute time-delay relay is provided to cater for start-up conditions, and a 30-second time-delay relay for momentary losses of pressure.

2.2.8 Air is discharged to atmosphere via an exhaust air wind protection cowl. The ductwork incorporates a motor-operated pressure control damper assembly, actuated by a static pressure regulator.

2.2.9 Operation of the ventilation and pressurisation unit is through the local control panel of Q9 within Zone 06. An Emergency Stop pushbutton is located in the Battery Room, and a Shut-down/Reset pushbutton at the Battery Room section of the HVAC control panel.

2.3 Q9B — Generator Package

2.3.1 Fresh air from a common intake plenum chamber is supplied to the generator acoustic enclosures at a rate of approximately 470 changes per hour and to the Generator Room at a rate of 12.5 changes per hour by two axial flow fans (one duty and one standby). Each fan has a capacity of 35.97m^3/s, and is directly driven by a 40.5kW electric motor. Fans are variable duty, each equipped **with mechanical linkage to adjust the blade pitch which automatically reduces the supplied air volume.**

2.3.2 Non-return isolation dampers are provided in each supply fan discharge duct. The non-return dampers are operated by an electro-servomotor, interlocked with the fan selector switch and automatic changeover switches. The non-return dampers are automatically positioned to suit the operational fan. In the event of duty fan failure (including failure to start) the standby supply fan will be automatically started by changeover switches working in conjunction with pressure switches, which operate in response to fan suction and discharge pressures. These pressure switches are automatically bypassed by a time-delay relay in order to permit the start sequence. Indication of standby fan operation is given at the HVAC annunciator panel, and at the QP ventilation annunciator panel.

2.3.3 Both fans discharge into a common generator area supply duct, which divides into four separate ducts in Zone 05; one to serve the Generator Room and the others to serve each of the three generator acoustic enclosures TA1, 2 and 3.

2.3.4 Each of the turbine acoustic enclosures is ventilated by full fresh air. The air volume flowing through each enclosure is $8.75m^3/s$, which maintains a maximum operational temperature of 50°C (with the generator operational).

2.3.5 The supply ductwork to each acoustic enclosure incorporates a manually operated regulating damper which is used for both air balancing and isolating purposes. Air flow through the enclosure is continuous and in the event of extended periods of turbine shutdown, the regulating damper should be closed. **The acoustic enclosure supply and exhaust ducts incorporate automatic shut-off dampers and fire dampers. Shut-off dampers are operated by electro-servomotors incorporating return springs, which automatically close on interruption of the electrical power supply.**

2.3.6 Each acoustic enclosure supply duct is provided with an air flow switch, and fire and gas detectors. Detection of gas, fire or loss of air flow within an enclosure activates the enclosure shut-off dampers; the Q9B ventilation system continues to serve the remaining operating turbines. The fire dampers are provided with a solenoid release mechanism, incorporating a fusible link to provide fail-safe operation in the event of an in-duct fire.

2.3.7 Each turbine enclosure is provided with an explosion-proof Div 1 ventilation fan, which provides cooling air for 20 minutes during the rundown period. This system is completely independent from the normal ventilation installation, and provides cooling air through separate supply and exhaust ductwork.

2.3.8 Acoustic enclosure air flow switches are interconnected with a 30-second time-delay relay to cater for momentary losses of pressure on failure of the duty supply fan. In the event that air pressure is not reinstated by the standby fan, the associated turbine will automatically trip, the rundown fan will start and alarm indication will be given at the annunciator panel in the HVAC Plant Room and at the QP ventilation annunciator panel.

2.3.9 Each acoustic enclosure discharges to atmosphere through the module roof, via a solenoid-operated fire damper, a spring-return motorised non-return damper and an exhaust cowl.

2.3.10 The room supply duct is equipped with a thermostatically controlled 108kW electric heater battery. The heater battery handles an air volume of $9.722m^3/s$ and increases the air temperature to 15°C. Heater operation is interlocked with the supply fans to prevent battery operation without air flow. The battery is equipped with an integral high limit safety cut-out thermostat. High level supply ducting incorporates an air volume manual regulating damper and an automatic shut-off damper. The shut-off damper is driven by an electro-servomotor, fitted with return spring, which automatically closes on interruption of the electric power supply.

2.3.11 A pressure of 18mmWG is maintained within the Generator Room by the duty fan working in conjunction with two pressure control exhaust louvres in the floor. Exhaust louvre dampers are operated by an electro-servomotor, activated by a static pressure regulator. The damper automatically opens or closes in order to maintain the required room differential pressure, and the motor is equipped with a return spring to shut the louvre in the event of interruption of the electrical power supply.

2.3.12 Room pressure is monitored by a differential switch set at 2.5mmWG. In the event of pressure falling below this set-point, the 380V MCC contactor is tripped, and an alarm will be initiated at the HVAC annunciator panel and also at the QP ventilation annunciator panel. A 2-minute time-delay relay is provided to cater for start-up conditions and a 30-second time-delay relay for momentary losses of pressure.

2.3.13 Operation of the generator area ventilation and pressurisation system is through the HVAC control panel within Zone 06. An Emergency Stop pushbutton is located near each acoustic enclosure and Reset pushbuttons at the generator section of the HVAC control panel.

2.4 Q9C – Transformer Room

2.4.1 Fresh air from the common inlet plenum chamber is supplied at a rate of 59 changes per hour to the Transformer Room by two axial flow fans (one duty and one standby) located in the HVAC Plant Room. Each fan has a capacity of 2.38m^3/s and is directly driven by a 2.2kW electric motor. Manually operated suction isolating dampers are provided in the fan inlet ducts, and servomotor-operated isolation dampers are provided in the fan outlet ducts. The servomotors are interlocked with the supply fan selector switch and automatic changeover switches.

2.4.2 Fan discharge non-return dampers are automatically positioned to suit the operational fan. In the event of duty fan failure (including failure to start) the standby supply fan will be automatically started by changeover switches working in conjunction with pressure switches, which operate in response to fan suction and discharge pressures. These pressure switches are automatically bypassed by a time-delay relay in order to permit the start sequence. Indication of standby fan operation is given at air conditioning unit Q9 local control panel and at the QP ventilation annunciator panel.

2.4.3 Incoming air is monitored by a gas detector and distributed throughout the room via high level ducting. The supply ducting is provided with an automatic isolating damper driven by an electro-servomotor, fitted with a return spring.

2.4.4 Air is extracted from the Transformer Room by two axial flow extract fans (one duty and one standby) through high level ducting. Each fan has a capacity of 2.38m^3/s and is directly driven by a 2.2kW electric motor. Manually operated isolating dampers are provided in the fan discharge ducts and servomotor-operated dampers are provided in the fan inlet ducts. The servomotor-operated non-return dampers are interlocked with the duty extractor fan selector switch and automatic changeover switches. The fan inlet dampers are automatically positioned to suit the duty fan. Air is discharged through the floor of the HVAC Plant Room via a motorised damper and exhaust cowl.

2.4.5 A positive static pressure of 6mmWG is maintained within the Transformer Room by the duty supply and extract fans working in conjunction with a pressure-controlled exhaust damper installed in the extract fan discharge ducting. The ventilation system provides sufficient cooling air to limit the internal temperature to a maximum of 35°C when the transformers are operational.

2.4.6 Room pressure is monitored by a differential switch set at 2.5mmWG. In the event of pressure falling below this set-point, the 380V MCC contactor is tripped, and an alarm will be initiated at the annunciator panel in HVAC Plant Room and also at the QP ventilation annunciator panel. A 2-minute time-delay relay is provided to cater for start-up conditions and a 30-second time-delay relay for momentary losses of pressure.

2.4.7 Operation of the ventilation and pressurisation unit is through the local control panel of Q9, within Zone 06. An Emergency Stop pushbutton is located in the Transformer Room, and a Shutdown/Reset pushbutton at the Transformer Room section of the HVAC control panel.

2.5 Q9D – Air Conditioning

2.5.1 The common air intake plenum chamber is provided with acoustic insulation, air filters and a gas detector. Two automatic shut-off dampers are also provided each operated by an electro-servomotor incorporating a return spring. Filtered air is taken from the intake plenum chamber by an air conditioning handling unit comprising the following sections:

(a) Mixing Section. With manually operated fresh/recirculation air regulation damper, plus secondary filter panels (for recirculation air).

(b) Coil Section. Containing 137kW (operational capacity) direct expansion cooling coil, with copper tubes and fins.

(c) Fan Section. Incorporating two axial flow fans (one duty and one standby). Each fan has a capacity of 5.44m^3/s, and is directly driven by an 11kW electric motor.

(d) Damper Section. Non-return discharge dampers operated by electro-servomotors which are interlocked with the fan selector switch and automatic changeover facilities. The fan suction side is fitted with manually operated isolating dampers. Automatic changeover facilities of the supply fans, activated by pressure switches, are as previously described.

2.5.2 Conditioned air from the package unit is discharged into a supply plenum chamber prior to distribution to three air conditioned zones which serve the various areas as follows:

(a) Zone 1 serves the Cable Room at 9.5 to 19 air changes per hour and the MCC at 6.5 to 13 air changes per hour via a thermostatically controlled 78kW heater handling an air volume of 2.482m^3/s, maintaining room temperatures at 22°C.

(b) Zone 2 serves Interface Room No 1 at 9 to 18 air changes per hour via a thermostatically controlled 54kW heater handling an air volume of 0.758m^3/s, maintaining a room temperature of 22°C.

(c) Zone 3 serves the Switchgear Room at 1.5 to 3 air changes per hour, and Interface Room No 2 at 12 to 24 air changes per hour via a thermostatically controlled 108kW heater handling an air volume of 2.204m^3/s, maintaining room temperatures at 22°C.

2.5.3 Heaters are equipped with an integral high limit safety cut-out thermostat, and are also interlocked with the air conditioning unit supply fans to prevent heater operation in the event of airflow failure.

2.5.4 The air conditioning supply duct serving Interface Room No1 and the three outlets serving Interface Room No 2 are each provided with fire dampers. The fire dampers are equipped with solenoid-release mechanisms, activated by the fire detection system, and incorporating a fusible link to ensure fail-safe operation in the event of an in-duct fire.

2.5.5 Each zone supply duct incorporates a manually operated regulating damper, acoustic attenuator, and shut-off damper. The branch ducting to Interface Room No 2 is also provided with a shut-off damper. These shut-off dampers are operated by electro-servomotors fitted with return springs which automatically close the damper upon interruption of the electrical power supplies. The MCC Room supply duct is provided with a manually operated damper.

2.5.6 Air for recirculation is extracted from the conditioned zones through a high level duct. A maximum of 50 per cent of the supply air volume may be recirculated via the mixing box in the air conditioning unit.

2.5.7 The recirculating ducts from Instrument Interface Rooms 1 and 2 incorporate fire dampers, similar in construction and operation to those described for the supply system.

2.5.8 Servomotor-operated shut-off dampers are provided in the recirculating duct from each air conditioned room with the exception of the MCC Room. The MCC Room recirculating duct is provided with a manually operated damper.

2.5.9 Manually operated dampers are provided in the recirculation ducts at the mixing box for balancing purposes.

2.5.10 A positive static pressure of 12mmWG is maintained within the areas by the duty supply fan working in conjunction with pressure controlled exhaust dampers, within the floors of the Cable, Switchgear and Instrument Interface Rooms. Exhaust air from the MCC is discharged via the Cable Room. The HVAC Plant Room is pressurised by virtue of being open to Zone 06 Switchgear Room.

2.5.11 Exhaust dampers are operated by electro-servomotors. The dampers automatically open or close in order to maintain the required room differential pressure, which is detected by a static pressure regulator. The motor is equipped with return spring and automatically closes the damper in the event of the electrical power being interrupted.

2.5.12 Air pressure is monitored by differential switches set at 2.5mmWG. In the event of pressure falling below the set-point, the 380V contactor is tripped, alarm indication being given at both the annunciator panel in HVAC Plant Room and the QP ventilation annunciator panel. A 2-minute time-delay relay is provided to cater for start-up conditions and a 30-second time-delay relay for momentary losses of pressure. Operation of the air conditioned area ventilation system is through the HVAC control panel within Zone 06. Emergency Stop pushbuttons are located in each room, excluding the HVAC Plant Room. Start/Stop and Reset pushbuttons are provided at the Air Conditioning section of the HVAC control panel.

2.6 Q9 – Refrigeration Unit

2.6.1 The refrigerant equipment employed is of the direct expansion type utilising R22 and comprises: compressor/receiver unit; air-cooled condenser; evaporator; and associated refrigerant pipework, valves and controls.

2.6.2 The refrigerant compressor/receiver is a package unit comprising an open-type compressor (197kW cooling capacity). The evaporating and condensing temperatures are 5°C and 45°C respectively, and the saturated suction and discharge temperatures are 7°C and 80°C respectively. The compressor is belt-driven by a 55kW electric motor.

2.6.3 The evaporators are located in the coil section of the air conditioning handling package unit. The total capacity of the two cooling coils is 180kW (maximum required operational capacity is 137kW), and the handled air volume of 5.44m^3/s is cooled from 22°C and 18°C wet bulb, to the off-coil temperature of 12°C. The evaporating temperature is 5°C.

2.6.4 The air-cooled condenser, located on the roof of Zone 05 Generator Room, has a total heat rejection capacity of 209kW, and the condensing temperature is 45°C. The condenser is equipped with two fans; each fan has a capacity of 25m^3/s and is directly driven by a 3kW electric motor.

2.6.5 Operation of the cooling equipment is interlocked with the air conditioning unit supply fan (via the main HVAC control panel) in order to prevent operation of the system when air is not being supplied.

3 DESCRIPTION – VENTILATION PACKAGE Q11

3.1 The Workshop and Stores, located in a Hazardous area, are pressurised by ventilation package Q11, to provide safe operating conditions for the Workshop equipment and personnel. A separate extract system, within the area, is provided for ventilation of the Welding Area.

3.2 Fresh air from a Safe area under the platform is introduced through an intake grille, located in the floor of the Stores Area. Incoming air is monitored by a gas detector and enters a mixing section, where recirculated room air may be introduced. The mixing section incorporates a motor-operated shut-off damper, which (by means of a return spring) automatically closes on interruption of the electrical power supply. Operation of the damper during winter months or when the external ambient is below 6°C, allows a maximum of 5 per cent room air to be recirculated in order to reduce winter heating requirements.

3.3 Supply air at 9 to 18 changes per hour is heated by a thermostatically controlled 160kW electric heater battery, to maintain a temperature of 18°C. Heater operation is interlocked with the supply fan pressure differential switches, to prevent the battery working without air flow. The heater is also equipped with an integral high limit safety cut-out thermostat.

3.4 Two axial flow supply fans (one duty and one standby) each with a capacity of 5.0m^3/s, and each directly driven by a 5.5kW electric motor, draw air through an acoustically insulated intake section incorporating manually operated suction isolating dampers. Servomotor-operated dampers are provided in the fan outlet ducts. The servomotor-operated isolation dampers are interlocked with the supply fan selector switch, and automatic changeover switches. The fan discharge dampers are automatically positioned to suit the duty fan.

3.5 In the event of duty fan failure (including failure to start) the standby supply fan will be automatically started by changeover facilities working in conjunction with pressure switches which measure fan suction and discharge pressures. These pressure switches are automatically bypassed by a time-delay relay in order to permit the start sequence. Indication of standby fan operation is both at the local control panel and remote at the QP ventilation annunciator panel common alarm XA–Q11–1.

3.6 Two axial flow extract fans (one duty and one standby) are provided to extract air from the Welding Area of the workshop; each fan has a capacity of 0.833m^3/s and is directly driven by a 0.37kW electric motor. The fans are provided with discharge non-return dampers which are operated by an electro-servomotor, interlocked with the fan selector switch and automatic changeover facilities. Changeover facilities of the extract fans are identical to the supply fans described above.

3.7 Fan discharge air is passed through a sound attenuator and exhausted to atmosphere. The discharge duct is fitted with an automatic shut-off damper driven by an electro-servomotor, provided with return spring which automatically closes the damper in the event of interruption of the electrical power supply.

3.8 A positive pressure of 12mmWG is maintained within the area by the duty supply fan working in conjunction with two pressure control exhaust louvres, one located in the Workshop floor and the other in the Stores floor. Each exhaust louvre control damper is driven by an electro-servomotor, activated by a static pressure regulator. The dampers automatically open or close in order to maintain the required pressure differential, and the control motor return spring ensures shut-off of the louvres in the event of failure or interruption of the power supply.

3.9 Room pressure is monitored by a differential switch set at 2.5mmWG. In the event of the pressure falling below this set-point, the 380V MCC contactor is tripped and an audible alarm will be initiated. A 3-minute time-delay relay is provided to cater for start-up conditions, and a 30-second time-delay relay for momentary losses of pressure.

3.10 Failure of both the supply duty and standby fans will shut down the ventilation package via the room pressure differential detection system.

4 DESCRIPTION – VENTILATION PACKAGE Q12

4.1 Each Pump House is served by its own ventilation package, Q12A or Q12B. These provide environmental heating and pressurisation in order to ensure safe operating conditions for the fire pump equipment, which is located within a Hazard classification area.

4.2 Fresh air from a Safe area under the platform is introduced through an intake grille in the Pump House floor. Incoming air is monitored by a gas detector and passes into a mixing section where room air may be recirculated, in order to reduce winter heating loads. Fresh and recirculated air quantities are controlled by a damper assembly. During normal conditions, full fresh air is supplied; however, when the external ambient temperature falls below 6°C, fresh air volume may be reduced to 50 per cent. The damper control motor, equipped with return spring, automatically closes the fresh air damper on interruption of the power supply.

4.3 Room supply air at 10.5 to 21 changes per hour is heated by a thermostatically controlled 40kW electric heater battery. The heater battery maintains an internal temperature of 22°C and is interlocked with the supply fans to prevent operation without air flow; the battery is also equipped with an integral high limit cut-out safety thermostat.

4.4 Treated air is drawn by supply fans into an acoustically insulated intake section incorporating isolating dampers. Two axial flow fans are provided (one duty and one standby), each directly driven by a 1.1kW electric motor and having a capacity of 0.917m^3/s. Manually operated isolating dampers are provided in the fan inlet duct, and servomotor-operated isolation dampers are provided in the fan outlet ducts; the servomotors are interlocked with the duty supply fan selector switch and automatic changeover switches.

4.5 Fan discharge non-return dampers are automatically positioned to suit the operational fan. In the event of duty fan failure (including failure to start) the standby supply fan will be automatically started by changeover facilities working in conjunction with pressure switches which operate in response to fan suction and discharge pressures. These pressure switches are automatically bypassed by a time-delay relay in order to permit the start sequence. Indication of standby fan operation is both at the local control panel and at the QP ventilation annunciator panel.

4.6 A positive pressure of 6mmWG is maintained within the Pump House by the duty fan working in conjunction with a pressure control exhaust damper in the Pump House floor. The exhaust control damper is driven by an electro-servomotor, activated by a static pressure regulator. The damper automatically opens or closes in order to maintain the required pressure differential, and the control motor return spring ensures shut-off of the damper in the event of failure or interruption of the power supply.

4.7 Room pressure is monitored by a differential switch set at 2.5mmWG. In the event of the pressure falling below this set-point, the 380V MCC contactor is tripped. A 2-minute time-delay relay is provided to cater for start-up conditions and a 30-second time-delay relay for momentary losses of pressure due to either opening of the Fire Pump House door, or failure of the duty fan unit.

4.8 Failure of both the duty and standby fans will shut down the ventilation package via the room pressure differential detection system.

4.9 Each Pump House ventilation system is provided with a control panel, located in the Pump House, and a Start/Reset pushbutton located in Zone 01 enclosure.

COMMON FRESH AIR INTAKE PLENUM CHAMBER

GENERATOR AREA

ACOUSTIC ENCLOSURE TA1

ACOUSTIC ENCLOSURE TA2

ACOUSTIC ENCLOSURE TA3

VENTILATION PACAKGE Q9B

MIXING BOX

COOLING COIL

SUPPLY PLENUM CHAMBER

ZONE 3 SUPPLY

ZONE 2 SUPPLY

ZONE 1 SUPPLY

SWITCHGEAR ROOM

INTERFACE ROOM No 2

INTERFACE ROOM No1

CABLE ROOM

MCC ROOM

AIR CONDITIONING PLANT ROOM

VENTILATION PACKAGE Q9D

WORKSHOP AND STORES AREA

VENTILATION PACKAGE Q11

TRANSFORMER ROOM

VENTILATION PACKAGE Q9C

BATTERY ROOM

VENTILATION PACKAGE Q9A

FIRE PUMP HOUSE (TYPICAL)

VENTILATION PACKAGE Q12

KEY

- DIFFERENTIAL PRESSURE SWITCH (CONTROLS OVERPRESSURE DAMPER)
- MOTOR-OPERATED SPRING RETURN DAMPER
- SOLENOID-OPERATED FIRE DAMPER
- MANUALLY OPERATED DAMPER
- MOTOR-DRIVEN FAN
- HEATER
- FILTER
- GAS MONITOR

ISSUE 1. JULY 1980

VENTILATION SYSTEMS 5.16

HYDRAULIC SYSTEM

1 GENERAL

1.1 This system provides motive power for the hydraulically actuated valves on the Platform. It comprises a central hydraulic power unit (Q7), four distribution circuits, local accumulators and local control stations for the valves.

1.2 The central hydraulic unit is located in Zone 02. Fluid is stored in a 4500-litre reservoir (V42); a low level switch in the vessel initiates an alarm if the fluid content drops below 1000 litres. Two gear-type pumps (P22A and B) are provided to pressurise the system. Each is driven by a 30kW electric motor and is rated to deliver 100 litres/min at a pressure of 150 bar. Excess pressure is relieved to the reservoir via a relief valve.

1.3 The pumps normally operate one duty and one standby, the duty pump starting and stopping in response to pressure switches connected to the discharge manifold. Cut-in and cut-out pressures are 125 and 138 bar respectively. A third pressure switch connected to the manifold initiates an alarm should the pressure fall below 118 bar.

1.4 An emergency hand pump, installed in parallel with the motor-driven pumps, can be used in the event of pump failure or for maintenance purposes. It has a capacity of 0.045 litre per double stroke.

1.5 Sixty-four accumulator sets are incorporated in the unit. Each comprises a 50-litre accumulator and a nitrogen bottle, and is protected against overpressure due to fire by a fusible plug which melts at 145°C.

1.6 The return lines from the valve controllers discharge into the reservoir via four strainers. Three spring-loaded check valves provide relief should the strainers become partially blocked.

1.7 The four distribution circuits each comprise 1.1/2in supply and 2in return lines, to which each valve actuator is connected via its controller. Two groups of accumulator sets, one of six and the other of thirteen, are provided as a standby supply for certain of the ESDVs. Other ESDVs have standby accumulators incorporated in their controllers.

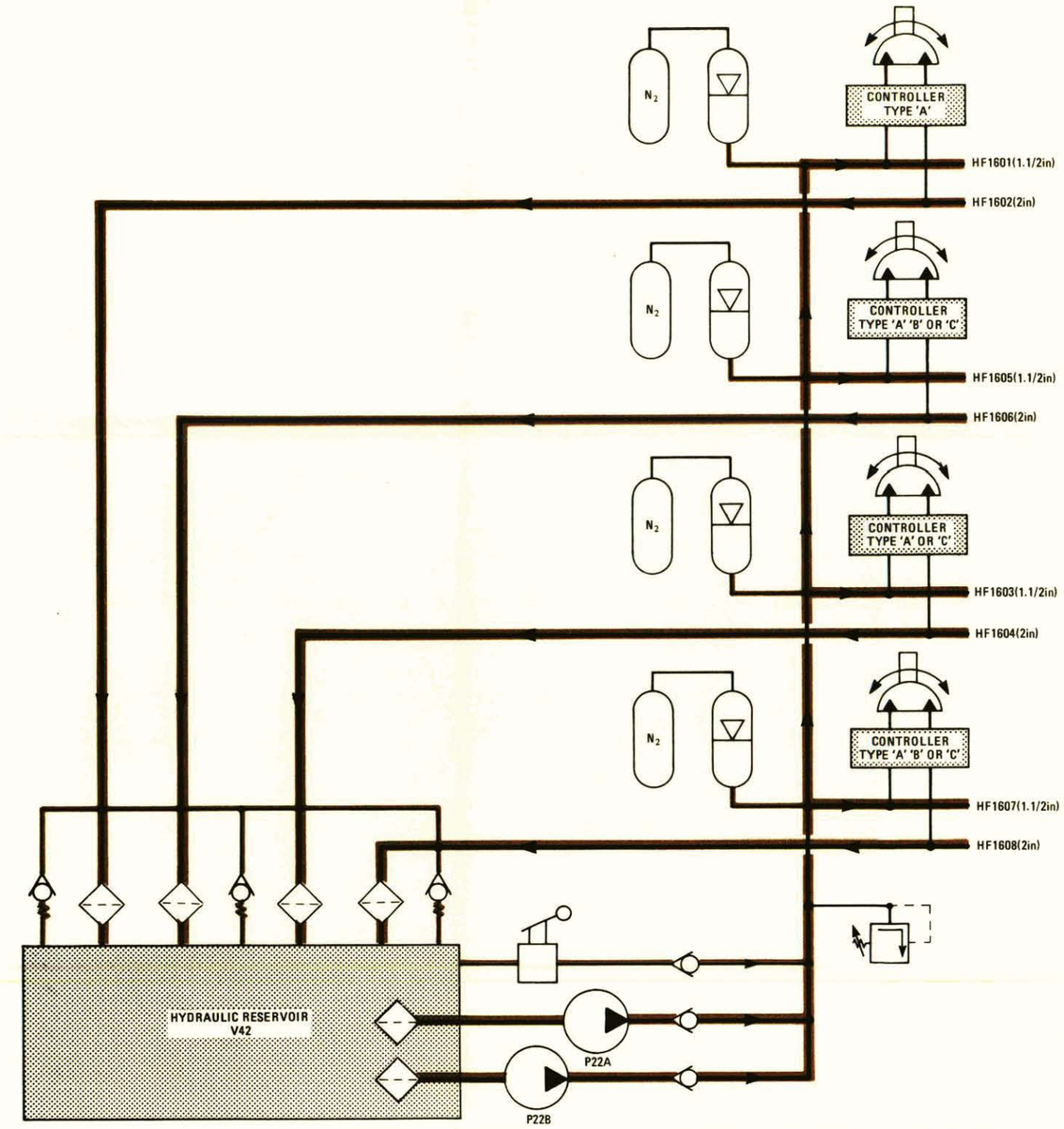
1.8 Three types of valve controllers are used, namely:

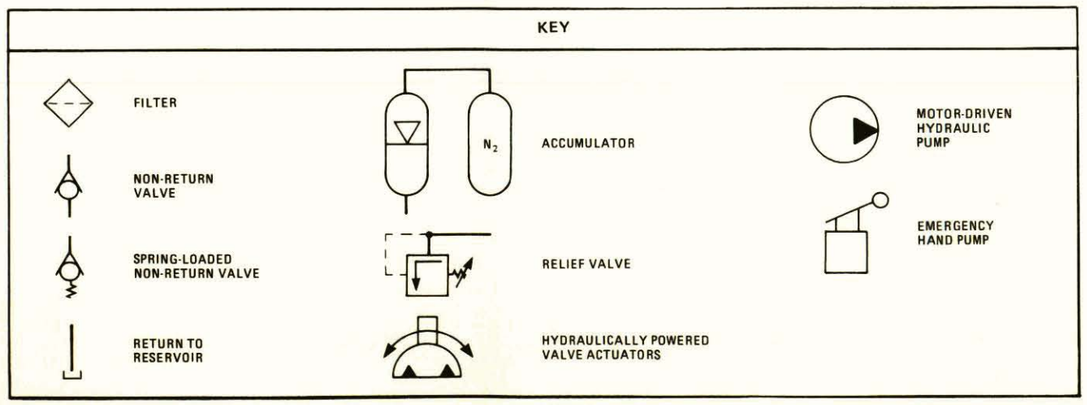
(a) Type A. Movement of the valve actuator is determined by the directional control valve, the position of which is controlled either locally, or remotely via a pneumatic circuit.

(b) Type B. These are similar to the Type A controllers, differing only in that the supply line incorporates an integral accumulator (5-litre/min controllers), or is connected to a local accumulator group (100-and 50-litre/min controllers).

(c) Type C. These are used for locally controlled valves. The actuator is positioned directly (50-litre/min controllers), or via a directional control valve (100-litre/min controllers).

1.9 The three valves (HV M3—1, 2 and 3), which control pig launching from M3, are themselves controlled via control valve manifold Q8. This manifold has provision for controlling the valves either manually, or automatically from the pig launch sequence unit.





LINE NUMBER	VALVE TAG NUMBER	CONTROLLER TYPE	FLOWRATE LITRES/MIN
HF1601 (1.1/2in)	ESDV V1A–3	A	100
	ESDV V1B–3		
	ESDV M1–2		
	ESDV V1A–1		
	ESDV V1C–3		
HF1602 (1.1/2in)	ESDV V2A–1	A	100
	ESDV V2B–1		
	ESDV V2C–1		
	ESDV B8		
	ESDV B2		
	ESDV B3		
	HV V1A–4	C	50
	HV V1B–4		
	HV V1C–4		
	HV V1A–3		
	HV V1B–3		
	HV V1C–3		
	ESDV TCP2–1	A	100
HF1605 (1.1/2in)	HV M5–6	C	50
	HV M4–6		100
	HV M4–3		50
	HV M5–3		
	HV M5–4		
	HV M5–5		
	HV M4–5		100
	HV M4–4		
	HV M4–1		
	HV M5–1		50
	HV M5–2		
	HV M4–2		100
CONTROL VALVE MANIFOLD – Q8			
	ESDV M10A–1	B	100/50
	HV SG–2	C	100
	HV SG–1		
	ESDV V1A–4	A	
	HV V1A–1	C	50
	ESDV V1B–4	A	100
	HV V1B–1	C	50

LINE NUMBER	VALVE TAG NUMBER	CONTROLLER TYPE	FLOWRATE LITRES/MIN
HF1605 (1.1/2in)	ESD V1C–4	A	100
	HV V1C–1	C	50
	ESD V1B–1	A	100
	ESD V1C–1		
	HV M1–3	C	50
	HV M1–1		
	HV M1–2		
	ESDV M1–1	B	100/50
	ESDV M2–1		
	HV M2–2	C	50
	HV M2–1		
	HV M2–3		
	HV M2–6		
	HV M1–6		
	HV M2–5		
	HV M1–5		
	HV M2–4		
	HV M1–4		
HF1607 (1.1/2in)	ESDV V1A–2	A	100
	ESDV M9–2	B	5
	ESDV V1B–2	A	100
	ESDV V1C–2		
	ESDV V2A–2		
	ESDV V2B–2		
	ESDV B7		
	ESDV V2C–2		
	HV V2A–1	C	50
	ESDV V2A–4	A	100
	HV V2A–2	C	50
	HV V2B–1		
	ESDV V2B–4	A	100
	HV V2B–2	C	50
	HV V2C–1		
	ESDV V2C–4	A	100
	HV V2C–2	C	50
	ESDV M4–1	B	100/50
	ESDV M3–1		
	ESDV M5–1		

ISSUE 1. JULY 1980

NITROGEN SYSTEM

1 GENERAL

1.1 The purpose of the system is to face all needs of nitrogen (including a part of needs for snubbing). The nitrogen H.P. system will also serve as back up gas for flare line purged by nitrogen.

2 Nitrogen unit:

2.1 The nitrogen unit G16 (refer 5.8.4) providing nitrogen gas at a rate of 50 Nm /hour and a purity of about 99 vol.%. The outlet pressure is 3 bar.

3 H.P. compression unit:

3.1 The nitrogen compression unit is filling the H.P. reservoir (8"network) from time to time depending upon the consumption forecast.

3.2 Preformance of the commpressor unit:

suction pressure 3 bar
discharge pressure 180 bar
Temp. after cooling 30-40 Degrees C.

The gas is produced in an air separation plant and is totaly oil free.

4 Connection compression/mudline:

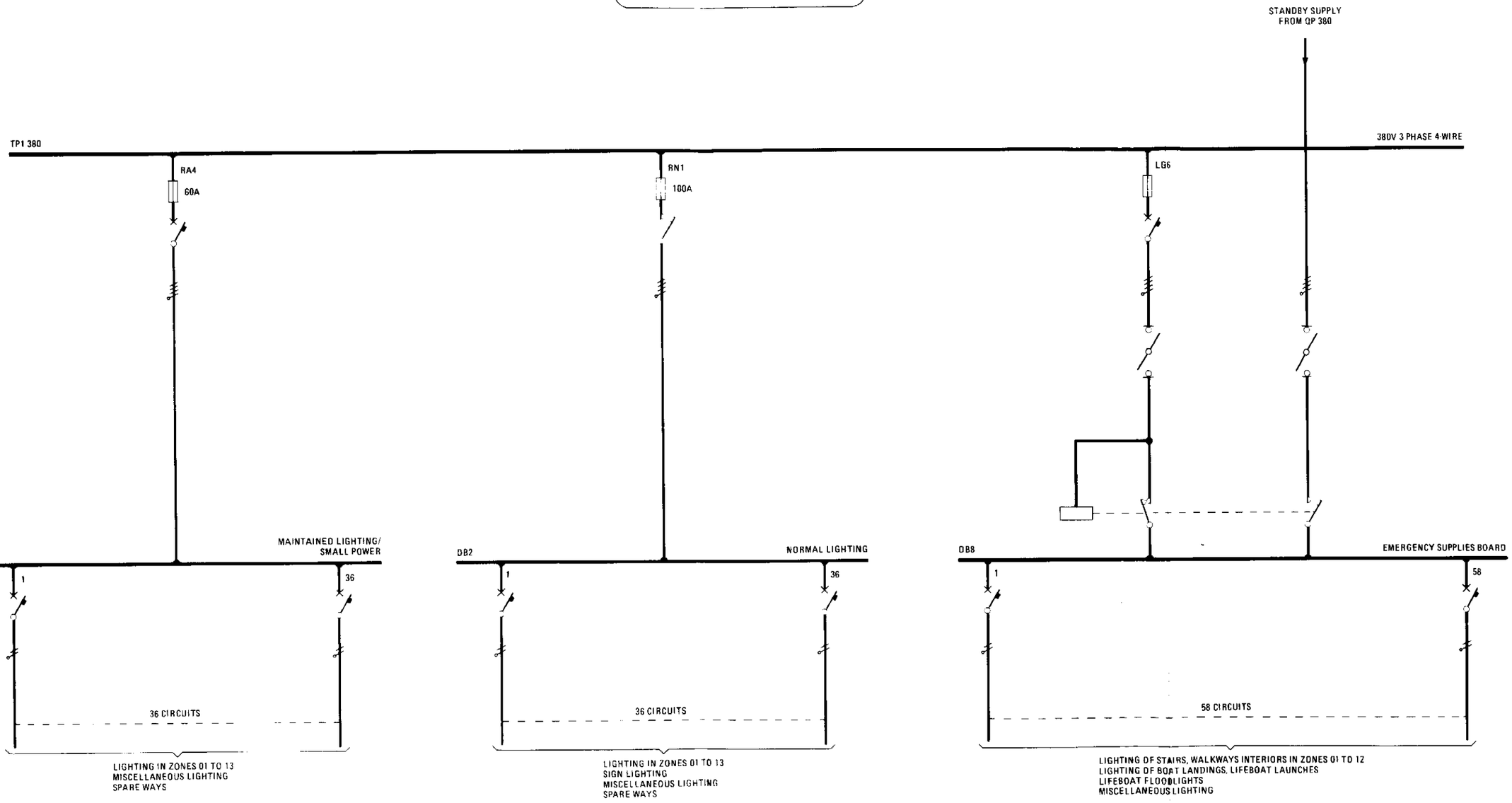
4.1 The connection from the H.P. compressor to mudline (H.P.reservoir) is equipped with a pressure safety valve set to a pressure less than the M.W.A.P. of the 8" mudline.

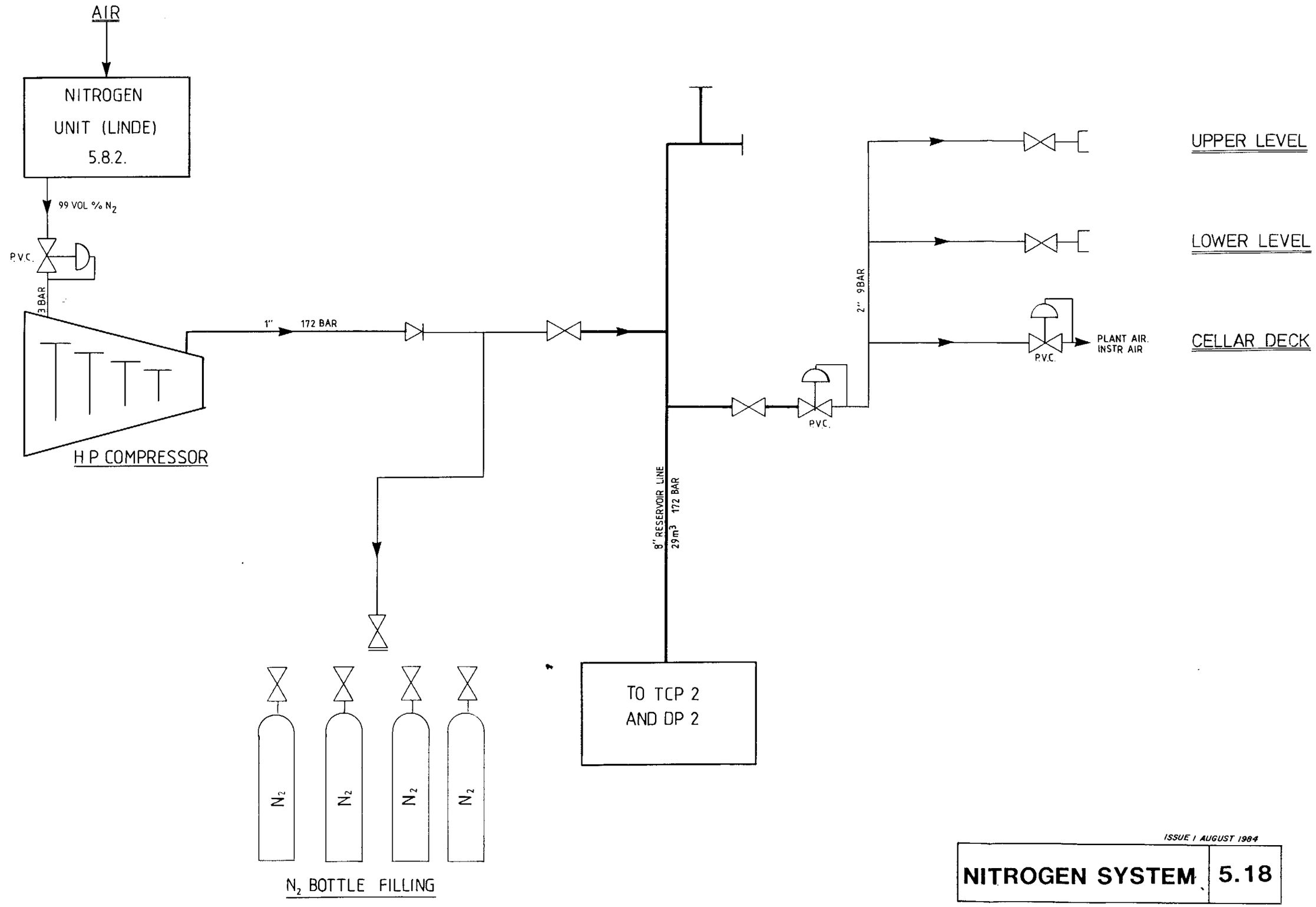
5 H.P. resovoir (mudline) storage:

5.1 8" mudline volume; CDP1 - TP1: 25m
TP1 - DP2: 36m

Total 61m

NOTE
FOR FURTHER MENTION OF LIGHTING
FED FROM DB1 SEE SECTION 9.14





ISSUE 1 AUGUST 1984

NITROGEN SYSTEM	5.18

FLOODING AND DEWATERING SYSTEM

For necessary maintenance and inspection at the riser and "J" tubes, which are routed up the inside of the support columns to the process areas, there are installed flooding and dewatering systems for emptying and flooding of the columns. The columns are normally filled with water to the sea level.

Dewatering system:

The dewatering system consists of two 6" pipes routed from the bottom of the column to a level fourteen meters above sea level. Each pipe is equipped with a remote operated valve at the outlet level and a submerged dewatering pump at the bottom of the column.
The emptying time is approximately 50 hours at a rate of 120 m^3/h for each column.

Flooding system:

The method is performed by utilizing the gravity of the sea water.
Water enters the 8" suction pipes and is allowed to enter the column under a full rate of flow.
The flooding system consists of two 8" pipes routed from a level six meters below the sea level to the bottom of the column. Each pipe is equipped with a diffuser at the bottom level and a flooding valve at the inlet level. The filling time is approximately 6 hours at a rate of 1000m^3/h.

Interconnection line.

The columns are interconnected with a 10" pipe at the bottom level.
This pipe is equipped with two remote operated valves placed in different columns.

COLUMNS RECIRCULATION SYSTEM

1 The recirculation system is installed to keep the temperature difference between the sea and the water inside the column below a maximum of 12 Degrees C.
This is done to avoid stress in the concrete.

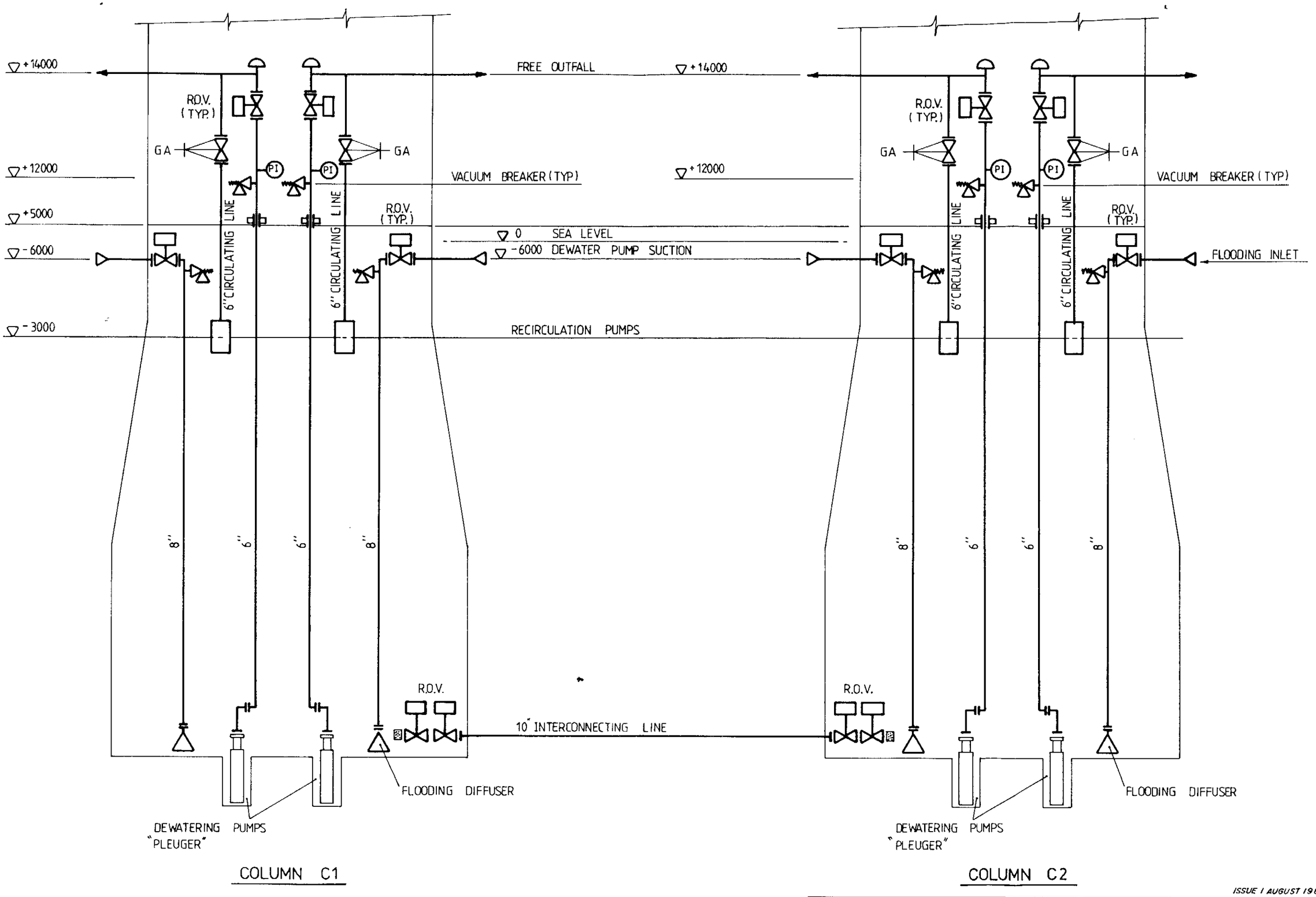
1.1 Recirculation System:

The water is entering the recirculation pumps at a level 3m below the surface of the water in the column.
Flooding lines are kept open to refill the column from the bottom.

1.2 During normal production two recirculation pumps are required to cool column 1, and one recirculation pump to cool column 2.

1.3 Operation of circulation pumps is done by the production department.
Temperature difference is recorded every day.

1.4 The recirculation system (refer following sketch) in each column consists of two 6" pipes routed from the pumps at a level 3m below the surface and connected to the dewatering line at a level of 14m above the sea.



ISSUE 1 AUGUST 1984

FLOODING/DEWATERING/RECIRCULATION SYSTEM	5.20.1

CHAPTER 6

TRANSPORT FACILITIES

CONTENTS

SUPPLY VESSELS

1 GENERAL

1.1 It is anticipated that the following supply vessels will be engaged in the replenishment of platforms.

1.2 The table covers relevant data concerning the supply vessels' dimensions and capabilities.

Vessel	Length Overall	Beam	Draught	Gross Tonnage (tonnes)	Free Deck Space	Capacities					Discharge Rates			
						Deck Cargo	Potable Water	Bulk Tanks	Drill Water	Fuel Oil	Potable Water	Drill Water	Fuel Oil	Cement
'PRINCESS SUPPLIER'	58.95m	12.60m	4.10m	497	31.5 x 9.5m	630T	456T	153m³	506T	477m³	Head 60m 80m³/h	Head 60m 80m³/h	Head 60m 77m³/h	50 Tonn/h
'NORINDO SUPPLIER'	58.95m	12.60m	4.10m	497	31.5 x 9.5m	630T	456T	153m³	506T	477m³	Head 60m 80m³/h	Head 60m 80m³/h	Head 60m 77m³/h	50 Tonn/h

NOTE
'PRINCESS SUPPLIER' and 'NORINDO SUPPLIER' are equipped as FI–FI Class II vessels.

END

CHAPTER 7

MATERIALS HANDLING

CONTENTS

DIAGRAMS

CRANES

1 GENERAL

1.1 Two Bucyrus Erie Mk 60 pedestal mounted marine cranes M7 and M8 are provided. M7 is located on the south-west corner of Zone 04 and M8 on the north-east corner of Zone 03.

1.2 The cranes are supplied for general lifting duties within their lifting areas.

2 DESCRIPTION

2.1 Each cranes load performance is as follows:

(a) Main Hoist — 43.09 tonnes at 80° boom angle, 7.62m radius.
3.18 tonnes at 18° boom angle, 36.57m radius.

(b) Whip Hoist — 5.44 tonnes at 80° to 37° boom angle, 6.10m to 32.00m radius.
2.72 tonnes at 16° boom angle, 38.10m radius.

2.2 Each crane has a boom length of 36.58m and operates within a range of 80° above to 12° below the horizontal.

2.3 Power to each crane is supplied by a General Motors 12V–71N 12-cylinder diesel engine, via hydraulic transmission.

2.4 An adjustable boom hoist limit device enables the boom to be stopped at predetermined high and low angles. Actuating pins on the boom foot trip the microswitch which controls the boom hoist hydraulic motors operation. These pins normally work from 60° to 80° above to 12° below the horizontal. An override button, located in the operators cab, allows the boom to be raised or lowered beyond the trip position.

2.5 A two block warning device operates when the hoist line hook reaches a predetermined distance from the boom hoist sheaves. Two limit switches, mounted on the boom point, are wired in parallel so that actuation of either switch will cause a warning bell to sound.

2.6 An anti-two block shut-off device prevents the hook from being drawn into the boom hoist sheaves. Two limit switches, mounted on the boom point, are wired in parallel so that actuation of either will initiate shutdown of the hydraulic motors.

PLATFORM NORTH N

PEDESTAL CRANE M7
BUCYRUS - ERIE Mk 60

47.5t
7.6m

22t
20m

3.5t
36m

LIMIT OF TRAVEL

MODULE 05

MODULE 04

MODULE 03

MODULE 02

MODULE 01

MODULE 23

3.5t
36m

22t
20m

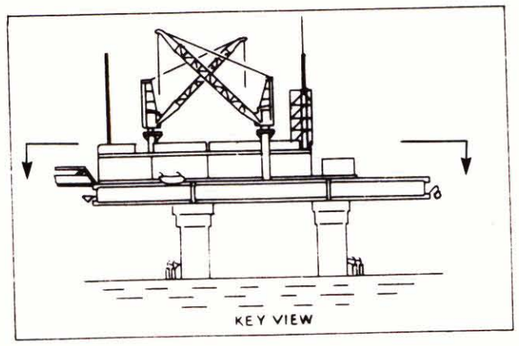
47·5t
7·6m

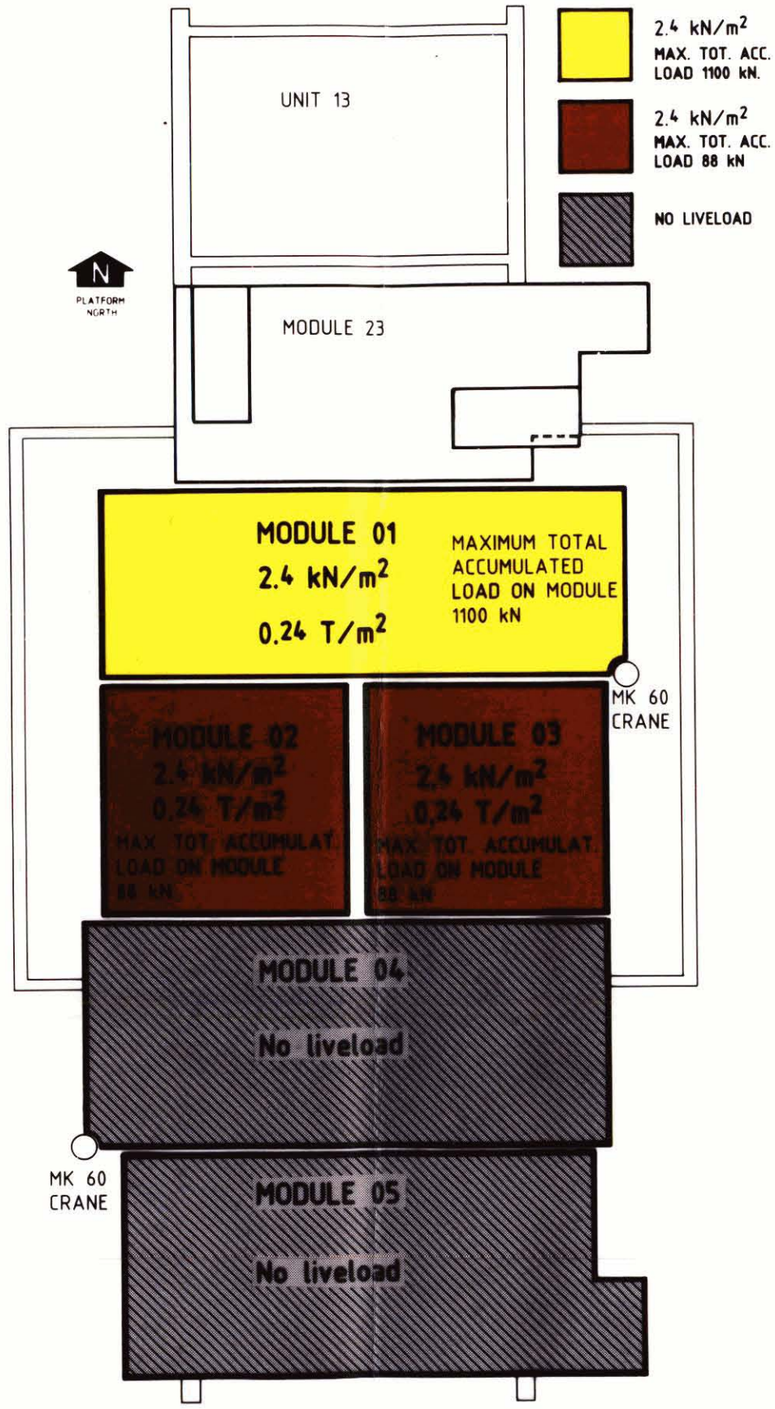
LIMIT OF TRAVEL

PEDESTAL CRANE M8
BUCYRUS –ERIE Mk 60

ISSUE 2 AUGUST 1984

CRANES	7.1.1

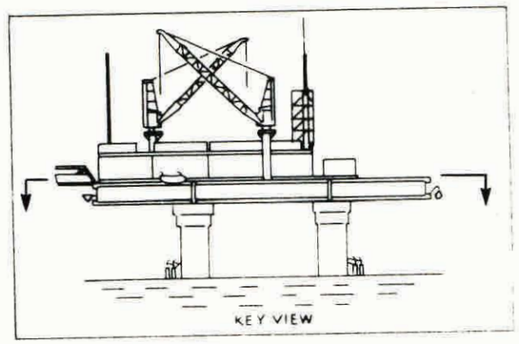


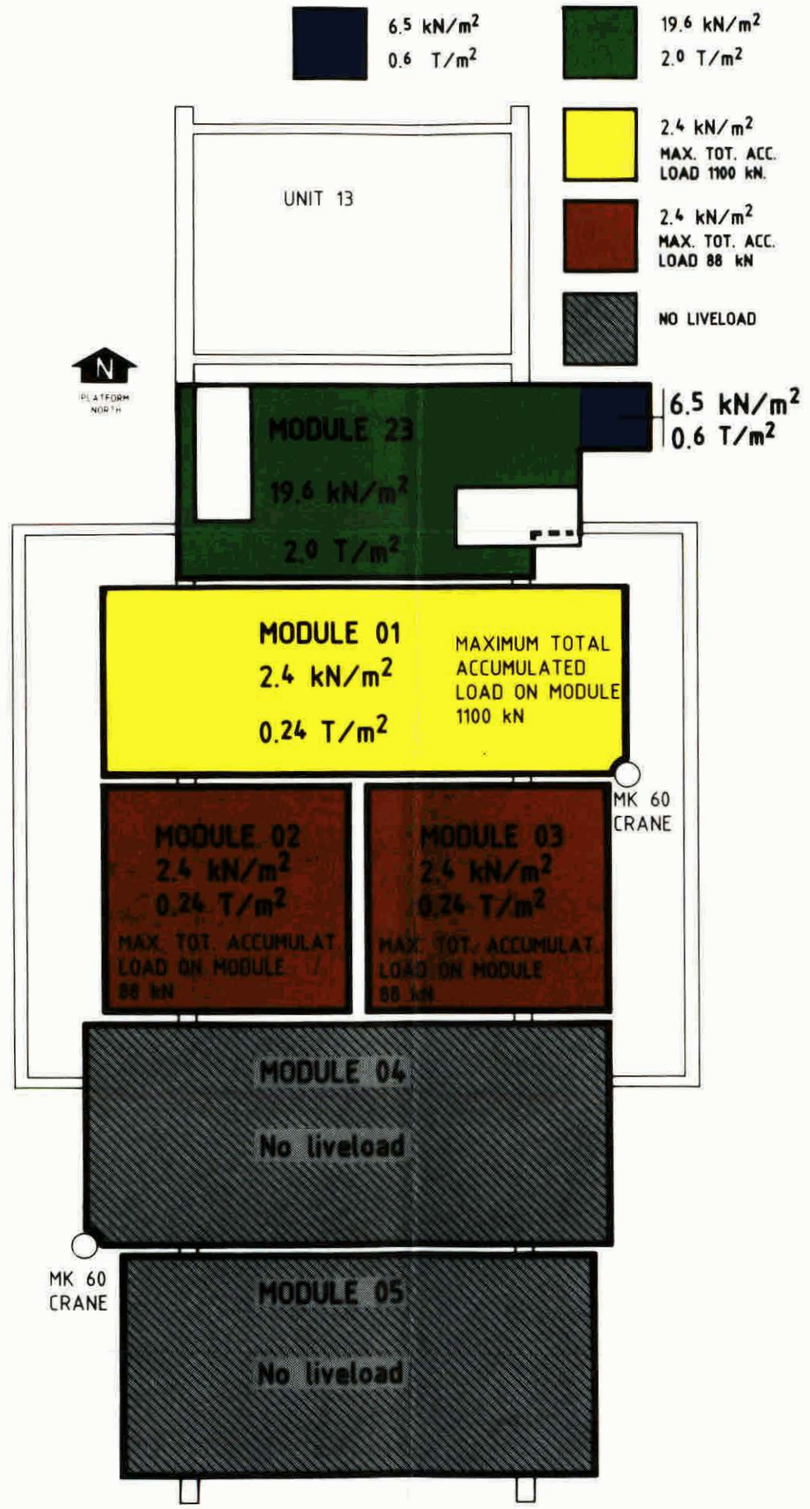


MODULE 01, 02, 03, 04 AND 05
ALLOWABLE LIVE LOAD
UPPER DECK

ISSUE 1. AUG. 1984

LIVE LOAD ON OPEN DECK AREAS Upper deck	7.1.2.

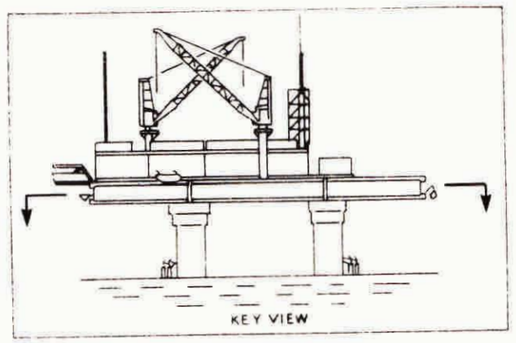


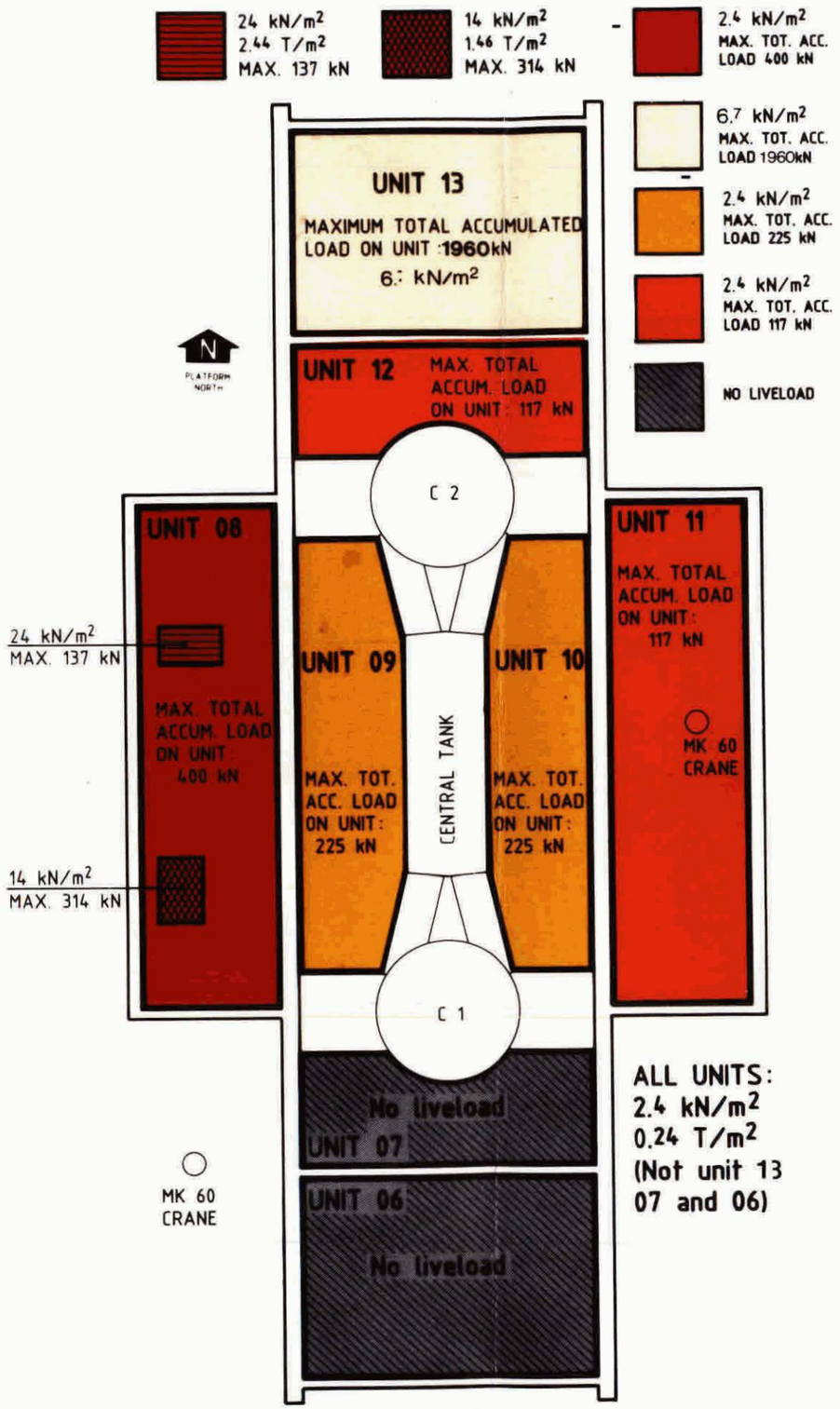


MODULE 01, 02, 03, 04, 05 AND 23
ALLOWABLE LIVE LOAD
MAIN DECK

ISSUE 1. AUG. 1984

LIVE LOAD ON OPEN DECK AREAS Main deck	7.1.3.





UNITS 06, 07, 08, 09, 10, 11, 12, AND 13
ALLOWABLE LIVE LOAD
CELLAR DECK

LIFTING EQUIPMENT

To assist in servicing of equipment, overhead hoists are installed as tabulated below.

TAG No	LOCATION	FUNCTION	TYPE	TROLLEY DRIVE	HOIST DRIVE	RAIL TRAVEL	LIFT	LOAD	DIAGRAM 7.2 FIGURE No
M18A M18B	Workshop Area, Zone 08	Handling heavy equipment and tools	Travelling monorail crane	0.27kW electric motor	3.1kW electric motor	26.185m at 20m/min 20.800m at 20m/min	6m at 3.2m/min	5 tonnes	1
M19A M19B	Main Generator Area, Zone 05	Servicing main generators TA1, TA2 and TA3	Travelling gantry type crane	Manual chain	Chain pulley block	Longitudinal 10.400m Lateral 1.790m Longitudinal 9.200m Lateral 1.740m	6.096m	2 tonnes	2
M20A	Fire Pump P6A Area, Zone 12	Servicing fire pumps P6A and P6B	Travelling monorail crane	Manual chain	Chain pulley block	3.15m	3.50m	10 tonnes	3
M20B	Fire pump P6B Area, Zone 07								
M21	Process Area, Zone 09	Servicing condensate return pumps P2A and P2B	Travelling monorail crane	Manual chain	Chain pulley block	10.25m	2.5m	5 tonnes	4
M22A M22B	Main Generator Area, Zone 05	Servicing main generators TA1, TA2 and TA3	Travelling monorail crane	Manual chain	Chain pulley block	9.14m 18.00m	6.096m	10 tonnes	4
M23A	Fire Pump P6A Area, Zone 12	Servicing ancillary small capacity pumps	Travelling monorail crane	Manual chain	Chain pulley block	5.68m	3.8m	5 tonnes	4
M23B	Fire Pump P6B Area, Zone 07								
M24A	Fire Pump P6A Area, Zone 12	Spare	Fixed hoist		Chain pulley block		4.15m	7.5 tonnes	5
M24B	Fire Pump P6B Area, Zone 07	Servicing mud water pump P5							

END

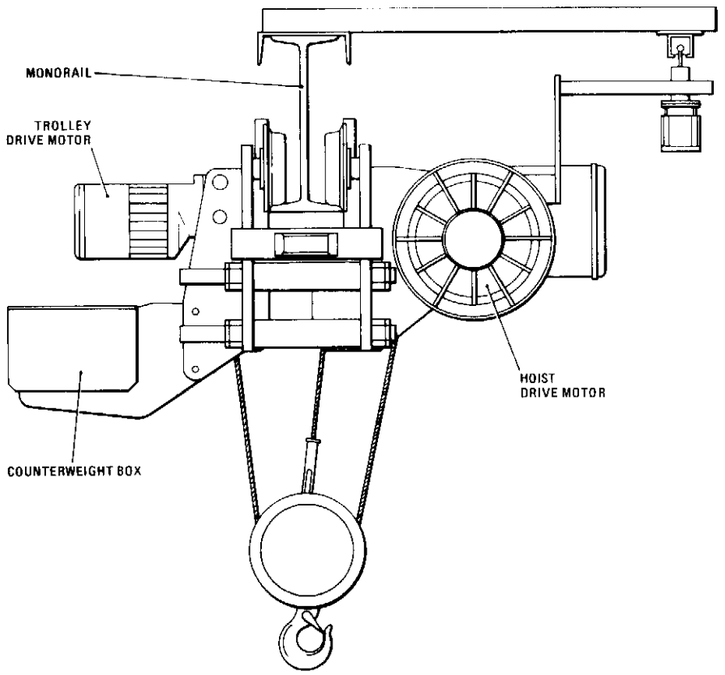


FIG 1
M18A & B

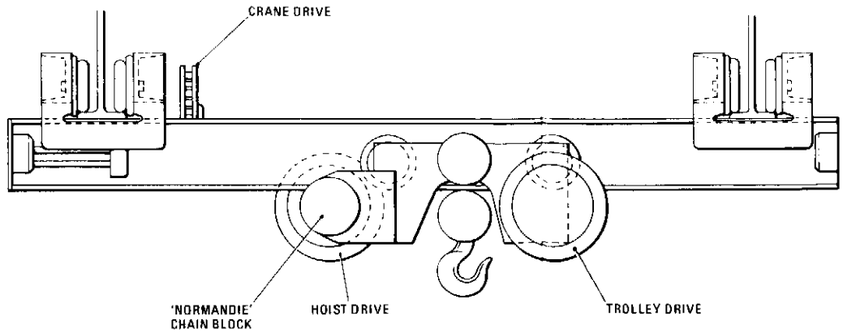


FIG 2
M19A & B

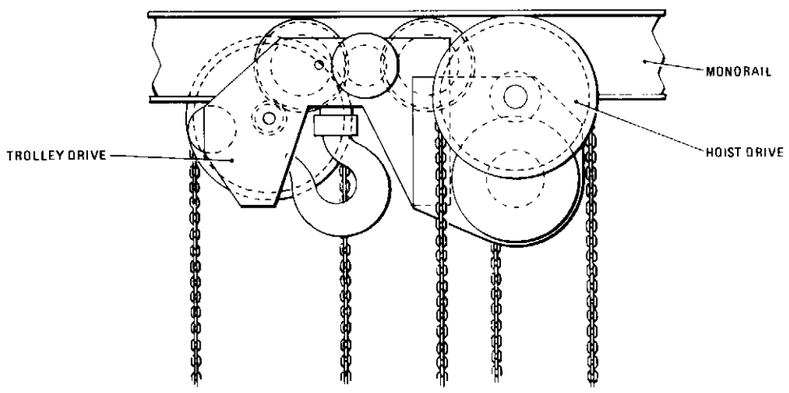


FIG 3
M20A & B

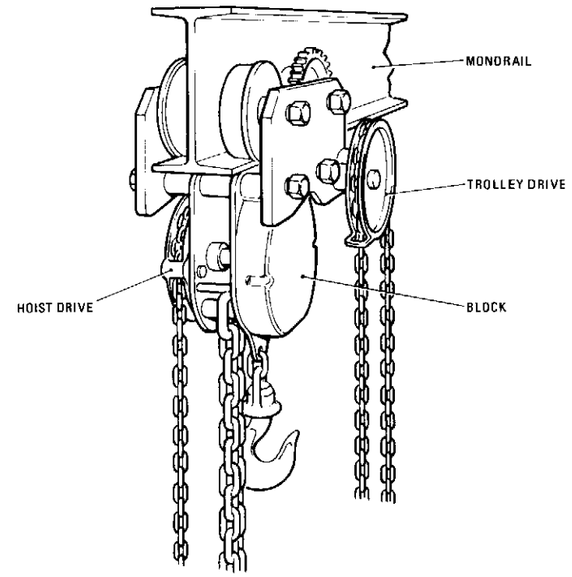


FIG 4
M21, M22A & B AND M23A & B

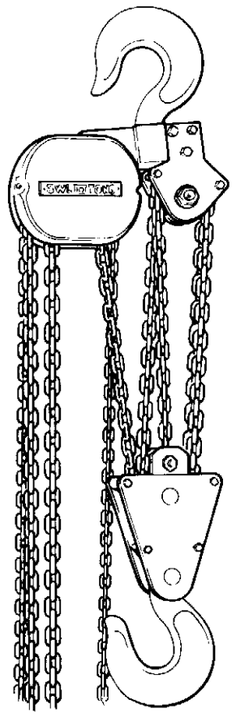


FIG 5
M24A & B

BULK HANDLING SYSTEMS

1 DIESEL FUEL

1.1 Diesel fuel is normally supplied through 4in line DO851 from TCP2. It may also be supplied by service boat.

1.2 When bunkering from a service boat, diesel fuel is taken on through 4in lines DO851 and DO852 from the east and west loading areas respectively, via flexible hoses.

1.3 Storage tank level is indicated locally at the loading areas, and at the diesel fuel control panel. Local and remote alarms sound when the tank has filled to the upper level.

2 GLYCOL

2.1 Glycol replenishment is from a service boat through 4in lines G572 and G573, from the east and west loading areas respectively.

2.2 Storage tank level is indicated locally at the loading areas. A local alarm sounds when the tank has filled to the upper level.

3 METHANOL

3.1 Methanol replenishment is from either a service boat or TCP2.

3.2 Replenishment is through 3in line ME1511 from TCP2, or through two 4in lines ME1501 from the east and west loading areas.

3.3 Methanol is bulk delivered in $6m^3$ capacity pods which are off-loaded onto the loading areas.

3.4 High and low storage tank level alarms indicate in the control room.

4 BOAT LANDINGS

4.1 Loading from service boats should not be effected under the following conditions:

(a) Current greater than 1.5 knots (0.77m/s).

(b) Wind greater than 40 knots (20.57m/s).

(c) Waves higher than 5m, at a frequency greater than 8.5s.

4.2 Both landing areas are illuminated by floodlights.

BULK HANDLING SYSTEMS

1 DIESEL FUEL

1.1 Diesel fuel is normally supplied through 4in line DO851 from TCP2. It may also be supplied by service boat.

1.2 When bunkering from a service boat, diesel fuel is taken on through 4in lines DO851 and DO852 from the east and west loading areas respectively, via flexible hoses.

1.3 Storage tank level is indicated locally at the loading areas, and at the diesel fuel control panel. Local and remote alarms sound when the tank has filled to the upper level.

2 GLYCOL

2.1 Glycol replenishment is from a service boat through 4in lines G572 and G573, from the east and west loading areas respectively.

2.2 Storage tank level is indicated locally at the loading areas. A local alarm sounds when the tank has filled to the upper level.

3 METHANOL

3.1 Methanol replenishment is from either a service boat or TCP2.

3.2 Replenishment is through 3in line ME1511 from TCP2, or through two 4in lines ME1501 from the east and west loading areas.

3.3 Methanol is bulk delivered in $6m^3$ capacity pods which are off-loaded onto the loading areas.

3.4 High and low storage tank level alarms indicate in the control room.

4 BOAT LANDINGS

4.1 Loading from service boats should not be effected under the following conditions:

(a) Current greater than 1.5 knots (0.77m/s).

(b) Wind greater than 40 knots (20.57m/s).

(c) Waves higher than 5m, at a frequency greater than 8.5s.

4.2 Both landing areas are illuminated by floodlights.

C O N T E N T S

A - TECHNICAL SPECIFICATION

1. MAPE WINCHES

1.1 Design code

F.E.M. Federation Europeenne de la Manutention

Working class	:	V 5 (50000H)
Loading Factor	:	3
Mechanics class	:	5 m
Loading Factor	:	III
Safety R	:	2
Ratio N	:	1.6
Safe working load	:	10 kN

1.2 Description

The winch is a fabricated steel frame structure consisting of two flanges which are connected by a steel plate box-structure.

Each flange is equipped with a worm reduction gear.

The double-barrel drum assembly has two hubs fitted with bronze bushings and a brake rim.

One reduction gear is equipped with an explosion-proof electrical brake motor the other with an air motor.

The brake, which has a fastening link welded on to the frame, consists of a Ferrodo-lined steel band.

Usually, the brake is applied by cup washers located in the upper section of the air actuator. The air actuator is responsible for brake release. The brake may also be released manually in the event of pneumatic system failure.

A slewing ring, fixed both to a baseplate and to the winch frame structure, allows the winch to turn through 360 degrees with steps every 15 degrees.

Two clutches manually actuated for coupling the drum on normal or emegency reduction gear. One clutch must be engaged before the other can be released.

Drum is equipped with a galvanized steel wire, steel core. The wire is fixed to the drum by means of a bolted wedge and a clamp.

Fixing of wire on cage is by a conical thimble and wire clamp.

1.3 General

These winches are for lifting/lowering cage inside the columns of TP1 platform for visual inspection of risers, and transportation of personnel and then with guided cage.

1.4 Main data

Explosion proof electric motor	:	3.5 kW at 700 rpm. 380 V 50 Hz
Nominal torque	:	38.5 Nm
Starting torque	:	54.0 Nm
Stall torque	:	69.0 Nm
* Air motor type: Globe RM 31	:	4.4 kW at 1500 rpm.
Working air pressure	:	4.9 bars
Air consumption	:	5 Nm3/mn
* Reduction gear el. motor side type SA 90		
Max Static Torque	:	2795 Nm
Gear ratio	:	64,03
* Reduction gear air motor side Type USOCOME SA90		
Max Static Torque	:	2688 Nm
Gear ratio	:	140,62
* El. motor fail safe type		
Braking torque	:	100 Nm
* Band brake on drum		
Braking torque	:	4120 Nm
* Drum capacity	:	2 x 150 m in 7 layer
Fabrication year	:	1979/80

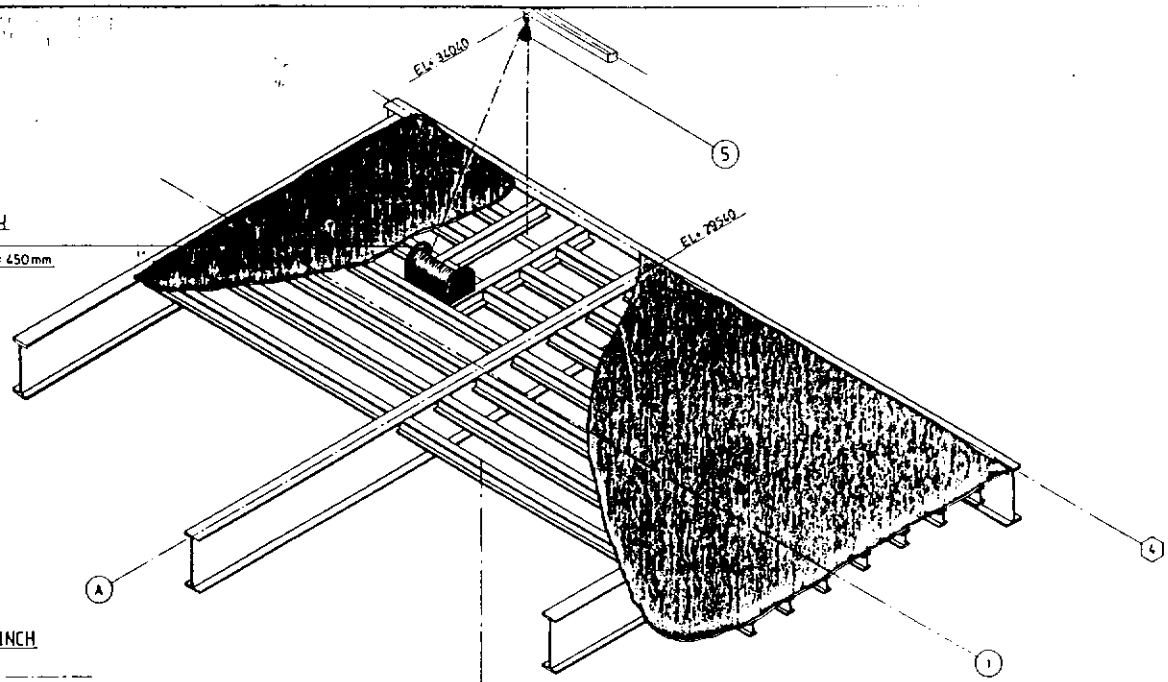
1.5 Performance data

Normal operation

at 1st layer	:	force	1000 kg
		speed	10.3 m/mn
at 7th layer	:	force	1000 kg
		speed	14.4 m/mn

Emergency operation

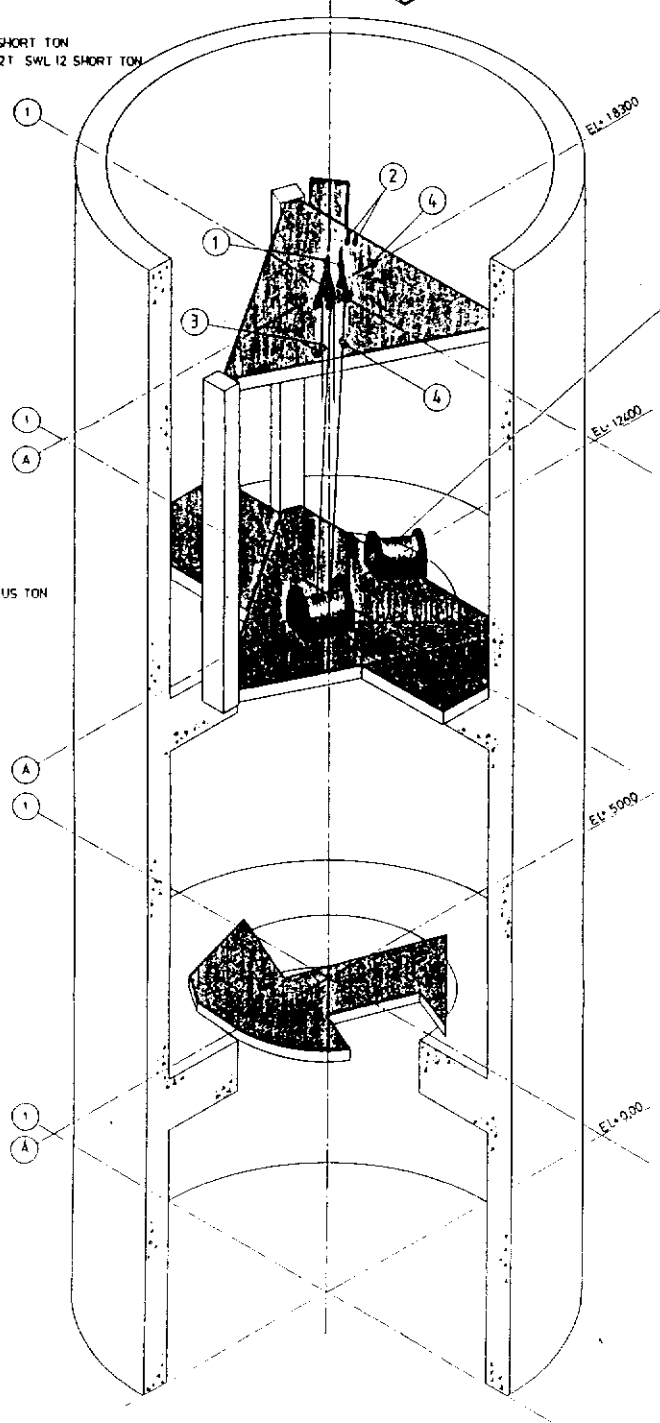
at 1st layer	:	force	1000 kg
		speed	10 m/mn
at 7th layer	:	force	1000 kg
		speed	14 m/mn



INGERSOLL RAND WINCH
K6UL S/N V10626D
MAX LENGHT OF DRUM: 450mm

MATERIAL WINCH

NOTE 5 "WIREROPE" — — — —
MATERIAL PER PADEYE:
2 OFF SHACKLES M 32 HR 12 T SWL 12 SHORT TON
1 OFF SINGLE SHEAVE BLOCK 601 N412T SWL 12 SHORT TON



INGERSOLL RAND SIZE: K6UL S/N V25925

MATERIAL WINCH

NOTE 4 "WIREROPE" — — — —
MATERIAL PER PADEYE:
1 OFF SHACKLE SWL 17 T D 1/84
1 OFF SHACKLE SWL 12 T M 32HR
1 OFF SNATCHBLOCK 1/D 60IN. SWL 12 US TON

PERSONNEL WINCH

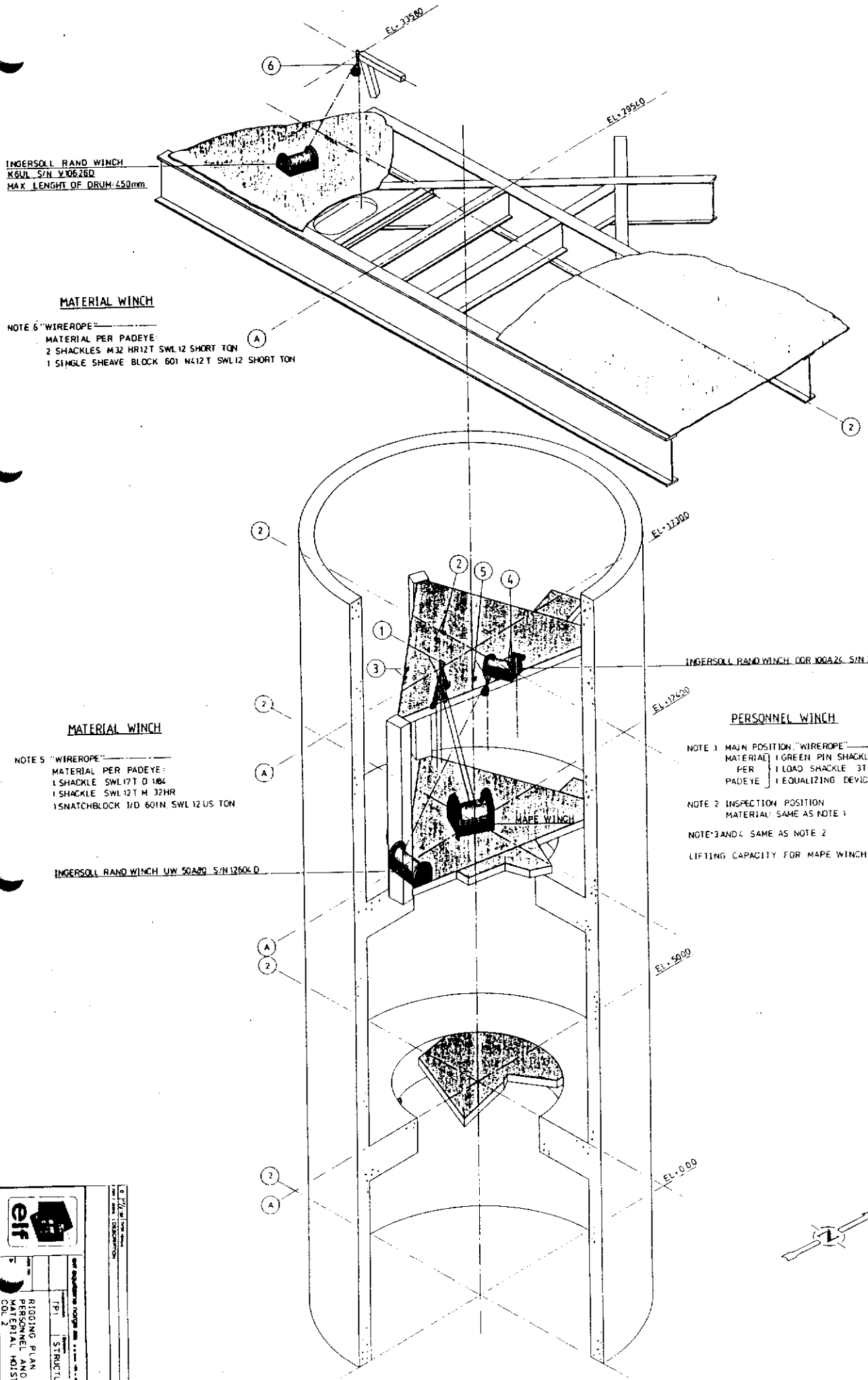
NOTE 1 MAIN POSITION "WIREROPE" ————
MATERIAL PER PADEYE:
1 OFF GREEN PIN SHACKLE "D" 6.5 T SWL
1 OFF LOAD SHACKLE 3 T SWL
1 OFF EQUALIZING DEVICE

NOTE 2 INSPECTION POSITION
MATERIAL: SAME AS NOTE 1.

NOTE 3 SAME AS NOTE 2

LIFTING CAPACITY FOR MAPE WINCH: SWL 10 TON

FINDO FIELD
FF 95 21
1:50
TP1
STRUCTURAL
RIGGING PLAN FOR
PERSONNEL AND
MATERIAL HOISTS COL1
0 20
1/1


EL. 33580
EL. 29540
INGERSOLL RAND WINCH
K6UL S/N V10626D
MAX LENGHT OF DRUM: 450mm
MATERIAL WINCH
NOTE 6 "WIREROPE"
MATERIAL PER PADEYE:
2 SHACKLES M32 HR12T SWL12 SHORT TON
1 SINGLE SHEAVE BLOCK 601 N.12T SWL12 SHORT TON
EL. 17300
INGERSOLL RAND WINCH, ODR 100A26, S/N 36879D
EL. 12600
MATERIAL WINCH
NOTE 5 "WIREROPE"
MATERIAL PER PADEYE:
1 SHACKLE SWL17T D 184
1 SHACKLE SWL12T M 32HR
1 SNATCHBLOCK 1/D 601N. SWL 12 US TON
INGERSOLL RAND WINCH UW 50A80 S/N 12604 D
MAPE WINCH
PERSONNEL WINCH
NOTE 1 MAIN POSITION "WIREROPE"
MATERIAL PER PADEYE: 1 GREEN PIN SHACKLE "D" 6.5 T SWL; 1 LOAD SHACKLE 3T SWL; 1 EQUALIZING DEVICE
NOTE 2 INSPECTION POSITION
MATERIAL: SAME AS NOTE 1
NOTE 3 AND 4 SAME AS NOTE 2
LIFTING CAPACITY FOR MAPE WINCH: SWL 10 TON
EL. 5000
EL. 0.00
N
FRIGG FIELD
FF 95 21 23 30 21 0
RIGGING PLAN FOR PERSONNEL AND MATERIAL HOISTS COL 2
TP1 STRUCTURAL

CHAPTER 8

COMMUNICATIONS

CONTENTS

DIAGRAMS

RADIO LINKS

1 GENERAL

Radio communications, except for lifeboat communications, are conducted from Platform QP. See the QP Operations Manual.

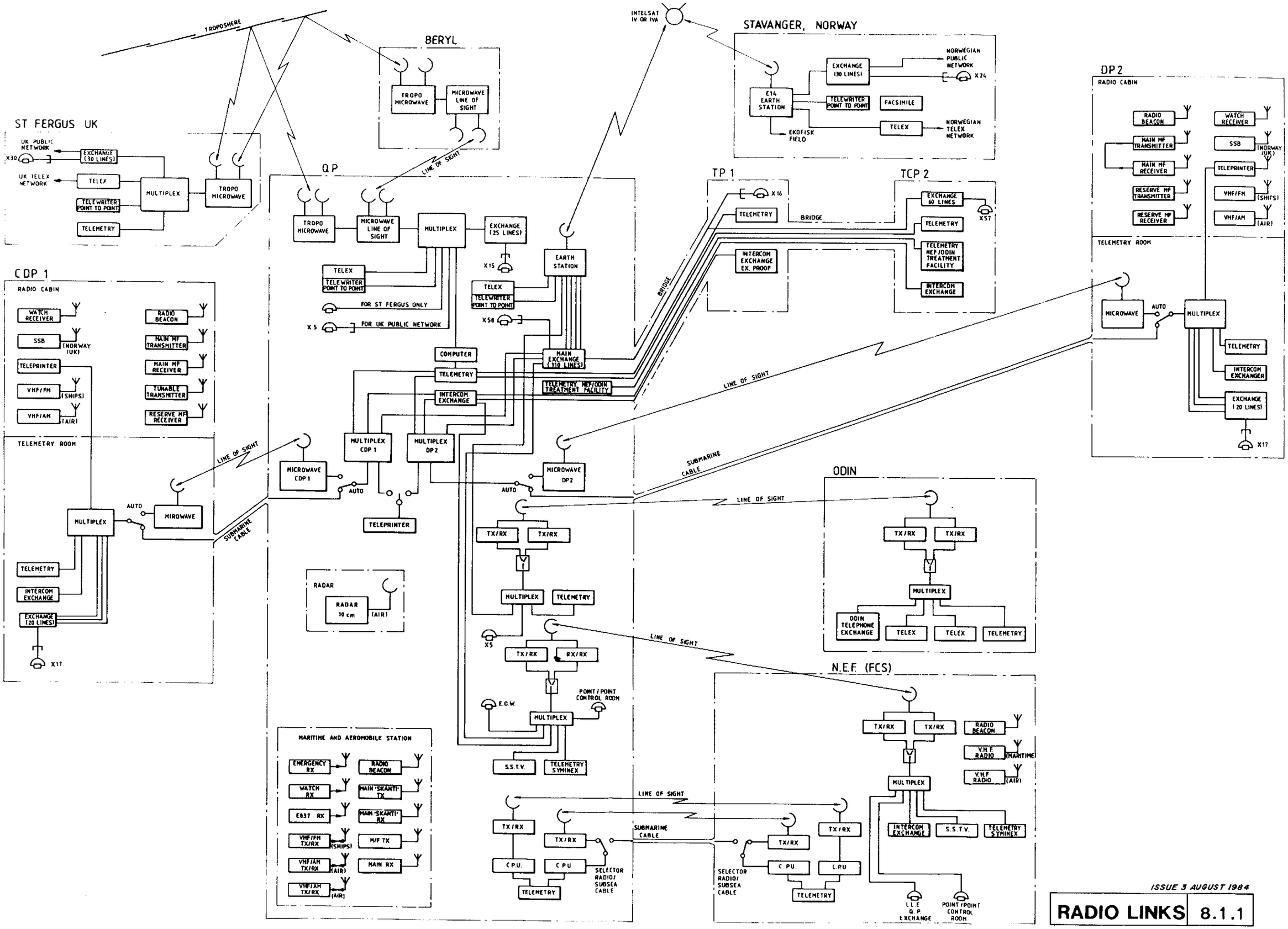
2 LIFEBOAT COMMUNICATIONS

2.1 The only items of radio equipment associated solely with TP1 are the VHF transceivers and radio beacons in the three lifeboats.

2.2 Lifeboats 1 and 3 have Marconi 'Survivor' sets, while lifeboat 2 has a Skanti 'Marinetta TRP1' set. All provide two-way automatic and manual communication on the international distress frequencies of 500, 2182 and 8364kHz.

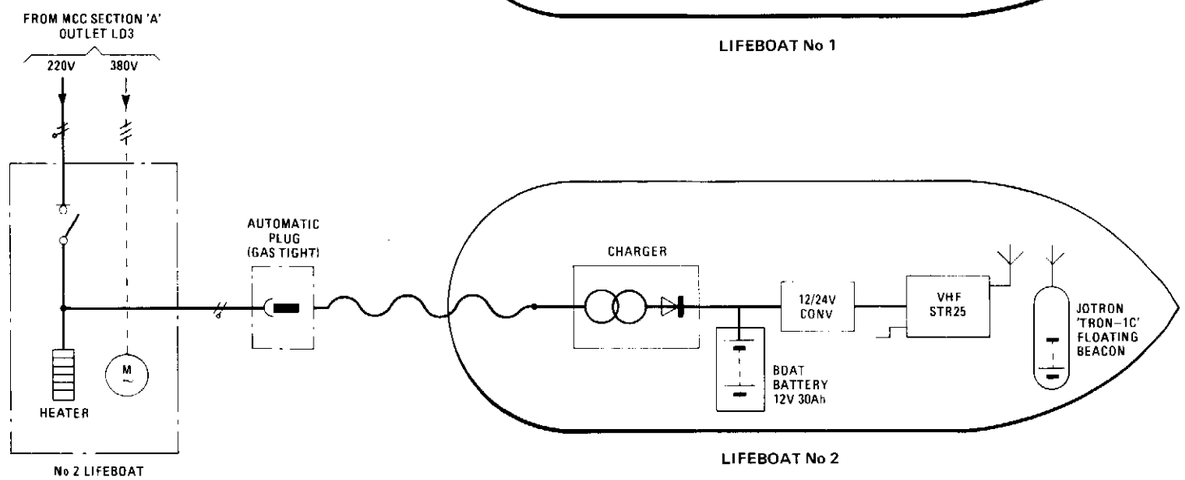
2.3 The Survivor sets have no external power supplies but operate from an internal hand-cranked generator. The Marinetta set in lifeboat 2 is powered from the engine 12V starter battery via a 12/24V dc converter unit, but it has a hand-cranked generator as a standby. The battery is kept charged through a flexible connection which is automatically released when the boat is lowered.

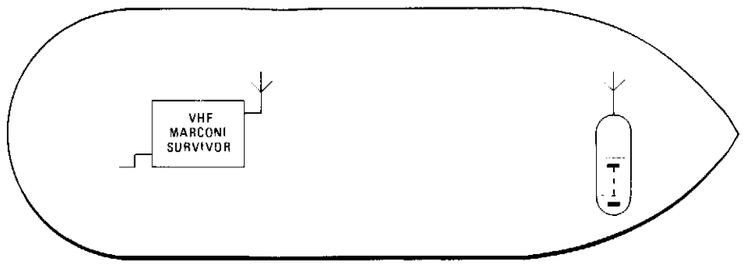
2.4 Each lifeboat has an automatic Jotron 'Tron 1C' radio beacon which begins to transmit on 121.5 and 243 MHz when lowered into the water. It has its own sealed, non-recharging battery which must be replaced after use, or every three years.

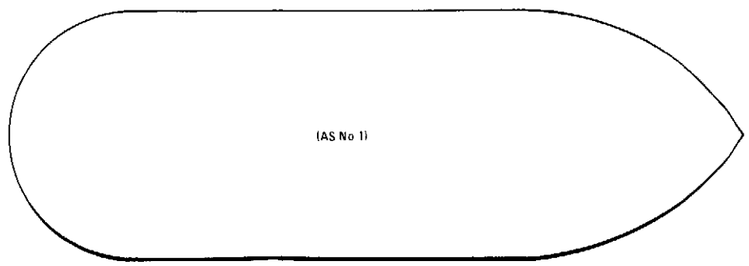


ISSUE 3 AUGUST 1984

RADIO LINKS 8.1.1


FROM MCC SECTION 'A'
OUTLET LD3
220V
380V
AUTOMATIC
PLUG
(GAS TIGHT)
HEATER
M
No 2 LIFEBOAT
DAVIT INSTALLATION
CHARGER
12/24V
CONV
VHF
STR25
BOAT
BATTERY
12V 30Ah
JOTRON
'TRON-1C'
FLOATING
BEACON
LIFEBOAT No 2


VHF
MARCONI
SURVIVOR
LIFEBOAT No 1


(AS No 1)
LIFEBOAT No 3

TELEPHONE SYSTEM

1 GENERAL

1.1 The exchange telephone system is commom to all five main platforms comprising the Frigg Field. Platforms QP and TP1 form a network having a common exchange in QP, the telephones in TP1 being outstations from this exchange.

1.2 TCP2 has its own exchange which is connected by four trunk lines to the QP exchange by cable via bridges and TP1 TO QP.

1.3 The detached platforms CDP1 and DP2 each have their own exchange, but each is connected by three tie-lines to the central QP/TP1/TCP2 system via a submarine cable link, with an alternative microwave link if the cable should fail.

1.4 In addition to the above, two dedicated telephone sets on NEF FCS are coupled via the UHF link to QP. One to a dedicated telephone set in the QP control room, one to the QP exchange.

1.5 The full telephone network is shown in block form in Diagram 8.1 where its position in relation to other inter-platform communications is shown.

2 DESCRIPTION

2.1 Exchanges

2.1.1 The principal automatic exchange in QP has 110 lines for internal (within QP) and inter-platform communications, and also for satellite communication with Norway. A second, 25-line, exchange is provided for use with the UK tropospheric-scatter radio link. The exchanges are of the conventional crossbar type.

2.1.2 The sub-exchanges in CDP1 and DP2 each have 20 lines, which include the three tie-lines to the main system via the under-sea cable or microwave links.

2.1.3 The sub exchange in TCP2 has 60 lines.

2.2 Instruments

Both wall-mounted and desk-type telephone instruments are provided, the latter being used in most offices and living accommodation. Wall-mounted types are, where necessary, enclosed for use in a Division 1 area.

2.3 Shore Links

2.3.1 The 110-line main exchange is also used for satellite communication with Norway (Stavanger), for which four trunk lines are provided between the exchange and the satellite earth station on QP.

2.3.2 Through this satellite link it is possible to speak to subscribers anywhere on the Norwegian public network. Telex, telewriter and facsimile services are also available through this link.

2.3.3 Radio communication with the UK (St Fergus) is through the other 25-line exchange, to which are connected 16 additional telephone instruments exclusively for this service. In addition, there are telephones for point-to-point connection to St Fergus (not through the exchange), and also five telephones for direct link with the UK public telephone network (not through the exchange). All are multiplexed with telex, telewriter and telemetry services and are passed to St Fergus either by direct troposcatter, or alternatively by line-of-sight microwave to Beryl and thence by Beryl's troposcatter to St Fergus. See Section 8.1.

2.3.4 There are telex and telewriter links between Platform QP and Norway, and between QP and UK, using the same satellite and troposcatter radio links as the telephone uses. At the Stavnger and St Fergus terminal the telex links can be extended into the Norwegian and UK public telex networks.

2.4 Power Supplies

This dc power for the QP exchanges is derived at 380V ac from the MCC via distribution board DB28, which supplies 220V single-phase (phaseto-neutral). This is taken to a local transformer/rectifier which converts it to 48V dc. A battery floats on the dc side anc has sufficient capacity to maintain the whole telephone system operational for 24 hours after complete loss of ac supply.

END

INTERCOM SYSTEM

1 GENERAL

1.1 A powered Intercom System, type Pamex, independent of the network connects all the control rooms and most of the offices and main living romms of all five platforms, comprising the main Frigg Field, and the Field Control Station of the satellite North East Frigg Field. This is installed primary for operational use.

1.2 A main exchange is installed on QP with satelitte exchanges on TCP2, CDP1 and DP2. This enables all subscribers to call any extension required. The system enables conference groups to be set up and messages to be given via the general call facility. The subscriber can use the system as a loudspeaking voice controlled system or push to talk, or as a full Duplex private telephone system, except for the exproof extension which are voice controlled or push to talk.

1.3 The NEF FCS Intercom system, type Pamex is coupled to the main QP exchange via one channel in the NEF UHF communications link.

1.4 The full Intercom network is shown in block form in diagram 8.1, where its position in relation to the other inter platform communication is shown.

2 DESCRIPTION

2.1 All control rooms and exproof extensions on the complex are directly connected to the QP exchange. The control rooms on CDP1 and DP2 are directly connected to the QP exchange via the submarine cable. The satellite exchange on TCP2 is connected to the QP exchange via cable. The satellite exchange on CDP1 and DP2 are connected to the QP exchange via the multiplex systems normally using the submarine cables, but changing over to microwave Radio-links on failure of the cable channel.

2.2 The main exchange on QP is for a maximum of 80 subscribers and 8 speech channels. The exchange is expandable to 240 subscribers. The satellite exchanges located on TCP2, CDP1 and DP2 are for a maximum of 48 subscribers and 4 speech channels.

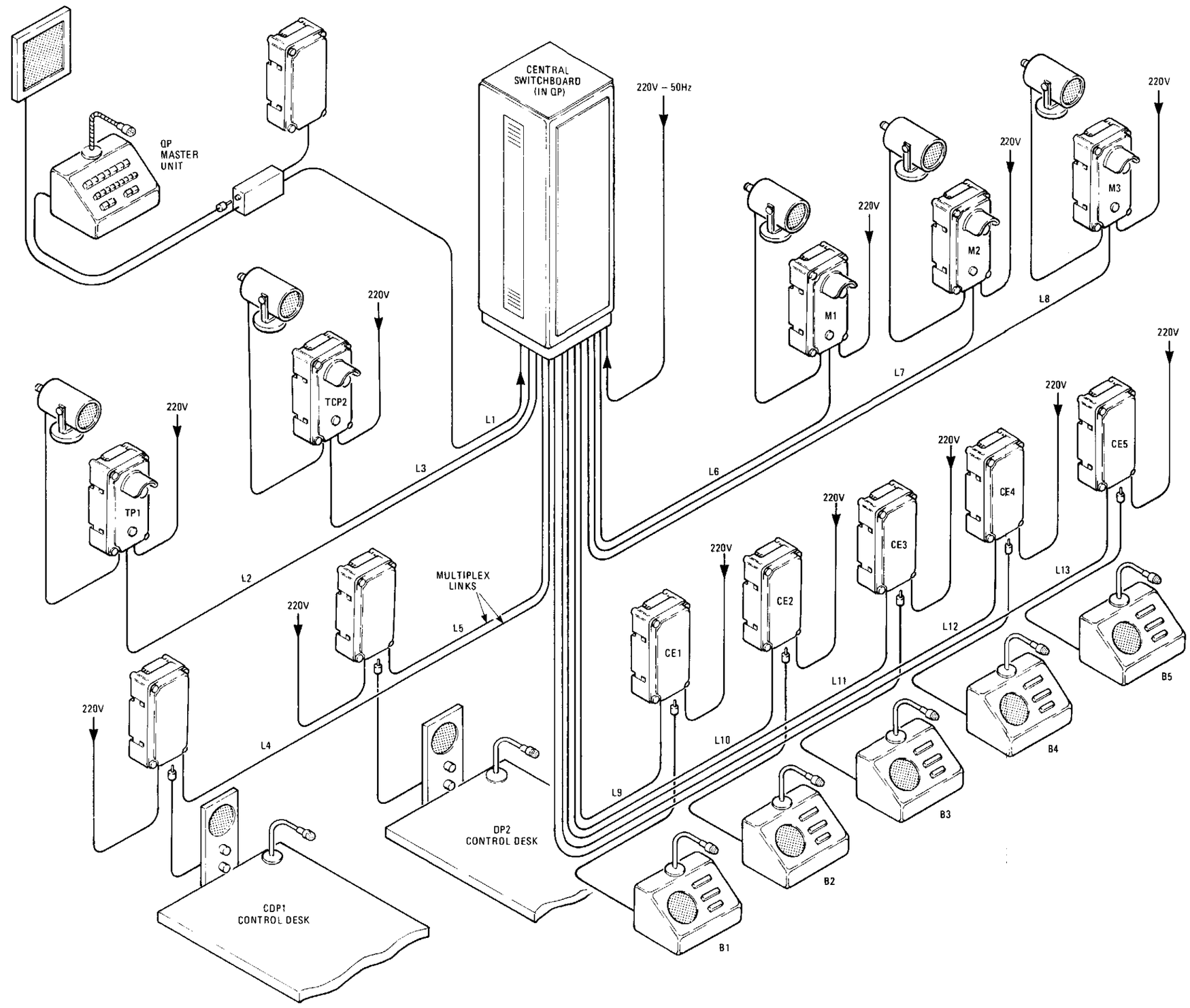
2.3 The QP exchange is capable of setting up a conference group with the TP1 interface room 1, TCP2 interface room, control room compression, CDP1 control room, DP2 control room and QP control room. Further more, the QP control room, QP radio, QP rig office and QP telecom are capable of using the general call facility to give messages.

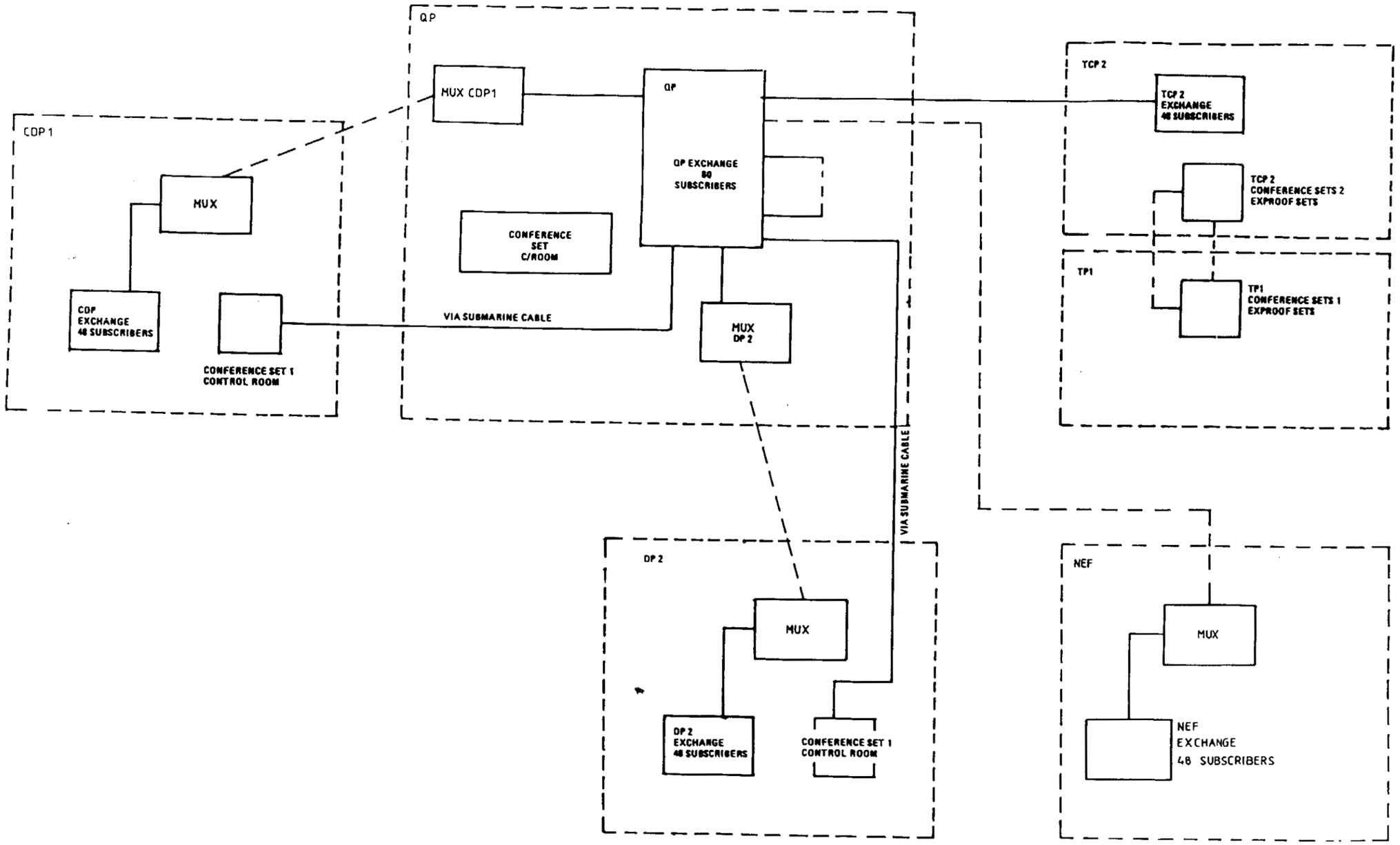
2.4 The satellite exchanges are powered so that they will have power cut off in case of a shutdown. The QP exchange will cut off power to all sets connected to it on the treatment platforms in case of a shutdown on the treatment platforms. Exproof sets are not included in this cut off.

2.5 The normal desksets are loudspreaking with a built-in loudspeaking mode, with high background noise or the push to talk button can be used for normal functions. the set can also be used as a full duplex telephone set by lifting the control unit from the loudspeaker and using it as a handset.

2.6 The exproof sets are wall mounted with a built-in mike and external loudspeaker. The sets can be used as a semiduplex voice controlled set or, in case of high background noise for normal function, a push to talk mode.

2.7 The exchange on NEF FCS is for a maximum 48 subscribers and 4 speech channels. Only 20 subscribers numbers and trunkcards are used for interfacing with the UHF radio link to QP.


CENTRAL SWITCHBOARD (IN QP)
220V – 50Hz
QP MASTER UNIT
220V
TCP2
L1
L3
TP1
L2
MULTIPLEX LINKS
L5
L4
CDP1 CONTROL DESK
DP2 CONTROL DESK
M1
M2
M3
L7
L8
CE1
CE2
CE3
CE4
CE5
L6
L9
L10
L11
L12
L13
B1
B2
B3
B4
B5


QP
MUX CDP1
QP
QP EXCHANGE
80
SUBSCRIBERS
CONFERENCE
SET
C/ROOM
CDP 1
MUX
CDP
EXCHANGE
48 SUBSCRIBERS
CONFERENCE SET 1
CONTROL ROOM
VIA SUBMARINE CABLE
MUX
DP 2
TCP 2
TCP 2
EXCHANGE
48 SUBSCRIBERS
TCP 2
CONFERENCE SETS 2
EXPROOF SETS
TP1
TP1
CONFERENCE SETS 1
EXPROOF SETS
VIA SUBMARINE CABLE
DP 2
MUX
DP 2
EXCHANGE
48 SUBSCRIBERS
CONFERENCE SET 1
CONTROL ROOM
NEF
MUX
NEF
EXCHANGE
48 SUBSCRIBERS

PUBLIC ADDRESS AND ALARM SYSTEM

1 GENERAL

The Public Address (PA) System is common to three platforms – QP, TP1 and TCP2. It also provides the vehicle for the broadcasting of alarms. It is controlled from Master PA and Alarm Control Panels in QP Control Room.

2 DESCRIPTION

2.1 Public Address

2.1.1 The main items are housed in a 'PEGFA Rack' located in the Radio and Telemetry Room. It includes the main 3000W speech amplifier requiring 5kW of uninterruptible supply, which is obtained either from a 220V, single-phase supply from the main switchboard (QP 380) through DB26, or from a separate rectifier/inverter providing 220V, single-phase, 50Hz supported by a 24V 195Ah battery. This is sufficient to maintain the system operational with full output for 30 minutes after complete failure of QP's normal supply system. The rectifier/charger for the battery is supplied at 220V, single-phase, 50Hz also through distribution board DB26.

2.1.2 The PEGFA Rack includes the following:

(a) Line selector (25-way). Directs output from the speech amplifier into groups of lines on the various platforms. It is remotely controlled from the PA Control Panel and the Alarm Control Panel in QP and from the Fire Detection Systems in all the three platforms.

(b) Alarm Selector. Selects which alarm tone is directed into which platform.

(c) Alarm Signal Generator. Generates continuous or interrupted tones for passing to the various platforms by the Alarm Selector. The alarm signal generator contains two independent circuits such that, if one fails, the other is brought automatically into operation. Such a changeover initiates an alarm at the System Alarm Panel in QP Control Room.

(d) Alarm Test Unit.

(e) Microphone and preamplifier.

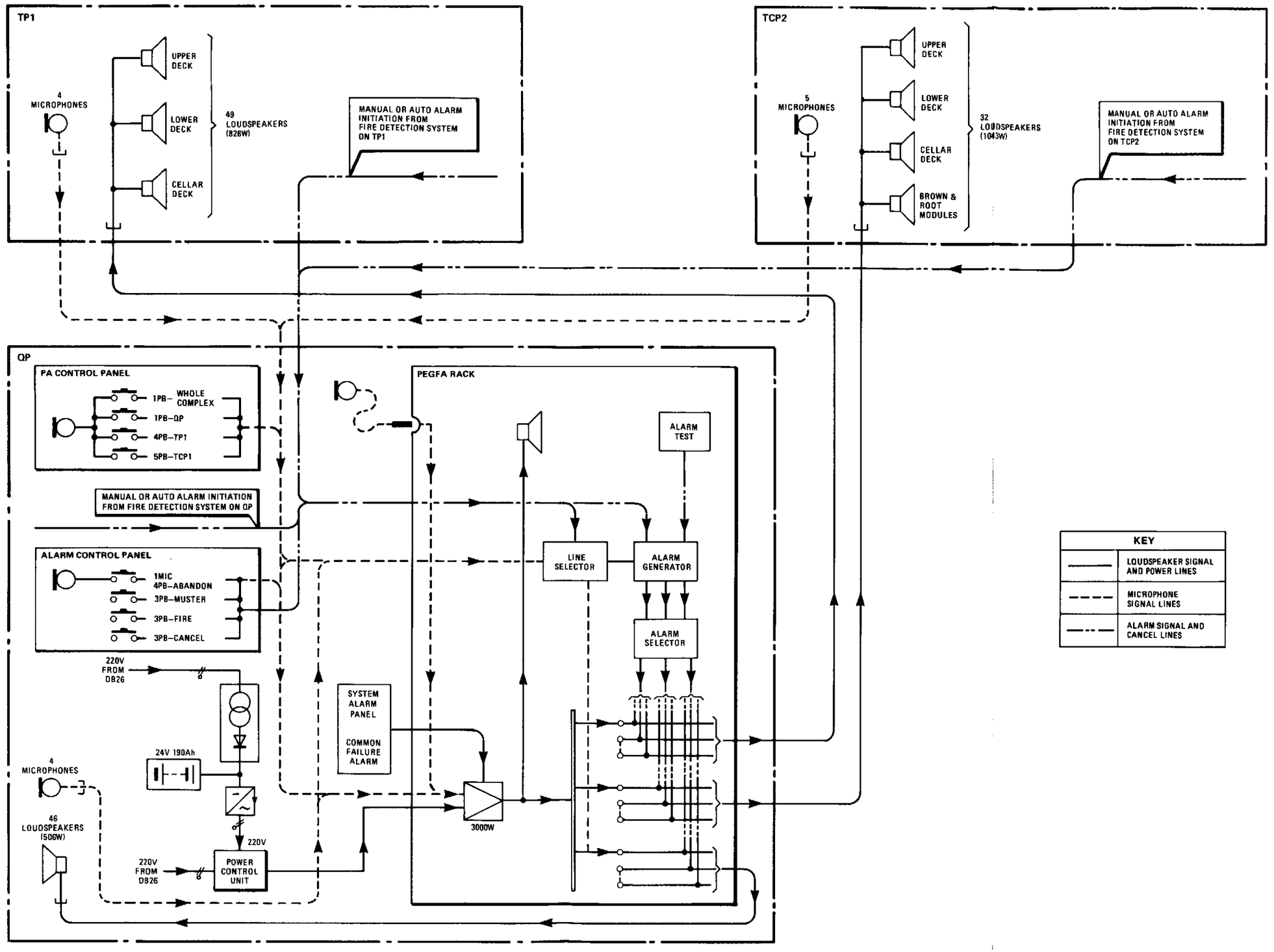
(f) Pilot loudspeaker.

(g) Instrumentation and controls.

2.1.3 Certain of the loudspeaker groups are arranged for selective muting (for example sleeping quarters at night when only an operational broadcast is being made). The muting is carried out by use of the appropriate line selector switches at the PA Control Panel in QP Control Room.

2.1.4 All loudspeakers are provided with taps on their internal transformers by which their acoustic output may be reduced in steps from the rated output (20W in most cases).

2.1.5 Associated with certain loudspeakers in noisy areas are two flashing lights – blue for public address and red for alarm. Loudspeakers have red lights fitted which flash automatically while the PA broadcast or the alarm is sounding.



KEY	
———	LOUDSPEAKER SIGNAL AND POWER LINES
- - - -	MICROPHONE SIGNAL LINES
—·—	ALARM SIGNAL AND CANCEL LINES

PUBLIC ADDRESS AND ALARM SYSTEM

1 GENERAL

The public Address (PA) System is common to three platforms -QP, TP1 and TCP2. It also provides the vehicle for the broadcasting of alarms. It is controlled from Master PA and Alarm Control Panels in QP Control Room.

2 DESCRIPTION

2.1 Public Address

2.1.1 The main items are housed in a 'PEGFA Rack' located in the Radio and telemetry Room. It includes the main 4000W speech amplifier requiring 8kW of uninterruptible supply, which is obtained either from a 220V, single-phase supply from the main switchboard (QP 380) through DB-26, or from a seperate rectifier/inverter providing 220V, three-phase, 50Hz supported by a 24V 195Ah battery. This is sufficient to maintain the system operational with full output for 30 minutes after complete failure of QP's normal supply system. The rectifier/ charger for the battery is supplied at 220V, single-phase, 50Hz also through distribution board DB26. A slave "PEGFA RACK", 1800W amplifier,is installed in TCP2 compression control room but controlled from Master PA on QP.

2.1.2 The PEGFA Rack includes the following:

(a) Line selector (25-way). Directs output from the speech amplifier into groups of lines on the various platforms. It is remotely controlled from the PA Control Panel and the Alarm Control Panel in QP and from the Fire Detection Systems in all the three platforms.

(b) Alarm Selector, Selects which alarm tone is directed into which platform.

(c) Alarm Signal Generator. Generates continuous or interrupted tones for passing to the various platforms by the Alarm Selector. The alarm signal generator contains two independent circuits such that, if one fails, the other is brought automatically into operation. Such a changeover initiates an alarm at the System Alarm Panel in QP Control Room.

(d) Alarm Test Unit.

(e) Microphone and preamplifier.

(f) Pilot loudspeaker.

(g) Instrumentation and controls.

2.1.3 Certain of the loudspeaker groups are arranged for selective muting level by level. The muting is carried out by use of the appropriate line selector switches at the PA Control Panel in QP Control Room.

2.1.4 All loudspeakers are provided with taps on their internal transformers by which their acoustic output may be reduced in steps from the rated output (20W in most cases).

2.1.5 Associated with certain loudspeakers in noisy areas are two flashing lights - blue for public address and red for alarm. Loudspeakers which are connected solely for alarm have red lights only, these flash automatically while the PA broadcast or the alarm is sounding.

2 Alarms

2.2.1 There are three types of general alarms:

(a)	Muster alarm	Consisting of continuous signal tone.
(b)	Fire alarm	Consisting of intermittent signal tones of one second duration, with a one second interval between tones.
(c)	Abandon alarm	Given by a verbal command over the loudspeaker broadcast system. There is no signal tone.

2.2.2 The system is capable of simultaneously broadcasting any one of the three alarms over any one of the three platforms QP, TP1 and TCP2, ie an Abandon alarm may be given on TP1 while a Muster alarm is being given on TP1 while a Muster alarm is being given on QP and TCP2.

2.2.3 There is automatic priority ranking of alarms on each platform. The priority of the signals in order of their importance is as follows:

Priority 1 - Abandon Alarm (verbal)
Priority 2 - Muster Alarm
Priority 3 - Fire Alarm

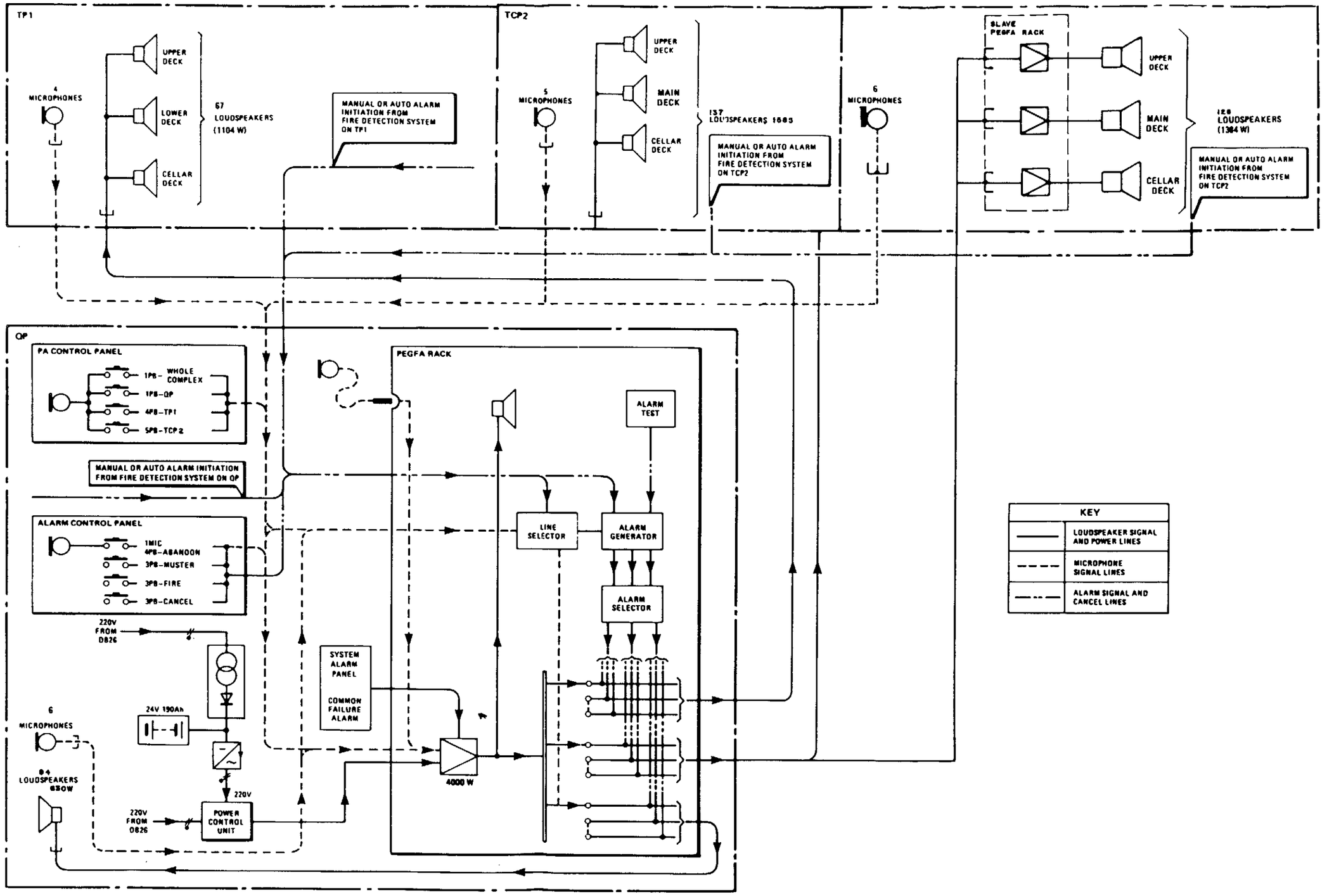
For example, if Fire alarm is being given on a platform and a Muster alarm is initiated on the same platform, the Muster alarm will override. However, the public address will override all alarm tones for a period of 10 seconds.

2.2.4 All audible alarms are initiated from one or other of the Alarm Control Panels except a Fire Alarm, which is automatically activated by the fire detection system.The gas detection system does not activate PA alarms automatically, but the operator may sound Fire Alarm by manually pressing a pushbutton.

2.2.5 If an alarm (Fire or Muster) has been given either manually or automatically, it can be cancelled by the CANCEL pushbutton on whichever Alarm Control Panel has been actuated.

2.2.6 The power for the alarm lights is derived from Distibution Board DB25 from the PEGFA Rack and it is distibuted through a Flashing Lamp Distribution Board/Relay Cabinet. There is a total of eight blue and eight red lamps in QP.

END


TP1
4 MICROPHONES
UPPER DECK
LOWER DECK
CELLAR DECK
67 LOUDSPEAKERS (1104 W)
MANUAL OR AUTO ALARM INITIATION FROM FIRE DETECTION SYSTEM ON TP1
TCP2
5 MICROPHONES
UPPER DECK
MAIN DECK
CELLAR DECK
137 LOUDSPEAKERS 1585
MANUAL OR AUTO ALARM INITIATION FROM FIRE DETECTION SYSTEM ON TCP2
6 MICROPHONES
SLAVE PEGFA RACK
UPPER DECK
MAIN DECK
CELLAR DECK
128 LOUDSPEAKERS (1384 W)
MANUAL OR AUTO ALARM INITIATION FROM FIRE DETECTION SYSTEM ON TCP2
QP
PA CONTROL PANEL
1PB- WHOLE COMPLEX
1PB-QP
4PB-TP1
5PB-TCP2
MANUAL OR AUTO ALARM INITIATION FROM FIRE DETECTION SYSTEM ON QP
ALARM CONTROL PANEL
1MIC
4PB-ABANDON
3PB-MUSTER
3PB-FIRE
3PB-CANCEL
220V FROM D826
24V 190Ah
6 MICROPHONES
84 LOUDSPEAKERS 630W
220V
220V FROM D826
POWER CONTROL UNIT
PEGFA RACK
ALARM TEST
LINE SELECTOR
ALARM GENERATOR
ALARM SELECTOR
SYSTEM ALARM PANEL
COMMON FAILURE ALARM
4000 W
KEY
LOUDSPEAKER SIGNAL AND POWER LINES
MICROPHONE SIGNAL LINES
ALARM SIGNAL AND CANCEL LINES

NAVIGATIONAL AIDS

1 GENERAL

1.1 Navigation equipment installed on platforms QP, TP1 and TCP2 complies with the requirements of the UK Department of Trade (Marine Division) January 1976 'Standard Marking Schedule for Offshore Installations'.

1.2 The following navigational aids are installed:

(a) Navigation lights.

(b) Obstruction lights.

(c) Foghorns.

(d) Helideck lights.

(e) Identification lights.

1.3 The navigation lights and main foghorns of all three platforms form two single inter-platform systems. Each system is separately controlled from Platform QP.

1.4 The obstruction lights are self-contained systems on each platform.

1.5 The identification lights are only on Platform QP.

2 DESCRIPTION

2.1 Navigation Lights

2.1.1 Three grouped sets of inter-platform white lights are installed as follows:

(a) One set on the north-east corner of TP1 at Cellar Deck level.

(b) One set on the south-east corner of TCP2 at Cellar Deck level.

(c) One set on the south-west corner of QP at Lower Deck level.

2.1.2 Each set comprises two main white lights and one secondary white light mounted vertically, with the secondary light topmost. Each light is enclosed in a marine lantern fitted with a single-piece fresnel lens.

2.1.3 The main lights are visible in clear weather over a range of 15 nautical miles through 270°. The two have a combined nominal luminous intensity of 14 000 candelas.

2.1.4 The secondary light is visible in clear weather over a range of 10 nautical miles through 270°. It has a nominal luminous intensity of 14 000 candelas.

2.1.5 The secondary lantern is equipped with a rotating lampholder containing four lamps. If a lamp fails, the next is automatically rotated into its place. An alarm will indicate in the control room when the last lamp is used.

2.2 Subsidiary Lights

2.2.1 Subsidiary red lights are installed on the other three corners of each platform, and at the centre of the bridges connecting them.

2.2.2 Each light is visible in clear weather over a range of three nautical miles through 270° (bridge lights 360°).

2.2.3 Each light is enclosed in a marine lantern fitted with a single-piece fresnel lens and a red filter.

2.2.4 Each lantern is equipped with a rotating lampholder containing four lamps. If a lamp fails, the next is automatically rotated into its place. An alarm will indicate in the control room when the last lamp is used.

2.3 Obstruction Lights

2.3.1 To warn aircraft of projections above the platforms, red obstruction lights are installed on the microwave tower of QP and the cranes of all three platforms.

2.3.2 The vertical distance between lights is a nominal 10m.

2.4 Identification Lights

2.4.1 Three grouped sets of identification lights are installed on the microwave tower of Platform QP, 120° apart at elevation +67.658m, to cover 360°.

2.4.2 Each set comprises three main and three standby white lights, each contained in a stainless steel enclosure.

2.4.3 All lights are visible in clear weather over a range of 22 nautical miles. Each light has a luminous intensity of 200 000 candelas and flashes once every five seconds.

2.4.4 The lights are automatically operated by a photo-cell. A manual On/Off switch is installed to override the system during helicopter take-off and landing.

2.5 Power Supplies

2.5.1 All navigational aids except secondary foghorns and obstruction lights receive their power supplies from Platform QP.

2.5.2 Each of the two main white navigation lights on each platform contains one 120V, 500W lamp. Each pair are connected in series and fed through a 220/240V auto-transformer in the base from the HALS 15 control unit supplied from distribution board DB31 on Platform QP.

2.5.3 The secondary white and subsidiary red navigation lights each contain one 12V lamp. The white light's power is 24W and the red light's 6.6W. Power at 120V, 150Hz is fed through a 120/12V transformer in each base from the ILS 750 control unit supplied from the 24V, 100Ah battery-supported navigation aids system of Platform QP.

2.5.4 The obstruction lights are supplied as follows:

(a) Platform QP – at 220V ac from DB31 (with battery support).

(b) Platform TP1 – at 220V ac from DB8 (no battery support).

(c) Platform TCP2 – at 220V ac from DB308 (no battery support).

2.6 Navigational Aids Control

2.6.1 Control unit HALS 15 (in QP) codes and distributes power supplies to the main white navigation lights of QP, TP1 and TCP2. Unit ILS 750 (in QP) controls and codes power supplies to the secondary white and subsidiary red navigation lights on these platforms.

2.6.2 Operation of QP, TP1 and TCP2 main white, subsidiary red and obstruction lights is normally controlled by separate sun switches on QP. A manual override switch is located in the QP Radio Room.

2.6.3 In the event of a main white navigation light failure, the secondary white light automatically comes into operation, giving an alarm indication in the control room.

2.6.4 All navigation lights on the three platforms are synchronised to transmit the morse letter 'U' every 15 seconds.

2.6.5 Should normal power supplies to the secondary white or subsidiary red navigation lights be interrupted, the lights will automatically continue to function powered by the 24V battery system. This battery has sufficient capacity to maintain the secondary white and subsidiary red lights and main foghorns on all three platforms for a minimum of four days and nights.

2.6.6 A control unit in the battery switch room of platform QP distributes power supplies to the main and standby identification lights. Operation of these lights is normally controlled by a sun switch on QP. A manual override switch is located in the Radio Room for use during helicopter operations. The lights are synchronised to flash at five second intervals.

2.6.7 In the event of main white identification lights failure, the standby lights automatically illuminate, together with alarm indication in the Radio Room.

2.7 Foghorns

2.7.1 Main and secondary foghorns are separately mounted and installed in pairs as follows:

(a) At the centre of TP1 north face, Cellar Deck level.

(b) At the centre of TCP2 east face, Cellar Deck level.

(c) At the centre of QP south face, Deck Support level.

2.7.2 Each main foghorn is a vertical array of eight emitters producing a horizontal acoustic beam through 360°, which sounds over a range of two nautical miles in still air.

2.7.3 Each secondary foghorn comprises two emitters producing a horizontal acoustic beam through 360°, which sounds over a range of half a nautical mile in still air.

2.8 Foghorn Power Supplies

2.8.1 The main foghorns of QP, TP1 and TCP2 operate in parallel at 120V, 250Hz. This supply is provided through control unit SCR 750 (in QP) containing a transformer/rectifier and inverter, with the navigational aids 24V battery system floating across the dc link. The rectifier in this unit acts as a charger for the 24V, 1000Ah navigational aids battery. Power to the control unit is supplied from distribution board DB31 on Platform QP.

2.8.2 The secondary foghorns on the three platforms are supplied independently of each other. All are dc operated and powered from local 12V, 30Ah transformer/rectifiers and batteries. Each is fed from the local emergency (standby) supplies board. The batteries float across the transformer/rectifier outputs. A 'float' and 'boost' facility is provided. Float is the normal trickle charge condition and Boost is used to recharge the battery. When the battery is fully charged it will revert automatically to Float, indication being given at the charger panel.

2.9 Foghorn Control

2.9.1 The main foghorns on QP, TP1 and TCP2 are manually operated by a switch in the QP Radio Room.

2.9.2 Control unit SCR 750 (in QP) controls and codes power supplies to the main foghorns of all three platforms, the common output current being measured by a Horn Current Monitor in QP. Should the output of any main foghorn fall below a preset level, the control unit automatically initiates sounding of the secondary foghorns on all three platforms, and causes an alarm to indicate in QP Control Room.

2.9.3 The secondary foghorns on TP1 and TCP2 are synchronised to the secondary foghorn on QP, which acts as 'master'. There is no independent direct switching of the secondary foghorns, they operate from the main foghorn control unit, but only on main foghorn failure.

2.9.4 The main and secondary foghorns are synchronised to sound the morse letter 'U' every 30 seconds.

2.9.5 Should normal power supplies to a main foghorn be interrupted, it automatically continues to receive power from the 24V, 1000Ah navigational aids battery system. This battery system has sufficient capacity to maintain the main foghorns on all three platforms (as well as the secondary white and subsidiary red navigation lights) for a minimum of four days and nights.

2.9.6 Should normal power supply to a secondary foghorn be interrupted, its 12V, 30Ah battery automatically takes over. The battery system has sufficient capacity to maintain the foghorn for a minimum of four days and nights.

2.10 Helideck Lighting

2.10.1 The QP helideck perimeter is marked by 32 flush-mounted, 25W lights, alternately blue and white. They are a nominal 3m apart.

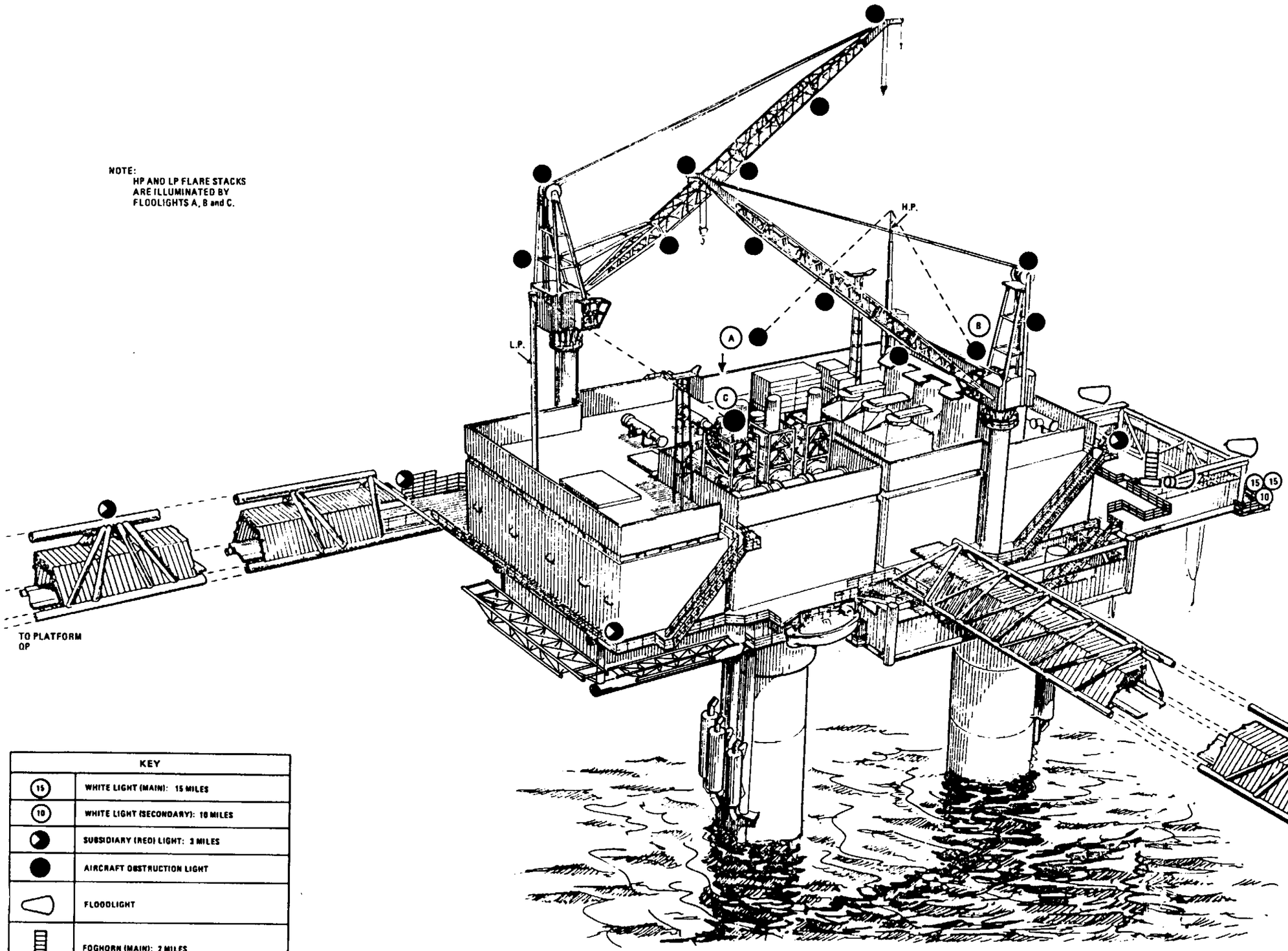
2.10.2 To ensure that the loss of any one light will not leave the perimeter unmarked, the lights are fed by six separately switched circuits at 110V ac. Power is supplied from distribution board DB31 via a transformer/rectifier with supporting battery, followed by an inverter. Final distribution is through DB25.

2.10.3 Should the power supply be interrupted the helideck lights are automatically transferred to battery supply.

2.10.4 Operation of the lights is manually controlled by the Helicopter Control Officer.

2.10.5 Two pairs of 500W tungsten-halogen floodlights are installed on the hangar roof to illuminate the helideck. Power is supplied from emergency supplies board DB25.

NOTE:
HP AND LP FLARE STACKS ARE ILLUMINATED BY FLOODLIGHTS A, B and C.

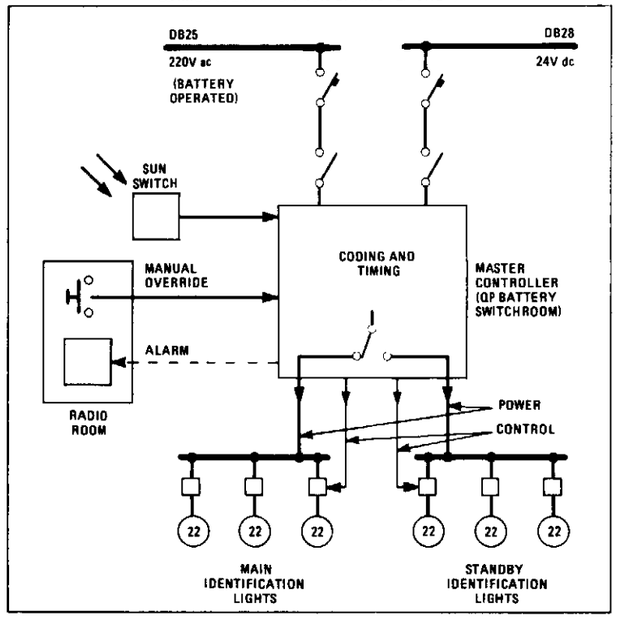


KEY	
15	WHITE LIGHT (MAIN): 15 MILES
10	WHITE LIGHT (SECONDARY): 10 MILES
	SUBSIDIARY (RED) LIGHT: 3 MILES
	AIRCRAFT OBSTRUCTION LIGHT
	FLOODLIGHT
	FOGHORN (MAIN): 2 MILES
	FOGHORN (SECONDARY): 1/2 MILE

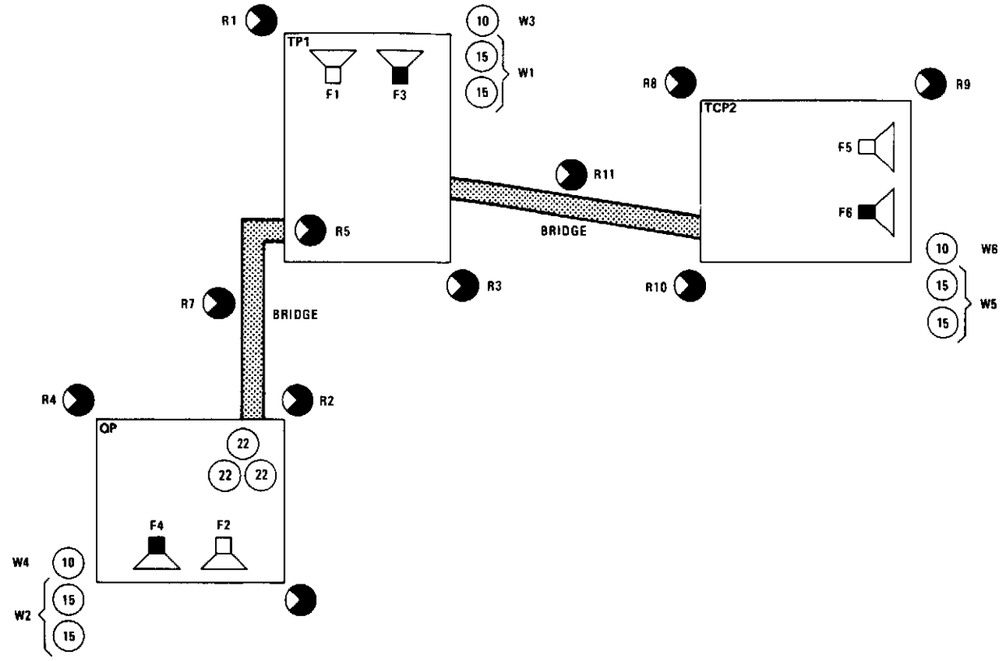
ISSUE 3. AUGUST 1984

NAVIGATIONAL AIDS Location	8.5.1

22-MILE IDENTIFICATION LIGHTS (QP ONLY)



GEOGRAPHICAL DISPOSITION



N

KEY		
15	WHITE LIGHT (MAIN)	15 MILES
10	WHITE LIGHT (SECONDARY)	10 MILES
	RED LIGHT (SUBSIDIARY)	3 MILES
22	MAIN & STANDBY IDENTIFICATION LIGHT	22 MILES
	FOG HORN (MAIN)	2 MILES
	FOGHORN (SECONDARY)	1/2 MILE
	CONTROL LINK	

NOTES

1. THE TWO NAVIGATION LIGHTS AND THE MAIN FOGHORN CONTROL UNITS ARE LOCATED ON THE QUARTERS PLATFORM
2. THE THREE SECONDARY FOGHORN CONTROL UNITS AND THEIR BATTERIES ARE ADJACENT TO THEIR RESPECTIVE FOGHORNS ON PLATFORMS QP, TP1 & TCP2

MAIN WHITE (15 MILE)

220V 1-PHASE FROM DB31 (OUTLET D6)

SUN SWITCH

QP

HALS 15 CONTROL UNIT

MANUAL SWITCH (RADIO ROOM)

TIMER CONTACT

220V 50Hz

FAILURE ALARM TO QP CONTROL ROOM

220/240V +5% + 10% + 15%

15 15 15

15 15 15

W1 W2 W5

TP1 QP TCP2

ITEMS SO MARKED ARE ENCLOSED FOR DIVISION 1 OR DIVISION 2 OPERATION

SECONDARY WHITE (10 MILE) AND SUBSIDIARY RED (3 MILE)

SUN SWITCH

QP

ILS 750 CONTROL UNIT

MANUAL SWITCH

TIMER CONTACT

120V 150Hz

CHANGEOVER TO 10-MILE LIGHTS

120V 150Hz QP

10 10 10

W3 W4 W6

TP1 QP TCP2

120V 150Hz QP

R1 R3 R5 R2 R4 R6 R7 R8 R9 R10 R11

TP1 QP QP/TP1 TCP2 TP1/TCP2

24V 1000Ah

QP

VOLTAGE AND CURRENT MONITOR

MAIN FOGHORNS (2 MILE)

220V 1-PHASE FROM DB31 (OUTLET D5)

QP

SCR 750 CONTROL UNIT

MANUAL SWITCH (RADIO ROOM)

250Hz

TIMER CONTACT

120V 150Hz

FOG HORN FAILURE ALARM TO QP RADIO ROOM

QP HORN CURRENT MONITOR

120/12V

F1 F2 F5

TP1 QP TCP2

START 1/2 MILE FOGHORNS

SECONDARY FOGHORNS (1/2 MILE)

220V 1-PHASE FROM DB31 (OUTLET D46)

QP

12V 30Ah

ALARM

F4 QP MASTER 1/2 MILE FOGHORN WITH TIMER

220V 1-PHASE FROM DB8 (OUTLET D46)

TP1

12V 30Ah

ALARM

F3 TP1 SLAVE 1/2 MILE FOGHORN

220V 1-PHASE FROM DB308 (OUTLET D39)

TCP2

12V 30Ah

ALARM

F6 TCP2 SLAVE 1/2 MILE FOGHORN

SYNCHRONISE AND CONTROL

ISSUE 1. JULY 1980

NAVIGATIONAL AIDS
Overall System

8.5.2

		Title	Issue
Section	9.2	ELF contingency plan & emerg.proced	4.April 93
Section	9.3	Area classification	3.Aug. 91
Diagram	9.3.1	cellar deck (FF 95.23.03.0048)	11.May 93
Diagram	9.3.2	lower level (FF 95.23.03.0046)	14.May 93
Diagram	9.3.3	upper level (FF 95.23.03.0047)	15.May 93
Diagram	9.3.4	looking West&East(FF 95.23.03.0074)	15 March 93
Diagram	9.3.5	looking South&North(FF95.23.03.0075)	14 March 93
Section	9.4 P.1	Audible and visual alarm	5.April 93
Section	9.4 P.2	" " " "	2.April 93
Diagram	9.4.1	Audible and visual alarm,cellar deck	7.April 93
Diagram	9.4.2	Audible and visual alarm,lower level	8.April 93
Diagram	9.4.3	Audible and visual alarm,upper level	4.April 93
Section	9.5 P.1	Shut downs	6.April 93
Section	9.5 P.2	" "	6.April 93
Section	9.5 P.3	" "	5.April 93
Section	9.5 P.4	" "	2.April 93
Diagram	9.5.1	Shutdown logic FF95.16.06.1414,1050	May 93
Diagram	9.5.2	Analysis of Safety Function FF 95 16 06 1046, (3 sheets)	May 93
Section	9.6	Fire & smoke detection	5.April 93
Diagram	9.6.1	Cell.dk (FF 95.16.06.1389 Sht.105)	May 93
Diagram	9.6.2	Low.Lvl (FF 95.16.06.1389 Sht.104)	May 93
Diagram	9.6.3	Upp.Lvl (FF 95.16.06.1389 Sht.103)	June 90
Section	9.7 P.1	Gas detection	5.April 93
Section	9.7 P.2	" "	7.April 93
Diagram	9.7.1	cellar deck Lvl(FF 95.16.06.1390 Sht.13)	May 93
Diagram	9.7.2	lower level (FF 95.16.06.1390 Sht.14)	May 93
Diagram	9.7.3	upper level (FF 95.16.06.1390 Sht.15)	May 93
Section	9.8 P.1	Fire fighting facilities	2.Aug. 91
Section	9.8 P.2	" " "	4.April 93
Diagram	9.8.1	" " " cell.deck lev.	7.April 93
Diagram	9.8.2	" " " lower level	8.April 93
Diagram	9.8.3	" " " upper level	4.April 93
Section	9.9 P.1	Fire water system	2.Aug. 91
Section	9.9 P.2	" " "	4.April 93
Section	9.9 P.3	" " "	4.April 93
Section	9.9 P4		5.April 93
Diagram	9.9	" " "	5.April 93
Section	9.10 P.1	Halon system	3.June 90
Section	9.10 P.2	" "	3.Aug. 91
Diagram	9.10.1	" " cellar deck level	7.April 93
Diagram	9.10.2	" " lower level	7.April 93
Diagram	9.10.3	" " upper level	5.April 93
Section	9.11	Firewalls & fireproofing	3.June 90
Diagram	9.11.1	" " " cell.deck.lev.	5.April 93
Diagram	9.11.2	" " " lower level	6.April 93
Diagram	9.11.3	" " " upper level	3.April 93
Section	9.12 P.1	First aid	4.Aug. 91
Diagram	9.12	" "	1.July 80
Section	9.13	Escape routes	1.July 80
Diagram	9.13	Safety plot plan & esc. routes	88
Diagram	9.13.1	" upper level	2.June 90
Diagram	9.13.2	" lower level	4.April 93
Diagram	9.13.3	" cellar deck level	4.April 93
Section	9.14	Emergency lighting	1.Mar. 87
Diagram	9.14	" "	2.Oct. 82
Section	9.15 P.1	Lifesaving equipment	3.Aug. 91
Section	9.15 P.2	" "	1.July 80
Section	9.15 P.3	" "	4.Aug. 91
Section	9.15 P.4	" "	1.July 80
Diagram	9.15.1	" " lifeboat,davit & winch	1.July 80
Diagram	9.15.2	" " liferaft	1.June 80

ORGANISATION

To be issued later

EAN CONTINGENCY PLAN AND EMERGENCY PROCEDURES

1 GENERAL

This document establishes the procedures to be used by the Elf Offshore Installation Manager or his deputy with regard to fixed structures, working barges, mobile rigs, supply and standby vessels in the Frigg Field and/or transport units to and from the Frigg Field. It itemises the procedures to be used in the event of the following major incidents:

(a) Fire/explosion.

(b) Total loss or damage which puts the installation out of operation.

(c) Total loss or damage to work barge, supply boat or standby vessel.

(d) Uncontrolled drift of rig or work barge from drilling or operating position.

(e) Uncontrolled blowout or other case of uncontrolled release of hydrocarbons, with or without ignition.

(f) Helicopter crashing or landing in the sea or crash landing on the installation, mobile rig, barge, work boat or standby vessel etc.

(g) Major sabotage or threat of major sabotage.

(h) Oil or other form of serious pollution.

(j) Serious illness, sudden death, or serious accident.

(k) Diving accident.

(l) Serious crime.

(m) Loss of, accident with, or danger from any radioactive source.

(n) Minor illness requiring evacuation.

(p) Man overboard.

(q) Any other incident requiring action or assistance from EAN.

AREA CLASSIFICATION

1 GENERAL

1.1 Platform areas have been evaluated for risk using the Institute of Petroleum Model Code of Safe Practice – Drilling and Production in Marine Areas – second edition part 8, 1972 Section 8, and the latest revision of the Institute of Petroleum Electrical Safety Code as a basis.

1.2 A dangerous area is one in which there exists or may exist a dangerous atmosphere. These areas are classified Zone 0, Zone 1 and Zone 2 or Unclassified as defined below.

ZONE 0	An area in which a dangerous atmosphere could continuously be present.
ZONE 1	An area in which a dangerous atmosphere is likely to occur under normal operating conditions.
ZONE 2	An area in which a dangerous atmosphere is only likely to occur under abnormal operating conditions.

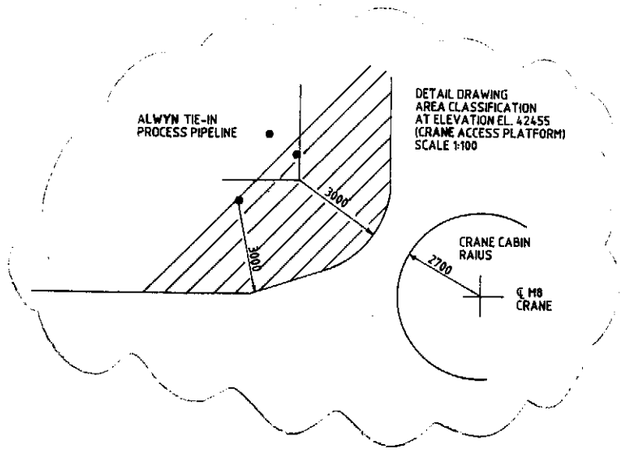
2 UNCLASSIFIED AREAS

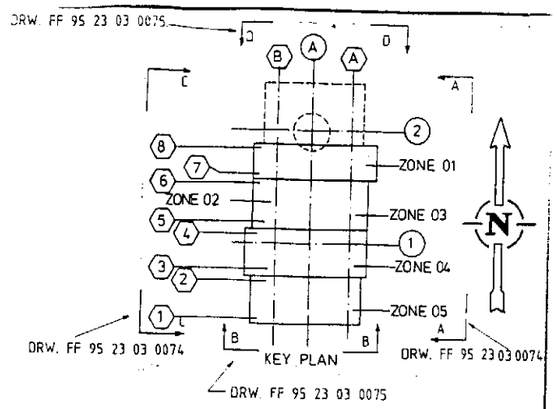
These are areas not included in the dangerous category and, on TP1, are achieved as follows:

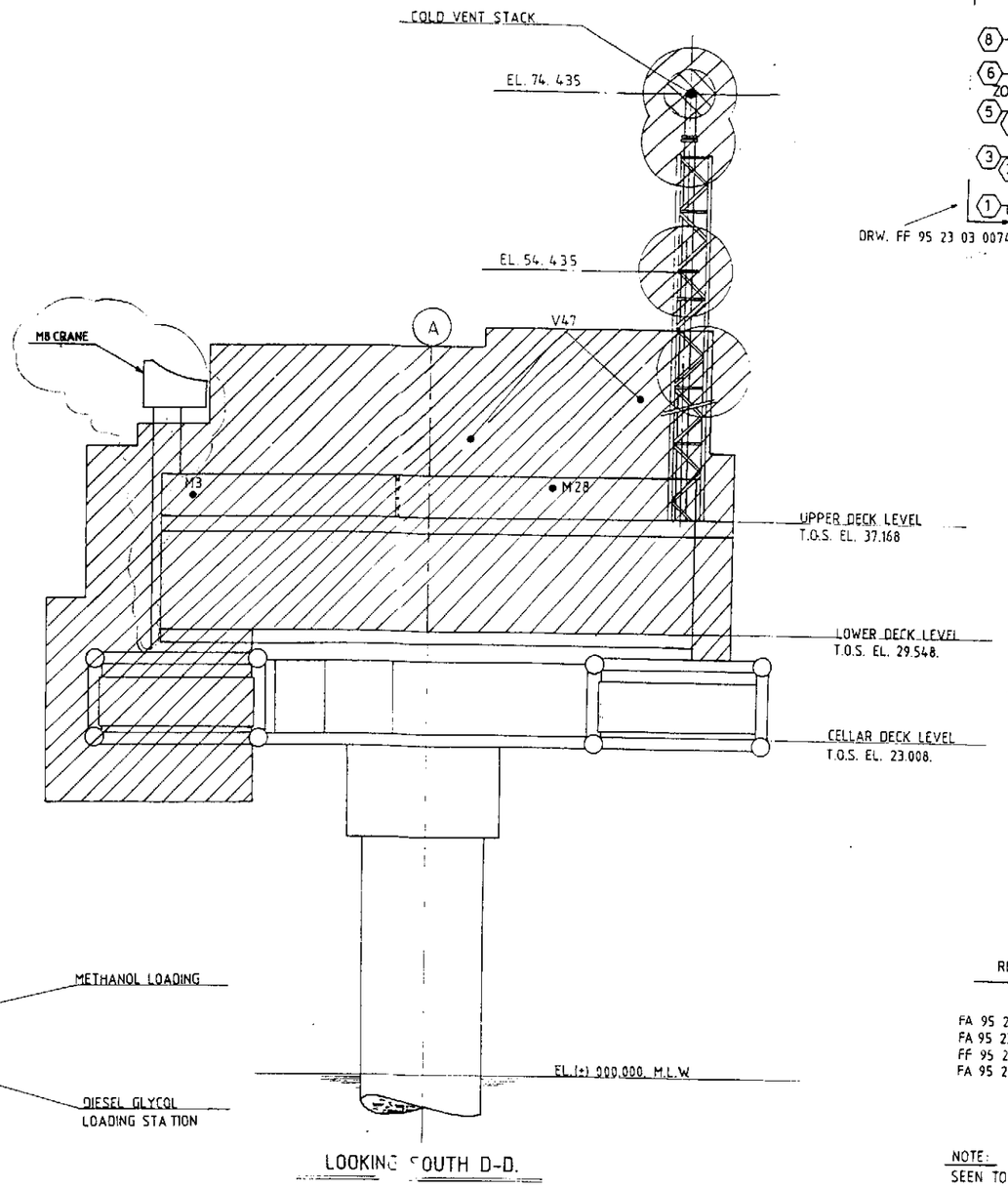
(a) Pressurising an enclosed space with air taken from an unclassified area.

(b) Defining exterior areas which are considered to be an adequate distance from any possible gas or vapour escapes so that the gas or vapour will be dispersed before reaching this area.

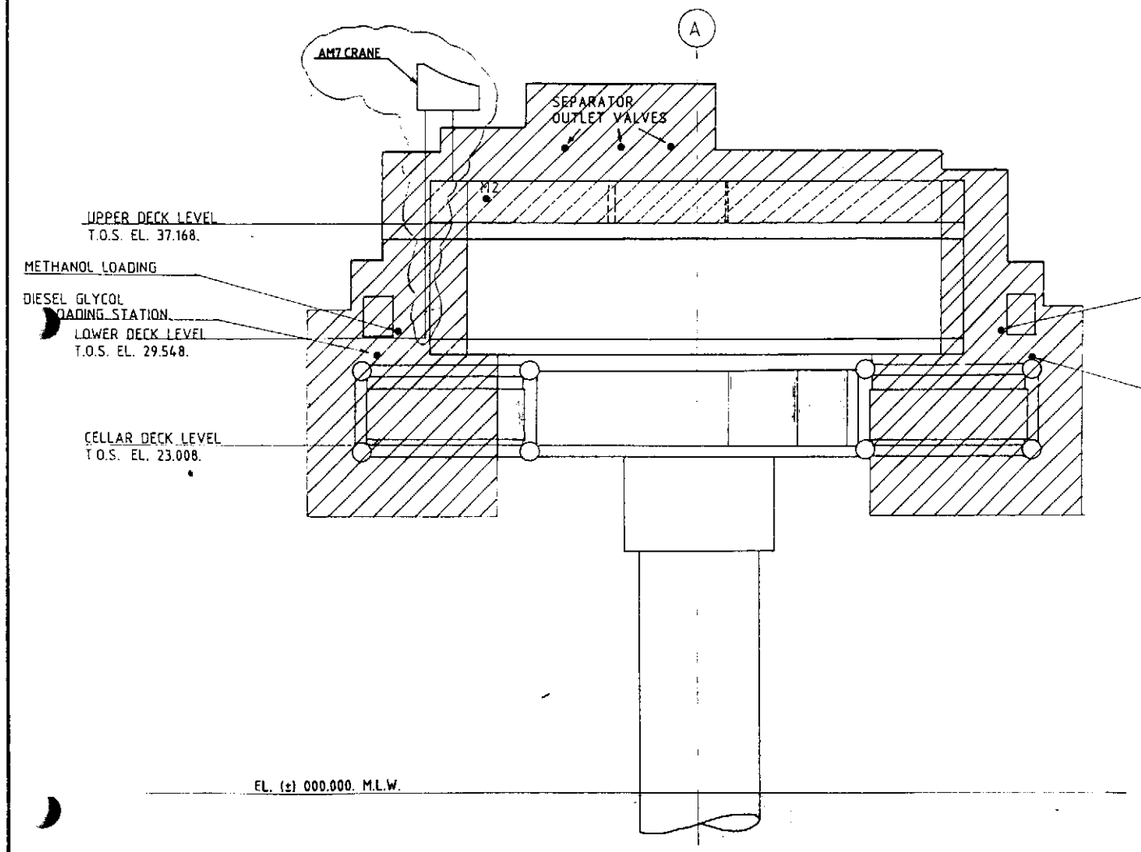
(c) Force vented areas which have a high rate of ventilation with air coming from an unclassified area. These areas are normally classified as Zone 2 if the ventilation is shut down.







LOOKING SOUTH D-D.



LOOKING NORTH B-B.

NOTES:

1. AREA CLASSIFICATION OF AREA IS IN ACCORDANCE WITH INSTITUTE OF PETROLEUM CODE OF SAFETY PRACTICE PARTS 1 & 8.

2. CLASSIFIED EQUIPMENT TO MEET THE MINIMUM REQUIREMENTS FOR GAS GROUPS IN ACCORDANCE WITH BS.S. 4683 GROUP II A OR EQUIVALENT IEC CLASS IIA.

LEGEND.

- ZONE 2 AREA.
- SAFE AREA.
- SOURCE OF HAZARD.
- ZONE 1 AREA.

REFERENCE DRAWINGS.

FA 95 23 03 0046. AREA CLASSIFICATIONILOWER LEVEL)
FA 95 23 03 0047. AREA CLASSIFICATION (UPPER LEVEL)
FF 95 23 03 0048. AREA CLASSIFICATION (CELLAR DECK)
FA 95 23 03 0074. AREA CLASSIFICATION.
LOOKING WEST A&A & EAST C-C

NOTE:
SEEN TO MIDDLE OF PLATFORM.

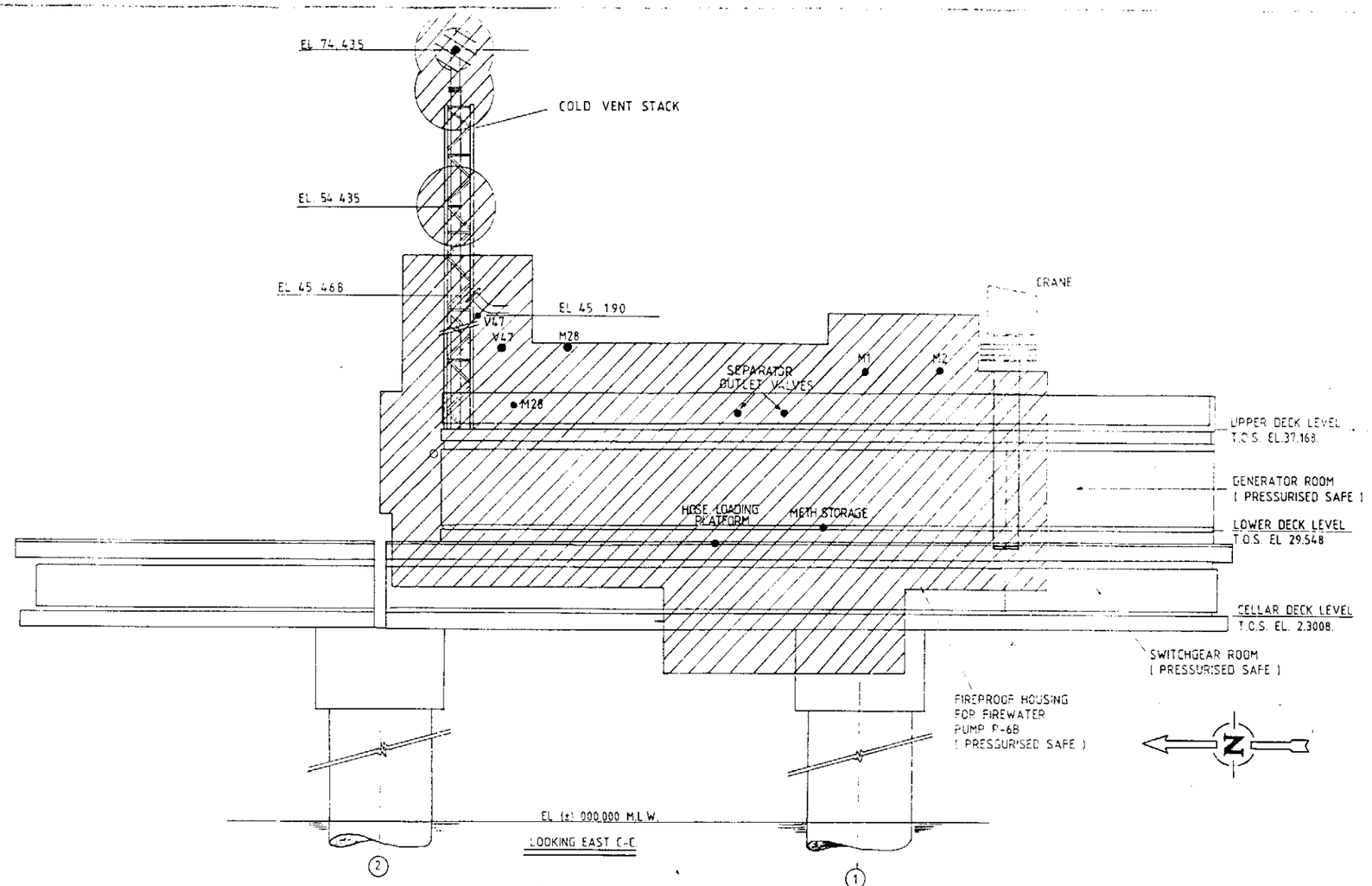
rev.	date	DESCRIPTION	by	app.
14	310393	REWISED AREA CLASSIFICATION CRANE M8	KNA	
13	6.6.90	TP1 RISER AS BUILT.		
12	1.11.89	ALWYN INTEGRATION	AH	
11	16.3.87	UPDATED	KB	
10	1.7.87	UPDATED	WT	
09	11.3.87	REVISED ZONE 2 AREA REDRAWN THE DRAWING.	WT	

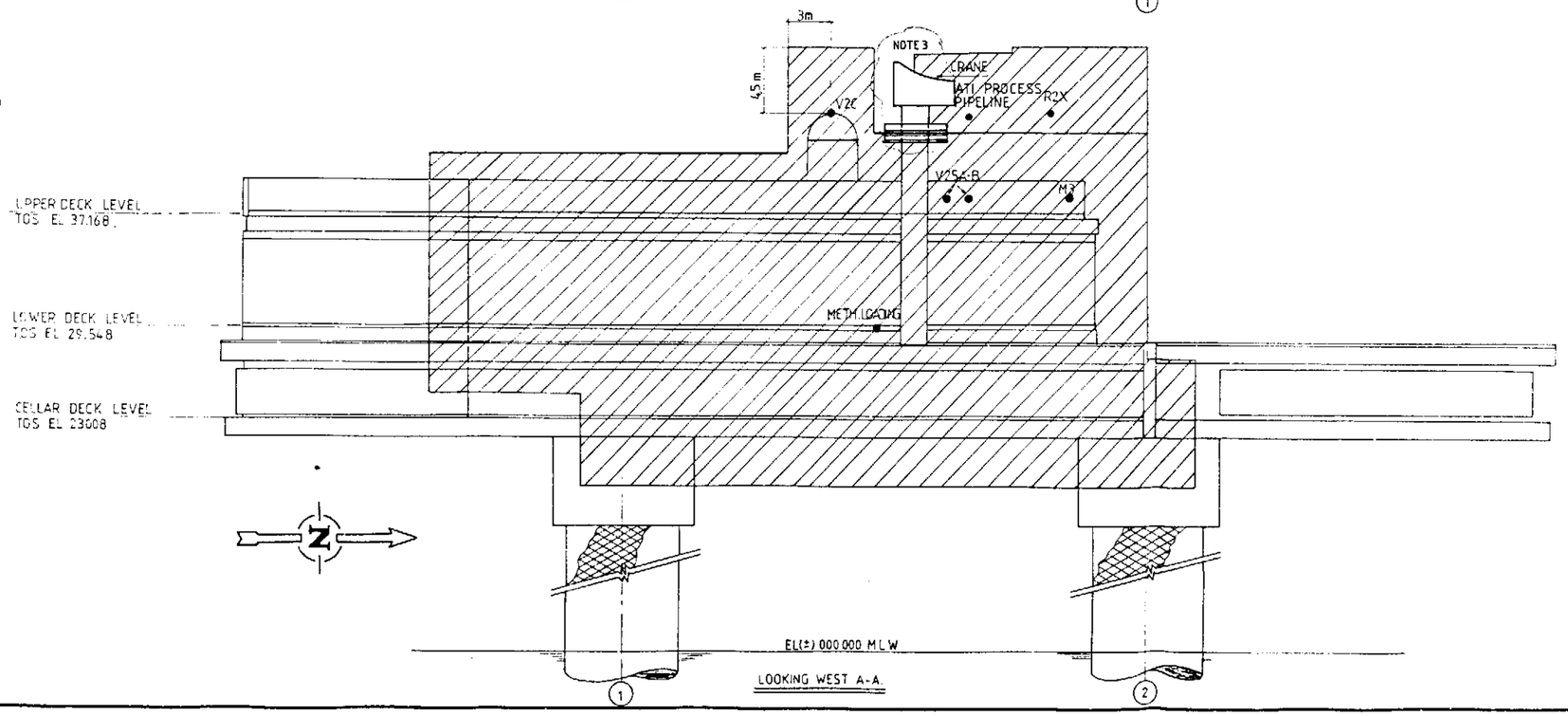
elf aquitaine norge as o.o.box 168 – 4001 Stavanger

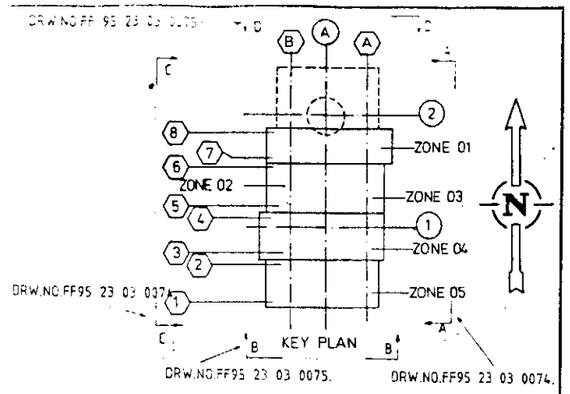
	Installation	System
	TP1	
Job no.	AREA CLASSIFICATION	
Scale 1:200	LOOKING NORTH & SOUTH	

FRIGG FIELD

Drwg. no. FF 95 23 03 0075 | Rev. 14 | Sheet 1







NOTES:

1. AREA CLASSIFICATION OF AREA IS IN ACCORDANCE WITH INSTITUTE OF PETROLEUM CODE OF SAFE PRACTICE PART 1 & 6.
2. CLASSIFIED EQUIPMENT TO MEET THE MINIMUM REQUIREMENT FOR GAS GROUPS IN ACCORDANCE WITH BS.S. 4683 GROUP II A OR EQUIVALENT I.E.C. CLASS IIA.
3. THE CRANE IS LOCATED IN NON CLASSIFIED AREA REF. DRAWING NO 95 23 03 0075 REV.14 SECTION D-D AND DETAIL DRAWING.

LEGEND:

- ZONE 2 AREA
- SAFE AREA
- SOURCE OF HAZARD
- ZONE 1 AREA.

REFERENCE DRAWINGS.

FA 95 23 03 0046 AREA CLASSIFICATION (LOWER LEVEL)
FA 95 23 03 0047 AREA CLASSIFICATION (UPPER LEVEL)
FF 95 23 03 0048 AREA CLASSIFICATION (CELLAR DECK)
FA 95 23 03 0075 AREA CLASSIFICATION
LOOKING NORTH B-B & SOUTH D-D.

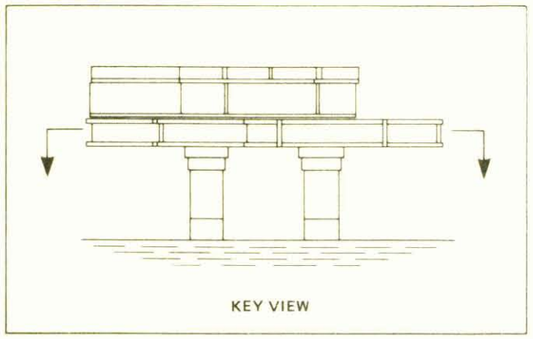
NOTE
SEEN TO MIDDLE OF PLATFORM

rev	date	DESCRIPTION	by	app
15	310393	REVISED AREA CLASSIFICATION CRANE M8	K.M.	
14	4.93	TRIP REPORT AS BUILT	KM	
13	2.93	REVISED INSTRUCTION	K.M.	
12	1.93	UPDATED	K.B.S.	
11	4.11.92	UPDATED	A.S.	
10	7.9.92	UPDATED	K.T.	
09	9.3.92	UPDATED AND REDRAWN THE DRAWING	W.T.	

elf aquitaine norge as p.o box 188 - 4001 Stavanger

	Installation	System
	TP1	
Job no	AREA CLASSIFICATION	
Scale 1:200	LOOKING WEST & EAST.	
FRIGG FIELD	Drwg no FF 95 23 03 0074	Rev 15

Sheet 1/



PLATFORM NORTH N

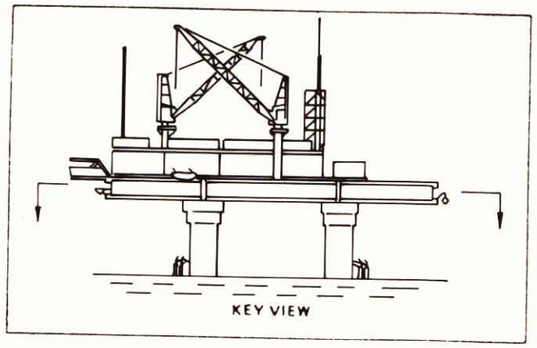
METHANOL LOADING
TOILET
ZONE 08
WORKSHOP (PRESSURISED SAFE)
STORAGE AREA (PRESSURISED SAFE)
WALKWAY No 1
WALKWAY No 2
AIR CONDITIONING ROOM
INSTRUMENT INTERFACE ROOM No 1
FIREWATER PUMP HOUSING (PRESSURISED SAFE)
ZONE 07
ZONE 09
5.5kV SWITCHBOARD
ZONE 06
SWITCHGEAR ROOM
COLUMN 1 INSIDE STRUCTURAL SUPPORT CAN
COLUMN 2 INSIDE STRUCTURAL SUPPORT CAN
ZONE 12
FUTURE COMPRESSOR UTILITIES PACKAGE
LIFEBOAT No 7
TRANSFORMER ROOM
INSTRUMENT INTERFACE ROOM No 2
FIREWATER PUMP HOUSING
ZONE 10
ZONE 13
PIPERACK TO OP BRIDGE
WALKWAY No 3
WALKWAY No 4
ZONE 11
METHANOL LOADING

KEY
- ZONE 1
- ZONE 2
- NON-HAZARDOUS

ISSUE 2. FEBRUARY 1981

AREA CLASSIFICATION
Cellar Deck Level

9.3.1



PLATFORM NORTH N

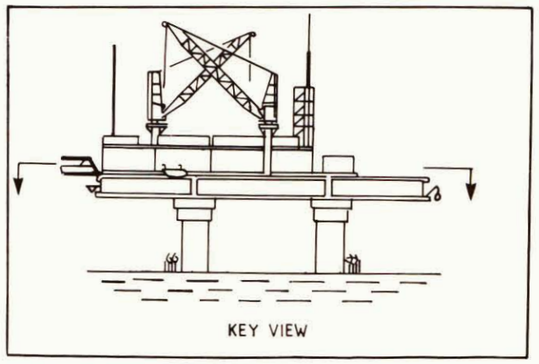
METHANOL LOADING
TOILET
UNIT 08
WORKSHOP (PRESSURISED SAFE)
STORAGE AREA (PRESSURISED SAFE)
WALKWAY No 1
WALKWAY No 2
AIR CONDITIONING ROOM
INSTRUMENT INTERFACE ROOM No 1
VS
UNIT 07
UNIT 09
FIREWATER HOUSING (PRESSURISED SAFE)
FUTURE COMPRESSOR UTILITIES PACKAGE
INSIDE STRUCTURAL SUPPORT CAN
INSIDE STRUCTURAL SUPPORT CAN
5.5kV SWITCHBOARD
UNIT 06
SWITCHGEAR ROOM
LIFEBOAT No 7
INSTRUMENT INTERFACE ROOM No 2
FIREWATER PUMP HOUSING
UNIT 10
TRANSFORMER ROOM
UNIT 13
PIPERACK TO OP BRIDGE
WALKWAY No 3
WALKWAY No 4
UNIT 11
METHANOL LOADING

KEY
ZONE 1
ZONE 2
NON-HAZARDOUS

ISSUE 4 AUGUST 1984

AREA CLASSIFICATION
Cellar Deck Level

9.3.1



PLATFORM NORTH

LIFEBOAT No 5

M7 PEDESTAL

BRIDGE TO QP

METHANOL STORAGE PLATFORM

HOSE LOADING PLATFORM

HOSE STORAGE PLATFORM

MODULE 04

MODULE 02

MODULE 01

MODULE 23

CALIBRATION CONTAINER

HATCH WAY

HATCHWAY

BATTERY ROOM

HATCHWAY

MODULE 05

MAJOR ACCESS WAY TO DP OR TCP2

MODULE 03

CONTACTOR VALVE MANIFOLDS

CABLING ROOM

M8 PEDESTAL

ROV PLATFORM

LIFEBOAT No 6

METHANOL STORAGE AND HOSE LOADING PLATFORM

BRIDGE TO TCP2

KEY

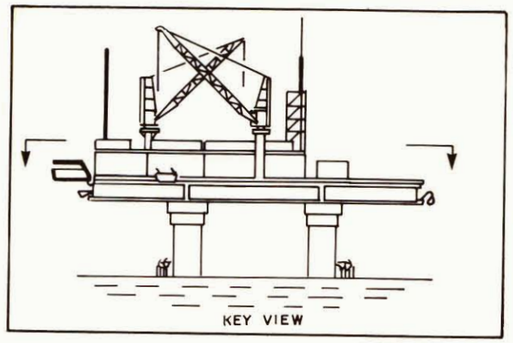
ZONE 2

NON-HAZARDOUS

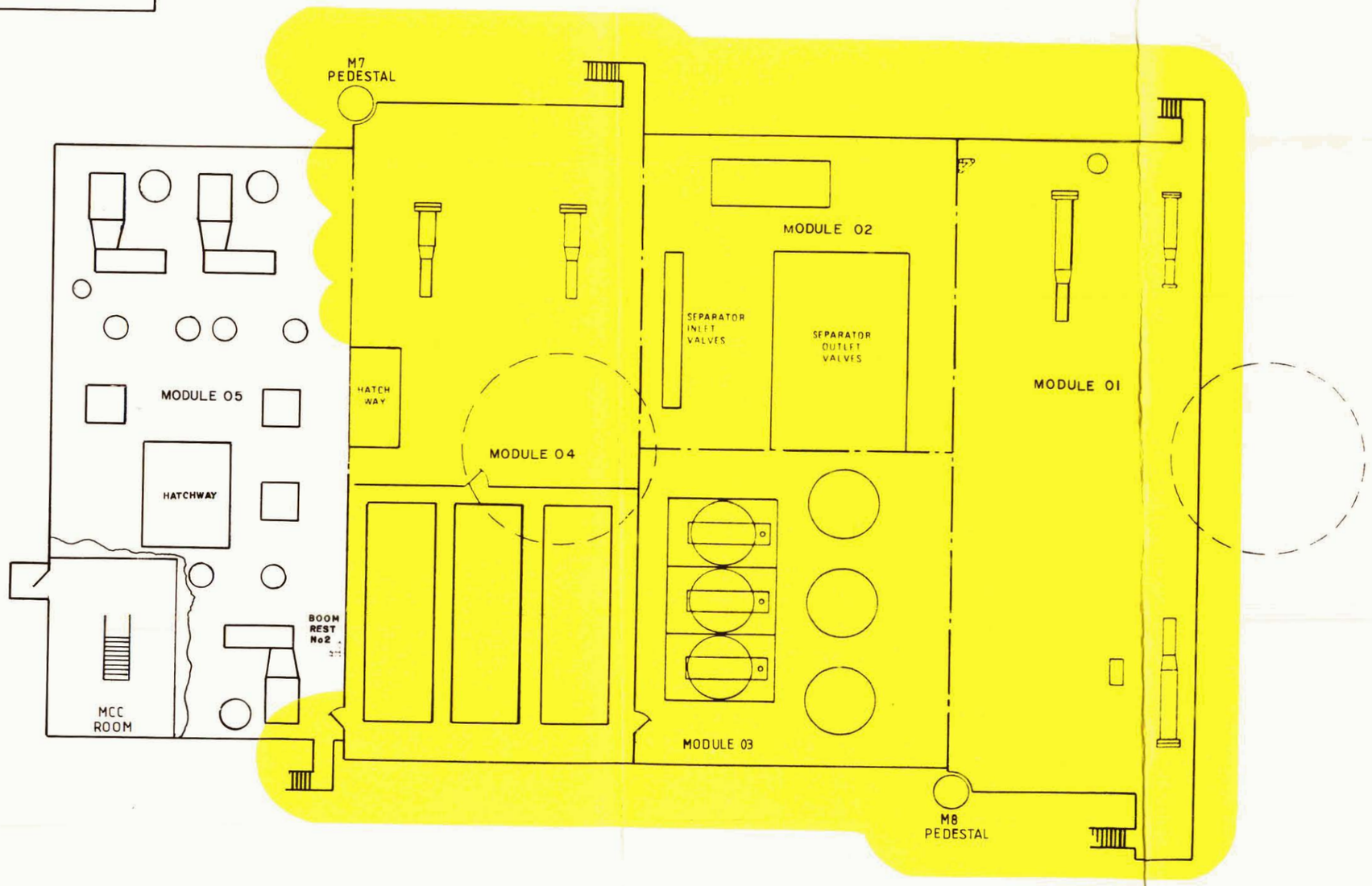
ISSUE 4 AUGUST 1984

AREA CLASSIFICATION
Lower Level

9.3.2



PLATFORM NORTH N



KEY

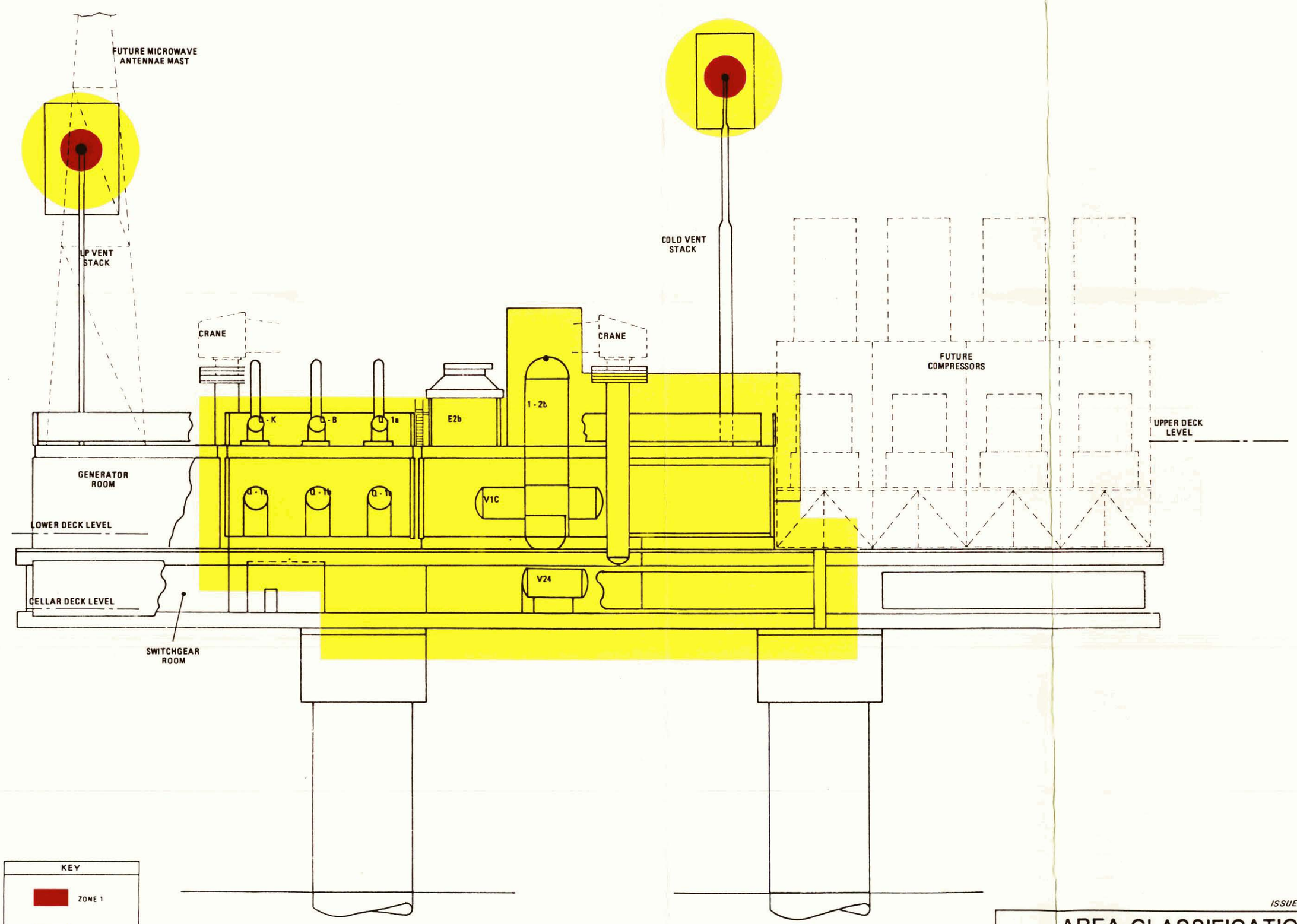
ZONE 2

NON-HAZARDOUS

ISSUE 4 AUGUST 1984

AREA CLASSIFICATION
Upper Level

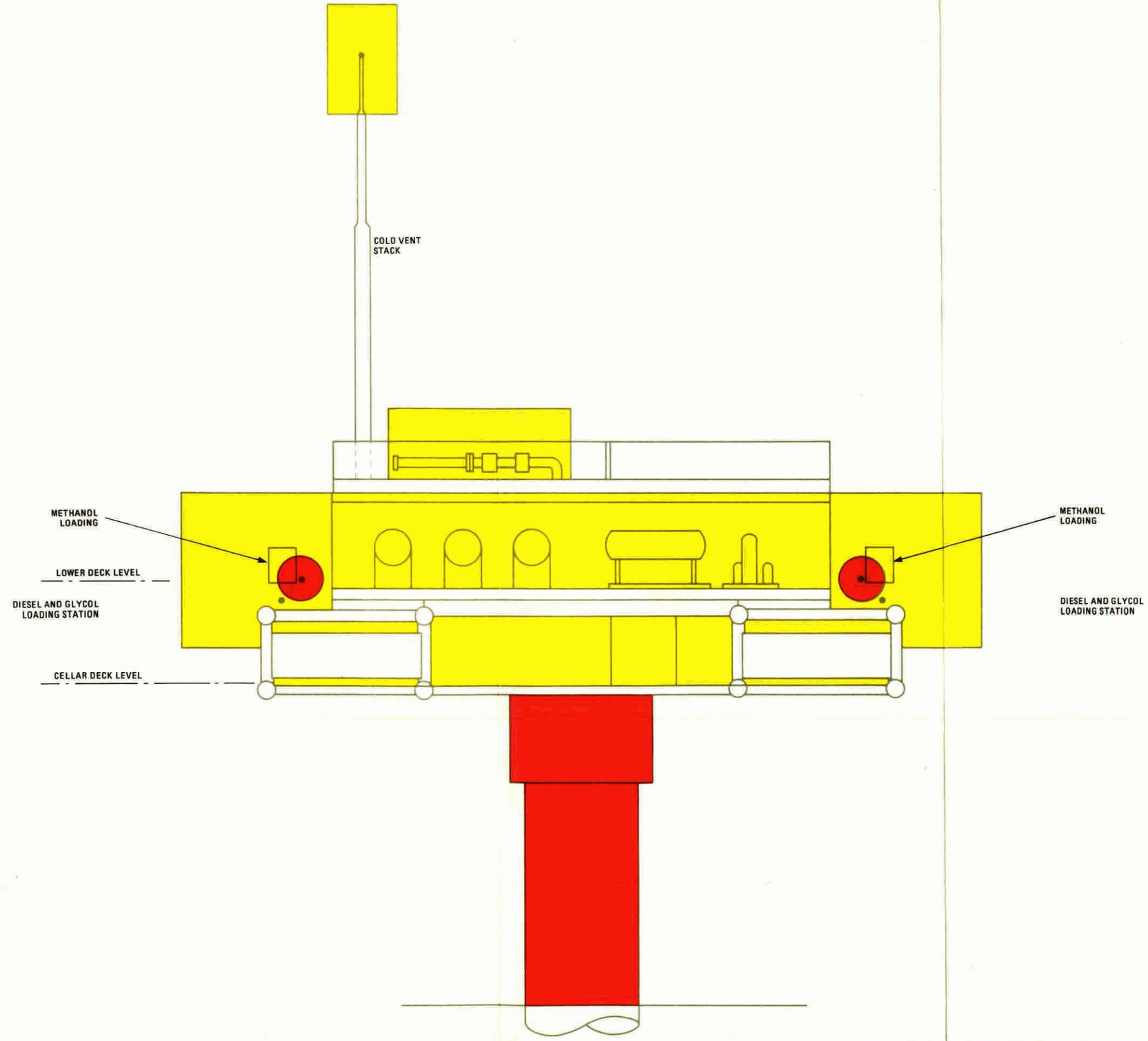
9.3.3



ISSUE 3 AUGUST 1984

AREA CLASSIFICATION
Hazard Section 'A-A' Looking West

9.3.4



KEY

ZONE 1

ZONE 2

ISSUE 2. FEBRUARY 1981

AREA CLASSIFICATION
Hazard Section 'B–B' Looking North

9.3.5

AUDIBLE AND VISUAL ALARMS

1 GENERAL

1.1 Audible and visual alarms are provided to give personnel information on the safety status of the platform.

1.2 Overall platform audible and visual alarms are broadcast by the Public Address (PA) System, refer to section 8.4.
These alarms are divided into the following categories:

(a) Verbal command
(b) Muster alarm
(c) Fire alarm

1.3 Local alarms are provided in certain areas for personnel evacuation and fire team orientation.

2 DESCRIPTION

2.1 Overall platform audible alarms:

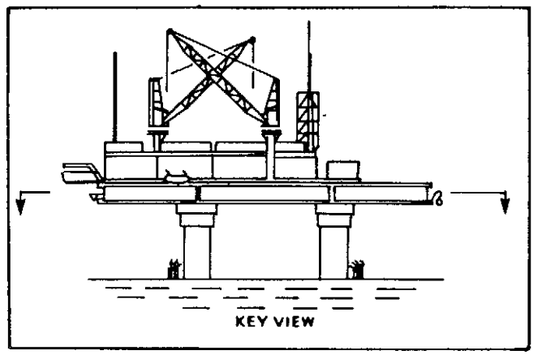
2.1.1 The audible alarms, broadcast by the Public Address System, are automatically ranked in following priorities:

(a) Verbal command
(b) Muster Alarm - continuous tone
(c) Fire alarm - intermittent tone at one-second intervals.

If a 'Fire' alarm is being given and a 'Muster' alarm is initiated the 'Muster alarm will override.

An 'Abandon' alarm is verbal command given over the public address system from a microphone at the main control desk. Verbal command override alarm tone for a period of 10 seconds.

2.1.2 Operation of audible alarms is controlled manually from pushbuttons and automatically by the Fire Detection System. Muster and fire alarm pushbuttons are situated on the Alarm Control Panel in the Control room.
A selector switch on the Alarm Control Panel allows for alarm tone selection. 'Muster' and fire alarms may be cancelled by actuation of a 'Cancel' pushbutton on the Alarm Control Panel.



PLATFORM NORTH N

UNIT 08
WORKSHOP
STORAGE AREA
WALKWAY No 1
WALKWAY No 2
AIR CONDITIONING ROOM
INSTRUMENT INTERFACE ROOM No 1
UNIT 07
VS
UNIT 09
FIREWATER 1 HOUSING
5.5kV SWITCHBOARD
UNIT 06
SWITCHGEAR ROOM
INSTRUMENT INTERFACE ROOM No 2
TRANSFORMER ROOM
COLUMN 1
COLUMN 2
FUTURE COMPRESSOR UTILITIES PACKAGE
LIFEBOAT No 7
UNIT 13
UNIT 10
PIPERACK TO OP BRIDGE
WALKWAY No 3
WALKWAY No 4
UNIT 11

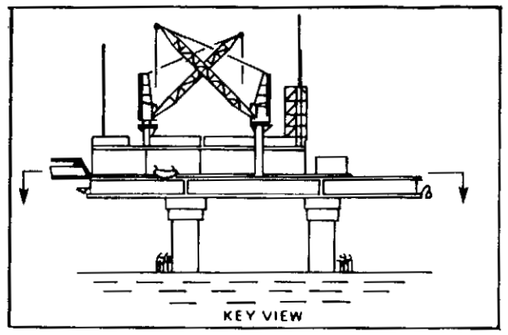
KEY

- FAB FIRE ALARM BUTTON
- PA AUDIBLE ALARM LOUDSPEAKERS
- R RED ALARM FLASHING LIGHT
- B BLUE ALARM FLASHING LIGHT

ISSUE 4 AUGUST 1984

AUDIBLE AND VISUAL ALARMS
Cellar Deck Level

9.4.1



PLATFORM NORTH N

LIFEBOAT Nº 5
M/ PEDESTAL
METHANOL STORAGE PLATFORM
HOSE LOADING PLATFORM
HOSE STORAGE PLATFORM
BRIDGE
FAB
MODULE 01
MODULE 02
CALIBRATION CONTAINER
HATCH WAY
MODULE 05
BATTERY ROOM
HATCHWAY
MODULE 01
HATCHWAY
MODULE 23
MAJOR ACCESS WAY TO OP OR TCP2
MODULE 03
CONTACTOR VALVE MANIFOLDS
CABLING ROOM
M8 PEDESTAL
ROV PLATFORM
METHANOL STORAGE AND HOSE LOADING PLATFORM
BRIDGE TO TCP2
LIFEBOAT Nº 6

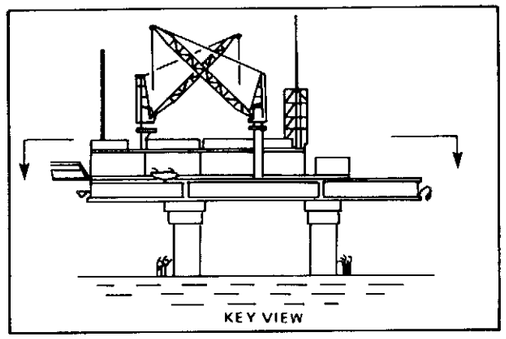
KEY

- FAB — FIRE ALARM BUTTON
- PA AUDIBLE ALARM LOUDSPEAKER
- R — RED ALARM FLASHING LIGHT
- B — BLUE ALARM FLASHING LIGHT

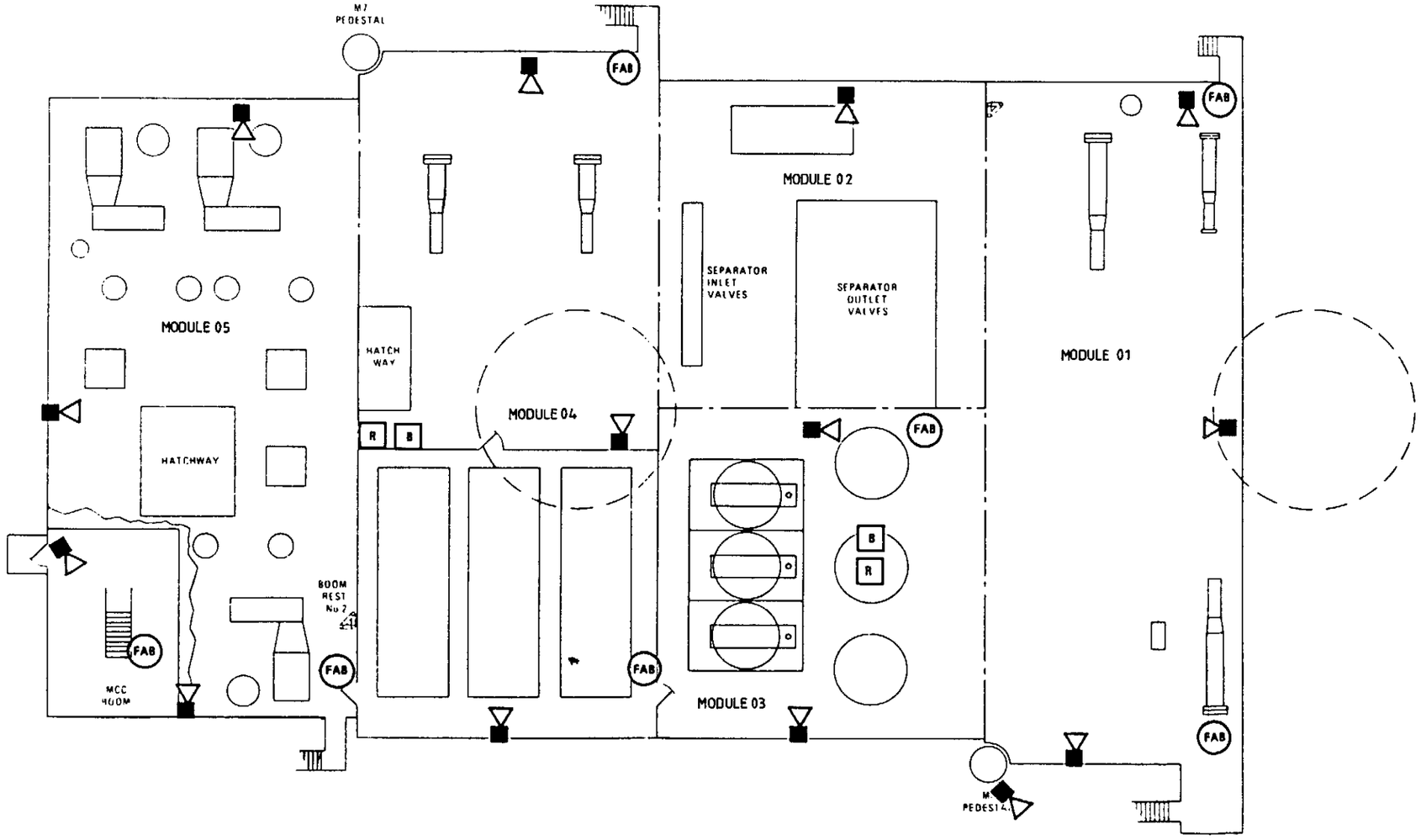
ISSUE 4 AUGUST 1984

AUDIBLE AND VISUAL ALARMS
Lower Level

9.4.2



PLATFORM NORTH N



KEY	
FAB	FIRE ALARM BUTTON
	PA AUDIBLE ALARM
R	RED ALARM FLASHING LIGHT
B	BLUE ALARM FLASHING LIGHT

ISSUE 4 AUGUST 1984

AUDIBLE AND VISUAL ALARMS
Upper Level

9.4.3

SHUTDOWNS

1 GENERAL

1.1 The major objectives of the TP1 shutdown system are:

(a) Prevention of injury to personnel.

(b) Prevention of damage to equipment.

(c) Operation of equipment with the minimum amount of production stoppages.

1.2 These objectives are met by Shutdown Systems which provide for shutdown of equipment of varying levels. Five levels of shutdown are provided; these are based on the degree of danger arising from a number of emergencies.

2 DESCRIPTION

2.1 First Level Shutdown

2.1.1 TP1 first level shutdown is initiated by operation of FSD pushbutton HS–MSD–1 in QP Control Room.

2.1.2 The effects of a TP1 First Level Shutdown are:

(a) A complete process shutdown without decompression.

(b) The main 5.5kV generators stop, the 5.5kV circuit breakers open and the 380V diesel generators on QP will start.

(c) The process pumps stop, and the ventilation system shuts down.

(d) The fire pumps start.

(e) The fire alarm sounds and warning lights flash.

(f) The relevant alarm annunciators operate in the TP1 Interface Room and the QP Control Room.

2.2 Second Level Shutdown

2.2.1 TP1 second level shutdown is initiated by operation of either ESD pushbutton HS–12 in QP Control Room or ESD pushbutton HS–13 in TP1 Interface Room.

2.2.2 The effects of a Second Level Shutdown are:

(a) A complete process shutdown with decompression after an adjustable delay of from 10 seconds to 10 minutes.

(b) The process pumps and fans stop, and the ventilation system shuts down.

(c) The fire pumps start.

(d) The fire alarm sounds and warning lights flash.

(e) The relevant alarm annunciators operate in the TP1 Interface Room and the QP Control Room.

2.3 Third Level Shutdown

2.3.1 TP1 third level shutdown is initiated by:

(a) Operation of ESD pushbuttons, as follows:

QP Control Room	HS–ESD–6
TP1 Interface Room	HS–ESD–1
QP Bridge Lifeboat Station	HS–ESD–3
TCP2 Bridge	HS–ESD–4
Motor Control Centre	HS–ESD–5
Zone 04 Upper Level	
Zone 02 Lower Level	

(b) Detection of fire in the Process Areas.

(c) Detection of gas at a level of 60 per cent LEL in the Process Areas.

(d) Detection of gas at a level of 60 per cent LEL around the Glycol Regeneration firewalls.

2.3.2 Limited third level shutdown is initiated by:

(a) Detection of gas at a level of 60 per cent LEL in the common ventilation inlet ducts.

(b) Detection of fire in the Workshop/Stores Areas.

(c) Detection of gas at a level of 60 per cent LEL in the Workshop/Stores Areas.

(d) Detection of fire in the Fire Pump Houses.

(e) Detection of gas at a level of 60 per cent LEL in the Fire Pump Houses.

2.3.3 The effects of Third Level Shutdown are:

(a) A complete process shutdown without decompression.

(b) Load shedding of all non-essential electrical supplies.

(c) The process pumps and fans stop.

(d) The ventilation system shuts down on fire and gas detection only.

(e) The fire pumps start on operation of the ESD pushbuttons, fire and gas detection only.

(f) The deluge valves open on fire detection, and gas detection around the Glycol Regeneration firewalls only.

(g) The fire alarm sounds and warning lights flash on operation of the ESD pushbuttons and fire detection only.

(h) The relevant alarm annunciators operate in TP1 Interface Room and QP Control Room.

2.3.4 Limited third level shutdown effects are as follows:

(a) Detection of gas in the common ventilation duct will isolate TP1 5.5kV supply and shut down the ventilation system only.

(b) Detection of fire or gas in the Workshop/Stores Areas or Fire Pump Houses will shut down the ventilation system only.

2.4 Fourth Level Shutdown

2.4.1 Fourth level shutdown will affect individual process streams A, B or C only. Typical initiations for one stream only are as follows:

(a) Third level shutdown.

(b) Pushbutton in QP Control Room.

(c) Pushbutton in TP1 Interface Room.

(d) Low pressure in stream free water knockout separator.

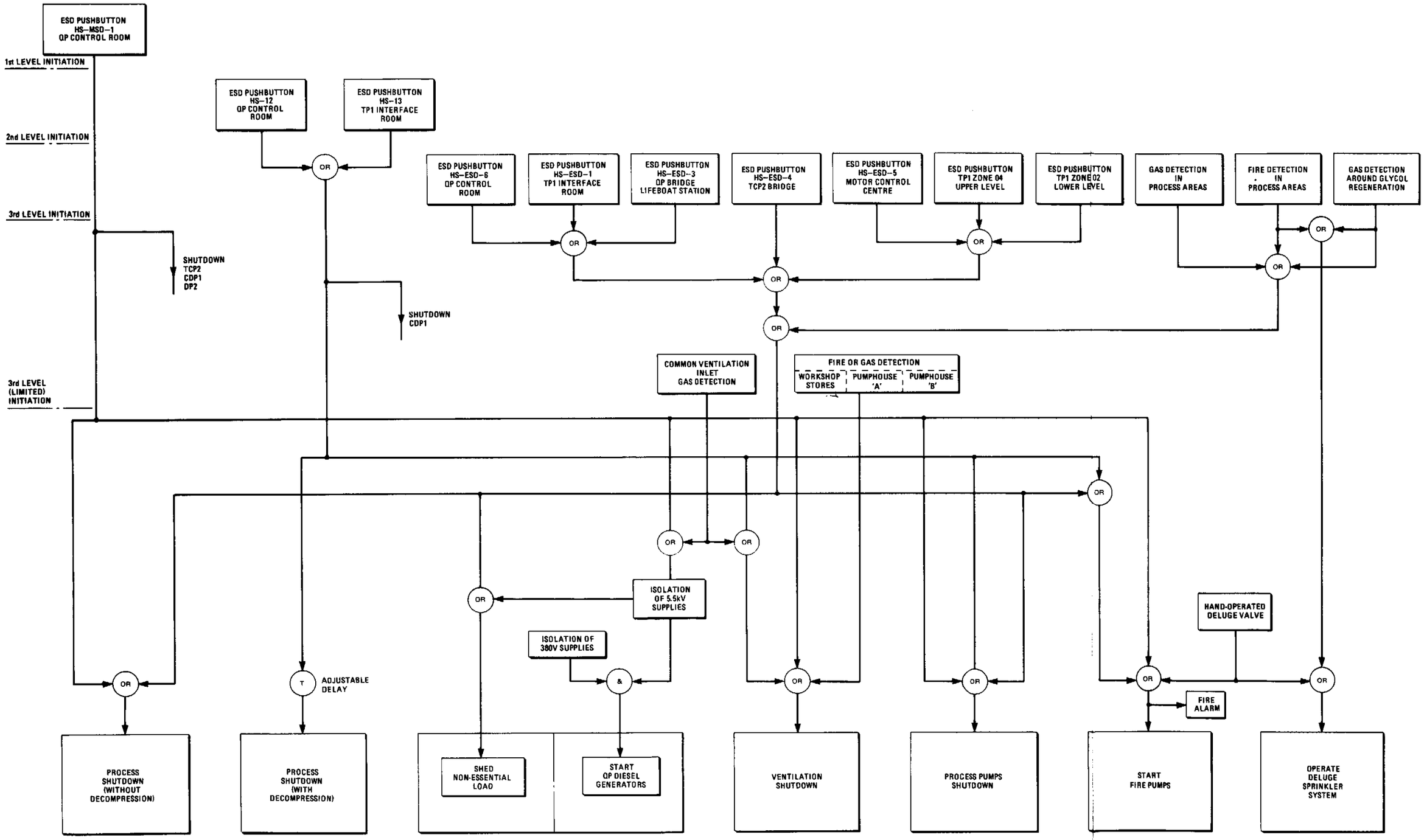
(e) Low pressure in stream glycol contactor.

(f) High pressure in stream outlet to sales gas header.

2.4.2 Effects of Fourth Level Shutdown. Initiation of the fourth level shutdown will result in closure of all emergency shutdown valves (ESDV) within the gas treatment stream.

2.5 Fifth Level Shutdown

Fifth level shutdown will affect various discrete equipments or groups of equipments in individual streams. The shutdown of various equipments will be initiated by equipment malfunctions, or in certain cases as a result of third level shutdown.



ISSUE 1. JULY 1980

SHUTDOWNS	9.5

ANALYSIS OF SAFETY FUNCTION

GROUP A,B,C

STREAM A, B, C } ISOLATION

SD LEVEL	DEVICE	TAGS	LOCATION
1	BREAK GLASS PUSHBUTTON	HS-MSD-1	QP CONTROL ROOM
2	BREAK GLASS PUSHBUTTON	HS-12	QP CONTROL ROOM
	BREAK GLASS PUSHBUTTON	HS-13	TP1 SHUTDOWN CAB'T
3	PUSHBUTTON	HS-ESD-6	QP CONTROL PANEL
	PUSHBUTTON	HS-ESD-1	TP1 SHUTDOWN CAB'T.
	PULL HANDLE VALVE	HS-ESD-2	TP1 FIELD
	PULL HANDLE VALVE	HS-ESD-3	TP1 FIELD
	PULL HANDLE VALVE	HS-ESD-4	TP1 FIELD
	PULL HANDLE VALVE	HS-ESD-5	TP1 FIELD
	CONTACTS IN SERIES	FIRE IN PROCESS AREA	TP1 FIRE DETECT CAB'T
	CONTACTS IN SERIES	GAS 60% IN PROCESS AREA	TP1 GAS DETECT CAB'T
4	PUSHBUTTON	HS-3	QP CONTROL PANEL
	PUSHBUTTON	HS-2	TP1 SHUTDOWN CAB'T.
	PRESSURE SWITCH	PSH-V2A-5A	TP1 FIELD
	PRESSURE SWITCH	PSL-V2A-22A	TP1 FIELD
	PRESSURE SWITCH	PSH-V2B-5A	TP1 FIELD
	PRESSURE SWITCH	PSL-V2B-22A	TP1 FIELD
	PRESSURE SWITCH	PSH-V2C-5A	TP1 FIELD
	PRESSURE SWITCH	PSL-V2C-22A	TP1 FIELD
5	PRESSURE SWITCH	LSLL-V2A-5A	TP1 FIELD
	PRESSURE SWITCH	LSHH-V14A-3	TP1 FIELD (GLYCOL UNIT)
	PRESSURE SWITCH	PXH-V14A-1	TP1 FIELD
	RELAY CONTACT	MC-M3-1	TP1 MISCEL RACK
	TELEMETRY CONTACT	MC-CM3-1	FROM TCP2
	TELEMETRY CONTACT	(MC-CM13-1)	FROM TCP2 (FUTURE)
	RELAY CONTACT	MC-V2A-1	TP1 MISCEL RACK
	RELAY CONTACT	MC-V2B-1	TP1 MISCEL RACK
	RELAY CONTACT	MC-V2C-1	TP1 MISCEL RACK
	PRESSURE SWITCH	PSL-M3-2	TP1 FIELD
	TELEMETRY CONTACT	PSL-CM3-2	FROM TCP2
	PRESSURE SWITCH	LSLL-V2B-5A	TP1 FIELD
	PRESSURE SWITCH	LSHH-V14B-3	TP1 FIELD
	PRESSURE SWITCH	PXH-V14B-1	TP1 FIELD
	PRESSURE SWITCH	LSLL-V2C-5A	TP1 FIELD
	PRESSURE SWITCH	LSHH-V14C-3	TP1 FIELD
	PRESSURE SWITCH	PXH-V14C-1	TP1 FIELD

SHUTDOWN OR CONTROL DEVICE I.D.	FUNCTION PERFORMED
	GROUP A
ESDV-V2A-1	HP GAS INLET GLYCOL CONTACTOR
ESDV-V2A-4	GAS TO SALES HEADER
ESDV-V2A-2	RICH GLYCOL FROM GLYCOL CONTACTOR
	GLYCOL REGENERATION UNIT
E2A-STOP	ELECTRICAL SHUTDOWN
P10A-STOP	
P10B-STOP	
	GROUP B
ESDV-V2B-1	HP GAS INLET GLYCOL CONTACTOR
ESDV-V2B-4	GAS TO SALES HEADER
ESDV-V2B-2	RICH GLYCOL FROM GLYCOL CONTACTOR
	GLYCOL REGENERATION UNIT
E2B-STOP	ELECTRICAL SHUTDOWN
P10C-STOP	
P10D-STOP	
	GROUP C
ESDV-V2C-1	HP GAS INLET GLYCOL CONTACTOR
ESDV-V2C-4	GAS TO SALES HEADER
ESDV-V2C-2	RICH GLYCOL FROM GLYCOL CONTACTOR
	GLYCOL REGENERATION UNIT
E2C-STOP	ELECTRICAL SHUTDOWN
P10E-STOP	
P10F-STOP	

NOTE: 1. MC-M3-1 AND MC-(V2A(B)(C)-1) MUST BOTH BE OPERATED TO CLOSE ESDV-V2A(B)(C)-4 WHEN THE STREAM IS CONNECTED TO PIPE 1. MC-CM3-1 AND MC-V2A(B)(C)-1 MUST BOTH BE OPERATED TO CLOSE ESDV-V2A(B)C(C)-4 WHEN THE STREAM IS CONNECTED TO PIPE 2.
2. PSL-M3-2 CLOSES ESDV-V2A(B)(C)-4 WHEN THE STREAM IS CONNECTED TO PIPE 1 . PSL-CM3-2 CLOSES ESDV-V2A(B)(C)-4 WHEN THE STREAM IS CONNECTED TO PIPE 2.
THE CHOICE OF THE PIPE IS OPERATED FROM THE SELECTOR SWITCH HS-A(B)(C)

PROCESS STREAM SHUTDOWN Matrix | 9.5.2

ANALYSIS OF SAFETY FUNCTION

GROUP U

PLATFORM ISOLATION AND COMMON FUNCTIONS

SD LEVEL	DEVICE	TAGS	LOCATION	SHUTDOWN OR CONTROL DEVICE I.D.	FUNCTION PERFORMED: WET GAS FROM COP1	WET GAS FROM COP1	MUD (TEMPORARY)	CONDENSATE FROM COP1	SALE I GAS TO SCOTLAND	TORN DRY GAS FROM 26"	TORN DRY GAS FROM 32"	GAS LINE "A" FOR CLOSING	GAS LINE "B" RDV	CONDESATE LINE ON COP1	COP1 SHUTDOWN	COP1	ELECTRICAL NON ESSENTIAL SUPPLIES	ELECTRICAL SHUTDOWN	ELECTRICAL SHUTDOWN TO TCP2	MOISTURE PIPE 1 TO TCP2	PRESSURE LOW IN PIPE 1 TO TCP2	FIRE WATER PUMPS	START FIRE WATER PUMPS TO OP AND TCP2	PIG LAUNCHING SEQUENCE INTERDICTION	SEPARATOR GAS INLET	SEPARATOR DUMP VALVE	SEPARATOR DUMP VALVE	SEPARATOR GAS OUTLET	SEPARATOR GAS INLET	SEPARATOR DUMP VALVE	SEPARATOR DUMP VALVE	SEPARATOR GAS OUTLET	SEPARATOR GAS INLET	SEPARATOR DUMP VALVE	SEPARATOR DUMP VALVE	SEPARATOR GAS OUTLET
					ESDV-M1-1	ESDV-M2-1	ESDV-M10A-1	ESDV-M9-2	ESDV-M3-1	ESDV-M4-1	ESDV-M5-1	PSL-M1	PSLL-M2	PSLL-M9.3				P1 STOP	P2 STOP	CP1 CP2 STOP	MC-M3-1	PSL-M3-2	P6A START	P6B START			ESDV-V1A1	ESDV-V1A2	ESDV-V1A3	ESDV-V1A4	ESDV-V1B1	ESDV-V1B2	ESDV-V1B3	ESDV-V1B4	ESDV-V1C1	ESDV-V1C2	ESDV-V1C3	ESDV-V1C4
1	BREAK GLASS PUSHBUTTON	HS-MSD-1	OP CONTROL ROOM		X	X	X	X	X	X	X				X	X		2	2	X			X	X												
2	BREAK GLASS PUSHBUTTON	HS-12	OP CONTROL ROOM		X	X	X	X	X	X	X					X	X	2	2	X			X	X												
	BREAK GLASS PUSHBUTTON	HS-13	TP1 SHUTDOWN CAB'T		X	X	X	X	X	X	X					X	X	2	2	X			X	X												
3	PUSHBUTTON	HS-ESD-6	OP CONTROL PANEL		X	X	X	X	X	X	X						X	2	2	X			X	X												
	PUSHBUTTON	HS-ESD-1	TP1 SHUTDOWN CAB'T		X	X	X	X	X	X	X						X	2	2	X			X	X												
	PULL HANDLE VALVE	HS-ESD-2	TP1 FIELD		X	X	X	X	X	X	X						X	2	2	X			X	X												
	PULL HANDLE VALVE	HS-ESD-3	TP1 FIELD		X	X	X	X	X	X	X						X	2	2	X			X	X												
	PULL HANDLE VALVE	HS-ESD-4	TP1 FIELD		X	X	X	X	X	X	X						X	2	2	X			X	X												
	PULL HANDLE VALVE	HS-ESD-5	TP1 FIELD		X	X	X	X	X	X	X						X	2	2	X			X	X												
	CONTACTS IN SERIE	FIRE IN PROCESS AREA	TP1 FIRE DETECT CAB'T		X	X	X	X	X	X	X							2	2	X			X	X												
	CONTACTS IN SERIE	GAS 60% IN PROCESS AREA	TP1 GAS DETECT CAB'T		X	X	X	X	X	X	X							2	2	X			X	X												
	TELEMETRY CONTACT	START FIRE WATER PUMPS	FROM OP AND TCP2																	X			X	X												
4	PRESSURE SWITCH	PSL-V1A-2A	TP1 FIELD																						X	X	X	X								
	HAND SWITCH	HS-ESD-V1A	TP1 FIELD																						X	X	X	X								
	PRESSURE SWITCH	PSL-V1B-2A	TP1 FIELD																										X	X	X	X				
	HAND SWITCH	HS-ESD-V1B	TP1 FIELD																										X	X	X	X				
	PRESSURE SWITCH	PSL-V1C-2A	TP1 FIELD																														X	X	X	X
	HAND SWITCH	HS-ESD-V1C	TP1 FIELD																														X	X	X	X
5	TELEMETRY CONTACT	PSHL-1P-1	FROM INTERM PLATFORM				X											2	2				X													
	PRESSURE SWITCH	PSH-M1-3	TP1 FIELD		X																															
	PRESSURE SWITCH	PSL-M1-1	TP1 FIELD		X		1				X																									
	PRESSURE SWITCH	PSH-M2-3	TP1 FIELD			X	X																													
	PRESSURE SWITCH	PSL-M2-1	TP1 FIELD			X	(1)				X																									
	PRESSURE SWITCH	PSH-M9-3	TP1 FIELD				X																													
	PRESSURE SWITCH	PSL-M9-3	TP1 FIELD				X				X																									
	PRESSURE SWITCH	PSH-M4-1	TP1 FIELD					X																												
	PRESSURE SWITCH	PSL-M4-2	TP1 FIELD					X																												
	PRESSURE SWITCH	PSH-M5-1	TP1 FIELD						X																											
	PRESSURE SWITCH	PSL-M5-2	TP1 FIELD						X																											
	PRESSURE SWITCH	PSH-M3-2	TP1 FIELD				X											2	2	X			X													
	PRESSURE SWITCH	PSL-M3-2	TP1 FIELD				X											2	2	X		X	X													
	VALVE POSITION SWITCH	E2SL-M3-1	TP1 FIELD															2	2	X			X													
	TELEMETRY CONTACT	STOP P1-P2	FROM TCP2															2	2																	
	RELAY CONTACT	MC-M3-1	TP1 MISCEL'S RACK																		X															
	PUSHBUTTON	HCR-P6A	OP FIRE/GAS PANEL																				X													
	PUSHBUTTON	HCR-P6B	OP FIRE/GAS PANEL																					X												
	POSITION SWITCH	ZS-M3-1	TP1 FIELD																						X											
	PRESSURE SWITCH	LSLL-V1A-7A	TP1 FIELD																							X	X									
	PRESSURE SWITCH	LSHH-V1A-6A	TP1 FIELD																								X									
	PRESSURE SWITCH	LSLL-V1B-7A	TP1 FIELD																												X	X				
	PRESSURE SWITCH	LSHH-V1B-6A	TP1 FIELD																													X				
	PRESSURE SWITCH	LSLL-V1C-7A	TP1 FIELD																																X	X
	PRESSURE SWITCH	LSHH-V1C-6A	TP1 FIELD																																	X

NOTE: 1. PSL-M1-1 AND PSL-M2-1 MUST BOTH BE OPERATED TO CLOSE ESDV-M9-2 2. STOP P1-P2 FROM TCP2 ONLY OPERATES WHEN THE CONDESATES IS INJECTED IN PIPE 2.

ANALYSIS OF SAFETY FUNCTION

GROUP V BRIDGE ISOLATION
GROUP Y BRIDGE ISOLATION
GROUP W BLOW DOWN (WITH TIME DELAY)

FUNCTION PERFORMED

SD LEVEL	DEVICE	TAGS	LOCATION	SHUTDOWN OR CONTROL DEVICE I.D.	GAS TO COMPRESSOR	GAS FROM COMPRESSOR	CONDESATE TO/FROM TCP2	CONDESATE TO/FROM TCP2	WET GAS TO/FROM TCP2	DRY GAS TO/FROM TCP2		BRIDGE ISOLATION (TO TCP2)		WET GAS FROM CDP1 VENT	WET GAS FROM CDP1 VENT		HP GAS VENT	SEPARATOR VENT	GLYCOL CONTACTOR VENT	GAS TO GLYCOL CONTACTOR VENT		HP GAS VENT	SEPARATOR VENT	GLYCOL CONTACTOR VENT	GAS TO GLYCOL CONTACTOR VENT		HP GAS VENT	SEPARATOR VENT	GLYCOL CONTACTOR VENT	GAS TO GLYCOL CONTACTOR VENT		HP GAS VENT	WET GAS FROM CDP1 VENT	SALES GAS HEADER VENT	CONDESATE SURGE TANK VENT		BRIDGE BLOWDOWN (TO TCP2)				DRY GAS TO/FROM TCP2 AT TCP2		SHUTDOWN COMPRESSOR A OR C
				ESDV-88	ESDV-82	ESDV-83	ESDV-87	ESDV-M1-2	ESDV-TCP2-1			ESDV-M1-3	ESDV-M2-3		ESDV-V1A-5	ESDV-V1A-6	ESDV-V2A-3	ESDV-V2A-8		ESDV-V1B-5	ESDV-V1B-6	ESDV-V2B-3	ESDV-V2B-8		ESDV-V1C-5	ESDV-V1C-6	ESDV-V2C-3	ESDV-V2C-8		ESDV-V2C-6	ESDV-V1C-7	ESDV-V2C-7	PCV-V3-4						ESDV-CTCP2-1				
1	BREAK GLASS PUSHBUTTON	HS-MSD-1	QP CONTROL ROOM		X	X	X	X	X	X		X																															
2	BREAK GLASS PUSHBUTTON	HS-12	QP CONTROL ROOM		X	X	X	X	X	X				X	X		X	X	X	X																							
	BREAK GLASS PUSHBUTTON	HS-13	TP1 SHUTDOWN CAB'T				X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X							
3	PUSHBUTTON	HS-ESD-6	QP CONTROL PANEL		X	X	X	X	X	X		X																															
	PUSHBUTTON	HS-ESD-1	TP1 SHUTDOWN CAB'T.				X	X	X	X		X																															
	PULL HANDLE VALVE	HS-ESD-2	TP1 FIELD		X	X	X	X	X	X		X																															
	PULL HANDLE VALVE	HS-ESD-3	TP1 FIELD		X	X	X	X	X	X		X																															
	PULL HANDLE VALVE	HS-ESD-4	TP1 FIELD		X	X	X	X	X	X		X																															
	PULL HANDLE VALVE	HS-ESD-5	TP1 FIELD		X	X	X	X	X	X		X																															
	CONTACTS IN SERIES	FIRE IN PROCESS AREA	TP1 FIRE DETECT CAB'T.		X	X	X	X	X	X		X																															
	CONTACTS IN SERIES	GAS 60% IN PROCESS AREA	TP1 GAS DETECT CAB'T		X	X	X	X	X	X		X																															
	TELEMETRY CONTACT	BRIDGE ISOLATION (Y)	FROM TCP2 TREATMENT		X	X	X	X	X	X		X																															
	TELEMETRY CONTACT	BRIDGE ISOLATION (Y)	FROM TCP2 COMPRESSION		X	X																																				
4	PNEUMATIC RELAY	PX-V3-7	TP1 FIELD																												X			X								
	PNEUMATIC RELAY	PY-V26-6	TP1 FIELD																																							
5	VALVE POSITION SWITCH	EZSH-M3-1	TP1 FIELD									X																												X	X		
	PRESSURE SWITCH	PY-V2B-18A	TP1 FIELD									X																												X	X		
	PRESSURE SWITCH	PY-V2B-19A	TP1 FIELD									X																												X	X		
	TELEMETRY CONTACT	O/P PROTECTION	FROM TCP2									X																															

BRIDGE ISOLATION AND BLOWDOWN Matrix | **9.5.4**

FIRE AND SMOKE DETECTION

1 GENERAL

1.1 A fire and smoke detection system is provided on TP1 which will detect and give early warnings of outbreaks of fire.

1.2 Detection of fire will result in the following:

(a) An audible alarm will sound throughout the platform.

(b) TP1, TCP2 and QP firewater pumps will start.

(c) Indication of the fire area at the fire control panels in the Instrument Interface Room and QP Control Room.

(d) Initiation of Emergency Shutdown (ESD) if the fire is in certain areas; see Section 9.5.

(e) In certain circumstances Halon or water sprinkler systems will be brought into operation.Refer to Sections 9.9 and 9.10 for details of areas protected by these systems.

2 DESCRIPTION

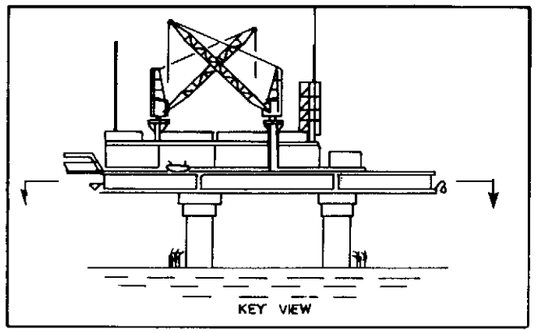
2.1 Three types of fire sensing elements are located at various positions throughout the platform. The sensing elements each transmit an electrical signal to a Minerva Type T870 control unit located in the Fire and Gas Detector Control Panel in the Instrument Interface Room.

2.2 The types and locations of sensors provided are:

(a) Heat detectors - Minerva Type F80, located in the gas turbine and workshop areas.

(b) Smoke detectors - Minerva Type F35 and F50, located in the condensate process and free water knockout separator areas.

(c) Ultraviolet detectors - Det-Electronics Type C7031B, located in Zones 01,02,03 and 04.



PLATFORM NORTH 2

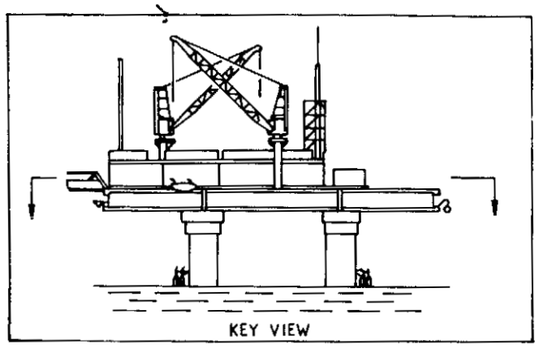
UNIT 08
WORKSHOP
STORAGE AREA
WALKWAY No 1
WALKWAY No 2
HD
SD
AIR IONIN
INSTRUMENT INTERFACE ROOM No 1
VS
UNIT 09
FIREWATER I HOUSING
UNIT 07
5 5kV SWITCHBOARD
UNIT 06
SWITCHGEAR ROOM
TRANSFORMER ROOM
INSTRUMENT INTERFACE ROOM No 2
FIREWATER II HOUSING
COLUMN 1
COLUMN 2
UNIT 10
FUTURE COMPRESSOR UTILITIES PACKAGE
LIFEBOAT No 7
UNIT 13
PIPERACK TO OP BRIDGE
WALKWAY No 3
WALKWAY No 4
UNIT 11

KEY
SD SMOKE DETECTOR
HD HEAT DETECTOR

ISSUE 4 AUGUST 1984

FIRE AND SMOKE DETECTION
Cellar Deck Level

9.6.1



PLATFORM NORTH N

LIFEBOAT NO. 5

M7 PEDESTAL

METHANOL STORAGE PLATFORM

HOSE LOADING PLATFORM

HOSE STORAGE PLATFORM

MODULE 04

MODULE 02

CALIBRATION CONTAINER

HATCH WAY

MODULE 05

BATTERY ROOM

CABLING ROOM

MAJOR ACCESS WAY TO Q.P. OR TCP2

MODULE 03

MODULE 01

CONTRACTOR VALVE MANIFOLDS

HATCHWAY

MODULE 23

M8 PEDESTAL

ROV PLATFORM

LIFEBOAT NO. 6

BRIGDE TO TCP 2

KEY

SD SMOKE DETECTOR

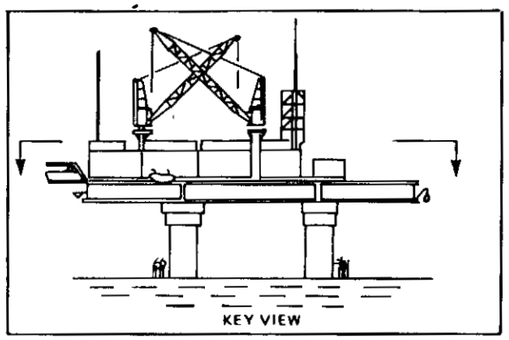
HD HEAT DETECTOR

UV ULTRA VIOLET DETECTOR

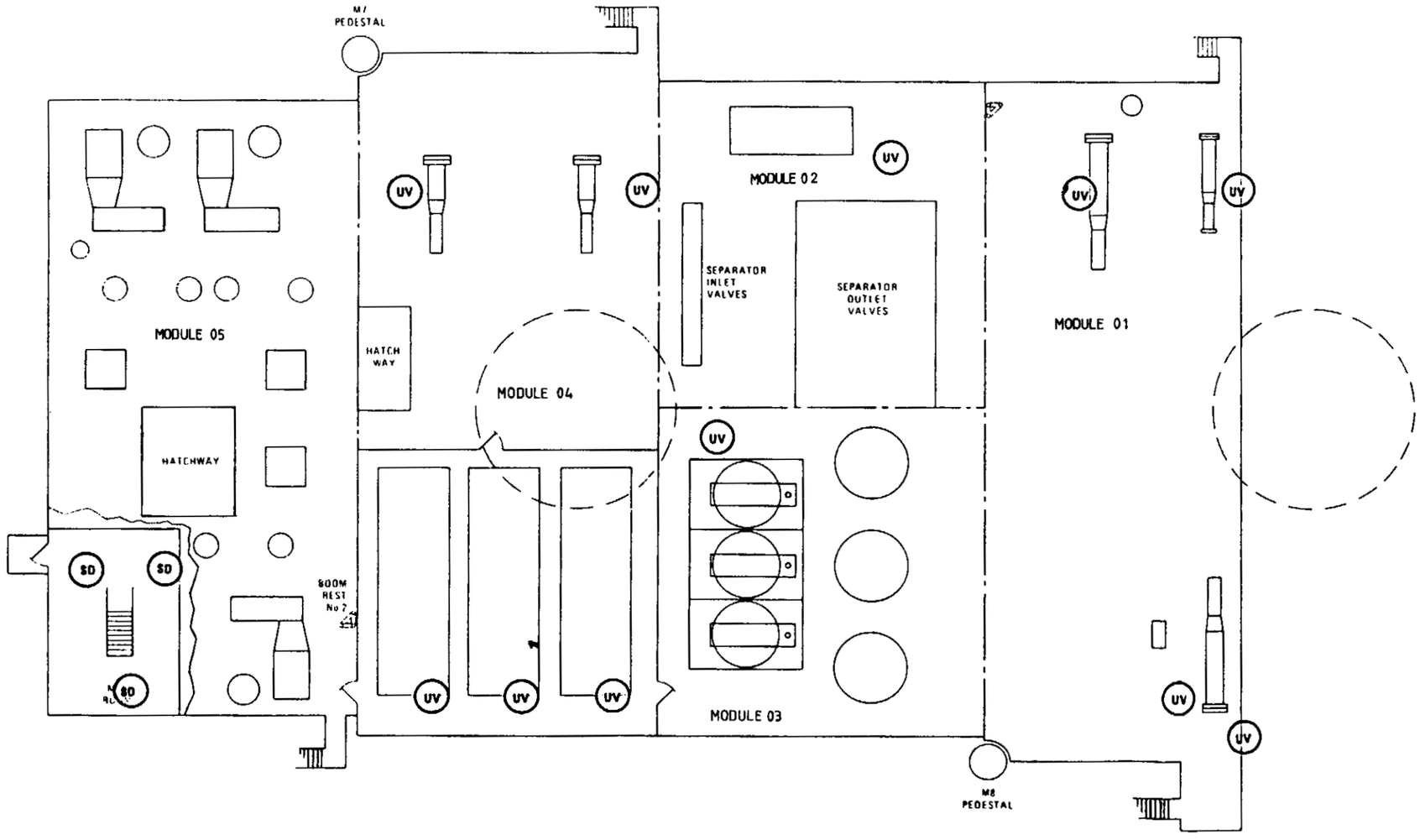
ISSUE 4 AUGUST 1984

FIRE AND SMOKE DETECTION
Lower Level

9.6.2



PLATFORM NORTH N



KEY	
UV	ULTRA-VIOLET DETECTOR
SD	SMOKE DETECTOR

ISSUE 4 AUGUST 1984

FIRE AND SMOKE DETECTION
Upper Level

9.6.3

GAS DETECTION

1 GENERAL

1.1 A gas detection system is provided on TP1 which detects the presence of flammable gas within a set range before the concentration of the gas becomes a hazard.

1.2 Detection of gas at the lower value of the set range will result in the following:

(a) An audible alarm will sound throughout the platform.

(b) TP1, TCP2 and QP firewater pumps will start.

(c) The hazard area will be indicated at the gas detection panels in TP1 Instrument Interface Rooms and QP Control Room.

2.1 The gas detection system on TP1 utilises Sieger Type 770 and 780 explosion proof sensor heads connected to Sieger Model 1402 or FS1 control units. Each gas detection loop comprises one sensor and one control unit.

2.3 Each control unit contains two manually adjustable alarm set points. Each set point is individually adjustable between 0 and 100 per cent of the lower explosive limit (LEL) of gas to air mixture.

2.4 The LEL settings of the sensors are:

Area/Zone	No of Detectors	LEL Setting	
		Low	High
Zone 01 Lower Level	8	20%	60%
Zone 02 Upper Level	4	20%	60%
Zone 02 Lower Level	4	20%	60%
Zone 03 Upper Level	4	20%	60%
Zone 04 Upper Level	8	20%	60%
Zone 05 Lower Level	9	20%	60%
Zone 05 Upper Level (Gas turbine air inlets)	3	-	15%
Zone 05 Upper Level	4	20%	60%
Zone 06 Cellar Deck S	4	20%	60%
Zone 07 Cellar Deck S	4	20%	60%

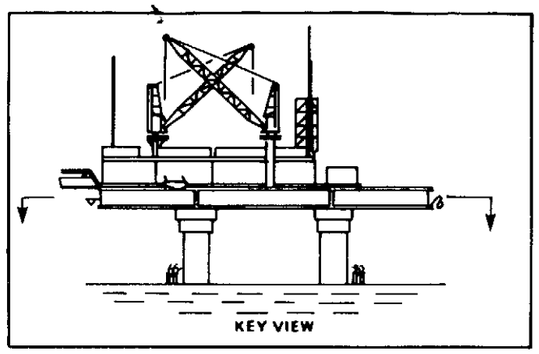
Area/Zone	No of Detectors	LEL Setting	
		Low	High
Zone 08 Cellar Deck N	1	20%	60%
Zone 09 Cellar Deck N	2	20%	60%
Zone 10 Cellar Deck S	2	20%	60%
Zone 10 Cellar Deck N	1	20%	60%
Zone 12 Cellar Deck N	1	20%	60%
Zone 12 Cellar Deck (Ingersoll Rand compressor air intake)	1	20%	60%
Leg C1 Cellar Deck	3	20%	60%
Leg C2 Cellar Deck	3	20%	60%

2.5 On 20% LEL (15% on Turbine Air Inlets) detected at any individual sensor a Zone alarm is initiated in QP control room.

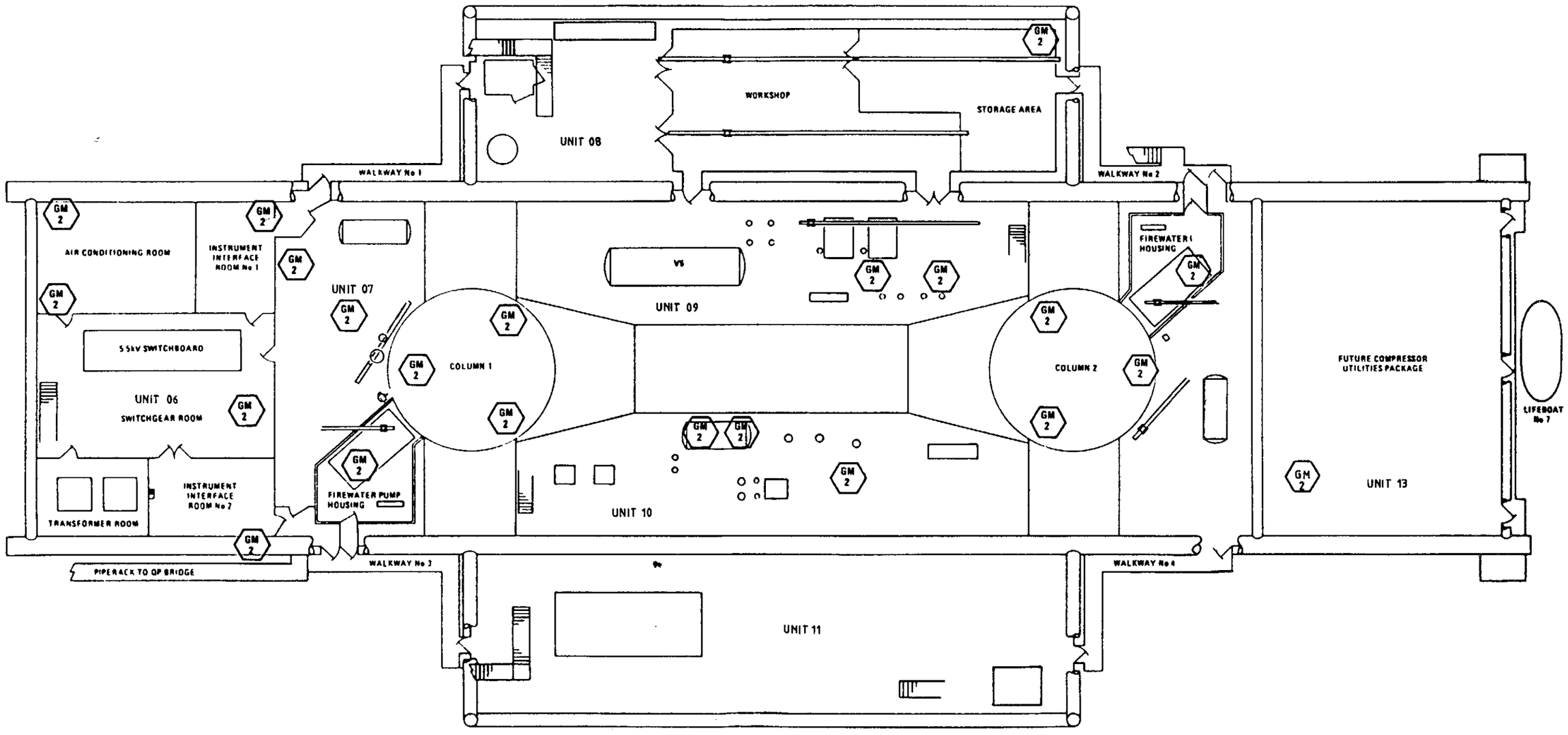
2.6 On 60% LEL detected at any individual sensor a general alarm is initiated in QP Control room.

2.7 All potentially hazardous process locations are monitored by two independent gas detection loops.
Coincidental 60% operation of both loops is required for shutdown in order to avoid spurious shutdowns due to equipment malfunction.

2.8 In Zone 05 (electrical areas) necessary ventilation and electrical equipment shutdowns and nominated local alarms (panel in MCC room) are initiated from relevant individual detectors.



PLATFORM NORTH N

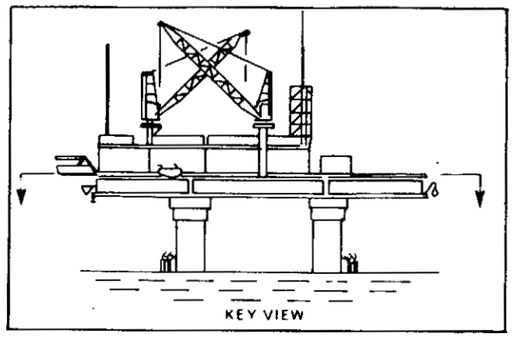


KEY
GM 2 GAS DETECTOR HEAD (TWO THRESHOLD LEVELS)

ISSUE 4 AUGUST 1984

GAS DETECTION
Cellar Deck Level

9.7.1



PLATFORM NORTH

LIFEBOAT Nº 5

M7 PEDESTAL

METHANOL STORAGE PLATFORM

HOSE LOADING PLATFORM

HOSE STORAGE PLATFORM

SHIELD TO TCP

MODULE 04

MODULE 02

MODULE 01

MODULE 05

MODULE 03

MODULE 23

CALIBRATION CONTAINER

HATCH WAY

BATTERY ROOM

HATCHWAY

CABLING ROOM

CONTACTOR VALVE MANIFOLDS

MAJOR ACCESS WAY TO DP OR TCP2

BRIDGE TO TCP2

METHANOL STORAGE AND HOSE LOADING PLATFORM

M8 PEDESTAL

ROV PLATFORM

LIFEBOAT Nº 6

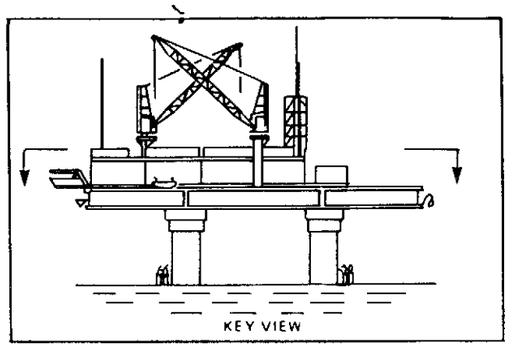
GM 2 — GAS DETECTOR HEAD (TWO THRESHOLD LEVELS)

GM 1 — GAS DETECTOR HEAD (ONE THRESHOLD LEVEL)

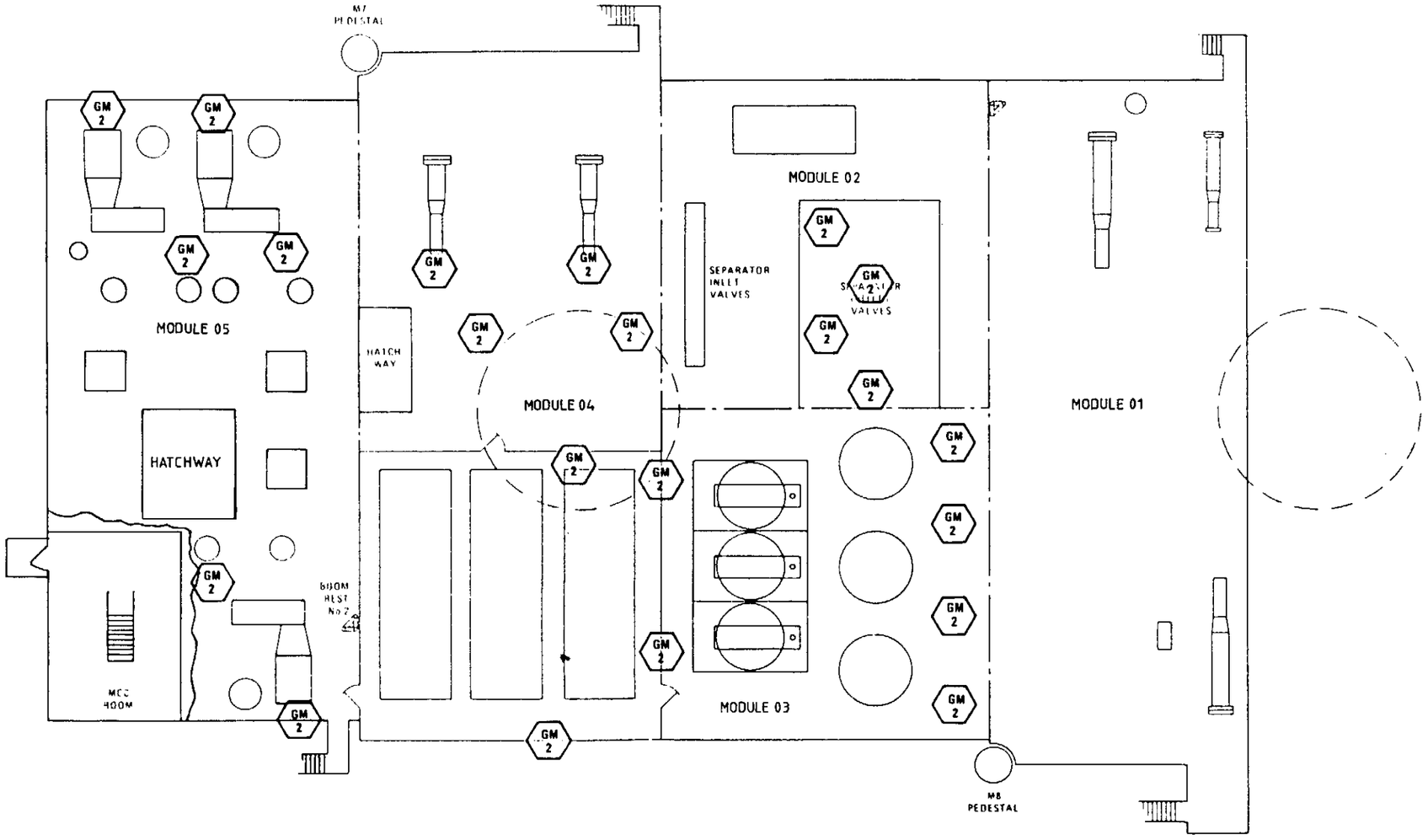
ISSUE 4 AUGUST 1984

GAS DETECTION Lower Level

9.7.2



PLATFORM NORTH N



KEY
GM 2 GAS DETECTOR HEAD (TWO THRESHOLD LEVELS)

ISSUE 3 AUGUST 1984

GAS DETECTION
Upper Level

9.7.3

FIREFIGHTING FACILITIES

1 GENERAL

1.1 TP1 is provided with automatic and manually operated firefighting facilities in accordance with the requirements of:

(a) Mineral Workings (Offshore Installations) Act 1971.

(b) Department of Trade (Marine Division).

(c) Det norske Veritas.

1.2 Each platform area is provided with at least one item from the following:

(a) Automatically operated firefighting systems.

(b) Manually operated firefighting equipment.

(c) Fireman's outfit and rescue equipment.

1.3 Five different types of extinguishant are used on TP1 as follows:

(a) CO_2. Suitable for liquid fuel and electrical equipment fires, particularly when damage may be caused by water or powder, or where the voltage is too high for water. Once dispersed, it gives no protection against re-ignition. Since CO_2 displaces oxygen, there is a risk of asphyxiation if used in a confined space.

(b) **Dry Powder.** Suitable for liquid fuel and electrical equipment fires. Since dry powder has no cooling properties it gives only limited protection against re-ignition.

(c) **Water Spray.** Suitable for solid fuel fires.

(d) **Halon 1301 (BTM).** This is a colourless, odourless, electrically non-conductive gas that extinguishes or prevents ignition by inhibiting the chemical reaction of fuel and oxygen, and is the least toxic of the vapour fire extinguishing agents. It is therefore suitable for fighting electrical fires or those involving flammable liquids. It will render a combustible mixture inert when it is present in approximately 6 per cent concentration. The discharge of Halon to extinguish a fire may create a hazard to personnel from the nature of Halon itself, and from the products of decomposition that result from exposure of Halon to the fire or other hot surfaces.

(e) **Foam.** Suitable for fires involving flammable liquids. Must not be used on electrical equipment.

2 DESCRIPTION

2.1 Independent Halon systems are provided in platform areas which present a special fire hazard or which contain electrical equipment. The Halon is stored in pressurised cylinders and is released automatically as a result of smoke detection in the protected area or manually as required. The Halon system associated with the cold vent stack is manually operated only.

2.2 The facilities which are supplied with sea water by the firewater system comprises:

(a) Water hosereels.

(b) Foam/water hosereels.

(c) Fire cannon monitors.

(d) Deluge systems.

(e) Washdown water hosereels.

2.3 Portable equipment comprises:

(a) CO_2 extinguishers — 6kg capacity.

(b) CO_2 extinguishers (trolley mounted) — 10kg capacity.

(c) Dry powder extinguishers — 12kg capacity.

(d) Dry powder extinguishers (trolley mounted) — 50kg capacity.

(e) Dry powder extinguishers (trolley mounted) — 100kg capacity.

2.4 **Fireman's Outfit and Rescue Equipment**

2.4.1 Fireman's outfits and rescue equipment are provided for the protection of rescue teams and to enable them to make forcible entry.

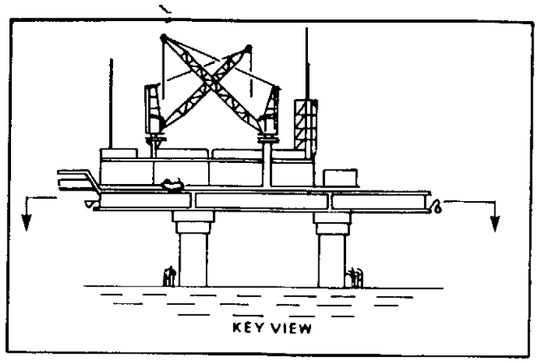
2.4.2 The equipment is located in protective boxes as follows:

(a) Fireman's Station, Lower Level, Zone 23 outside the Elf Office.

(b) Technical Teams Station, Lower Level, Zone 05, at the entrance to QP bridge

2.5 **Control**

The firewater system is supplied by pumps which are started automatically by operation of any fire alarm pushbutton. The location of the pushbuttons is shown on Diagram 9.8.



PLATFORM NORTH N

UNIT 08
WORKSHOP
STORAGE AREA
WALKWAY No 1
WALKWAY No 2
AIR CONDITIONING ROOM
INSTRUMENT INTERFACE ROOM No 1
UNIT 07
UNIT 09
VS
5 5kV SWITCHBOARD
UNIT 06
SWITCHGEAR ROOM
TRANSFORMER ROOM
INSTRUMENT INTERFACE ROOM No 2
FIRE WATER PUMP HOUSING
COLUMN 1
COLUMN 2
UNIT 10
UNIT 11
UNIT 13
FUTURE COMPRESSOR UTILITIES PACKAGE
LIFEBOAT No 7
PIPE RACK TO OP BRIDGE
WALKWAY No 3
WALKWAY No 4

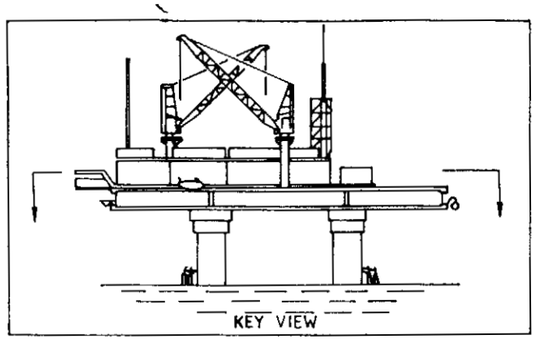
KEY

- C6 — 6 kg CO_2 EXTINGUISHER
- C10 — 10 kg CO_2 EXTINGUISHER
- D12 — 12 kg DRY POWDER EXTINGUISHER
- D50 — 50 kg DRY POWDER EXTINGUISHER
- D100 — 100 kg DRY POWDER EXTINGUISHER
- FAB — FIRE ALARM PUSHBUTTON
- DELUGE MANUAL START VALVE
- HALON MANUAL RELEASE
- FIRE CANNON MONITOR
- F — FOAM/WATER HOSE
- WASHDOWN WATER HOSEREEL

ISSUE 4 AUGUST 1984

FIREFIGHTING FACILITIES
Cellar Deck Level

9.8.1



PLATFORM NORTH N

LIFEBOAT NO. 5
BRIGDE TO Q.P.
METHANOL STORAGE PLATFORM
HOSE LOADING PLATFORM
HOSE STORAGE PLATFORM
MODULE 04
MODULE 02
MODULE 05
MODULE 01
MODULE 23
MODULE 03
CALIBRATION CONTAINER
HATCH WAY
BATTERY ROOM
CABLING ROOM
MAJOR ACCESS WAY TO Q.P. OR TCP2
CONTACTOR VALVE MANIFOLDS
HATCHWAY
ROV PLATFORM
LIFEBOAT NO. 6
BRIGDE TO TCP 2
METHANOL STORAGE AND HOSE LOADING PLATFORM
MR PEDESTAL

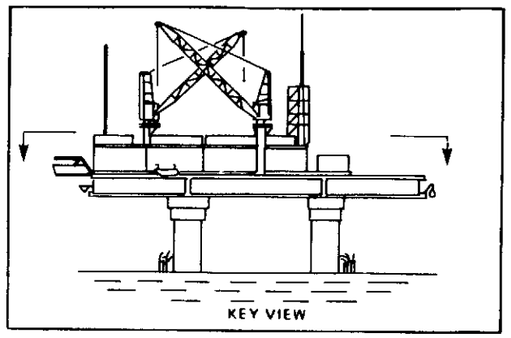
KEY

- C6 — 6kg CO_2 EXTINGUISHER
- C10 — 10kg CO_2 EXTINGUISHER
- D12 — 12kg CO_2 DRY POWDER EXTINGUISHER
- D50 — 50kg CO_2 DRY POWDER EXTINGUISHER
- D100 — 100kg DRY POWDER EXTINGUISHER
- W2 — WATER FIRE EXTINGUISHER 2gal CO_2 CARTRIDGE
- FAB — FIRE ALARM PUSHBUTTON
- DELUGE MANUAL START VALVE
- HALON MANUAL RELEASE
- FIRE CANNON MONITOR
- WASHDOWN WATER HOSEREEL
- FIREWATER HOSEREEL
- F — FOAM/WATER HOSE

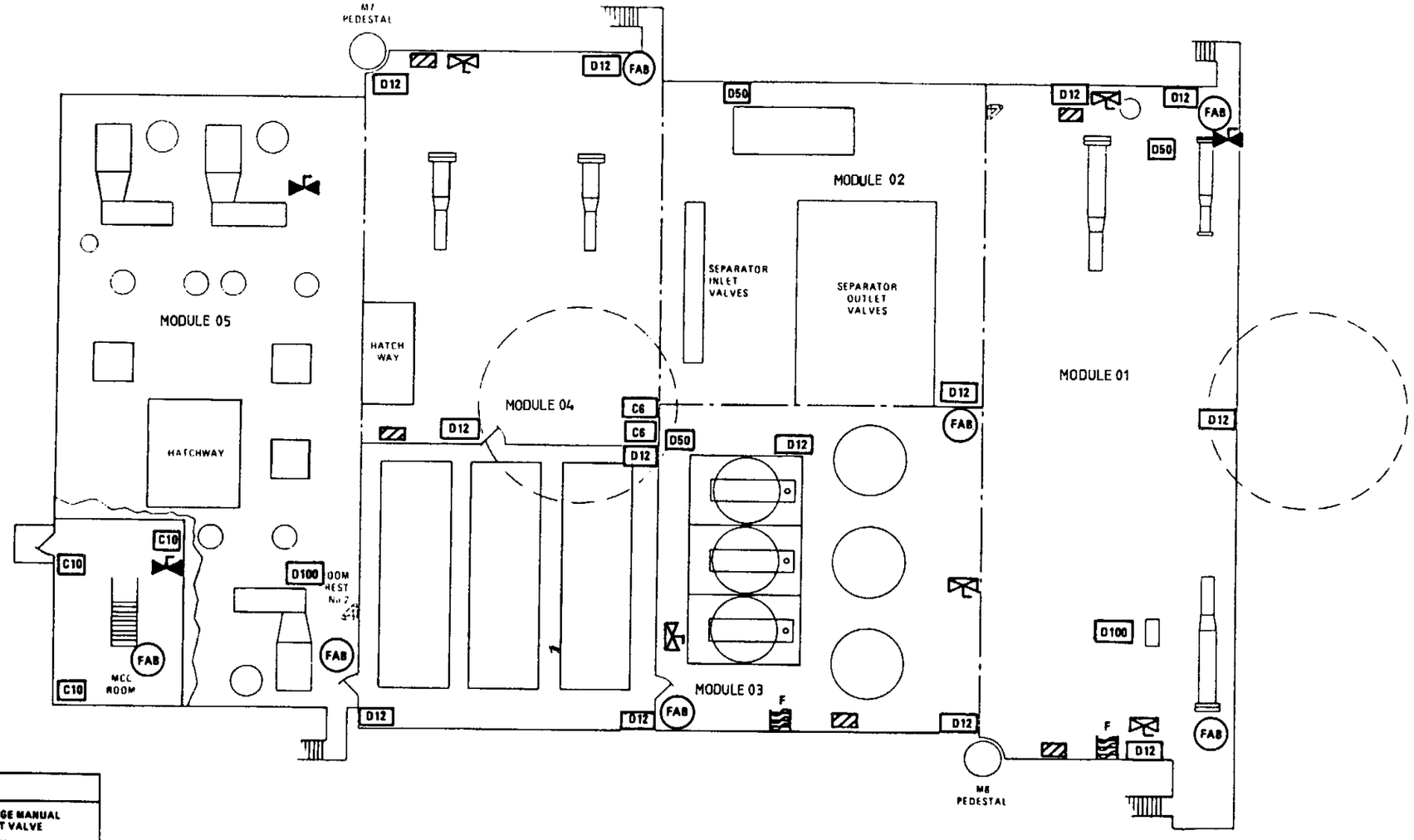
ISSUE 4 AUGUST 1984

FIREFIGHTING FACILITIES
Lower Level

9.8.2



PLATFORM NORTH N



KEY	
C6 6kg CO_2 EXTINGUISHER	DELUGE MANUAL START VALVE
C10 10kg CO_2 EXTINGUISHER	HALON MANUAL RELEASE
D12 12kg CO_2 DRY POWDER EXTINGUISHER	WASHDOWN WATER HOSEREEL
D50 50kg DRY POWDER EXTINGUISHER	FIREWATER HOSEREEL
D100 100kg DRY POWDER EXTINGUISHER	F FOAM/FIRE HOSE
FAB FIRE ALARM PUSHBUTTON	

ISSUE 4 AUGUST 1984

FIREFIGHTING FACILITIES
Upper Level

9.8.3

(b) Start buttons located in QP Control Room and the Instrument Interface Room.

(c) Start buttons at each pump's local control panel.

3.2 Diesel Engine Starting Systems

3.2.1 Each diesel engine's starting system is interconnected with a fail-safe pneumatic auto-start system, connecting each engine to the firewater pump control panels of TCP2 and QP. Solenoid valves fitted to the air lines serving each engine's auto-start system are interconnected to Start buttons located in QP Control Room.

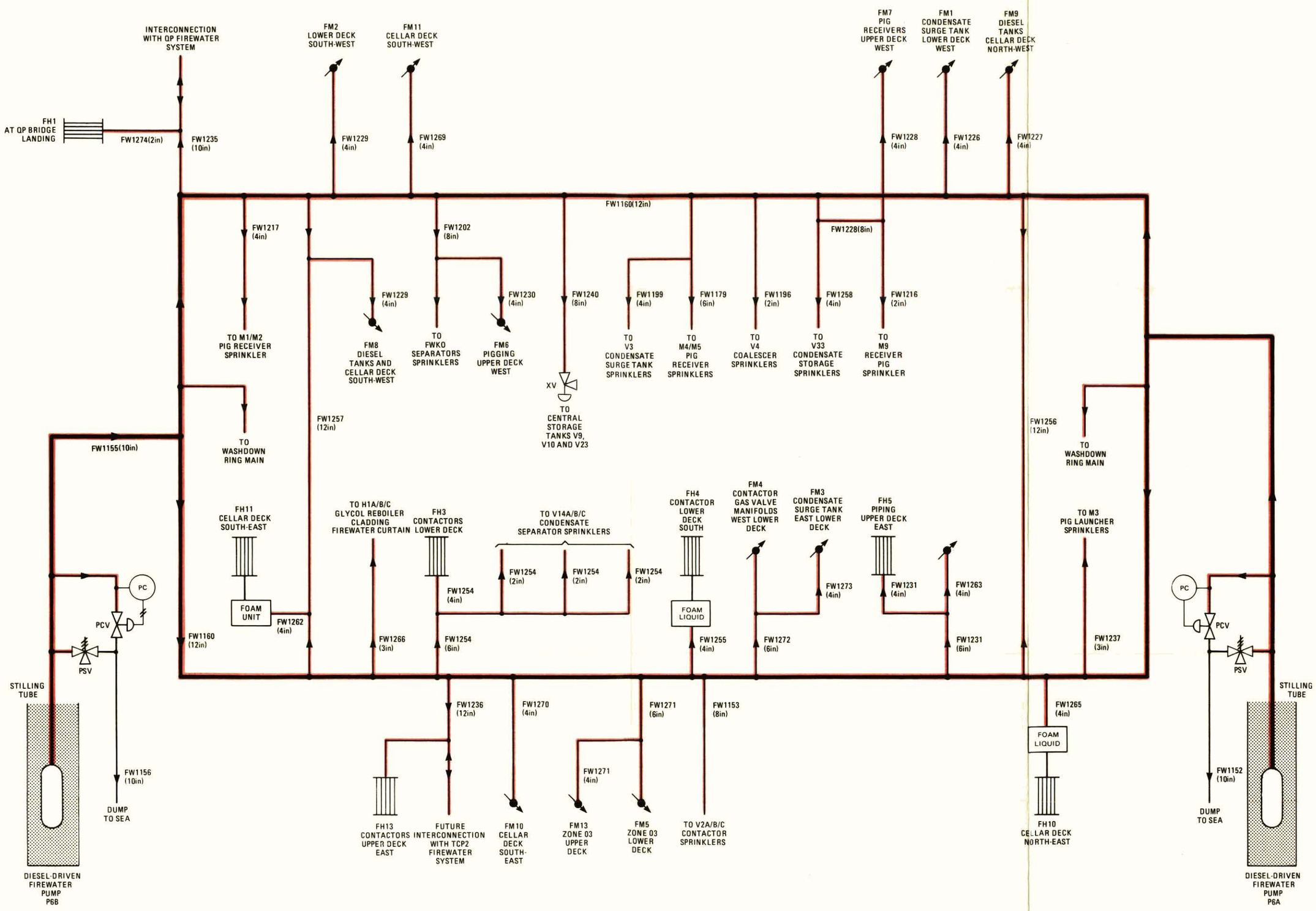
3.2.2 The pneumatic line connecting the platform with QP and TCP2 is also interconnected with the platform's individual deluge systems, and the platform's shutdown system and Fire Alarm buttons, via a solenoid valve.

3.2.3 The pneumatic interconnecting auto-start system described above is maintained at a pressure of 3.5 bar. In the event of temporary interruption to the air supply, system pressure is maintained by air volume tanks and non-return valves.

3.3 Sprinkler System Control

3.3.1 Each sprinkler system is controlled by a pneumatically operated deluge valve which opens automatically when two or more fire detectors in the same circuit are activated. When the system downstream of the deluge valve is pressurised, the valve is held in the open position by the action of a three-way valve, venting the deluge valve diaphragm. Therefore, the deluge valve can only be closed when the firewater pumps are stopped and the system depressurised.

3.3.2 Provision is made in the control circuit to manually open the deluge valve. Closing of the diaphragm hand valve will vent and open the deluge valve. On loss of air pressure, a pressure switch will initiate an alarm, and activate the firewater pumps if they are not already running. Pneumatic control circuits are protected against temporary loss of air supply by volume tanks and non-return valves.



ISSUE 1. JULY 1980

HALON SYSTEMS

1 GENERAL

Halon 1301 (BTM) is a colourless, odourless, electrically non-conductive gas that extinguishes or prevents ignition by inhibiting the chemical reaction of fuel and oxygen, and is the least toxic of the vapour extinguishing agents. It will render a combustible mixture inert when it is present in approximately 6 per cent concentrations. Halon is normally very safe. However, when Halon is released into the atmosphere within a compartment, that compartment should be vacated as soon as possible. Under extreme conditions the Halon can break down to form an acidic compound.

2 DESCRIPTION

2.1 Halon systems are located in selected platform areas to provide an automatic firefighting system. The appropriate Halon system may be automatically operated as a result of smoke detection via coincidence-interlocked circuits, or manually from 'break-glass' units located at the main entrance to each protected area.

2.2 Halon is distributed within each protected area by a pipework system fitted with discharge nozzles specially designed to suit the particular application and strategically located to flood the entire area.

2.3 To provide personnel with sufficient time to evacuate an affected area prior to the discharge of the Halon extinguishing system, a preset hydraulic time delay is incorporated in the release mechanism. During the time delay period an audible alarm will sound. The delay period is set when the time required for evacuation purposes has been determined, but will not exceed 30 seconds.

2.4 Visual indication is provided at the entrance to each Halon-protected area, showing the state of the system as follows:

(a) Green lamp illuminated indicating system in manual control.

(b) Yellow lamp illuminated indicating system in automatic control.

(c) Red lamp illuminated indicating Halon being released.

2.5 It is desirable to isolate the automatic operation of a Halon extinguishing system before personnel work within the protected area. To achieve this, a key-operated switch is provided at the main entrance to the area. Safety locking pins are provided to enable each Halon cylinder to be rendered inoperative.

3 LOCATION OF HALON SYSTEMS

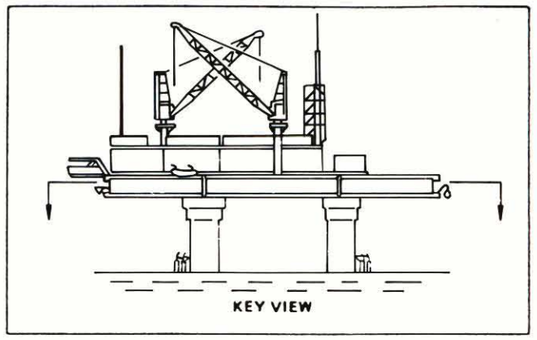
3.1 Completely independent Halon Systems are provided for each area listed below, ie each area has its own Halon bottles and smoke detectors, which only activate the system within that particular area:

Room/Area	Zone	Weight of Halon (kg)	Number of Containers
Upper Level			
LP Vent Stack	05	–	–
HP Relief Vent Stack	01	–	10

Room/Area	Zone	Weight of Halon (kg)	Number of Containers
Lower Level			
Motor Control Centre	05	73	1
Generator Area	05	–	3
Battery Room	05	18	1
Cabling Room	05	77	1
Cellar Deck			
HV Switchgear Room	06	261	2
Transformer Room	06	49	1
Air Conditioning Room	06	111	1
Interface Room No 1	06	40	1
Interface Room No 2	06	44	1

3.2 The Halon System for the cold vent stack comprises two individual manifolded racks of five bottles each. One bottle rack is ready for immediate use, the other is a standby rack and must be opened up before use. Operation of this system may take place from either the upper or lower deck.

END



PLATFORM NORTH N

UNIT 08

WORKSHOP

STORAGE AREA

WALKWAY No 1

WALKWAY No 2

AIR CONDITIONING ROOM

INSTRUMENT INTERFACE ROOM No 1

5.5 kV. SWITCHBOARD

UNIT 06

SWITCHGEAR ROOM

INSTRUMENT INTERFACE ROOM No 2

TRANSFORMER RM.

UNIT 07

VS

UNIT 09

FIREWATER I HOUSING

COLUMN 1

COLUMN 2

FIREWATER PUMP HOUSING

UNIT 10

FUTURE COMPRESSOR UTILITIES PACKAGE

LIFEBOAT No 7

UNIT 13

PIPERACK TO QP BRIDGE

WALKWAY No 3

WALKWAY No 4

UNIT 11

KEY

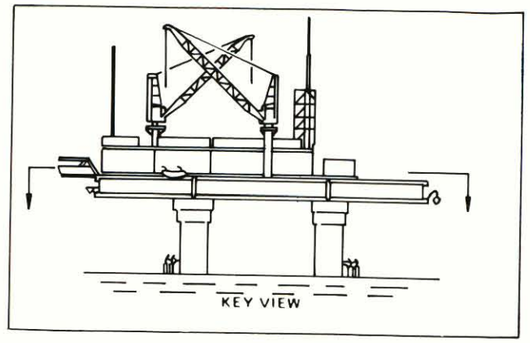
AREA PROTECTED BY HALON

MANUAL RELEASE LEVER

ISSUE 4 AUGUST 1984

HALON SYSTEMS
Cellar Deck Level

9.10.1



PLATFORM NORTH

LIFEBOAT NO 5

M7 PEDESTAL

METHANOL STORAGE PLATFORM

HOSE LOADING PLATFORM

HOSE STORAGE PLATFORM

BRIDGE TO QP

MODULE 04

MODULE 02

CALIBRATION CONTAINER

HATCH WAY

BATTERY ROOM

HATCH WAY

MODULE 05

MODULE 05

MODULE 01

HATCHWAY

MODULE 23

MAJOR ACCESS WAY TO QP OR TCP2

CONTACTOR VALVE MANIFOLDS

MODULE 03

CABLING ROOM

M8 PEDESTAL

ROV PLATFORM

METHANOL STORAGE AND HOSE LOADING PLATFORM

LIFEBOAT NO 6

BRIDGE TO TCP2

KEY

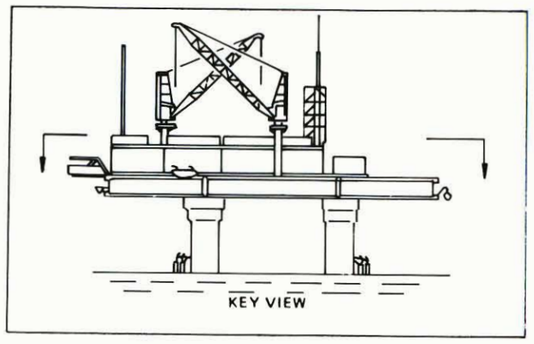
AREA PROTECTED BY HALON

MANUAL RELEASE LEVER

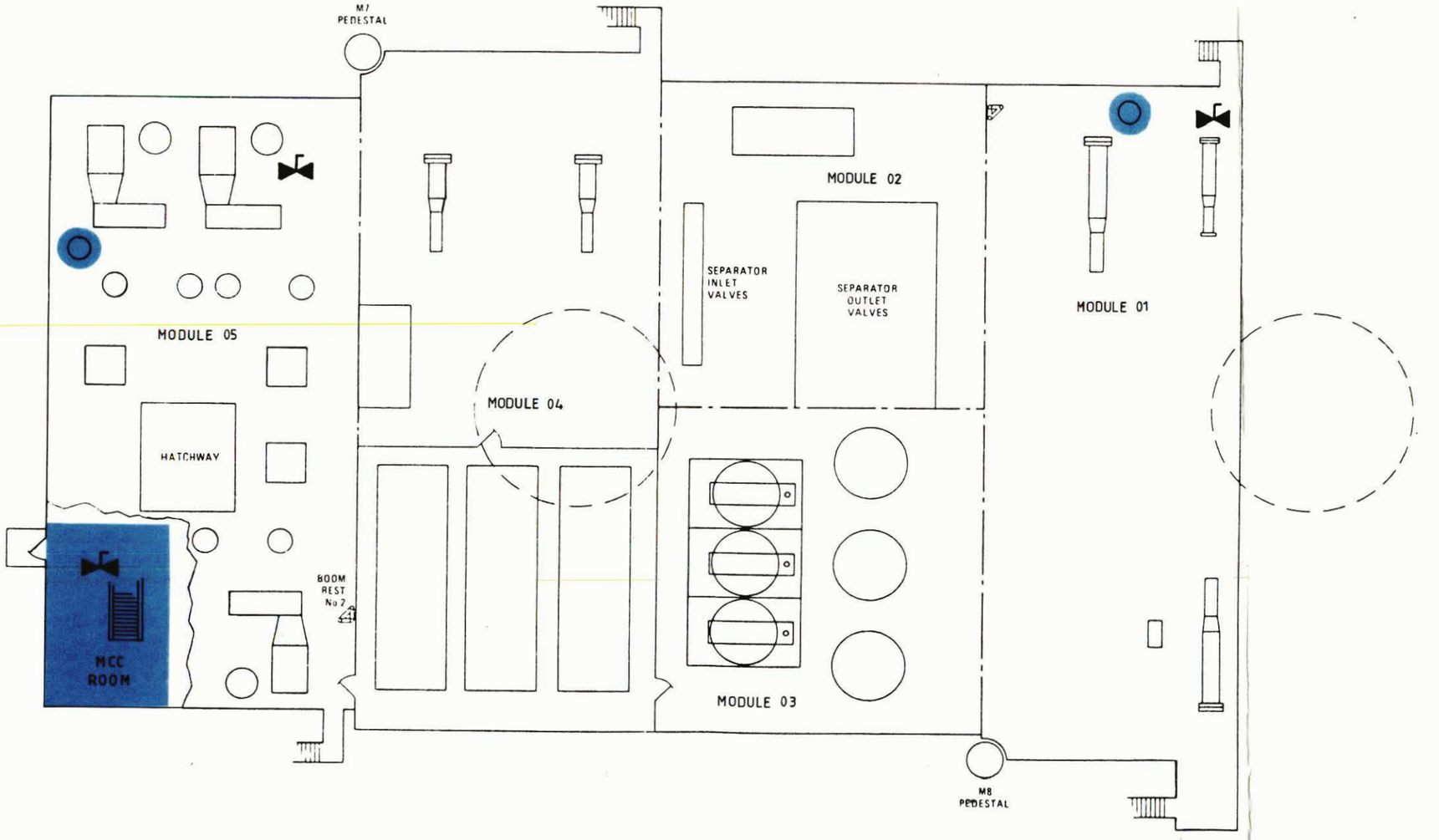
ISSUE 4 AUGUST 1984

HALON SYSTEMS
Lower Level

9.10.2



PLATFORM NORTH N



KEY

- AREA PROTECTED BY HALON
- MANUAL RELEASE LEVER

ISSUE 4 AUGUST 1984

HALON SYSTEMS Upper Level | **9.10.3**

FIREWALLS AND FIREPROOFING

1 GENERAL

Firewalls are installed at various locations throughout the platform to limit the spread of fire. Constructed from steel plate strengthened as necessary by corrugation or stiffeners, they protect certain areas from fire or prevent a fire from spreading by containing it within an area.

2 DESCRIPTION

2.1 Cellar Deck Level

2.1.1 Firewater pumps P6A and P6B are contained within rooms whose walls are constructed from 5mm steel of SOLAS class AO, and ceilings from 5mm steel plate with rock-wool cladding and aluminium sheet.

2.1.2 The internal walls of Nos 1 and 2 Interface Rooms are constructed from 5mm steel of SOLAS class AO. The ceilings of these rooms are constructed from 5mm steel coated with 35mm of marine mandolite, and the floors from 8mm carbon steel.

2.1.3 The internal walls of the Transformer and Air Conditioning rooms are constructed from 5mm carbon steel.

2.1.4 The workshop area is contained within internal walls constructed from 5mm carbon steel with rock-wool cladding and aluminium sheet. It is divided by a wall constructed from 5mm carbon steel.

2.2 Lower Level

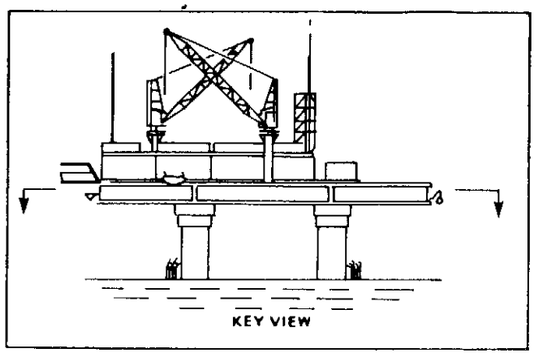
2.2.1 The internal wall of Zone 05, which contains the main generators, is constructed from 5mm steel of SOLAS class AO.

2.2.2 The north and west internal walls of the Battery Room and the west internal wall of the Cabling Room are constructed from 5mm steel and conform to A60 fire rating. The remaining internal walls of these rooms are constructed from 5mm carbon steel. The ceilings of these rooms are constructed from 5mm steel coated with 35mm of marine mandolite.

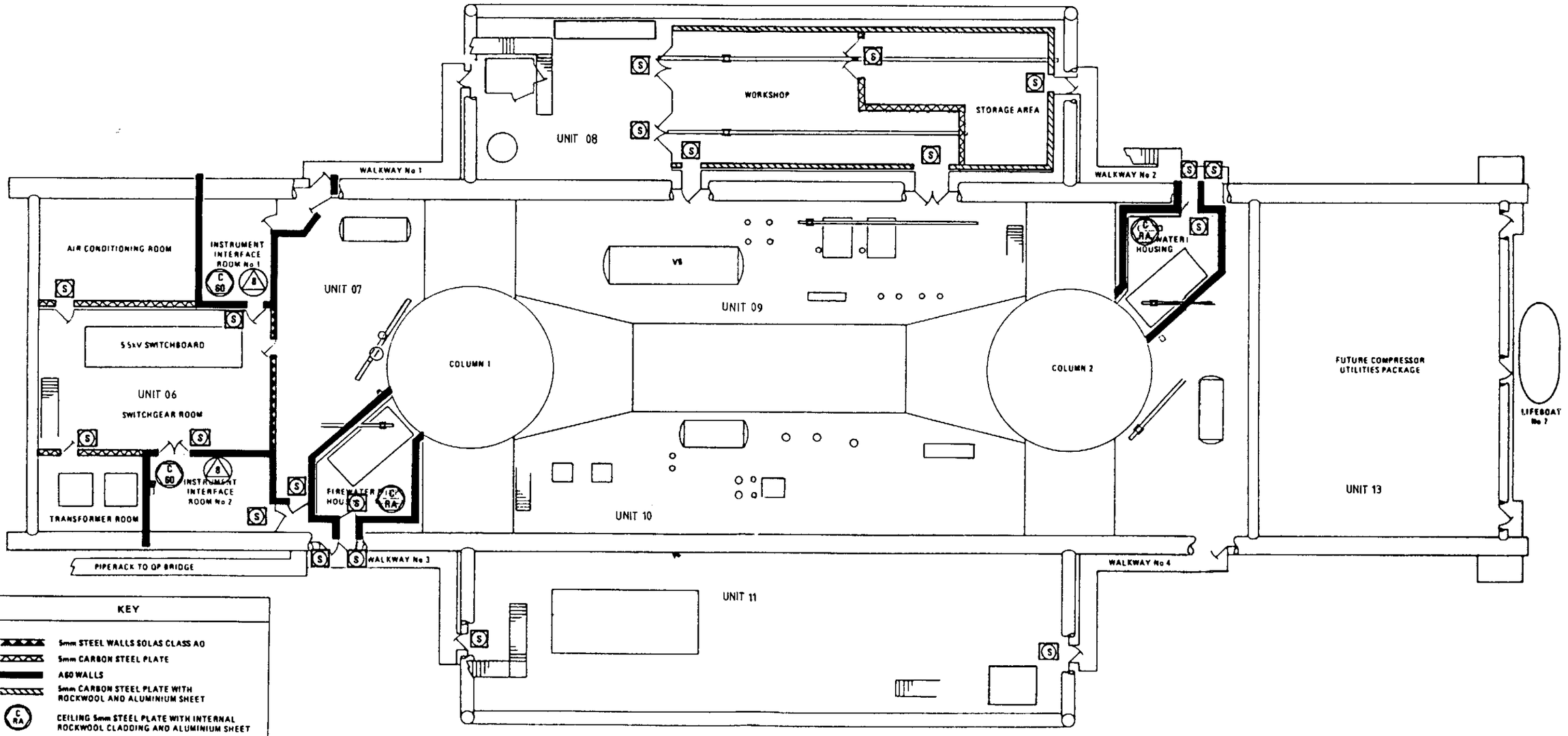
2.3 Upper Level

2.3.1 The internal walls of the room containing the glycol regeneration units are constructed from 5mm steel of SOLAS class AO.

2.3.2 The internal walls of the Generator Control Room are constructed from 5mm carbon steel.



PLATFORM NORTH N



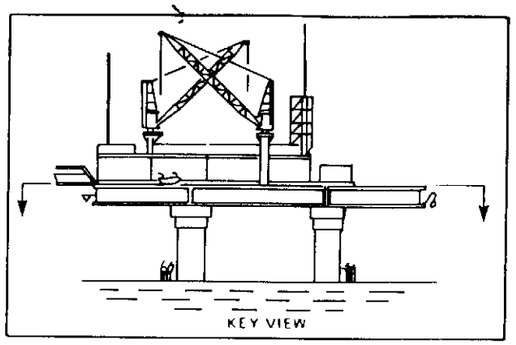
KEY

- 5mm STEEL WALLS SOLAS CLASS A0
- 5mm CARBON STEEL PLATE
- A60 WALLS
- 5mm CARBON STEEL PLATE WITH ROCKWOOL AND ALUMINIUM SHEET
- C RA — CEILING 5mm STEEL PLATE WITH INTERNAL ROCKWOOL CLADDING AND ALUMINIUM SHEET
- C 60 — CEILING 5mm STEEL PLATE COATED WITH 35mm MARINE MANDOLITE
- B — FLOOR 9mm CARBON STEEL PLATE
- S — SELF-CLOSING DOOR

ISSUE 4 AUGUST 1984

FIREWALLS AND FIREPROOFING
Cellar Deck Level

9.11.1



PLATFORM NORTH N

LIFEBOAT Nº 5

M/ PEDESTAL

METHANOL STORAGE PLATFORM

HOSE LOADING PLATFORM

HOSE STORAGE PLATFORM

MODULE 04

MODULE 02

MODULE 01

MODULE 23

MODULE 05

MODULE 03

HATCHWAY

HATCH WAY

CABLING ROOM

MAJOR ACCESS WAY TO UP OR TOP2

CONTACTOR VALVE MANIFOLDS

MR PEDESTAL

METHANOL STORAGE AND HOSE LOADING PLATFORM

ROV PLATFORM

LIFEBOAT Nº 6

BRIDGE TO TEP2

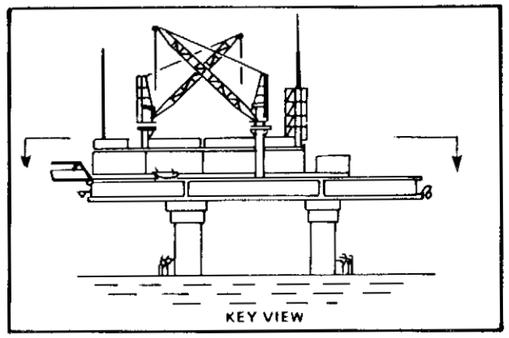
KEY

- 5mm STEEL WALLS SOLAS CLASS A0
- 5mm CARBON STEEL PLATE
- A60 WALLS
- S SELF-CLOSING DOOR
- C 60 CEILING 5mm STEEL PLATE COATED WITH 35mm MARINE MANDOLITE
- 60 FLOOR 5mm STEEL PLATE COATED WITH 35mm MARINE MANDOLITE

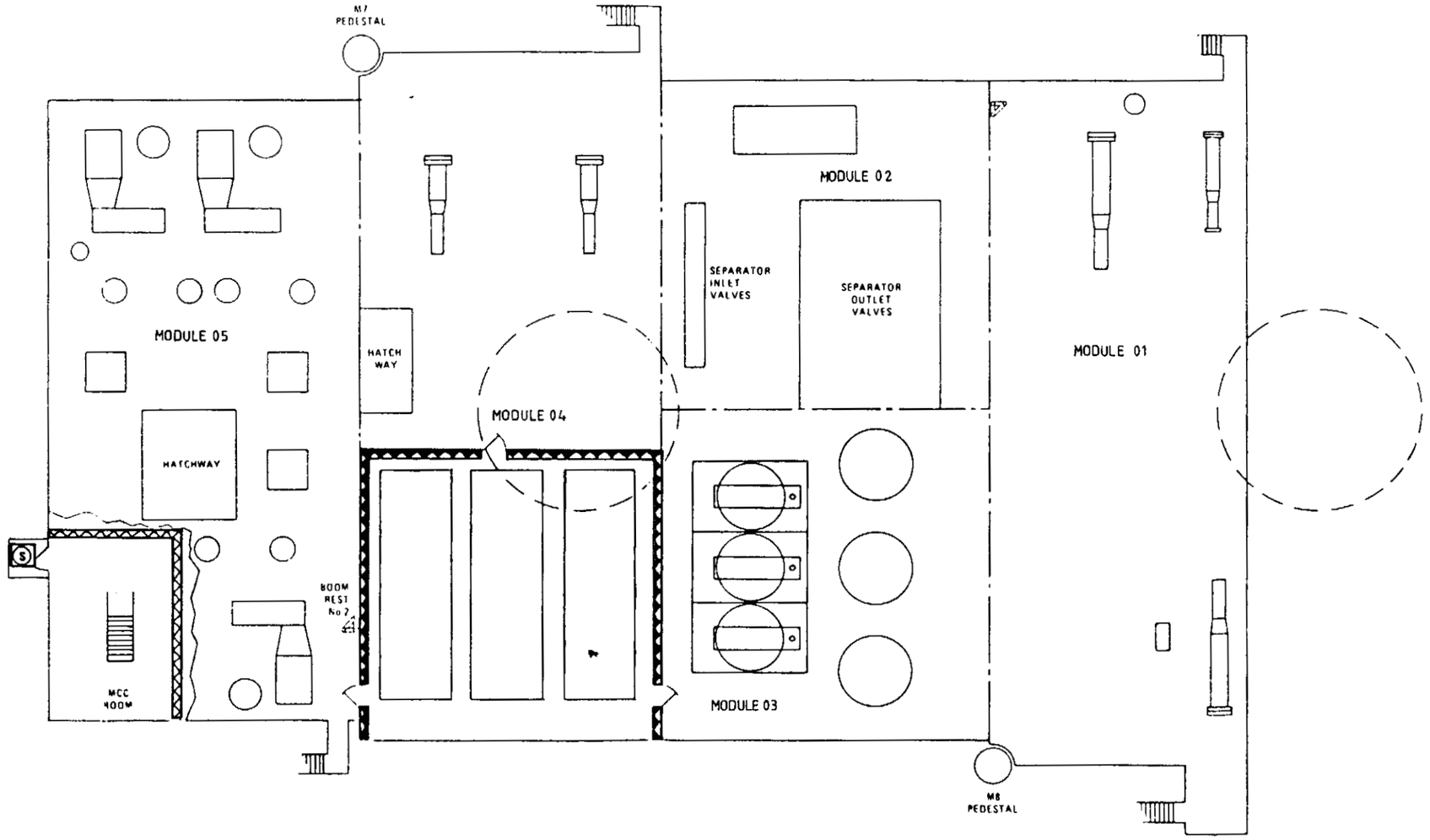
ISSUE 4 AUGUST 1984

FIREWALLS AND FIREPROOFING
Lower Level

9.11.2



PLATFORM NORTH N



KEY

- 6mm STEEL WALLS SOLAS CLASS A0
- 6mm CARBON STEEL PLATE
- (S) SELF-CLOSING DOOR

ISSUE 4 AUGUST 1984

FIREWALLS AND FIREPROOFING
Upper Level

9.11.3

FIRST AID

1 GENERAL

1.1 Platform QP is equipped with medical facilities to cater for the total complement of 120 ~~men~~ working on QP, TP1 and TCP2.

1.2 Two sick rooms and an infirmary are located on the middle deck of QP.

1.3 First aid kits and stretchers are distributed around the platform and a trained nurse will be available to administer first aid.

2 RESPIRATORY RESUSCITATION (ARTIFICIAL RESPIRATION)

2.1 General

2.1.1 There are several widely publicised methods of artificial respiration, the most effective of which are Mouth-to-Mouth (Mouth-to-Nose) and the Silvester method.

2.1.2 Whichever method is used, it must be commenced immediately the patient is discovered.

2.2 Mouth-to-Mouth (Mouth-to-Nose)

(1) Lay the patient on his back with support under the back of neck (Fig 1).

(2) Clear the patient's mouth of any obstruction eg water, oil, debris, vomit, false teeth, etc (Fig 2).

(3) Press the top of the patient's head to tilt it backwards. This ensures that the patient's airway is open (Fig 1).

(4) Press the patient's chin upwards to ensure that the tongue is clear of the airway (Fig 3).

(5) Open your mouth and take a deep breath, pinch the patient's nostrils closed (Fig 4).

(6) Place your mouth over the patient's, making sure that you have a good seal, and blow into the patient's mouth causing the chest to rise (Fig 5).

(7) Remove your mouth and watch the patient's chest fall.

(8) Repeat this cycle at a rate of 10 breaths per minute until normal breathing resumes, or until all hope is abandoned.

(9) When normal breathing resumes, place the patient into the Coma position (Fig 6). This ensures that any vomiting, saliva etc does not interfere with the patient's natural breathing.

(10) Keep a close watch on the patient's breathing at this stage, and obtain medical help as soon as possible.

(11) If for any reason the patient's mouth cannot be sealed, the hand supporting the chin may be used to close the mouth and the Mouth-to-Nose method used (Fig 7).

2.3 Silvester Method

2.3.1 If through some injury to the face, Mouth-to-Mouth (Mouth-to-Nose) cannot be used, the Silvester Method is recommended as an alternative. Proceed as follows:

(1) Lay the patient on his back.

(2) Place a support (folded jacket or similar) under the patient's shoulders (Fig 8).

(3) Clear the patient's mouth of obstructions, eg water, oil, debris, vomit, false teeth, etc.

(4) Kneel astride the patient's head (Fig 9).

(5) Grasp the patient's wrists and cross them over the lower part of his chest (Fig 9).

(6) Rock forward and press down on the patient's chest (Fig 9).

(7) Rock back and swing the patient's arms out and to the rear as far as possible (Figs 10 and 11).

(8) Repeat at a rate of 10 to 12 cycles per minute until normal breathing resumes, or all hope is abandoned.

(9) Keep the patient's mouth clear at all times.

RESPIRATORY RESUSCITATION

Figure 1

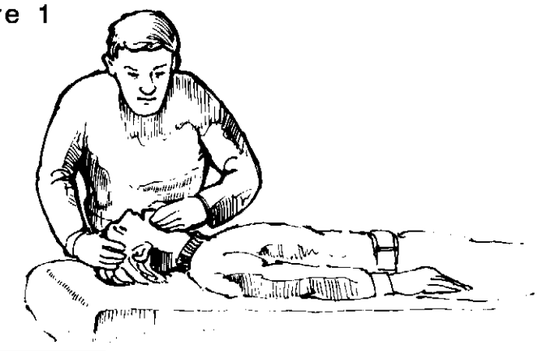


Figure 2

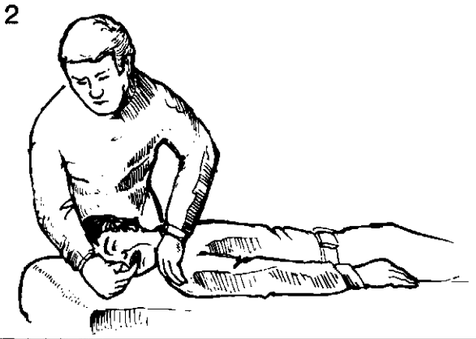
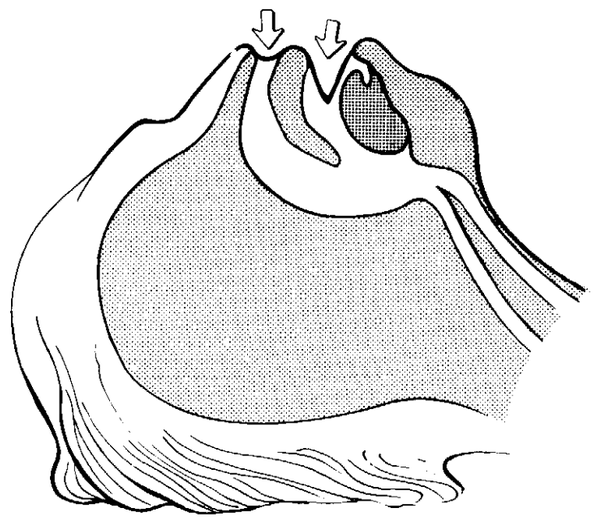


Figure 3



Mouth-to-Mouth
(Mouth-to-Nose)

Figure 4

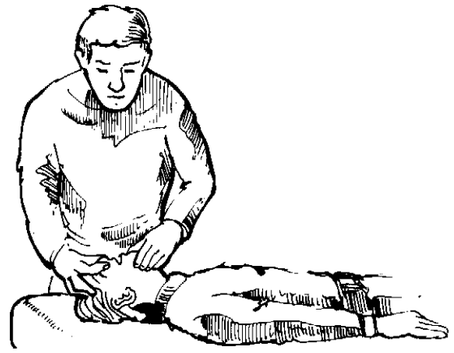


Figure 5

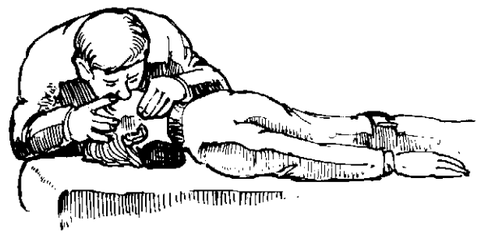


Figure 6

Figure 7

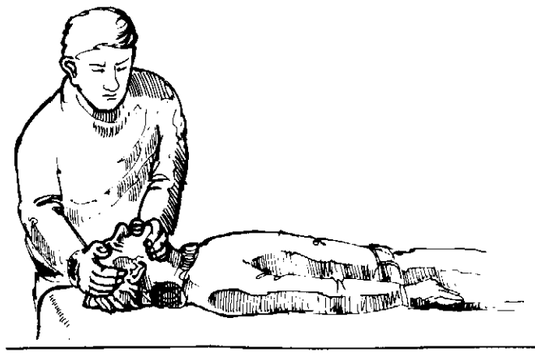


Figure 8

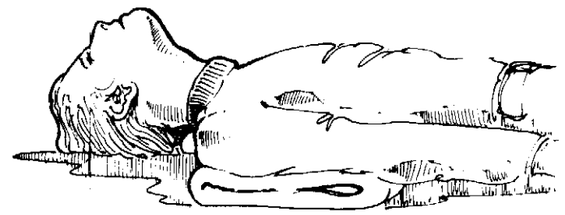


Figure 9

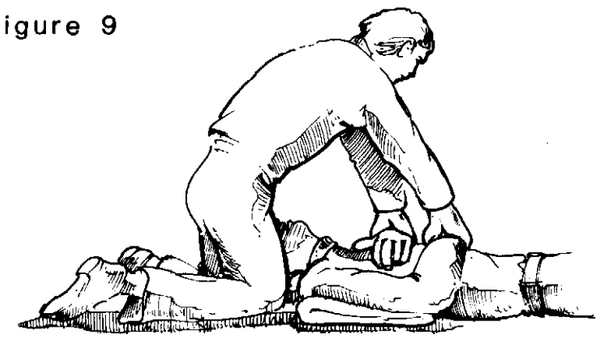


Figure 10

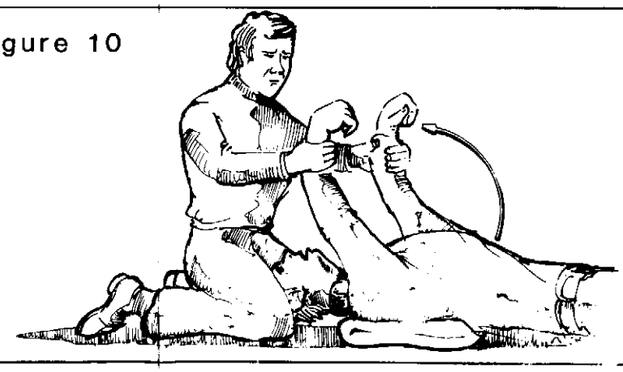
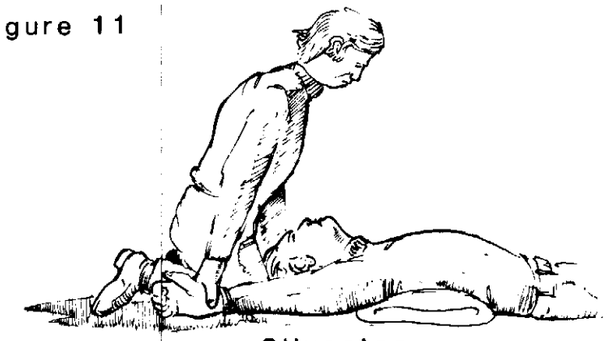


Figure 11



Silvester

ISSUE 1. JULY 1980

ESCAPE ROUTES

1 GENERAL

1.1 Escape routes are clear routes leading from platform areas to the lifeboat and liferaft stations.

1.2 There are exit points from each module or area which lead to an escapeway.

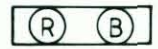
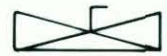
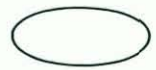
1.3 All regularly manned areas are provided with at least two well-defined escape routes which are indicated by prominently displayed signs. To avoid confusion and/or panic, personnel should, if possible, never move along escape routes against the directional arrows.

1.4 Personnel are allotted a lifeboat station on arrival on the platform, and should familiarise themselves with its position and the escape routes leading to it.

1.5 In the event of main power failure, adequate lighting of the escape routes is provided by the emergency lighting system.

1.6 The escape routes are indicated on Diagrams 9.13.1 to 9.13.3.

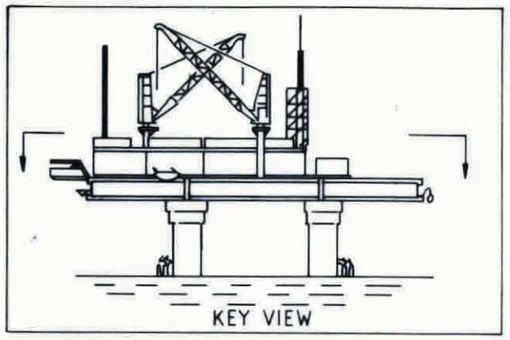
SYMBOL	SYMBOL DESCRIPTION
	PORTABLE FIRE-EXTINGUISHER DRY CHEMICAL, WATER, CO_2
	STATIONARY FI-FI EQUIPMENT FOAM UNIT, HOSE REELS, WASHDOWN REELS
	ALARM PUSHBUTTON FIRE PUMP START, GENERAL ALARM, MUSTER ALARM, DISASTER SHUTDOWN, EMERGENCY SHUTDOWN
	FIRE, TECHNICAL TEAM LOCKER BREATHING APPARATUS, FIREMEN OUTFIT
	CRASH KIT
	LIFERAFT
	LIFEJACKETS
	SURVIVAL SUIT

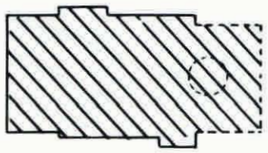
SYMBOL	SYMBOL DESCRIPTION
	LIFE BUOYS
	AREA PROTECTED BY HALON OR CO_2
	AREA PROTECTED BY DELUGE
	ESCAPE ROUTES
	RED&BLUE FLASHING LIGHT
	MANUAL ACTUATION OF AUTOMATIC HALON OR CO_2
	MANUAL DELUGE START COCK
	LIFEBOATSTATION
	FIRE WATER MONITOR

ISSUE 1 AUGUST 1984

ESCAPE ROUTES
SYMBOL LEGEND

9.13





PLATFORM NORTH N

M7 PEDESTAL SOKKEL

DOWN NED

TELEPHONE

DOWN

DOWN NED

PERS BASKET

MODULE 02

SEPARATOR INLET VALVES

SEPARATOR OUTLET VALVES

MODULE 01

MODULE 05

MODULE 04

HATCHWAY LUKE

STIGE TIL GANGVEI LAVERE ETASJE

LADDER TO WALKWAY LOWER LEVEL

PERS-BASKET

EM. TELEPHONE

FIRSTAID EQUIPMENT

DOWN NED

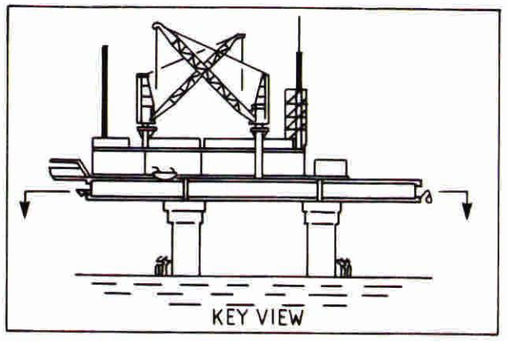
MODULE 03

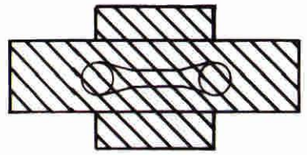
M8 PEDESTAL SOKKEL

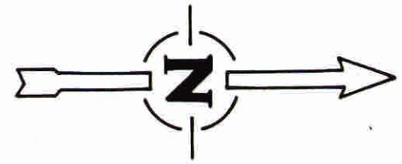
ISSUE 3 AUGUST 1984

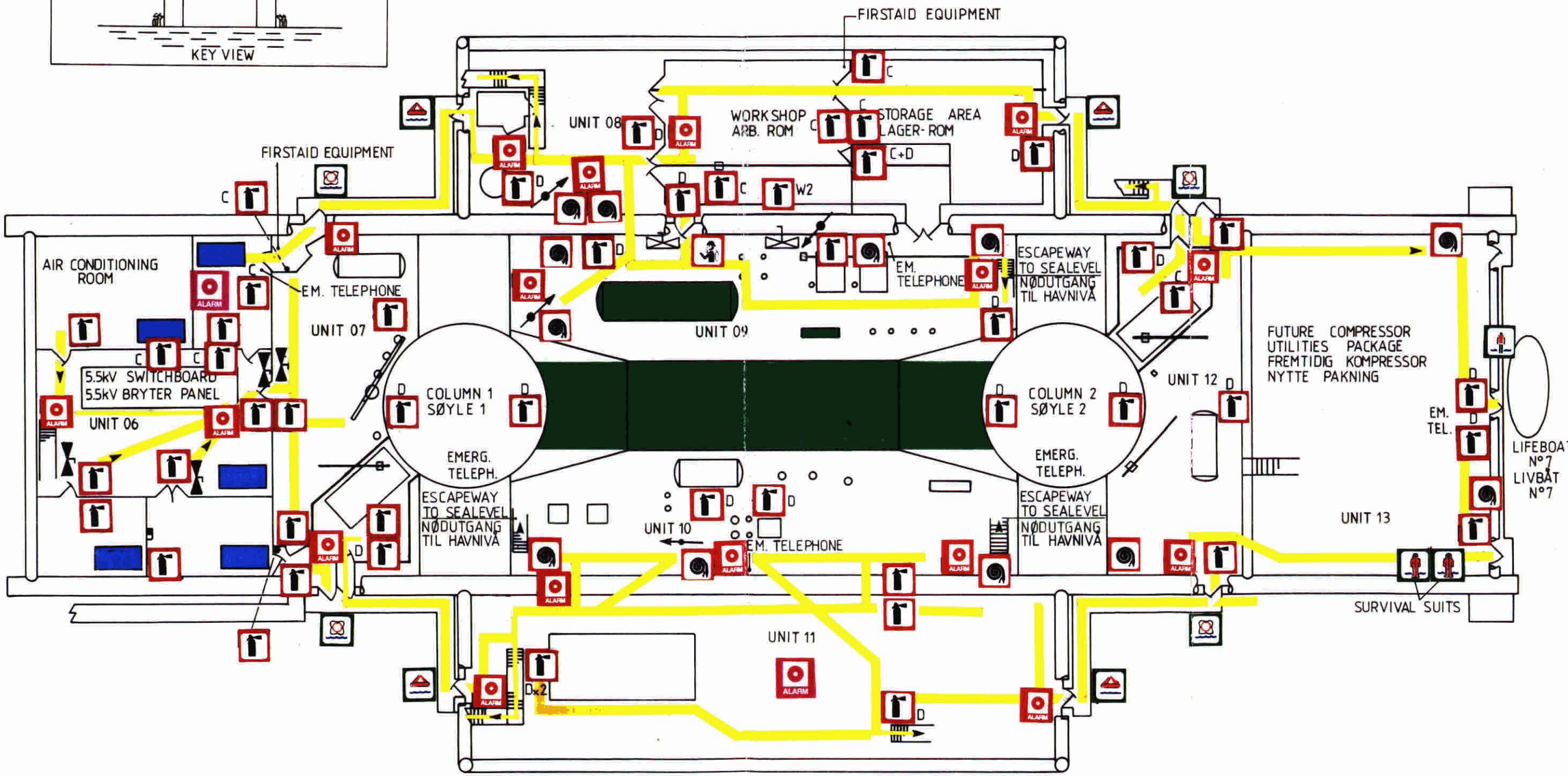
ESCAPE ROUTES Upper level **9.13.1**

TP 1 CELLAR DECK LEVEL



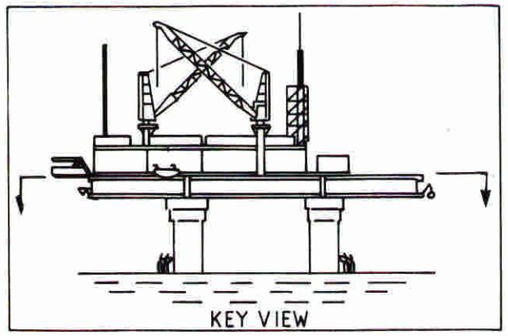






ISSUE 2 APRIL -89

SAFETY PLOTPLAN & ESCAPE ROUTES Cellar Deck Level	9.13.3



TP1 LOWER LEVEL

N

EM. LADDER FROM WINDOW
TCD OFFICE SPRINKLER
LADDER DOWN
EM. EXIT.

YOU ARE HERE
EM. TELEPHONE
STRETCHERS AND FIRST AID
LIFEBOAT LIVBAT
NOS
PEDESTAL
BRIDGE TO Q.P.
HOSE STORAGE PLATFORM
MODULE 04
MODULE 02
PRODUCTION OPERATOR
STRETCHERS AND FIRSTAID EQUIPMENT
MODULE 01
YOU ARE HERE
MODULE 23
BATTERY ROOM
x30
Cx2
MODULE 05
CONTACTOR VALVE MANIFOLS
INHIBITOR STOAGE TANK
MODULE 03
CABLING ROOM
PEDESTAL
EM. TELEPHONE
NO. 6
LIFEBOAT LIVBAT
HALON
MCC ROOM
INTERMEDIATE LEVEL

ISSUE 2 APRIL 89

SAFETY PLOTPLAN & ESCAPE ROUTES
Lower Level

9.13.2

EMERGENCY LIGHTING

1 GENERAL

1.1 For the purposes of this Section 'emergency maintained lighting' is considered to be lighting that has battery support and remains in operation for a limited period when all electricity generation has failed. The distribution board from which it is normally supplied is known as the Maintained Lighting board.

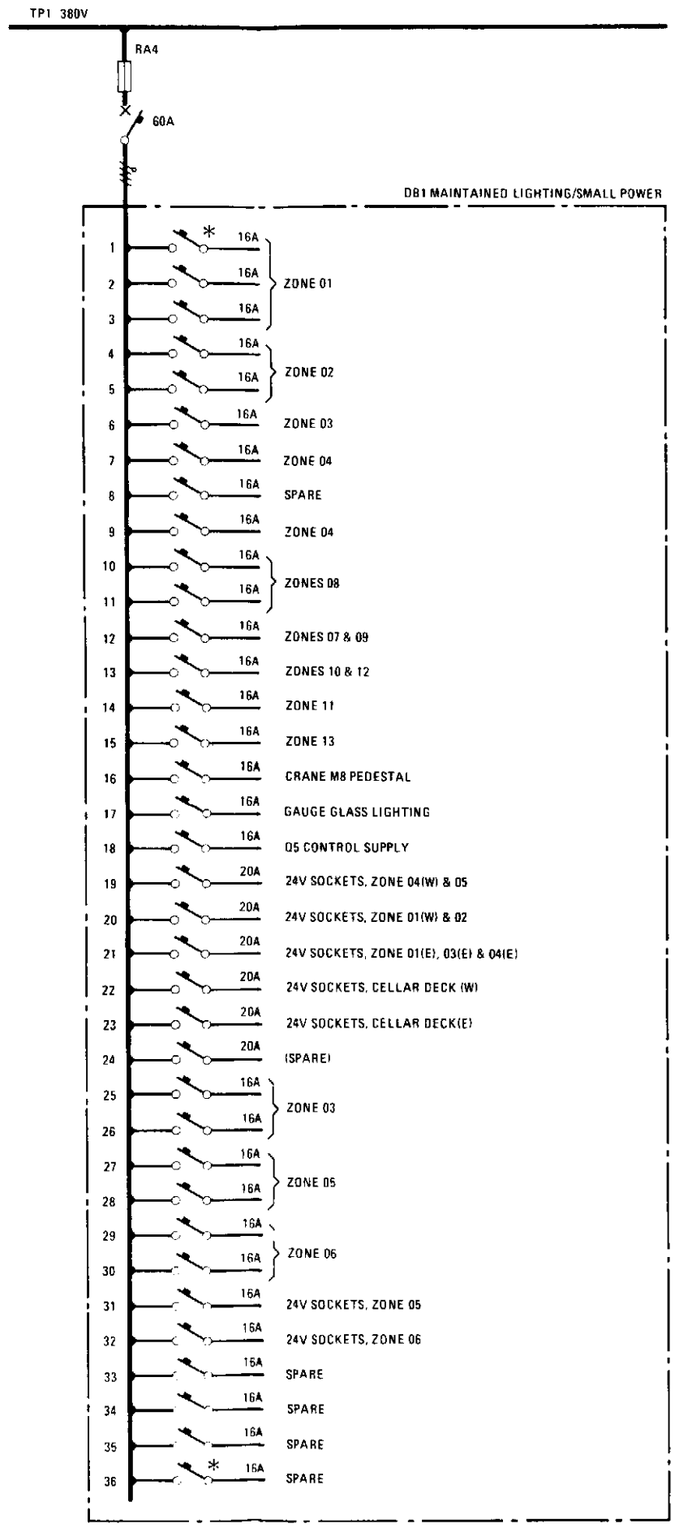
1.2 In particular, the lighting fed from the standby-supplies distribution board, DB8, is not considered to be emergency maintained lighting.

2 LIGHTING FITTINGS

2.1 Maintained lighting fittings are of the twin-tube 2 x 40W cold-cathode fluorescent type. They are similar to standard fittings but have a rechargeable, tubular, 6V battery mounted on top, together with a transformer/rectifier charger, an undervoltage relay, an inverter and a transformer.

2.2 During normal operation the charger provides a trickle charge for the battery, and both tubes are fed from the 220V ac input from DB1. When this fails the undervoltage relay connects the battery to the inverter, whose output is fed to the transformer and thence at 220V to one tube only. This arrangement provides emergency lighting at half the normal level for about 45 minutes.

2.3 Upon reappearance of the normal supply the circuit returns to normal and the battery is recharged. The recharge is slow, no boost rate being provided, and can take up to 24 hours after a deep discharge.



NOTE

ALL SWITCHES ARE 220V SINGLE-POLE PHASE-TO-NEUTRAL MINIATURE CIRCUIT BREAKERS, EXCEPT THOSE MARKED ✳ WHICH ARE DOUBLE-POLE PHASE AND NEUTRAL

LIFESAVING EQUIPMENT

1 GENERAL

1.1 Lifesaving equipment providing the primary means of personnel evacuation from the platform comprises the following:

(a) Three 50-man lifeboats.

(b) Four 25-man self-inflating liferafts.

1.2 The lifeboat system enables personnel to evacuate the platform quickly. The three lifeboats are located as follows:

(a) One on the west side of Zone 05 external walkway at the lower level.

(b) One on the east side of Zone 04 external walkway at the lower level.

(c) One on the north side of Zone 13 external walkway at the Cellar Deck level.

1.3 The lifeboats are totally enclosed, and protected by a water spray system which enables them to survive in an oil fire for 10 minutes. This allows the lifeboat to travel approximately one mile through burning oil when proceeding at maximum speed.

1.4 The liferafts are installed as a 'back-up' to the lifeboats. They are stowed in fibreglass containers located on the external walkway encircling the Cellar Deck as follows:

(a) One each at the north and south side of Zone 08.

(b) One at the east side of Zone 12.

(c) One at the east side of Zone 07.

2 DESCRIPTION

2.1 Lifeboats

2.1.1 The lifeboats are fibreglass Schat Watercraft Mk II lifeboats, fully equipped with survival equipment.

2.1.2 Lifeboat No 7 is powered by a 22.5 hp Petter PJ2W–RMR water-cooled diesel engine, fitted with a Bryce Berger hydraulic start system and Borg Warner hydraulic gears. Lifeboats No 5 and No 6 are powered by Lister engines.

2.1.3 The water spray system consists of a nominal $16m^3$ capacity tank charged to 250 bar, driving a Watercraft CP10 pump which draws sea water through the bottom of the boat and discharges it through a filter to spray nozzles.

2.1.4 Air exhausted from the water spray pump is sufficient to supply the engine when running at full throttle, to provide air for personnel, and to maintain a slight pressure in the passenger space to exclude toxic fumes.

2.1.5 The lifeboat is stowed in Schat Type ORD/DHM davits which allow the boat to be lowered, without power, at a controlled speed of 60 to 120 ft/min. Lowering is controlled by the helmsman by means of a control wire which passes through the boat canopy at the control position and connects to the winch brake. Lowering ceases at any position on release of the control wire.

2.1.6 The lifeboat is attached to the davit by two sets of falls, via Mills release gear. The release gear is operated from a handle on the port side of the steering platform, and is so designed that it will not release until the boat is waterborne.

2.1.7 The lifeboat is hoisted by a Schat Type BE4 winch which is driven by a 26kW electric motor controlled from a local panel. Limit switches are fitted to the boat mounting to stop the motor when the boat is in the stowed position and to prevent overhoisting. A crank handle is provided to rewind the falls in the event of power failure and for final boat stowage. The handle does not revolve when the hoist motor is running or when the boat is being lowered by gravity.

2.1.8 When the boat is in the stowed position it is secured by a gripe wire at bow and stern. The gripe wire is secured at the inboard end by a slip hook to facilitate quick release, and incorporates a turnbuckle for adjustment.

2.1.9 Access into the lifeboat is by two watertight doors at each side.

2.1.10 The lifeboat carries sufficient fuel for 24 hours' operation, and is provided with emergency equipment stowed in the steering console locker, as follows:

(a) Pyrotechnic signals.

(b) A battery-operated portable radio-telephone, for emergency frequency use only, which incorporates a distress alarm facility that actuates alarm systems in ships and coastguard stations.

(c) A battery-operated flashing beacon, with line, which is stowed upside down. When inverted, the beacon automatically switches on and will operate when floating in water.

(d) A VHF beacon buoy for air/sea rescue. Release of the flexible antenna switches on the beacon which then operates for 48 hours.

(e) A battery-operated hand torch.

(f) A portable radar reflector.

2.2 Liferafts

2.2.1 The liferafts are of the MM Mark 6 SOLAS approved type, each, in its container, being stowed in a deck stowage cradle.

2.2.2 Each liferaft comprises two superimposed buoyancy tubes, a double-skin floor and a canopy. The buoyancy tubes are automatically inflated by a CO_2 cylinder, located in a pocket underneath the raft, which is discharged during the launch sequence. Inflation of the raft also erects the canopy. Boarding may commence approximately 30 seconds after launch.

2.2.3 Water pockets under the liferaft provide stability, and a drogue may be streamed to limit drift and provide directional stability.

2.2.4 Access to the raft is by embarkation ladders and knotted ropes, via a boarding ramp. A lifeline encircles the raft.

2.2.5 Each liferaft is provided with the following equipment and emergency rations:

Bailer	2
Sponge	2
Safety knife	2
Inflator (bellows type)	1
Repair kit	1
Rescue line with quoit	1
Paddles	2
Water-activated cells with lamps	2
Parachute distress signal	2*
Hand flares	6*

Signalling torch and spare batteries	1
Signalling mirror	1*
Whistle	1*
Fishing kit	1*
Concentrated food	300 oz*
Sweets	150 oz*
Potable water	37.5 litre*
Graduated drinking vessel	1*
Safety tin openers	3*
Anti-seasickness tablets	150*
First aid kit	1*
Rescue signal table	1
Instruction book	1*
Record card	1

NOTE: Items marked * are stored in the emergency pack within each liferaft. Other items are stowed in the raft.

2.3 Lifebuoys

2.3.1 A total of 12 lifebuoys is provided. They are located throughout the platform on external walkways.

2.3.2 Each lifebuoy installation is provided with a water-activated Aqualite.

2.3.3 When the lifebuoy is thrown overboard, the Aqualite is automatically released by its lanyard. Once in the water it will illuminate for 45 minutes.

2.3.4 The buoysmoke is manually pulled from its bracket, which breaks the device that operates smoke release, and then thrown overboard. The smoke signal operates for 15 minutes.

3 OPERATION

3.1 To Lower the Lifeboat

Personnel are to exercise lifeboat drill at least once every 10 days. On hearing the 'intermittent' signal of the Muster Alarm, personnel are to proceed to their allotted lifeboat station and:

(1) Check that the winch brake is fully on.

(2) Release the gripes by pulling the quick-release slip hooks, and allow the weight of the boat to be taken by the falls. Check that the operating wire of the Mills quick-release gear is not fouling the superstructure.

(3) Check that the fuel tank outlet valves are open.

(4) Using the hydraulic start system, start the engine as follows:

(i) Depress and hold the throttle control pushbutton (to disengage the gears), and push the throttle lever to the Full Ahead position.

(ii) Check that the decompression levers are facing forward.

(iii) In cold weather, lift the Overload Stop (painted yellow).

(iv) Take up the slack on the starting lever, then firmly pull the lever, and overcoming initial resistance, move the lever through its full travel.

(v) Return the starting lever to its original position.

(vi) When the engine fires, move the throttle lever to the Neutral position. The lever engages the hydraulic gears when operated.

(5) Open the hatches and ventilators, embark personnel, secure the hatches.

(6) Pull the control wire to lower the boat.

(7) When the boat is waterborne and the weight is off the falls, pull the quick release handle to disengage the Mills release gear.

(8) Close the ventilators.

(9) Move the throttle lever to the required Ahead position, then steer the lifeboat away from the platform.

(10) If required, operate the water spray system by opening the valve (painted red), under the forward centre seat.

3.2 **To Hoist the Lifeboat**

(1) Check that the winch brake is fully on.

(2) Check the function of the 'overhoist' and 'stowed position' limit switches, by manually operating the levers.

(3) Position the lifeboat under the falls, and engage the Mills release gear.

(4) Stop the engine.

(5) Close the starter box main circuit breaker at the winch position.

(6) Operate the winch motor and hoist the lifeboat. Check that the control wire is coiling correctly.

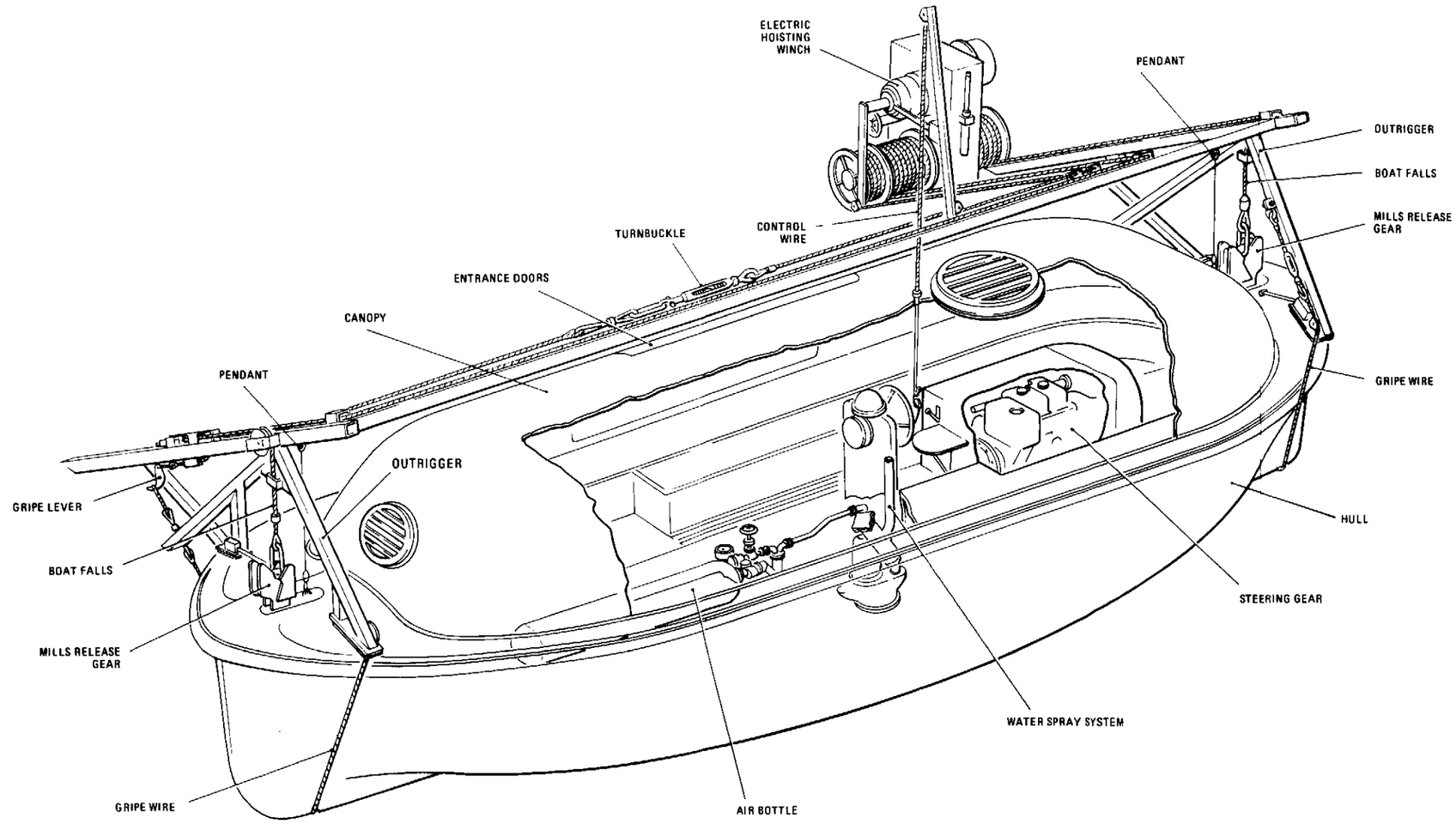
(7) When the lifeboat is 6in from the stowed position, stop the winch motor.

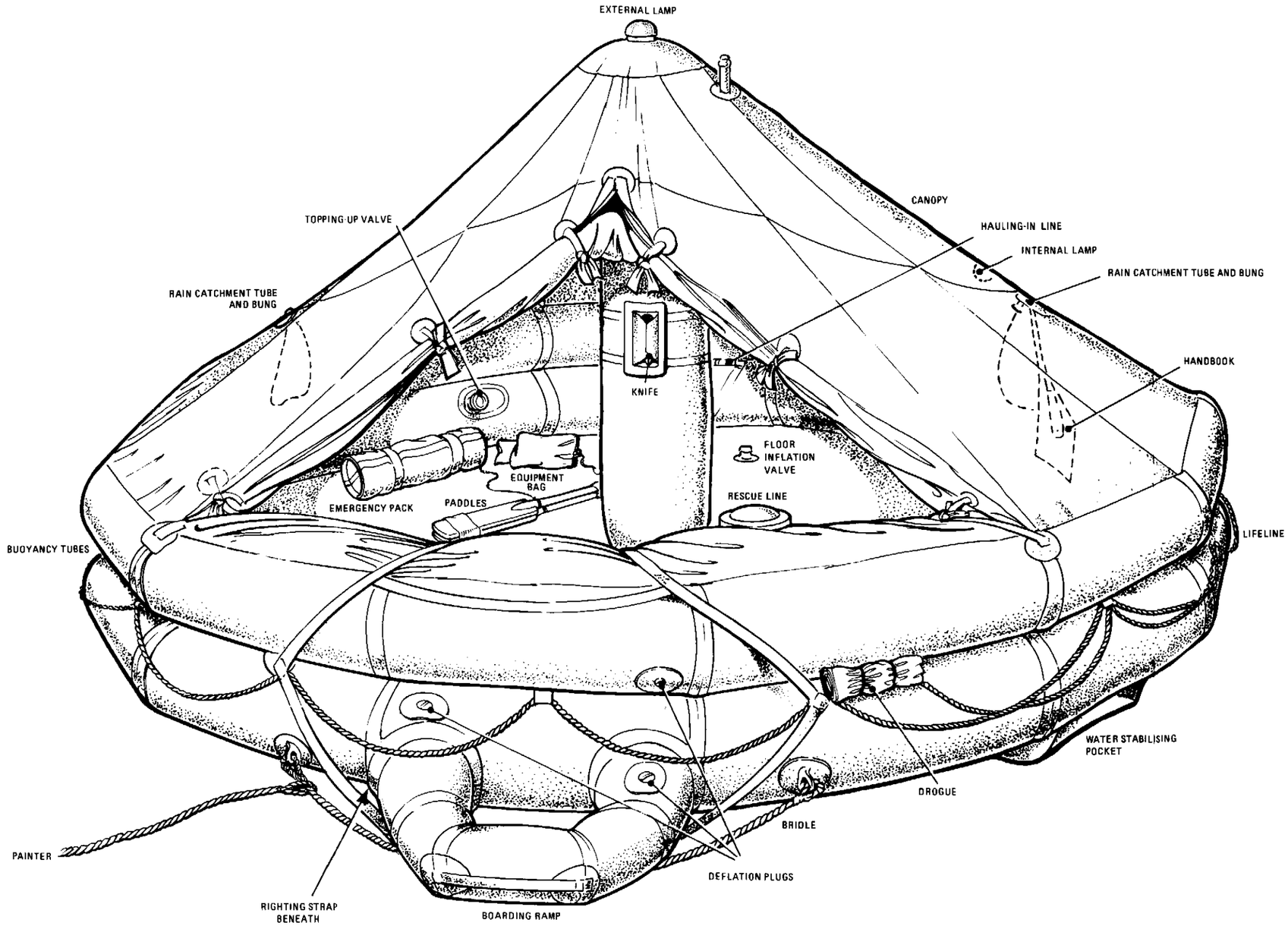
(8) Open the main circuit breaker and complete stowage of the boat by hand crank.

(9) Secure the gripes.

(10) When the boat is secure, release the brake to take the weight of the falls, then leave the brake fully on.

END


ELECTRIC HOISTING WINCH
PENDANT
OUTRIGGER
BOAT FALLS
MILLS RELEASE GEAR
CONTROL WIRE
TURNBUCKLE
ENTRANCE DOORS
CANOPY
PENDANT
GRIPE WIRE
OUTRIGGER
GRIPE LEVER
BOAT FALLS
HULL
STEERING GEAR
MILLS RELEASE GEAR
WATER SPRAY SYSTEM
GRIPE WIRE
AIR BOTTLE


EXTERNAL LAMP
CANOPY
TOPPING-UP VALVE
HAULING-IN LINE
INTERNAL LAMP
RAIN CATCHMENT TUBE AND BUNG
RAIN CATCHMENT TUBE AND BUNG
HANDBOOK
KNIFE
FLOOR INFLATION VALVE
EQUIPMENT BAG
EMERGENCY PACK
PADDLES
RESCUE LINE
BUOYANCY TUBES
LIFELINE
WATER STABILISING POCKET
DROGUE
BRIDLE
PAINTER
DEFLATION PLUGS
RIGHTING STRAP BENEATH
BOARDING RAMP

PERSONNEL TRACKING SYSTEM

1 GENERAL

1.1 The Personnel Tracking System provides means for access control and personnel tracking on the Frigg Field.

1.2 Safety registration of personnel movements are performed:

(a) Between Field platforms

(b) Between Field and onshore.

1.3 The system communicates with similar systems onshore at EAN main office and Heliport at Forus.

2 DESCRIPTION

2.1 The system used is a Programmed Access and Security System (PASS) manufactured by Cardkey Systems LTD.

2.2 Magnetic coded ID-cards are used to registrate arrival/departure. Cardreaders have to be used, strategically located.

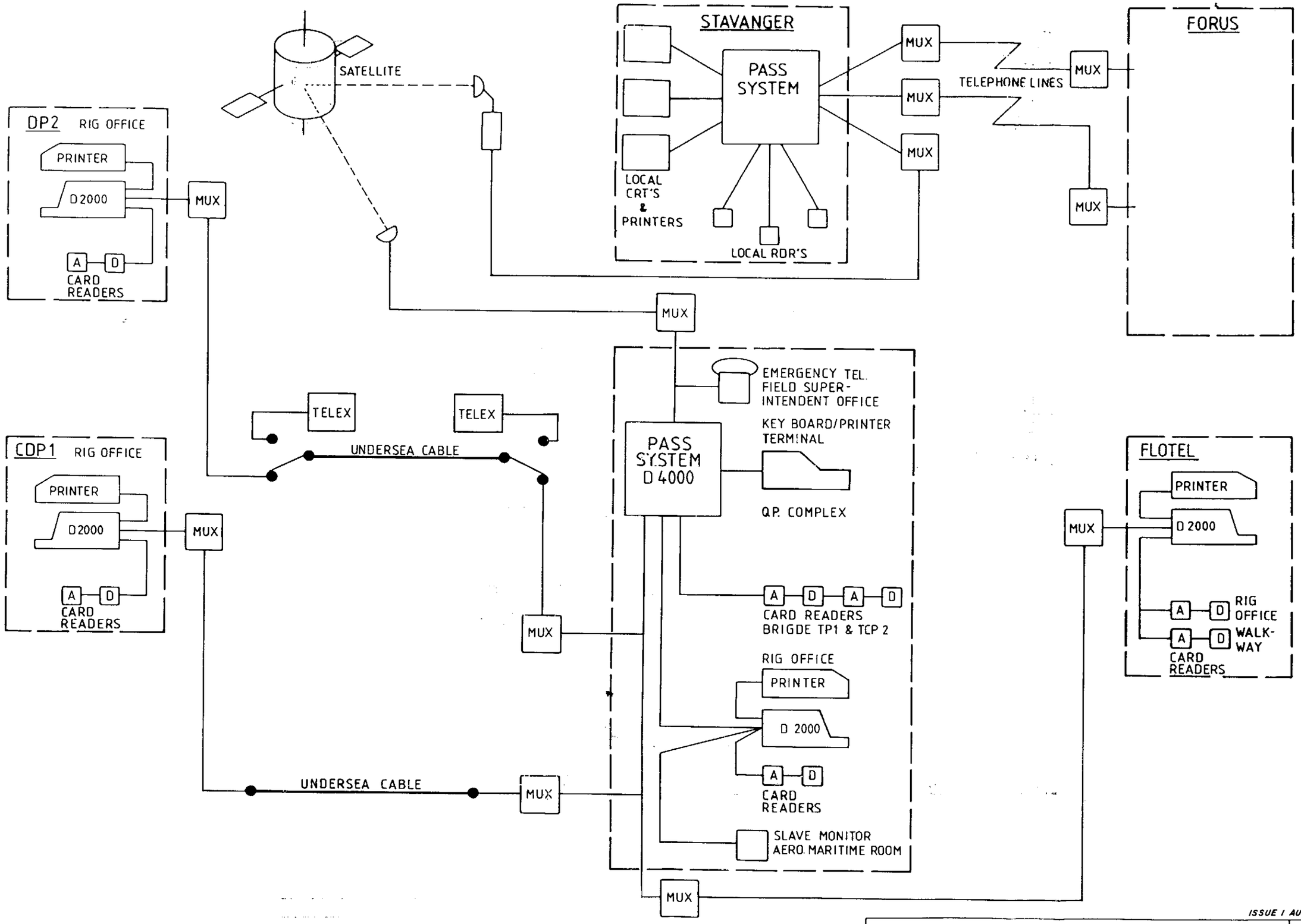
2.3 The offshore system is basically arranged as follows:

- D4000 Pass central control - QP
- Floppy discs - QP
- Keyboard / printer - QP
- D2000 controller - Rig offices QP-CDP1-DP2- Flotel
- System printer - Rig Offices QP-CDP1-DP2- Flotel
- Cardreaders - Rig Offices and bridges.

2.4 The PASS system is designed to run unattended and will only require infrequent visits to remove and file printouts.

2.5 The system maintains a database of all personnel offshore, but other services may be implemented as Helicopter booking, CCTV etc.

END



ISSUE 1 AUGUST 1984

PERSONNEL TRACKING SYSTEM

9.16