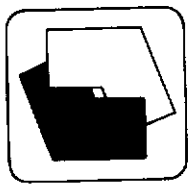
elf aquitaine norge a/s

FRIGG FIELD

CDP 1

VOL 1
OPERATIONS MANUAL



Norsk Hydro | statoil | TOTAL

BRITISH COMMITTEE
OF DET NORSKE VERITAS

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

CERTIFICATE OF FITNESS OF OFFSHORE INSTALLATION

Certificate Number: DnV 0115/86/0

Name or other designation of offshore installation: 10/1 - FRIGG CDP1

Description of installation: Gravity Type Production Platform

Name(s) of owner(s): Elf Aquitaine Norge A/S (Operator)
Total Oil Marine Ltd
Elf Oil Exploration and Production (UK) Ltd
Aquitaine Oil (UK) Ltd
Norsk Hydro A/S
Total Marine Norsk A/S
Den Norsk Stats Oljeselskap A/S (STATOIL)

THIS IS TO CERTIFY pursuant to Regulation 9 (1) of the Offshore Installations (Construction and Survey) Regulations 1974 that the above-described offshore installation is fit to be *established/stationed and maintained in waters to which † Mineral Workings (Offshore Installations) Act 1971 applies, †subject to the following limitations:

The helicopter landing area is limited to helicopters with a maximum size 'D' 25.3 (Twentyfive Point three) meters.
Scrubber Desanders FA 101-1 up to and including 14, FA 101-16 up to and including 21, FA 101-23 and 24 are not to be taken into service before thorough examination has been carried out to the satisfaction of Det norske Veritas.

continued on opposite page

This Certificate remains valid subject to annual and additional surveys in accordance with the Regulations until 30th September 1991 unless previously terminated by the Secretary of State.

Issued at LONDON on 30th September 19 86

Signed P. Dan Nielsen (Secretary) (Chairman)

Designation Secretary / Chairman

On behalf of Det norske Veritas

Certifying Authority
appointed pursuant to the Regulations

* delete whichever is inapplicable
† delete if inapplicable

The equipment in the drilling package shall not be taken into use for operations related to drilling or workover before surveyed to the satisfaction of Det norske Veritas.

FRIGG FIELD

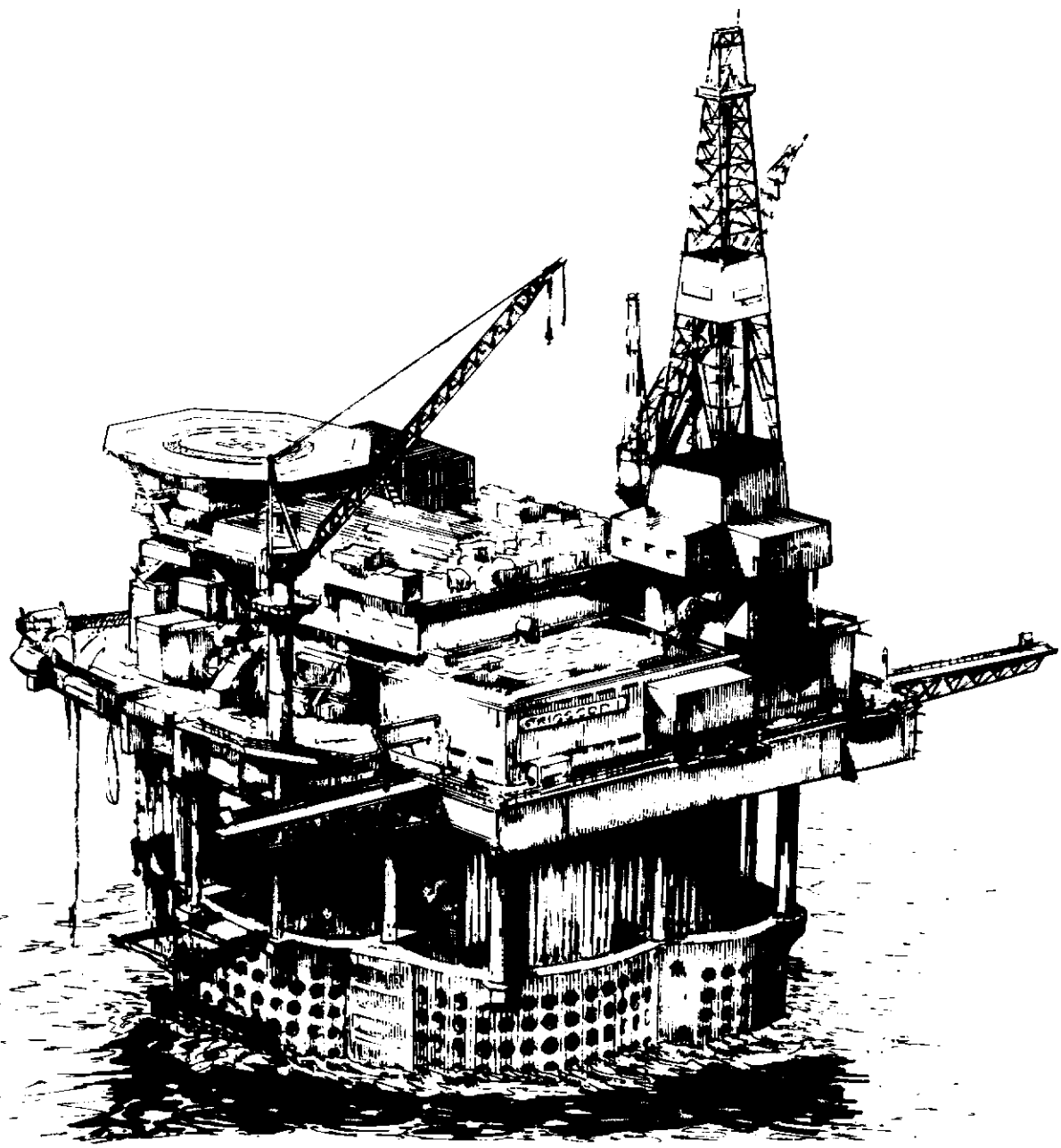
PLATFORM CDP1

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.



FRONTISPIECE

elf aquitaine norge a/s
Engineering Dept.

MASTER FILE

RECORD OF AMENDMENTS

Issue No	Dated	Amended by (Signature)	Date
2	oct 82	K. Gundersen	3/1/83
3	oct 82	K. Gundersen	3/1.83
3	June 84	T. Leiglad	85
New Index list		~~T. Leiglad~~	6/1-86
General update	Oct. 88	K. Tallaksen	20/10/88
Updated	Jan. 89	K. Tallaksen	12/1/89

PIPING/FLOW SYMBOLS

GATE VALVE

BALL VALVE

VALVE NORMALLY CLOSED

CHECK VALVE

HAND CONTROL VALVE

ANGLE VALVE

THREE-WAY VALVE

DIAPHRAGM-OPERATED CONTROL VALVE

ROTARY MOTOR-OPERATED VALVE

SOLENOID-OPERATED VALVE

PRESSURE SAFETY RELIEF VALVE

FAIL SAFE OPEN

FAIL SAFE CLOSE

TUNDISH

PUSHBUTTON

MOTOR DRIVEN FAN

FILTER

OR

HOSE CONNECTION

BLIND FLANGE

SCREWED CAP

FLEXIBLE HOSE

BURSTING DISC

HEAT EXCHANGER

ELECTRIC MOTOR-DRIVEN CENTRIFUGAL PUMP

RECIPROCATING PUMP

POSITIVE DISPLACEMENT PUMP

HAND PUMP

POTAMETER

ORIFICE TYPE PRIMARY ELEMENT

SUBMERGED PUMP

MAIN FLOW LINE AND DIRECTION

SECONDARY FLOW LINE AND DIRECTION

FLOW LINES JOINING

FLOW LINES CROSSING

INSTRUMENT PNEUMATIC LINE

INSTRUMENT ELECTRICAL LINE

FLOW ABBREVIATIONS

HCV	HAND CONTROL VALVE	PSV	PRESSURE SAFETY VALVE
LC	LOCKED CLOSED	ROV	REMOTE OPERATED VALVE
LCV	LEVEL CONTROL VALVE	RV	RELIEF VALVE
MCC	MOTOR CONTROL CENTRE	SV	SAFETY VALVE
PCV	PRESSURE CONTROL VALVE	CSO	CAR SEAL OPEN

INSTRUMENT SYMBOLS

LOCAL MOUNTED INSTRUMENT

LOCAL PANEL MOUNTED INSTRUMENT

MAIN PANEL MOUNTED INSTRUMENT

LAL LEVEL ALARM LOW

LALL LEVEL ALARM LOW LOW

LC LEVEL CONTROLLER

LI LEVEL INDICATOR

FT FLOW TRANSMITTER

LSH LEVEL SWITCH HIGH

FE FLOW ELEMENT

LSL LEVEL SWITCH LOW

LSLL LEVEL SWITCH LOW LOW

LT LEVEL TRANSMITTER

PAH PRESSURE ALARM HIGH

PAL PRESSURE ALARM LOW

Pdi PRESSURE DIFFERENTIAL INDICATOR

PI PRESSURE INDICATOR

PS PRESSURE SWITCH

PSH PRESSURE SWITCH HIGH

PSL PRESSURE SWITCH LOW

TS TEMPERATURE SWITCH

XT TRANSMITTER (MISCELLANEOUS)

Issue 3,-Oct.88

GLOSSARY OF SYMBOLS

CDP1

Operational Manual

Chapter 1 Introduction

		Title / Content	Issue
		Content	1. July 80
Section	1.1	Frigg Field Location	3. Oct. 88
Diagram	1.1	Frigg Field Location	3. Oct. 88
Section	1.2	Summary of installation	3. Oct. 88
Diagram	1.2	Summary of installation	3. Oct. 88
Section	1.3	Frigg Field Process Flow, page 1, 2	3. Oct. 88
Diagram	1.3	Frigg Field Process Flow	3. Oct. 88

Chapter 2 Platform Structure

		Contents	4. Sep. 86
Section	2.1 page 1	Platform Construction	2. Oct. 88
Section	2.1 page 2		2. Oct. 88
Section	2.2	Environmental design criteria	3. Oct. 88
Diagram	2.2	Environmental design criteria	2. Oct. 82
Section	2.3 page 1	Geotechn. and struct. instrument.	3. Oct. 88
Section	2.3 page 2		1. Oct. 88
Diagram	2.3	Geotechn. and struct. instrument.	1. July 80
Section	2.4 page 1	Primary Structure	3. Oct. 88
Section	2.4 page 2	Primary Structure	3. Oct. 88
Section	2.4 page 3	Primary Structure	2. June 84
Diagram	2.4	Primary Structure	1. July 80
Section	2.5 page 1	Secondary Structure	2. Oct. 82
Section	2.5 page 2	Secondary Structure	2. Oct. 82
Section	2.5 page 3	Secondary Structure	2. July 86
DRWG FF	9121347002		27. June 84
DRWG FF	9136351396		20. Feb. 86
Diagram	2.5	Secondary Structure	2. June 84
Section	2.6 page 1	Risers & Flowlines	1. July 80
Section	2.6 page 2	Risers & Flowlines	1. July 80
Diagram	2.6	Risers & Flowlines	1. July 80
Section	2.7 page 1	Materials and Construction	1. July 80
Section	2.7 page 2	Materials and Construction	3. June 84
Section	2.7 page 3	Materials and Construction	2. Oct. 82
Section	2.7 page 4	Materials and Construction	1. July 80
Section	2.7 page 5	Materials and Construction	2. June 84
Section	2.7 page 6	Materials and Construction	3. Oct. 88
Diagram	2.7	Materials and construction pipel.id.	1. July 80
Section	2.8 page 1	Cathodic Protection	1. July 80
Section	2.8 page 2	Cathodic Protection	1. July 80
Diagram	2.8	Cathodic Protection	1. July 80
Section	2.9	Inspection and Maintenance	1. Oct. 82

Chapter 3 Equipment location

		Content	1. July 80
Section	3.1	Equipment Location	2. June 84
Diagram	3.1.1	Equipment Location Service Deck	3. Oct. 88
Diagram	3.1.2	Equipment Location Prod. Deck	5. Oct. 88

Chapter 4 Drilling packages

Chapter 5 Production facilities

Chapter 6 Utilities

Cont.

Chapter 6 Cont.

Chapter 7 Transport facilities

Chapter 8 Materials Handling

Chapter 9 Communications

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 layout is shown on Diagram 1.1.

2. PLATFORMS

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

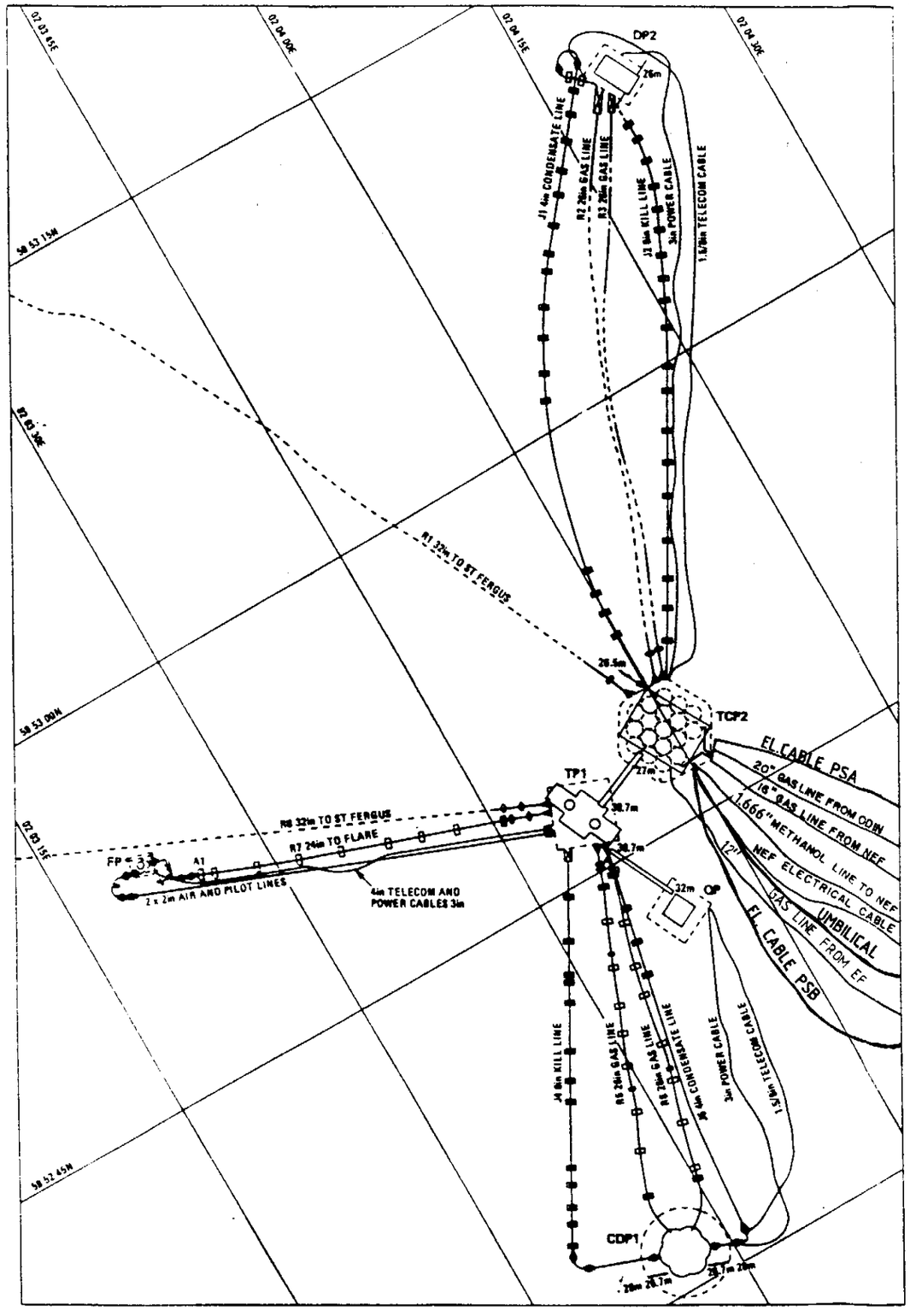
3. SATELLITE FIELDS

The East Frigg Field is located on the boundary of the blocks 25/1 and 25/2 some 18 km. from Frigg Centre.
The North East Frigg Field, is located in block 25/1 - 30/10 some 18 km. from Frigg Centre.

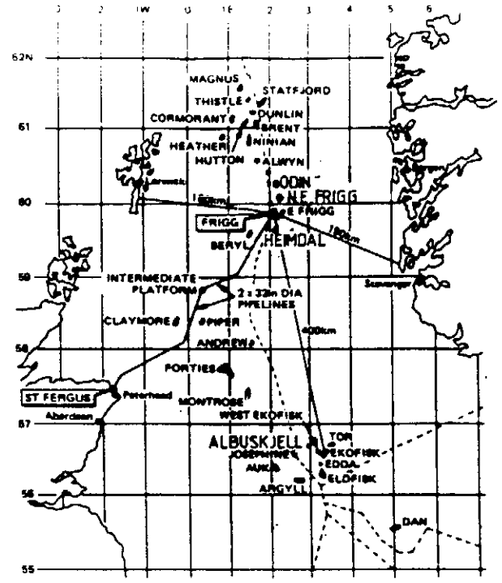
4. INTERCONNECTED FIELDS

Odin - 30/10
Alwyn- 3/9 (UK Sector)

END



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



N
TRUE NORTH

PLATFORM CO-ORDINATES

STRUCTURE	GEOGRAPHICAL CO-ORDINATES	UTM CO-ORDINATES	TRUE ORIENTATION
DP1 MAST	58° 52' 49" 718 N 02° 04' 48" 765 E	6 638 334.39 N 448 686.95 E	—
DP2	58° 53' 19" 675 N 02° 04' 29" 604 E	6 639 248 60 N 448 660 90 E	232° 52' 12"
TP1	58° 52' 47" 276 N 02° 03' 51" 366 E	6 638 540 74 N 447 676 38 E	336° 29' 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 60 N 447 662 98 E	336° 17' 43"
CDP1	58° 52' 31" 388 N 02° 03' 41" 745 E	6 638 088 30 N 447 488 81 E	619° 37' 41"
FP	58° 52' 53" 519 N 02° 03' 21" 293 E	6 638 748 50 N 447 158 50 E	—

KEY

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

ISSUE 3. OCT. 88

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, is used to increase pipeline pipeline capacity.

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 serves as a support for 24 gas producing wells and living quarter.

(b) DP2 - is registered '25/1 - FRIGG - DP2' as an offshore installation. It is an eight-legged steel lattice structure achored by piles, and stands in 98m of water, and serves as a support for 24 gas producing wells and living quarter.

(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 120 persons.

(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 colums 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. Gas produced and treated on Alwyn is transported via this platform 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,North East Frigg,East Frigg and Odin is treated, compressed on this platform before being transported to the St.Fergus terminal.

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

2.2 The three central platforms TP1, TCP2 and QP are linked by bridges. Drilling/production platforms CDP1 and DP2 are located 500m and 800m from their respective treatment platforms. The NEF Field Control Station and subsea equipment some 18km north-east of Frigg. The East Frigg Subsea production facilities are some 18km. east of Frigg.

2.3 Interconnected fields ODIN and ALWYN.

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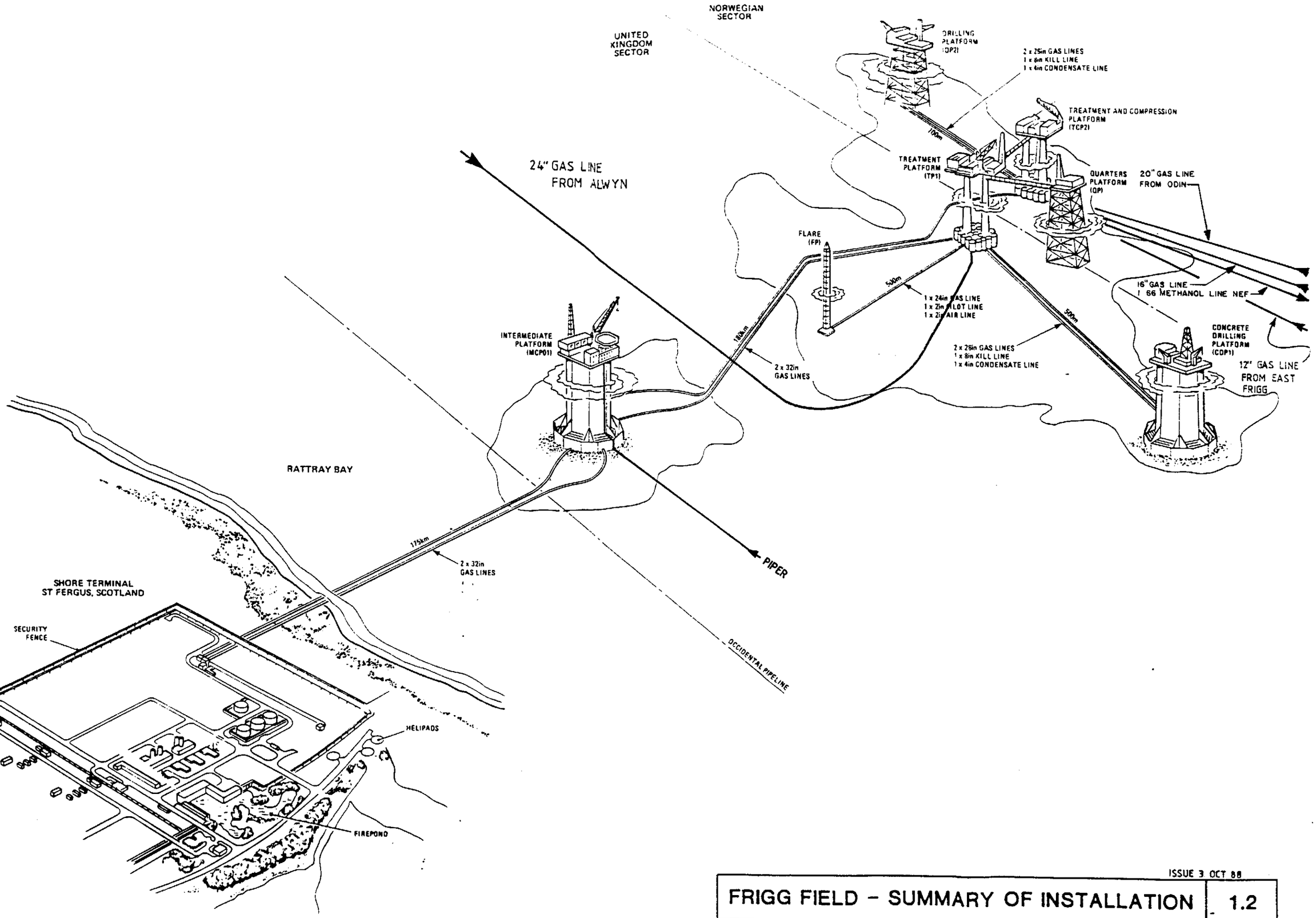


ISSUE 3 OCT 88

FRIGG FIELD - SUMMARY OF INSTALLATION	1.2

FRIGG FIELD PROCESS FLOW

1. GENERAL

1.1 The Frigg Field installation produced, treats, meters and exports natural gas via an intermediate menifold 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 (23 wells are gas producers) wells drilled from CDP1 passes through two 26" flow lines to TP1.The scrubber deaanders installed downstream of each wellhead on CDP1 are now bypassed, apart from well 15 where the scrubber is still in operation for observation reasons. A maximum wellhead pressure of 172 barg and a gas flow rate of 2.0 to 2.5 MMSCMD has been allowed for in the design of scrubber desanders, valves and pipework. Two wells (well 25/26) on CDP1 are used as observation wells.

2.2 Gas produced by the 23 wells drilled from DP2 passes through two 26" flow lines to TCP2. Scrubber desanders similar to those on CDP1 are installed, but now bypassed, except on well A22A. Two wells on DP2 (well 22/24) are used for observation purposes and one well (well 3) is for liquid injection (including methanolated water from ODIN, NEF and EAST FRIGG) from TCP2.

2.3 Gas produced by NEF and EF is transported to TCP2 through a 16" and a 12" pipeline for treatment and compression before being transported to St. Fergus terminal. Gas produced by Odin is transported to TCP2 through a 20" line for treatment and compression before being transported to St. Fergus.

2.4 The gas produced and treated on the Alwyn field is transported to TP1 through a 24" line then transferred to the 32" sea line on it's way to St. Fergus terminal.

2.5 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 and fuel gas treatment with interconnection between TP1 and TCP2.

2.6 The process equipment installed on TCP2 is similar to that on TP1, except for one FWKO vessel which is implemented in the Odin stream process equipment, and the addition of gas compression equipment to boost gas pressure prior to dehydration and pipeline export to St. Fergus. A 26" low (well head) pressure gas line from TP1 to TCP2 feeds TP1 gas to the compressor suction. A 24" high pressure gas line returns compressed gas from TCP2 to the TP1 dehydration system.

2.7 A 26" 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.

2.8 A 32" 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 plaform to St. Fergus. This 32" line may also be used to equalize the pressure between the export lines, if required.

2.9 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 subsea line; TCP2 is conncted into the start of the sea line on TP1 via the inter-platform bridge. FP is certified for a continous flow rate of 10 MMSCMD with a maximum allowable short period flow rate of 34 MMSCMD. As the flaring of the gas only takes place as 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 continous flowrate of 2400 SCMD. In the event of a failure of the nitrogen supply, fuel gas at a continous 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.

This back-up system has been modified to handle low temperature gas as a result of Alwyn gas arriving on TP1 at low temperature. Consequently the cold vent system acts as a permanent relief system for equipment and piping handling cold gas as well as being a back-up system for the flare platform.

Control and display devices for the Frigg Field process installation, NEF, EF, ODIN and ALWYN are contained on QP. More advanced equipment, the FCDA is installed both in CCR on QP, and in Compression Control Room on TCP2, to operate the East Frigg process equipment.

3. CONTROL

The determining factor in controlling process flow is the required pressure at the St. Fergus terminal inlet. There are a 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.

ALWYN
24" SEA LINE
LEAK DETECTION
DEPACKING CONTROL VALVES
FUTURE
FUTURE
DRY GAS OUTLET MANIFOLD
32" SEA LINE TO ST FERGUS VIA MCP 01
N2/FUEL GAS
HP RELIEF SCRUBBER
FROM RELIEF AND BLOWDOWN
FROM TP1/TLP2 RELIEF AND BLOWDOWN
COLD VENT
COLD VENT K.O. DRUM V47
32"
FLARE PLAT FORM (FP)
24" SEA LINE
26in SEA LINES
FWKO SEPARATOR (TYPICAL OF 3)
26"
CONDENSATE SURGE TANK
CONDT. STORAGE TANK
GLYCOL CONTACTOR (TYPICAL OF 3)
COALESCER
MUD PUMP
WELLHEAD TYPICAL OF 24
CONCRETE DRILLING PLATFORM (CDP1)
QUATERS PLATFORM QP
DISTRIBUTION BOARD
DISTRIBUTION BOARD
INTER PLATFORM BRIDGES
WET GAS INTERCONNECTING HEADER
TREATMENT PLATFORM (TP1)
CONDENSATE INTERCONNECTING HEADER
DRY GAS INTERCONNECTING HEADER
DISTRIBUTION BOARD
PRIMARY POWER GENERATION
NATURAL GAS COMPRESSORS
COMPRESSION AREA
32" SEA LINE TO ST.FERGUS VIA MCP 01
CHOKE VALVE (TYPICAL OF 24)
26" SEALINES
FWKO SEPARATOR (TYPICAL OF 2)
HP RELIEF SCRUBBER
GLYCOL CONTACTOR (TYPICAL OF 3)
MUD PUMP
WELLHEAD TYPICAL OF 24
DRILLING PLATFORM (DP2)
NEF
16
SEA LINE
FWKO SEPARATOR
GAS SCRUBBER
CONDENSATE SURGE TANK
CONDENS. RECYCLE TANK
TREATMENT AREA
ODIN
20
SEA LINE
FWKO SEPARATOR
GAS SCRUBBER
COALESCER
EF
12"
SEA LINE
FWKO SEPARATOR
GAS SCRUBBER
TREATMENT AND COMPRESSION PLATFORM (TCP 2)

ISSUE 3 OCT. 1988

FRIGG FIELD - PROCESS FLOW

1.3

CHAPTER 2

PLATFORM STRUCTURE

CONTENTS

DIAGRAMS

PLATFORM CONSTRUCTION

1 INTRODUCTION

Initially it was intended that the platform would be used as a booster station on the Frigg-to-Scotland subsea gas pipeline. However, it became necessary to use the platform for drilling and production in the Frigg Field.

2 GENERAL

2.1 The platform is a concrete gravity drilling and production platform constructed in two parts – namely a steel/concrete main deck structure mounted on a concrete substructure. The substructure comprises various post-tensioned concrete components centred around a central shaft.

2.2 The concrete substructure extends from the seabed to the transition central shaft/main deck at elevation +126.600m.

2.3 All structural elements are prestressed using the Freyssinet cable system. The slab, raft walls, tunnels, diaphragms, lobate walls and core are prestressed both vertically and horizontally.

The concrete substructure comprises the following main elements:

(a) A raft foundation of 101m diameter, with base slab, radial and circular wall stiffeners for transmission of loads to the foundation.

(b) Six radial tunnels (incorporated in the raft structure) connected to the central shaft and accommodating the horizontal part of the risers through the structure. Tunnels at axes C and D have been blocked for the installation of drilling conductors.

(c) A lobate cylindrical vessel which constitutes the floating unit during construction and towing. It also provides foundation for the deck-supporting columns. The upper part of the lobate wall is perforated and acts as a breakwater.

(d) A central shaft (core) accommodating the main risers and also providing the main rigid support for the deck. The shaft is dry.

(e) Interior diaphragms (below el +68,000) and struts and beams (el +68,000 and +107,000) connecting the central shaft and lobate wall structure.

2.4 The main design contractors were C.G. Doris in accordance with the following criteria:

(a) ACI 318–71; Building Code Requirements for Reinforced Concrete.

(b) C.G. Doris; Frigg MP1/DP1 Platform, Design Criteria Codes, 26th June 1975.

(c) FIP–CEB; Recommendations 1970.

(d) C.G. Doris; Document No 1393 Technical Specifications for Reinforced and Prestressed Concrete.

2.5 Scour of the foundation is limited by a perforated wall, constructed as part of the substructure base raft. Anti-scour mats are rolled out 2.8m from the tip of the foundation, and gravel dump is placed outside the slab in north and south quarters.

3 MATERIALS

3.1 Materials to the following specifications were used in platform construction:

(a) Concrete with a compressive strength of 400kg/cm^2 (28 days on 15 x 30cm cylinders), equivalent to characteristic cube strength fcu = 50N/m^2.

(b) Reinforcement of quality K540 (fy = 4000kg/cm^2) in accordance with Norwegian Standard 481, Part 2, and characteristic strength as follows:

(i) Mild steel of 250N/mm^2.

(ii) High yield steel of 410N/mm^2.

(c) Prestressing steel to British Standard 3617, 1971. The type of cable used was Freyssinet 12T15 with a guaranteed minimum breaking strength of 25.4 tons per strand.

(d) Structural steelwork to DIN 17100–ST. 5.2.3–M for primary members and NFA35501–E26.Z for secondary members.

3.2 Nominal quantities of construction materials used were as follows:

(a) Concrete – 5000m^3.

(b) Reinforcing steel – 6400 tonnes.

(c) Post-tensioning steel – 2600 tonnes.

3.3 Total submerged weight of the structure is 232.000 tonnes, which includes the sand ballast contained within the substructure lobed walls to a height of 60 m.

ENVIRONMENTAL DESIGN CRITERIA

1.0 SOIL PROFILE

Tabulated below is the soil profile as defined by samples taken from CDP1 location.

Depth Below Seabed (m)	Soil Description
0 to 9	Medium to fine sand DR = 80 to 90 per cent
9 to 16	Upper clay C_u = 13 to 25t/m^2
16 to 38	Medium to fine sand with layers of clay C_u = 15t/m^2
38 to 80	Hard clay C_u = >50t/m^2
80 to 150	Medium dense sand

2.0 SCOUR PROTECTION

A scour protection system for "carpets" was fitted at the installation of the platform, but this system is now considered inefficient due to damage. Gravel dump was placed in two 90 degrees sectors (north and south) during autumn 1983 right outside the slab to prevent scouring. The scour condition is considered presently stable.

3.0 SETTLEMENT

Settlement of the concrete structure is measured three times a year by optical means using QP as reference.

E N D

WIND

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

SEA

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

MAXIMUM TIDE AND STORM ELEVATIONS

STORM AND OPERATING CONDITIONS

1.6m ABOVE LAT

WAVE HEIGHT

STORM CONDITIONS	DYNAMIC ANALYSIS
29m	17.4m

WAVE FREQUENCY

STORM CONDITIONS	DYNAMIC ANALYSIS
15s	12s

STORM SURGE

0.6m

SURFACE CURRENT

STORM CONDITIONS

1.35m/s

LINEAR VARIATION

SEABED +30m CURRENT

STORM CONDITIONS

0.70m/s

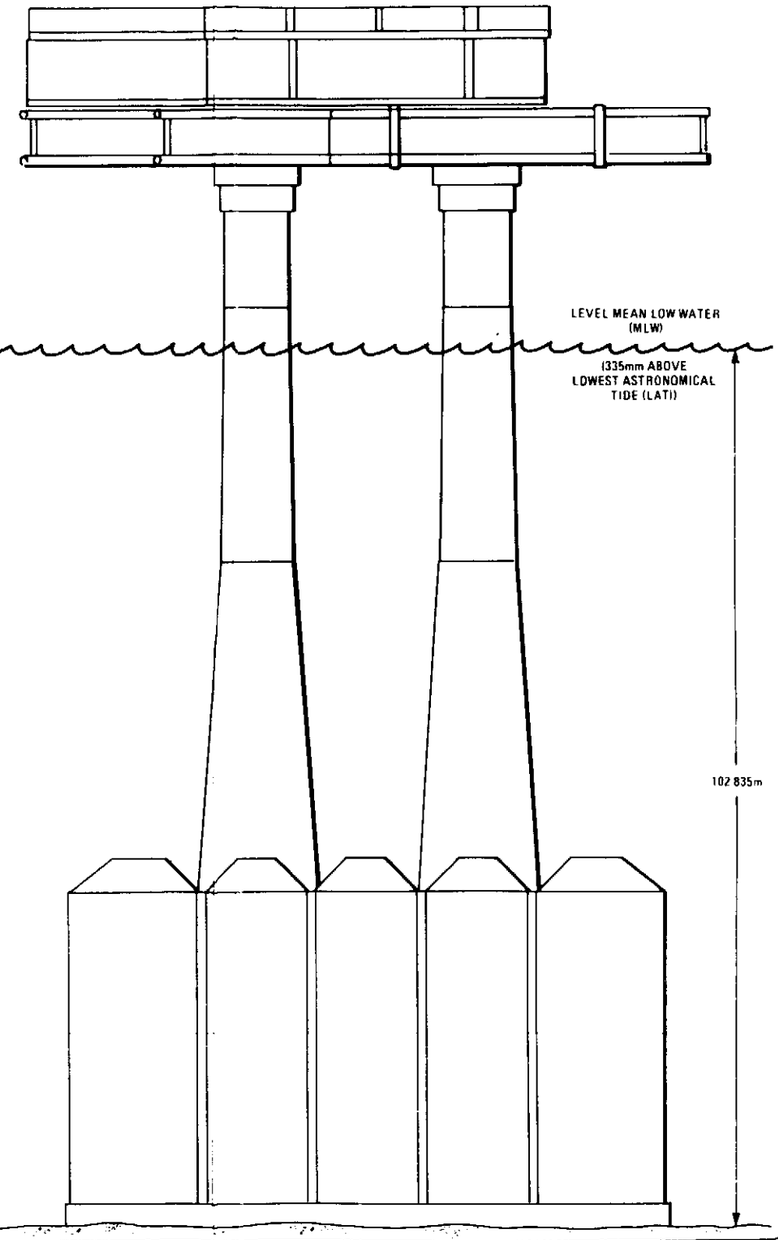
LINEAR VARIATION

SEABED CURRENT

STORM CONDITIONS

0.30m/s

MUD LINE



GEOTECHNICAL AND STRUCTURAL INSTRUMENTATION

1 GENERAL

1.1 Instrumentation is provided to measure accurately the structural behaviour of the platform.

1.2 The measurements are summarised as follows:

(a) Wave.

(b) Acceleration on deck and at base slab level.

(c) Pressure under base slab.

(d) Deep interstitial pressure.

(e) Settlement and horizontal displacement.

2 DESCRIPTION

2.1 The Syminex foundation instrumentation system is installed to enable continuous surveillance of foundation conditions, readings being transmitted to recording equipment located in Module BR2 Electrical Room.

2.2 Platform displacements are measured by two pairs of accelerometers located at base and deck level, which work through 90 degrees and give co-ordinated readings of horizontal disturbances.

2.3 Pore water pressure is measured by a pressure sensor located in a cavity underneath the base slab on the south-east side of the platform.

2.4 Deep pore pressure below the platform base is measured by vibrating wire pressure sensors located in strings penetrating into the soil beneath the base slab at two locations namely cells A and E.

2.5 Vertical settlement is determined by optical means using QP as a reference. The settlement now shows a stable condition.

2.6 Horizontal displacement is measured by a bi-axial inclinometer capable of reading up to 30 degrees displacement from the vertical.

2.7 A Data Acquisition System is installed in Module BR2. Sampling from 1983 is carried out at 16Hz on digital magnetic tape and, under normal conditions, one routine sequence is recorded every 24 hours.

NOTE

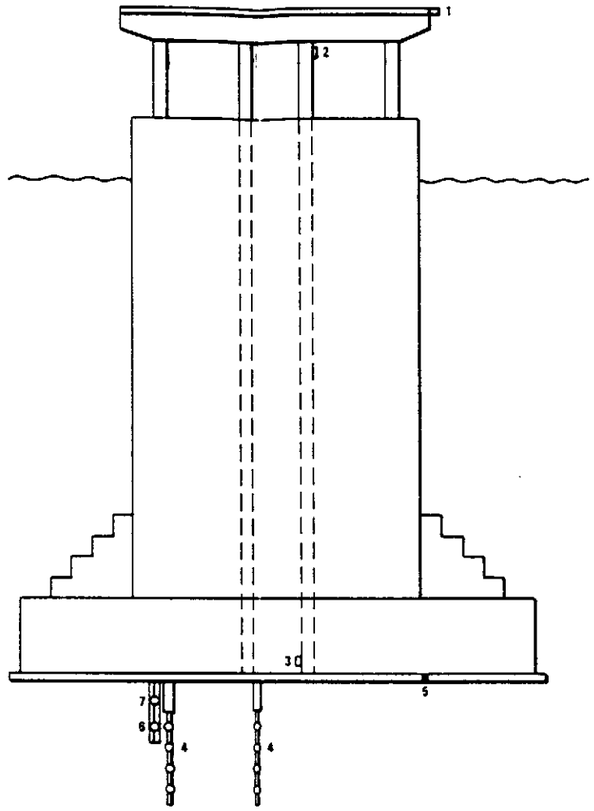
The data received from the instrumentation system and the measurements taken should be sent to DnV as the Certifying Authority.

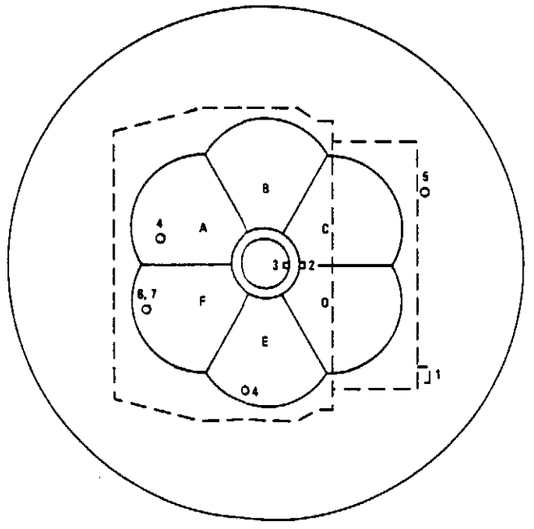
2.8 Since 18 September 1983, the previous instrumentation has been extended with the measurement of the absolute elongation between two points located on each side of the the crack on the external diaphragms ED35 and ED65. The objective of this specific monitoring is to follow up the evolution of the cracks.

2.9 During summer 1985, the instrumentation has been completed by 15 supplementary sensors with pressure measurement by piezometer, 5 hydrodynamic pressures just above the slab and 10 pore pressures just below the slab. They are distributed between 5 locations; two in the vicinity of the external diaphragm ED-35, two in the vicinity of the external diaphragm ED-65, one in the vicinity of the perforated wall PW-57.

3 Instrumentation status

The system is still in operation, and gives valuable information about the platform behaviour.





N PLATFORM NORTH

KEY
1 WAVE HEIGHT METER
2 DECK ACCELERATION
3 BASE ACCELERATION
4 DEEP PORE PRESSURE
5 SLAB TOTAL PRESSURE
6 SELECTIVE SETTLEMENT
7 HORIZONTAL DISPLACEMENT

ISSUE 1. JULY 1980

GEOTECHNICAL AND STRUCTURAL INSTRUMENTATION 2.3

PRIMARY STRUCTURE

1 GENERAL

1.1 The primary structure is a concrete substructure comprising post-tensioned components which support the main deck structure, and upon which stand the modules housing the drilling and production facilities.

1.2 Main elements of the substructure are as follows:

(a) Base raft.

(b) Cylindrical structure.

(c) Interconnecting struts, beams, nodes and diaphragms.

1.3 The substructure, standing in 99.4m of water, is designed to withstand 100-year storm forces.

2 DESCRIPTION

2.1 Base Raft

2.1.1 The base raft consists of a raft foundation of 107m diameter, with a base slab and radial and circular wall stiffeners which transmit platform loads to the foundation.

2.1.2 Six tunnels radiating from the central shaft are incorporated in the raft. The tunnels contain the horizontal part of platform risers. Those at axes C and D are blocked to accommodate drilling conductors.

2.1.3 A perforated anti-scour wall is installed at the periphery of the base raft.

2.1.4 The base slab between the lobed walls of the cylindrical structure supports the sand ballast which rises to a height of 60 m.

2.2 Cylindrical Structure

2.2.1 The cylindrical structure comprises a 9m internal diameter central shaft surrounded by six equal segments. Each segment consists of a lobate wall braced by diaphragms and radial beams. The lobate walls provide support for the main deck structure supporting columns. The segments are identified by letters A to F inclusive as shown on Diagram 2.4.

2.2.2 In order to minimise wave loading, the upper sections of the lobate walls are perforated by 'Jarlan' holes.

2.2.3 The structure is divided into three parts by horizontal sections as follows:

(a) Lower part: elevation 0 to +30.0m.

(b) Middle part: elevation +30.0m to +69.20m.

(c) Upper part: elevation +69.20m to +126.60m.

2.2.4 The central shaft houses the two 26in gas lines which exit onto the seabed through the base raft tunnels. The shaft provides the main rigid support for the main deck structure, and is permanently empty to allow inspection.

2.3 Interconnecting Components

2.3.1 External diaphragms connect the lobate walls to the perforated anti-scour wall, via an external wall, up to the level +26.0m. Internal diaphragms connect the central shaft to the lobed walls, up to the level +68.0m.

2.3.2 Between elevations +68.0m and +107.0m, vertical nodes, which span as propped cantilevers, are interconnected with radial beams.

2.3.3 The interconnecting components transmit platform and environmental loads to the base.

3 PLATFORM LOADING

3.1 Deck loads are supported by concrete beams spanning the columns, which support the main deck structure and the central substructure shaft. Horizontal loading from wind is resisted by the central shaft, with each support column having a neoprene bearing at its head to allow horizontal movement and rotation of the beams.

3.2 Some 60 per cent of deck loading is concentrated on the central area (due to siting of modules). This has necessitated the limitation of live loading to avoid overstressing of the support beams. The areas that cannot accept additional live loads are clearly marked.

3.3 Gravity loads, together with vertical deck loads, act through compressive struts onto the sub-structure outer diaphragms and cause a 'tie' action across the platform base.

3.4 Loading imposed by the sand ballast, which is contained within the substructure to a height of 60 m is taken back up the internal diaphragms and thence by 'compressive strut' action onto the outer diaphragms.

4 DECK LOADING PLAN

4.1 Definition of deck loads are as follows:

DEAD LOAD Weight of structure inclusive of cladding etc. in module/pancake and the dry weight of the equipment known to be in the structure.

VARIABLE LOAD Is the variable part of the equipment load inside the structure. This includes mud, cement, bentonite, barite, water, oil etc., inside equipment and also the weight of pipes stacked on the module.

LIVE LOAD The live load on the structure includes allowance for change of equipment or use, extra loads imposed by ice or snow, water or people, moving machinery etc. Live load has only been considered to act on large areas unencumbered by equipment and also in accommodation areas.

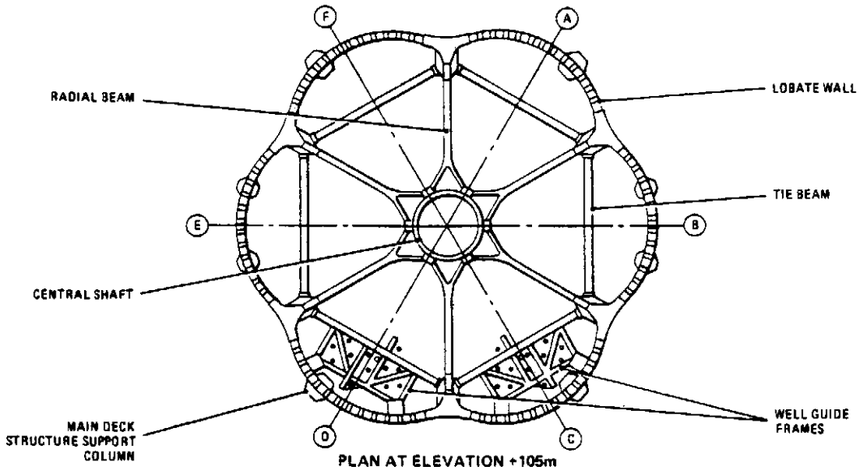
The loads given below are those originally used for the design of the platform. The maximum loading occurred during the drilling phase when the platform was loaded with casings and mud.

Today most of the loads defined under variable loads have been removed due to the fact that drilling has finished, but it is possible that drilling could occur again in which case the loads would again be applicable.

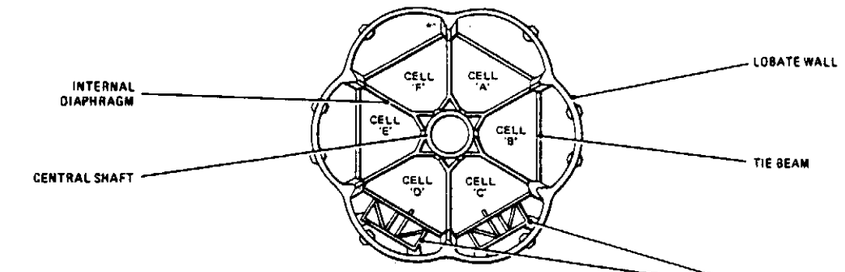
For the overall design of the platform, the figures given for the live load should apply for the local design of modules and pancakes and will not now normally exist.

4.2 Table of Loads

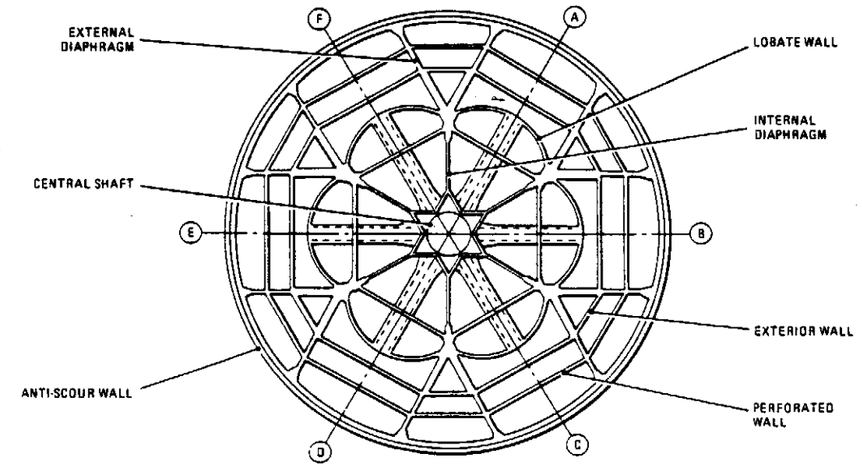
AREA MODULE/PACKAGE	DEAD LOAD KN	VARIABLE LOAD KN	LIVE LOAD KN
SD1	659	-	910
SD2	678	-	842
SD3	678	-	842
T1	659	1647	17
T2	630	1653	15
PH1	724	-	143
WH1A	3701	620	7748
WH1B	4128	3080	7861
PM2	5434	-	1020
PM3	8240	-	0
PM4	4279	-	3659
PACKAGE 1	3522	6337	-
PACKAGE 2A	1761	3497	-
DIVING	2334	-	-
PACKAGE 2B	1771	4763	-
PACKAGE 3	2825	6514	-
PACKAGE 4	2323	804	-
PACKAGE 5A	2080	2580	-
PACKAGE 5B	1275	5101	-
PACKAGE 6	3139	1766	-
PACKAGE 7	-	-	-
BR1	1715	-	2256
BR2	1027	67	1800
BURNER BOOM-W	360	16	49
BURNER BOOM-E	342	16	49
START UP SEPERATOR	454	260	-
CANTILEVER DECK	1692	1926	1931
NEW LIVING QUARTER	1349	-	1694
NEW RIG MODULE	270	-	327
M60 CRANE/PEDESTAL	405 + 468	423	-
NATIONAL CRANE/ PEDESTAL	432 + 440	700	-
TOTAL:	59436 KN	41770 KN	29142 KN



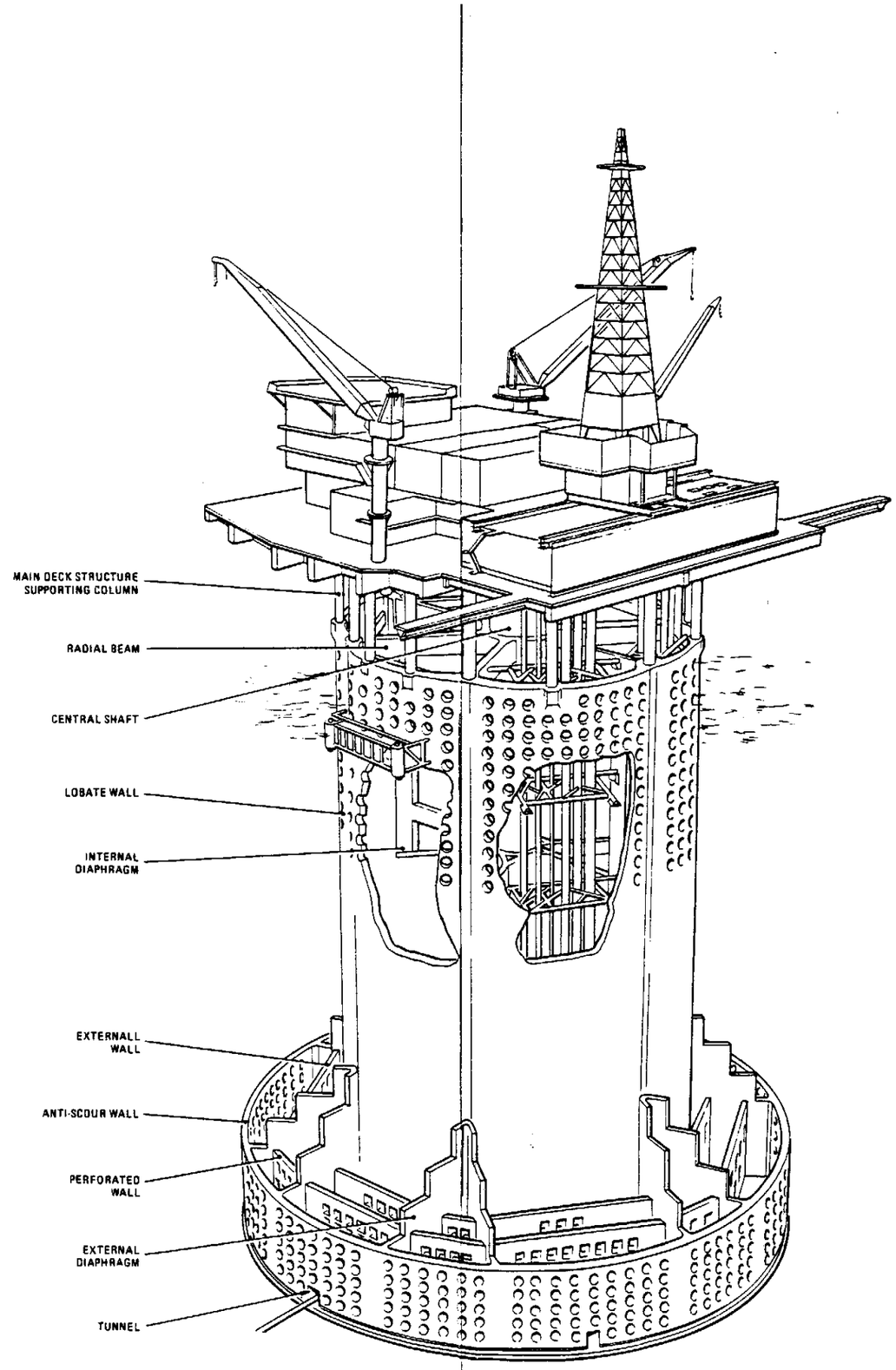
PLAN AT ELEVATION +105m



PLAN AT ELEVATION +65m



PLAN OF BASE RAFT



ISSUE 1. JULY 1980

SECONDARY STRUCTURE

1 GENERAL

1.1 The secondary structure contains modules which house the production and drilling facilities. It is supported by a main deck structure.

1.2 Each module houses equipment necessary to a production phase or support function, as follows:

(a) Modules WH1A and B, Well Production Facilities.

(b) Modules PM2 and 3, Process Facilities.

(c) Modules BR1 and 2, Electrical Power Generation and Control, Batteries and Utilities.

1.3 A drilling package is installed which consists of eight modules and a derrick. The modules are on the upper level of the structure; the derrick is above the wellhead modules at the platform southern edge.

1.4 The following appurtenances take cantilever support from the main deck structure:

(a) The living quarters structure (process operators, Module PM4) from the northern edge of the platform.

(b) Two burner booms from the east and west sides of the platform.

2 DESCRIPTION

2.1 Main Deck Structure

2.1.1 The major elements of the structure are prefabricated concrete beams which form a grid. They are rigidly connected to the central core of the primary structure, and are supported by 14 steel columns, the internals of which are filled with concrete. The tops of all main beams terminate at elevation +126.60m.

2.1.2 The nominal 15m high steel support columns are fixed to the lobed walls by anchor bolts. Neoprene/steel sandwich bearings on top form simple supports for the main deck beams, and allow rotational and horizontal movements.

2.1.3 A grid of secondary steel beams and stringers on top of the main concrete beams support the deck grating. The top of the grating terminates at nominal elevation +127.40m.

2.1.4 Steel skid beams supporting platform modules are installed as follows:

(a) Two, one each to the left and right of centre running north/south from the internal limits of Modules WH1A and B.

(b) Two, similar to (a) above but nearer the centre, running under Modules WH1A and B. The top of the skid beams terminate at nominal elevation +127.60m.

2.1.5 The central core gap between the primary and main deck structure consists of two box girder main beams and a floor grid of secondary beams. The space between the secondary beams is filled with concrete; they are supported on Neoprene bearings.

2.2 Modular and Other Deck Structure

2.2.1 A service deck comprising four modules (SD1 to 4) runs centrally across the platform from east to west. The roofs of the modules form part of the main deck structure. The floors interconnect the boat landing stations, provide material and personnel access to the central shaft, and support the winching equipment. Main structural members are hanger frames supported by east/west main concrete beams.

2.2.2 Modules WH1A and B are situated on the southern edge of the main deck structure. Each module measures a nominal 22.10m long x 13.7m wide x 7.60m high. They are constructed as one unit, and supported by three steel beams on two of the module support skid beams.

2.2.3 Liquid storage and pumping facilities are housed in Modules T1, T2 and PH1. They rest in trussed structures and hanger frames supported by north/south main concrete beams. The modules are situated to the left of centre on the northern end of the main deck structure.

2.2.4 Modules PM2 and 3 are situated centrally east/west across the platform. They are simple steel framed structures with main trusses spanning perpendicular to the steel module support skid beams, which are supported by main concrete beams.

2.2.5 Modules BR1 and 2 are situated BR1 at the north-east corner and BR2 at the north-west corner of the platform, alongside Module PM4. BR1 measures 9.290m long x 12.0m wide x 4.725m high, and BR2 9.303m long x 8.845m wide x 4.804m high. They are steel-framed structures supported by east/west main concrete beams.

2.2.6 The diving module containing the decompression chamber, and gas storage system is normally stored below the service deck. During the diving season the module is lowered by means of ropes and pulleys onto two circular rails mounted on the tie beams and radial arms at the top of the lobate wall. The two rails, one inner and one external rail, enable the module to be placed in any one of four positions over an arc of 280°. East and west transfer rails allow the module to extend over the lobate wall.

2.3 Drilling Package

2.3.1 The drilling package comprises a drilling rig, mud modules, storage modules, diesel module and living quarters. The drilling quarters have now been incorporated into the total living quarters.

2.3.2 Module dimensions are nominally as follows:

(a) Module 1 (derrick, substructure and skid beam structure), 5.338m long x 5.336m wide x 16.47m high. The derrick is 44.835m high.

(b) Module 2A (mud tanks and cementing unit), 16.60m long x 7.80m wide x 5.70m high.

(c) Module 2B (reserve mud tanks), 16.60m long x 7.80m wide x 5.70m high.

(d) Module 3 (mud tank and pumps, bulk storage), 21.24m long x 12.24m wide x 5.70m high.

(e) Module 4 (diesel module), 21.24m long x 10.24m wide x 5.70m high.

(f) Module 5A (drilling crew accommodation, laboratory and electrical equipment), 15.84m long x 11.96m wide x 5.70m high.

(g) Module 5B (bulk storage), 12.24m long x 11.96m wide x 5.70m high.

(h) Module 6 (drilling crew accommodation), 28.30m long x 28.30m wide x 12.10m high.

2.3.3 Modules 5A and 6 are now part of the total living quarters.

2.3.4 Two piperacks are situated above Modules 2A, 5B, 2B and 3. They have a storage capacity of 700 tonnes. The permissable load on piperack beams is 4 tonnes per metre.

2.3.5 A National OS–435 crane, installed on the east side of the main deck structure, is available for use in the drilling area. It has a lifting capacity of 173 400 lb at minimum radius and maximum elevation.

2.3.6 An integrated helideck measuring 28.3m x 28.3m at its extremities, takes cantilever support from quarters Module 6.

2.4 New Living quarter and Rig module.

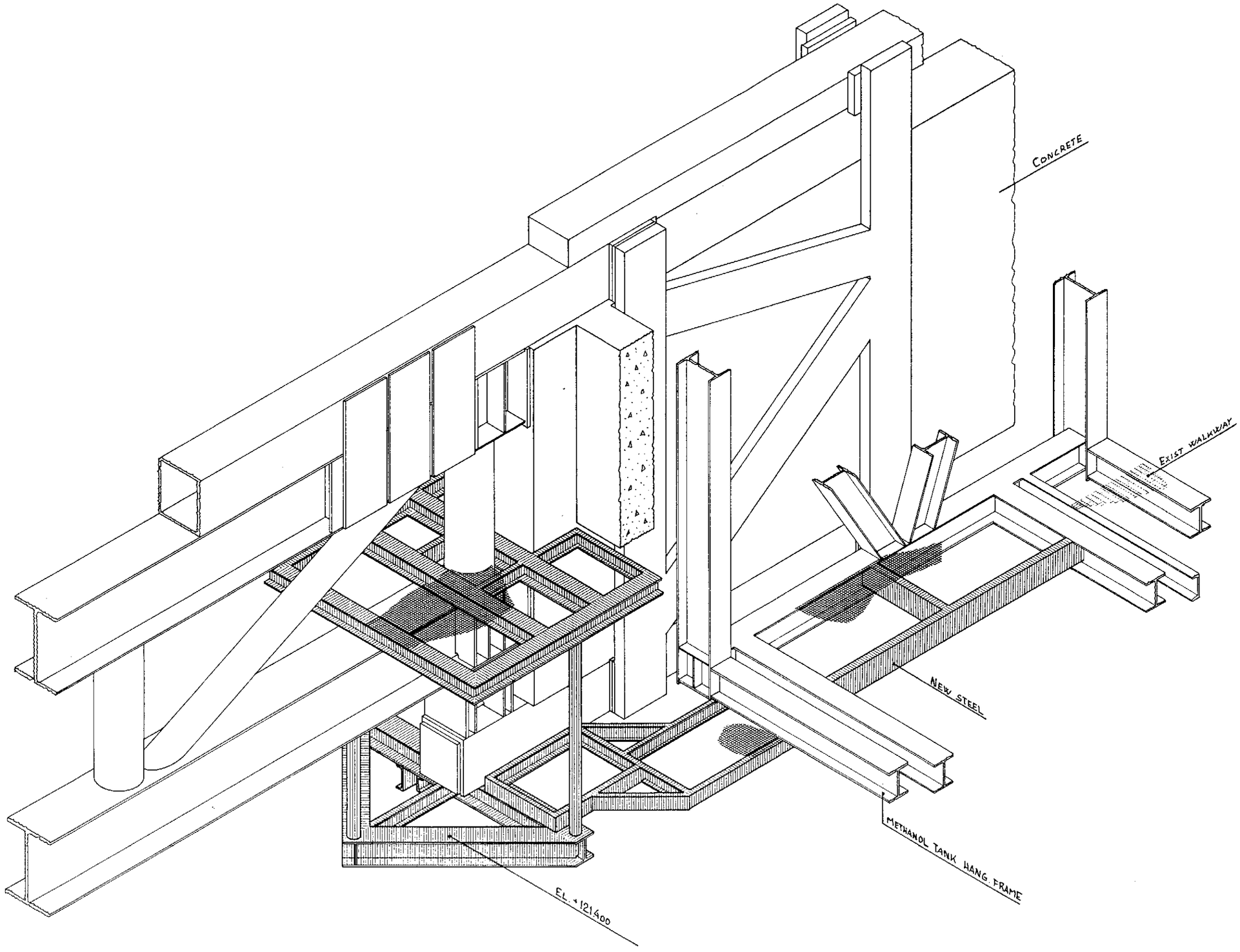
2.4.1 The new Living quarter is situated on the northern edge of the main deck structure. The unit measures a nominal 26.94m long x 7.44m wide x 10.47m high. It is installed as one unit by putting together stainless steel containers supported on skidbeams on the main deck. Skidbeams are designed for future walkway and lifeboat implantation.

2.4.2 The new rig module is situated on top of module 5A, east side. The module measures a nominal 9m long x 6m wide x 6,2m high. It is installed as one unit by putting together stainless steel containers supported directly on module 5A roof with brackets.

2.5 **CONDUCTOR GUIDE FRAME**

- **installation of vertical bracing in cell C and D between CGF at level -6m and concrete strut at el. + 105.1 m.**
- **installation of 4 nos. of shear key bolts on CGF 2 support in cell D at level -6m.**

END



NOTES

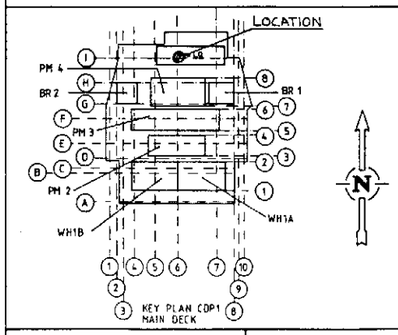
HANDRAILS WILL BE EAN STANDARD FIXED TYPE.

REFERENCE DRAWINGS

BROWN & ROOT CDP1 SS-242
-248
-250
-251

B-EN-SS-114
-115

FF 91 21 34 7003



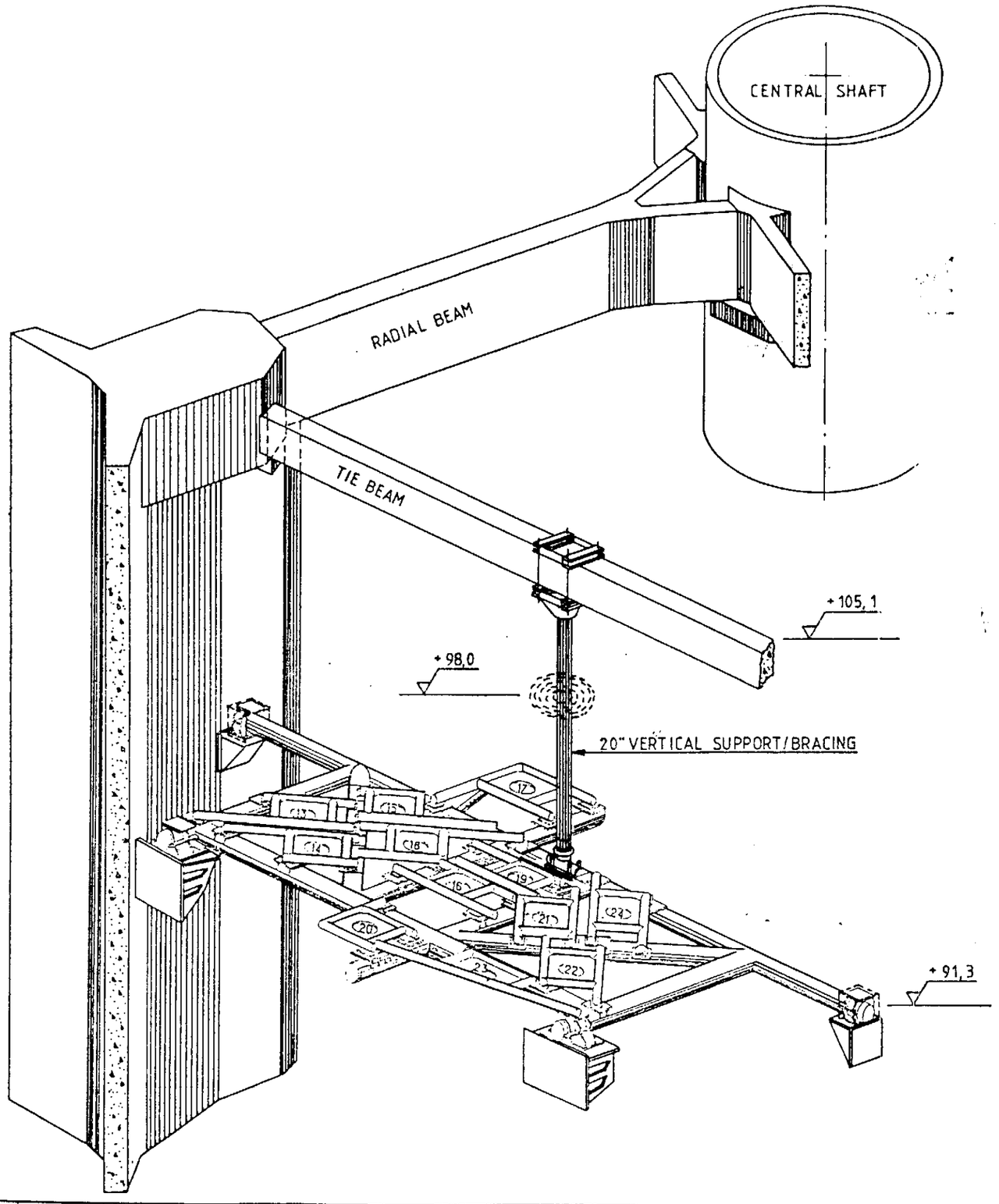
0 27.6.84 first issue PEL
rev. date DESCRIPTION by appr.

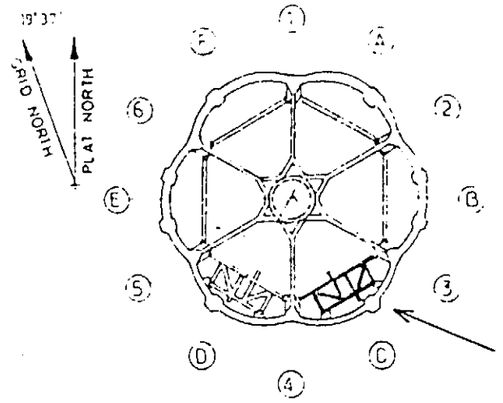
elf aquitaine norge as

elf

CDP1 STRUCTURAL
GENERAL ARRANGEMENT
INSP. PLATFORM ON
SR911178 CANTILEVER PLATFORM.
MAIN TRUSS 6.
1:25 WEST SIDE WITH ACCESS

FRIGG FIELD FF 91 21 34 7002 0





REF. DRG.
FF 91 36 35 1397 GENERAL VIEW OF VERTICAL BRACING IN CELL C. LEVEL E.
FF9136 35 1418 GENERAL VIEW OF VERTICAL BRACING IN CELL D. LEVEL E.

Rev.	Date	DESCRIPTION	by	app
0	20.2.86	First issue	TB	

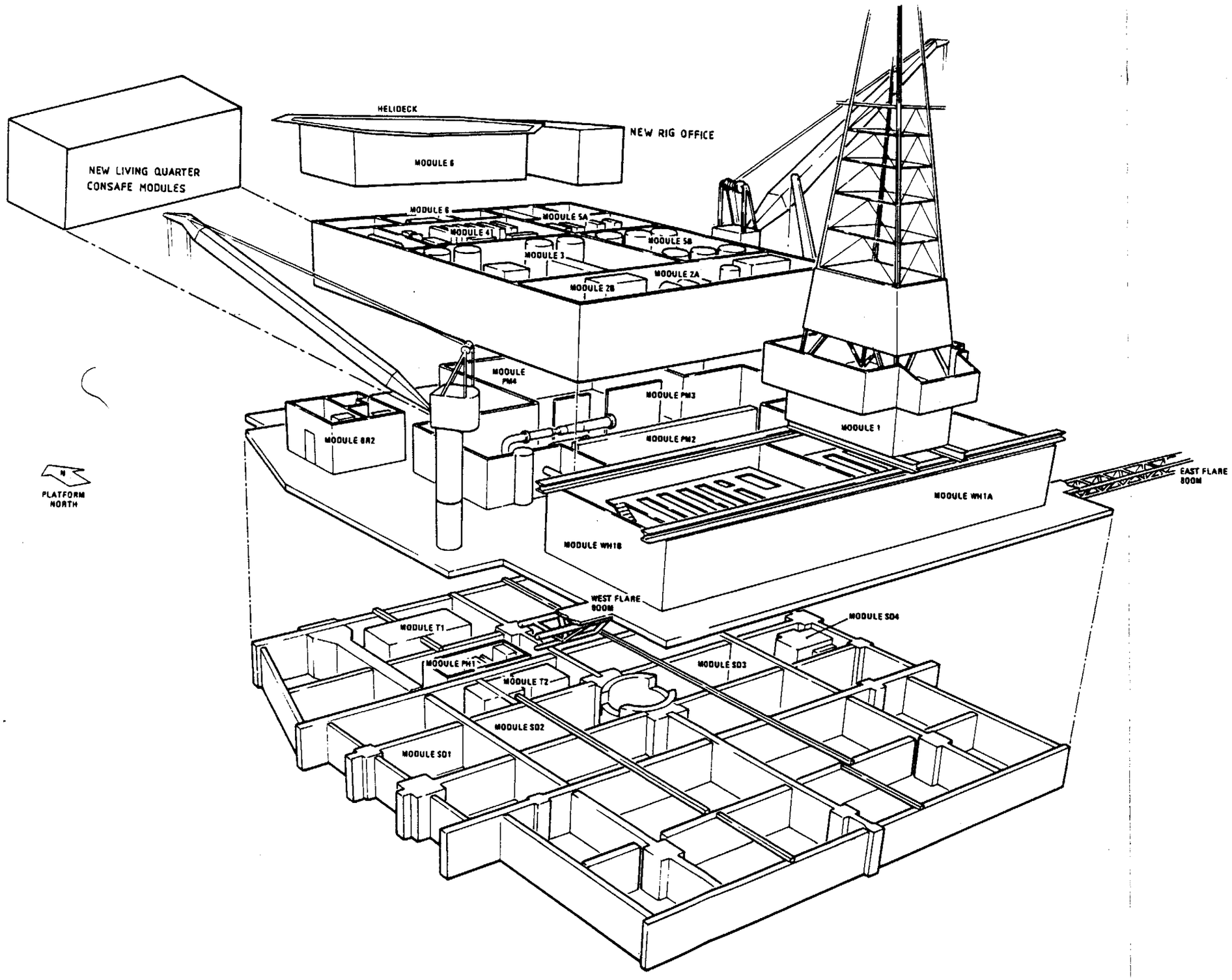
Contractor

elf aquitaine norge a/s
P.O. Box 168
4001 Stavanger

FRIGG FIELD

Installation: CDP1
System: UNDERWATER
Job no.:
Scale: NONE
OVERALL VIEW OF THE ADDITIONAL BRACING IN CELL C. SAME FOR CELL D.
Drwg no: FF 91 36 35 1396
Rev: 0
Sheet: /

Norsk AS Form 105 314



ISSUE 2 JUNE 1984

SECONDARY STRUCTURE	2.5

RISERS AND FLOWLINES

1 GENERAL

Platform risers and 'J' tubes transporting process products and utility services are installed in the central core and tunnels, and in the lobate wall cells of the primary structure.

2 DESCRIPTION

2.1 Risers in Lobate Wall Cells

2.1.1 The 30in slops pipe SW143 is installed through cell F. It is supported at elevations +71.19m and +103.65m and terminates at elevation +68.50m.

2.1.2 The 24in stilling tubes SW146, SW147 and SW148 of sea water pumps G112A, B and C respectively are installed through cell E. They are supported at elevations +71.19m and +103.65m and terminate at elevation +66.0m.

2.1.3 The 24in mud outfall line SW149 is installed through cell E, and 24in mud outfall line SW150 through cell B. They are supported at elevations +71.19m and +101.65m and terminate at elevation +68.50m.

2.1.4 The 24in stilling tube SW144 of firewater pump G101A is installed through cell F, and 24in stilling tube of firewater pump G101B through cell A. They are supported at elevations +71.19m and +103.65m and terminate at elevation +68.50m.

2.2 Central Core Risers

2.2.1 The six tunnels radiating from the central shaft through the base raft, house process and utility risers and 'J' tubes as follows:

(a) A 26in gas line through tunnel A.

(b) A 26in gas line through tunnel F.

(c) A 4in condensate line and two 'J' tubes containing power and communication cables through tunnel B.

(d) An 8in kill line and a 'J' tube containing (information required) through tunnel E.

(e) Tunnels C and D are sealed off to facilitate drilling.

2.2.2 Core risers are supported by anchor blocks in the tunnels and by anchor plates through the core.

2.2.3 Ancillary risers serving seepage and dewatering pumps and those transporting operating mediums, namely hydraulic fluid and compressed air, are installed through the core.

2.3 Seal Assemblies — Tunnels A and F

2.3.1 Seal assemblies prevent ingress of sea water at the tunnel extremities where the 26in gas lines exit onto the seabed.

2.3.2 Each seal is contained within a cylindrical metal caisson measuring 1.5m diameter x 3m long, which is embedded in the tunnel concrete. To prevent electrolytic corrosion the caissons are electrically insulated by an external coating of epoxy mortar (Adherent SIKADUR).

2.3.3 The main elements of a seal assembly are as follows:

(a) A main seal comprising two inflatable packers with the annular parts between the packers filled with SIKAFLEX. A hydraulic clamp is fitted on the tunnel side.

(b) A mechanical seal installed after the hydraulic clamp for safety purposes.

(c) An emergency seal installed on the seaward side to provide additional tightness in the event of pneumatic packer failure.

2.3.4 Compressed air is supplied to the seals via distribution panels and control manifolds installed in the central shaft.

2.3.5 The caissons of tunnels C and D are sealed by elliptical dished end covers, and filled with concrete.

2.4 Seal Assemblies — Tunnels B and E

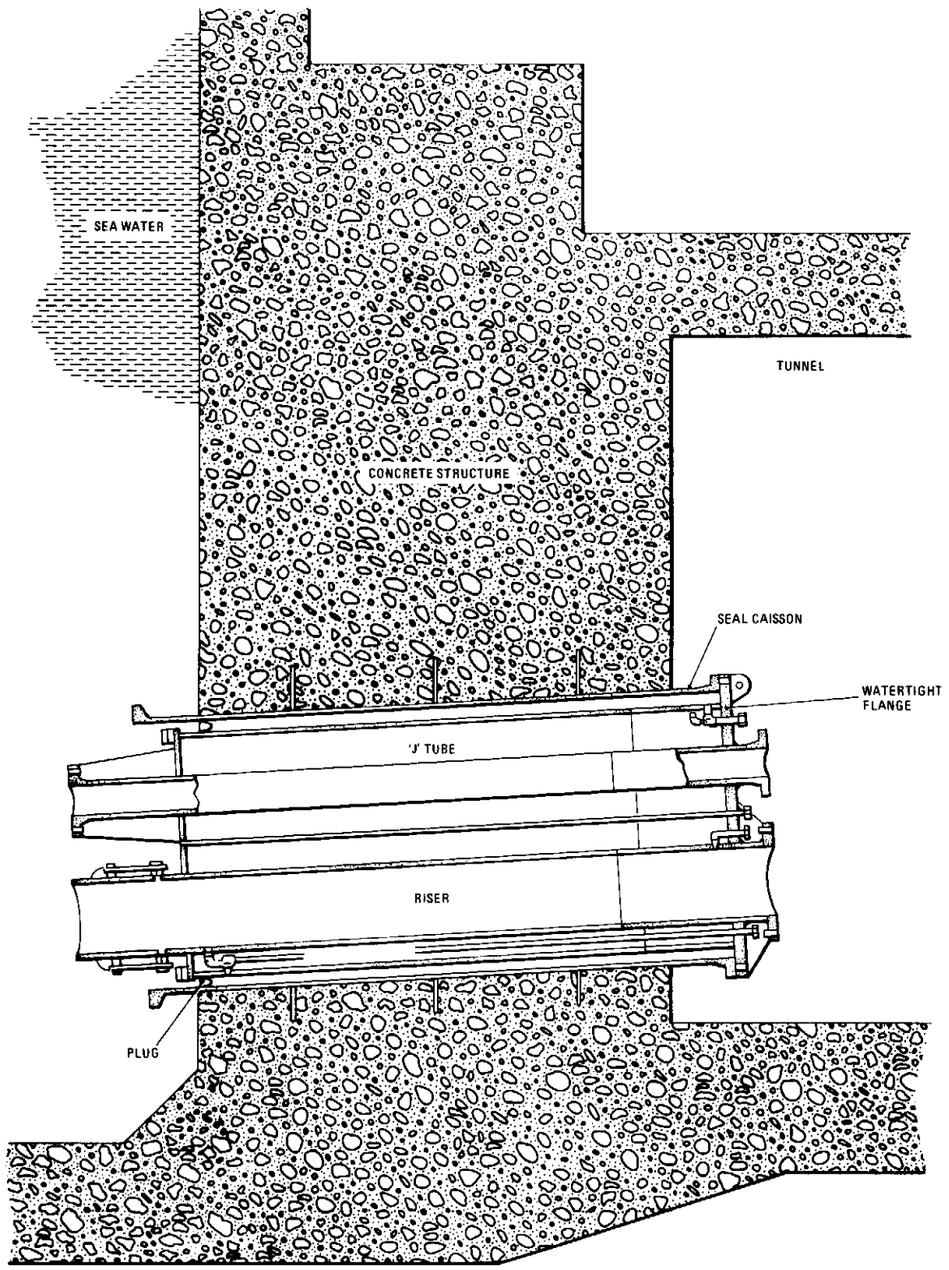
2.4.1 Seal assemblies prevent ingress of sea water at the tunnel extremities where the 4in/8in risers and 'J' tubes exit onto the seabed.

2.4.2 Each seal is contained within metal caissons identical to the 26in gas lines described above. The risers and 'J' tubes are housed in cartridges which with the caissons are constructed as a single unit.

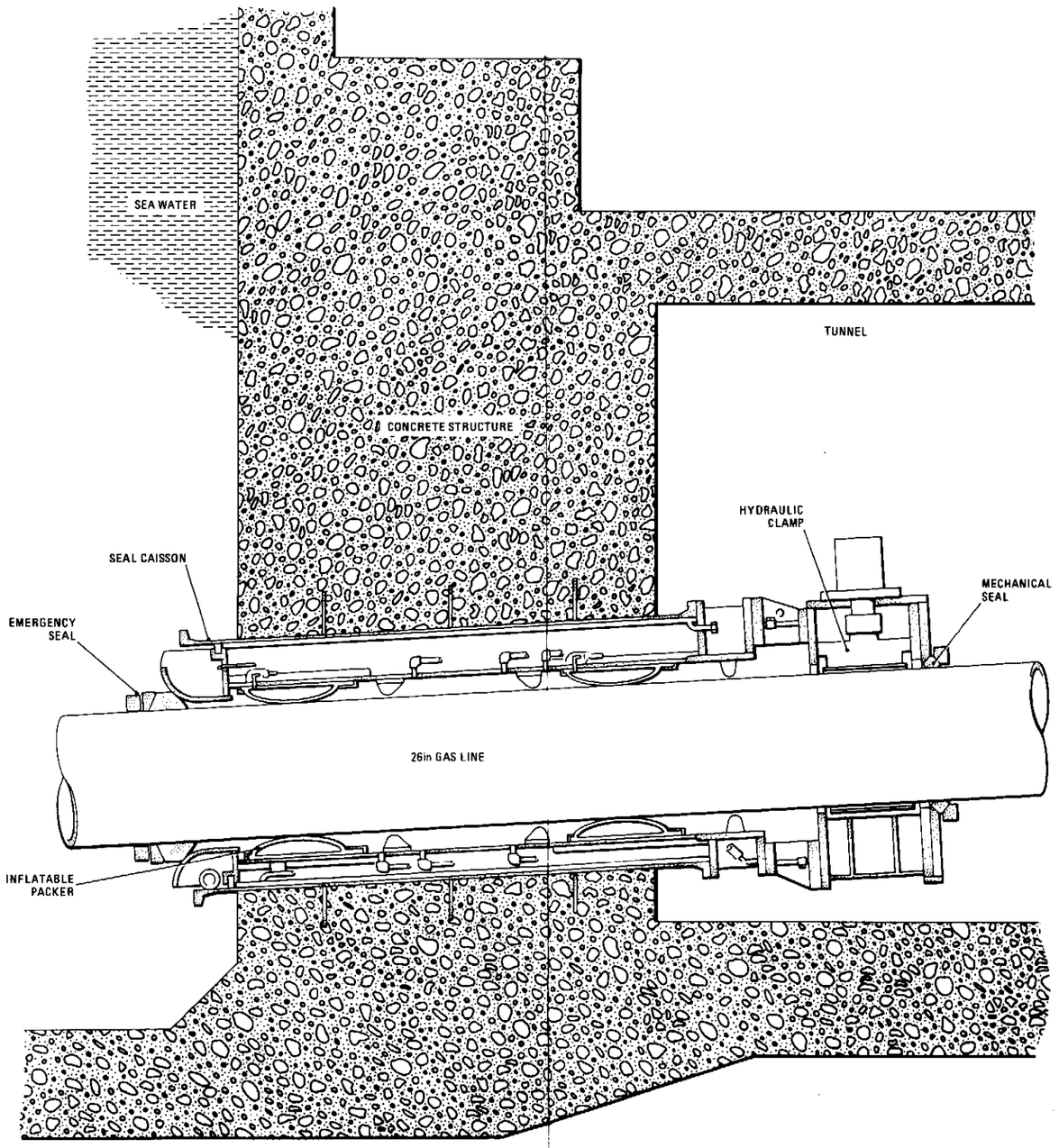
2.4.3 The internals of the cartridge between the caisson and the 'J' tube and 8in kill line (tunnel E), and the 'J' tubes and 4in condensate line (tunnel F) are filled with SIKAFLEX to prevent internal corrosion.

2.4.4 The annular space between the caisson and cartridge is filled with sea water. Ingress of sea water is prevented by a watertight flange on the tunnel side, and a plug on the seaward side.

END



SEAL ASSEMBLY TUNNELS 'B' AND 'E'



SEAL ASSEMBLY TUNNELS 'A' AND 'F'

MATERIALS AND CONSTRUCTION

1 GENERAL

1.1 The concrete substructure is divided into three parts by horizontal sections as follows:

(a) Lower part: elevation 0 to +30.000m.

(b) Middle part: elevation +30.000m to +69.200m.

(c) Upper part: elevation +69.200m to +126.600m.

1.2 The limits of the main deck structures are as follows:

(a) Main concrete beams (top elevation +126.600m).

(b) Skid beams (top elevation +127.550m and +127.750m).

(c) Secondary steel beams, stringers and grating (top of grating elevation +127.400m to +127.760m).

(d) Deck-supporting columns (bottom elevation +127.760m and height of columns approximately 15m).

2 CONTRACTORS

2.1 The concrete structure was designed by Europe Etudes, Paris, as consultant to C.G. Doris/ Howard, the main contractor. It was built in Andalsnes, Norway, by Norwegian Contractors A/S.

2.2 The main deck structure was designed by C.G. Doris with Europe Etudes as structural consultants. The concrete beams were fabricated and assembled in Andalsnes, Norway. The columns were fabricated by Steri, Ennery, France, and the skid beams by ACMC, Carpiquet France.

2.3 Module and other deck structure design and fabrication contractors were as tabulated below:

Item	Design	Fabrication
SD1, SD2 SD3, SD4	Brown & Root (Service Decks Design Report dated 4.6.75)	Reg Booth, Hartlepool, UK
PH, T1, T2	Brown & Root (Pump and Tank House Design Report dated May 1975)	Penn & Bauduin, Dordrecht, Holland
PM2, PM3, PM4	McDermott-Hudson, London (Design Reports dated December 1975)	UIE, St Wandrille, France
BR1, BR2	Brown & Root (Design Reports: BR1 dated 19.9.75, BR2 dated September 1975)	Wilson Walton Ltd, Middlesbrough, UK
WH1A, WH1B	Brown & Root (Design Report dated October 1974)	De Groot, Zwijndrecht, Holland
Cantilever Module	Brown & Root (Design Report dated February 1976)	Unknown
Burner Booms	Brown & Root (Design Report, May 1975)	Wilson Walton Ltd, Middlesborough, UK

Item	Design	Fabrication
Steel Decks in Central Core and Cap	C.G. Doris (Calc. note - Core Cap - dated 5.3.76)	Seagull Manufacturing Co. Ltd. Lowestoft,UK & ACMC, Carpiquet, France.
Gangways, Stairs and Handrails	C.G. Doris	
Jet Fuel Tank Support Structure	Brown & Root	
New living quarter New rig module	Consafe	Consafe Sweden

DESIGN CODES

The platform complies with the following codes and regulations:

American Petroleum Institute - API 6A

American Petroleum Institute - API 14A

American Petroleum Institute - API RP14C and ACI 318-71 Building Code Requirements for Reinforced Concrete.

American Institute of Steel Construction - AISC Specification for Design, Fabrication and Erection of Structural Steel for Buildings.

American National Standards Institute - ANSI B31 (Piping)

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

American Welding Society - Structural Welding - D11 Code 1977.

British Standards Institution - BS 302 - Wire Ropes for Cranes, Excavators and General Engineering Purposes.

British Standards Institution - BS 1515 - Part 1 Carbon and Ferritic Alloy Steels.

British Standards Institution - BS 1663 - Higher Tensile Steel Chain Grade 40 for Lifting Purposes.

British Standards Institution - BS 3243 - Hand Operated Chain Pulley Blocks.

British Standards Institution - BS 4018 - Pulley Blocks for Use with Wire Rope for a Maximum Lift of 25 ton/in2 Combination.

British Standards for Electrical Installations.

C.G Doris - Frigg MP1/DP1 Platform Design Criteria and Codes June 1975.

Department of Energy - Offshore Installations, Guidance on Design and Construction.

Department of Trade – Marine Division – Continental Shelf Act 1964 Section 4.

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 Feb 1974.

The Institution of Electrical Engineers – Regulations for the Electrical Equipment of Buildings – IEE.

International Electrotechnical Commission (IEC).

International Convention for Safety of Life at Sea 1960.

International Telecommunication Union – Radio Regulations.

Institute of Petroleum – Model Code of Safe Practice Electrical – Part1 1965.

Institute of Petroleum – Model Code of Safe Practice – Part 8 1972, Drilling, Production and Pipeline Operations in Marine Areas.

Norwegian Coast Directorate – Regulations for Marking of Production Platforms.

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

Statutory Instruments 1977 – No 486, Offshore Installations (Life Saving Appliances) Regulations 1977.

Statutory Instruments 1978 – No 611, Offshore Installations (Firefighting Equipment) Regulations 1978.

4 MATERIALS

4.1 The concrete structure is constructed from the following materials:

(a) Concrete mix:

Ordinary Portland cement	: 460 to 480kg/m^3
Sand (0–10mm)	: 810 to 880kg/m^3
Aggregate (10–25mm)	: 880kg/m^3
Water	: 175 to 190 litres/m^3

Admixtures:

Betokem LP	:	5 to 6 litres/m^3
Betokem R	:	0 to 2 litres/m^3
Betokem L (splash zone only)	:	0.2 to 0.8 litres/m^3

Quality:

Compressive strength (28 days on 15 x 30cm cylinders)	= 400kg/cm^2
Water/cement ratio	= $\leqslant$0.45
Slump	= 5 to 12cm
Air content in splash zone	= 3 ± 3/4%

(b) Normal reinforcement:

Quality used: KS 40 (fy = 4000kg/cm^2) in accordance with Norwegian Standard NS 481, Part 2.

(c) Prestressing steel:

The prestressing strands were supplied to British Standard BS 3617, 1971. Type of cable used: Freyssinet 12T15 with a guaranteed minimum breaking strength of 25.4 tons per strand. (The 12T15 cable is made up of 12 strands of 0.6in (15mm) diameter. Each strand is made up of seven wires of 5.1mm diameter, giving a cross-section area of strand = 143mm^2).

(d) Grout mix for cables:

Cement	:	100kg
Water	:	40 litres

Admixture:

Intraplast z	:	3kg

(e) Concrete cover to reinforcement = 6cm.

(f) Conductor guide frames:

Corbels	:	ST–52–3N
Frame	:	ST–37

4.2 The main deck structure is constructed from the following materials:

(a) Concrete : To the same specification as described above for the primary structure.

(b) Steel : Column steel — ST–52–3N (DIN 17100).

Column anchor bolts — XC.8(NFA) 35.554).

4.3 Modular and other deck structures are constructed from the following materials:

(a)	SD1,SD2, SD3,SD4,	: ST-52-3N.(All beam sections with depth 300mm). ST-37 (all beams 300mm and tubular sections).
(b)	PH,T1 and T2	: Sections HEA 360:ST-52-3N. Sections HEA 360:ST-37-2U.
(c)	PM2,PM3 PM4	: Main members: High Strength Steel. Secondary members: Mild Steel.
(d)	BR1 and BR2	: HEA 400, HEA 500,: ST-52-3N Remaining sections: ST-37-2U. Plates: ST-37-3N
(e)	Cantilever Module	: ST-52-3N.
(f)	Burner Booms East and West	: Main members: ST-52-3N. Other members: ST-52-2.
(g)	WH1A and WH1B	: Sections HEA 300:ST-52-3N. Section HEA 300:ST-37-N. Tubular sections:ST-52-3N.
(h)	Steel Decks in Central Core and Core Cap	: Core Cap: ST-52-3N (Box Girders). ST-37-2(Beam Sections).
(j)	Gangways, Stairs and Handrails	: ST-37-2
(k)	Jet Fuel Tank Support Structure	: Main members: ST-37-2N. Plate: ST-37-3N.
(l)	New living quarter	: Stainless steel 316L
	New rig module	: Carbon steel SIS 1312,SIS 1412.

5. PAINTS AND COATINGS

5.1 All surface preparation and coating on the platform complies with the following codes: .
Swedish Standards SIS.05.5900 - Pictorial Surface Preparation Standards for Painting Steel Surfaces 1967
SSPC Surface Preparation Specification-VIS1.

British Standards Institution - BS 4232 Surface Finish of Blast Cleaned Steel for Painting 1967.

European Scale of Degree of Rusting for Anticorrosive Paints.
STOCKHOLM 1961.

Elf-RE Standard Specification P7 - Coating for Marine Structures REV 1 March 1975.

Elf Norge - Frigg Field Painting Specification for Steel Structures DEP 1052, No 3-169 REV 1 March 1974.

American Society for Testing and Materials - ASTM A123 Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed or Forged Steel Shapes, Plates, Bars and Strips.

American Society for Testing and Materials - ASTM A153 Zinc Coating (Hot Dip) on Iron and Steel Hardware.

American Society for Testing and Materials - ASTM A 143 Safeguarding Against Embrittlement of Hot Galvanized Structual Steel Products.

5.2 External surface in the tidal range and splash zone are coated with antifouling paint as follows:

1 coat primer	- 75 microns
3 tie coats	- 1 x 25 microns, 2 x 100 microns
2 coats antifouling	- 40 microns each

5.3 External surface in the emerged zones (decks, bridges, etc.) are painted as folows :

1 coat Epoxy reinforced with glass flakes - 500 microns

5.4 High temperature surfaces + 100 C are painted silver as follows:

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

5.5 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 finishing 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.

5.6 Galvanized surface are etched and degreased and painted in accordance with the above specifications.

6. PIPELINE IDENTIFICATION SYSTEM

Pipeline system are identified by coloured arrows superimposed on coloured bands located at convenient intervals. Flow direction is indicated 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 galvanic action all submerged steel parts are cathodically protected by a system of sacrificial zinc anodes designed for a projected life of 20 years.

1.2 The design current density is 100mA/m^2 for bare steel in sea water for structure outside and inside the core. The current per well is taken to be 5A.

1.3 Isolating the steel items from the reinforcing bars in the concrete structure has been attempted. Allowance is, however, made for current demand in reinforcing bars, estimated at 1.0mA/m^2 for fully immersed concrete, and at 10.0mA/m^2 in the oxygen-rich exposure zone at water level.

2 SYSTEMS OF PROTECTION

2.1 Well Casings

The well casings are fitted to 24 wells drilled to a depth of approximately 1870m. Cathodic protection of well casings consists of 348 zinc anodes welded on steel strips fixed to the concrete structure on the outer face of the lobed wall on levels +72, +80 and +88m. Bonding is through steel rods to the deck and wellhead modules. The installed anodes are intended to provide an average current of about 5A per well. Provisions are made for installation of an impressed current system if necessary.

2.2 Conductor Tubes and Guide Frames

2.2.1 Only the guide frames above sand ballast at elevations +70.2m and +90.2m have been cathodically protected. The frames and conductor sleeves inside the sand ballast have only had a temporary function and are thus only coated.

2.2.2 The cathodic protection consists of 15 zinc anodes of 184kg welded on the upper surface of the tubular members on each of the two frames. These anodes are bonded to protect the conductor tubes above elevation 60m.

2.3 Risers

The risers and their fixing plates are cathodically protected by sacrificial zinc anodes. The cathodic protection for the two 24in mud outfalls has been designed for a 10-year life; the other risers have 20-year protection.

3 SACRIFICIAL ANODES

3.1 The sacrificial zinc anodes used on flat plates and structural steel members are in block form. Each anode is cast round a steel core which is welded to the surface to be protected.

3.2 Segmental-type bracelet anodes are used on pipelines and are attached by clamp bolts. The electrical connection is then made by thermite welding a copper cable from the anode to the pipelines.

4 INSULATION

Supports for the access platform riser sleeves and the 4in and 8in risers and 'J' tubes are all neoprene-lined.

5 PRECAUTIONS

5.1 Because a large number of zincs are connected between a large number of different points along the tube, there are bound to be differences of potential. If parts at even a small potential difference come into electrical contact, a local current will be set up and a spark might result which could cause a fire in a hazardous area. Consequently, the provisions and recommendations of the following codes apply:

(a) IP Electrical Model Code of Safe Practice in the Petroleum Industry, Part 1 — 5.4 & 5.7

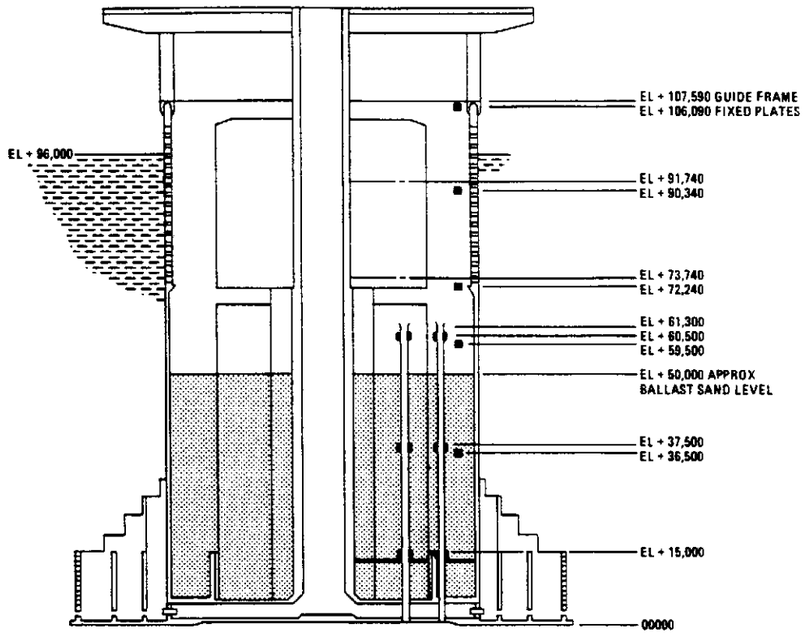
(b) International Oil Tanker and Terminal Safety Guide — 10.2 & 10.5

5.2 The points in the areas inside the core where small differences of potential may give rise to possible hazardous conditions are between risers and 'J' tubes and the platform rebar or structures connected to it, eg platform ladders and service lines.

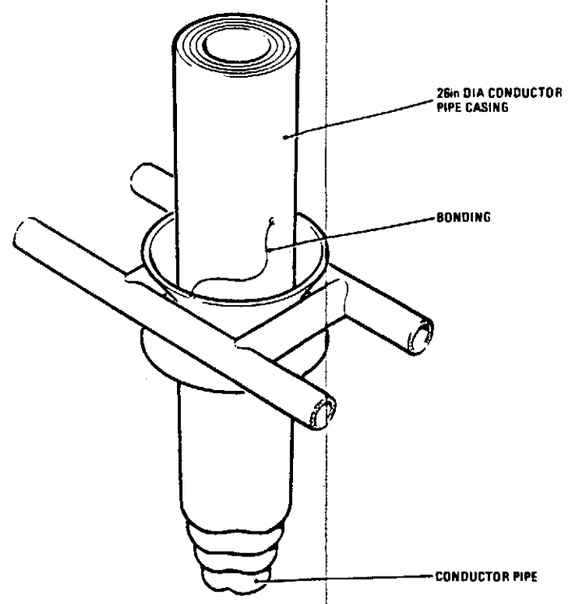
5.3 Use of a megger or similar instrument across an insulation point could result in spark generation at any point along the pipeline in the tunnel and core. Any deliberate contact between the riser and rebar is therefore prohibited.

5.4 Regular inspections, which are to include inspection of the neoprene linings of the riser and 'J' tube sleeves, will be required inside the core in the area above water level to ensure that there is no likelihood of an accidental contact developing. The same considerations will apply inside the core after dewatering.

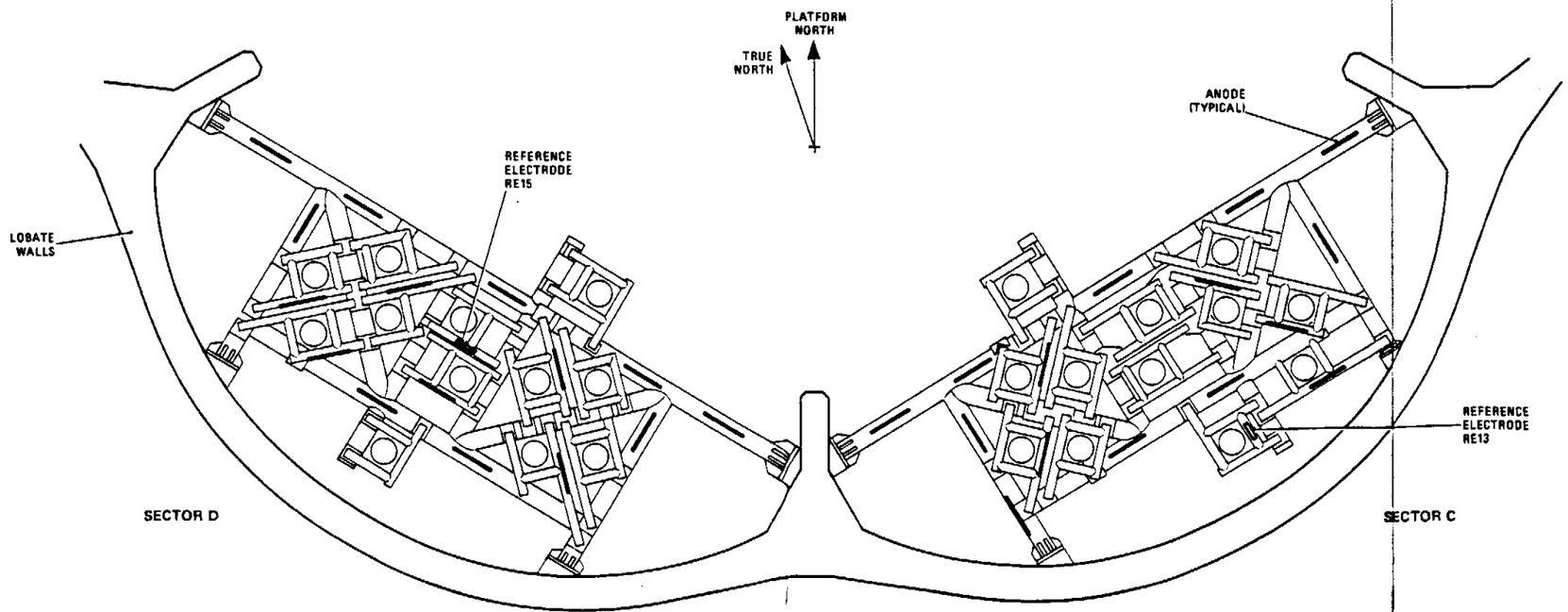
END



SECTION SHOWING 36in CONDUCTOR SLEEVES AND CONDUCTOR PIPE CASING GUIDES



DETAIL SHOWING CONDUCTOR AND GUIDE



PLANT AT ELEVATION EL + 72240

INSPECTION AND MAINTENANCE

1 GENERAL

Principally for safety reasons inspection and maintenance are considered as separate functions. A system of In-Service Inspections (IIS) has been developed to rationalize and monitor the inspection procedures for each platform, and together with a Preventive Maintenance System (PMS) will ensure the integrity of the systems and equipment.

The Frigg Field straddling the UK/Norwegian dividing line has four platforms subject to British Jurisdiction, CDP1, TP1, QP and FP; and two DP2 and TCP2 under Norwegian Jurisdiction. In order to operate the four U.K. sector platforms it is a legal requirement to have a current Certificate of Fitness, which is issued by a Certifying Authority on behalf of the Department of Energy. This certificate is not required for the Norwegian secta platforms, although a condition evaluation is made by the Norwegian Petroleum Directorate.

In order to obtain the basis for renewal of the Certificate of Fitness and meet the requirements of the condition evaluation all platforms are subject to major survey.

2 INSPECTION

2.1 Full details of the In-Service Inspections are given in the IIS manuals. Contained in these manuals are full details of the scope and methods of inspection together with recording and monitoring procedures. Areas covered include primary and secondary structures, process and utility systems, and all ancillary equipment.

3 MAINTENANCE

3.1 A Preventive Maintenance System is in operation for each platform covering the process and utility plant, safety and lifesaving equipment power generation/distrbution and all supporting functions.

3.2 It is a planned system, time based with a periodicity ranging from daily checks, to 5 yearly major overhauls. The individual maintenance routines have been compiled using manufacturers recommendations, operational experience, and to meet statutory requirements.

3.3 All running equipment is condition monitored, to ensure the incidence of unforeseen breakdown is reduced to a minimum. Static plant and equipment is regularly inspected for deterioration and malfunctions.

3.4 Maintenance requests to carry out the individual routines are issued offshore prior to the activity period, so enabling the best use to be made of resources with the minimum disruption to production.

CHAPTER 3

EQUIPMENT LOCATION

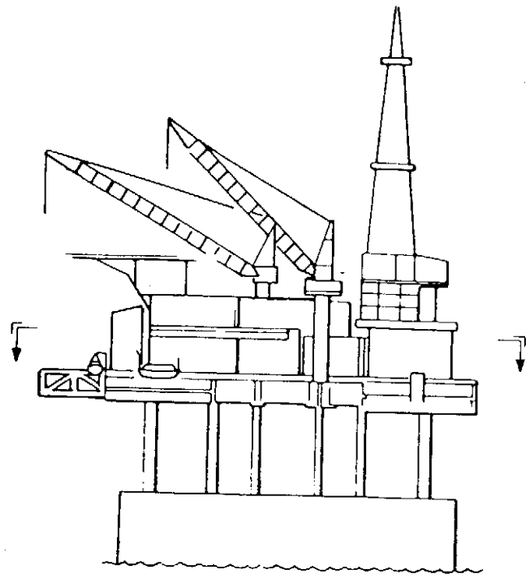
CONTENTS

DIAGRAMS

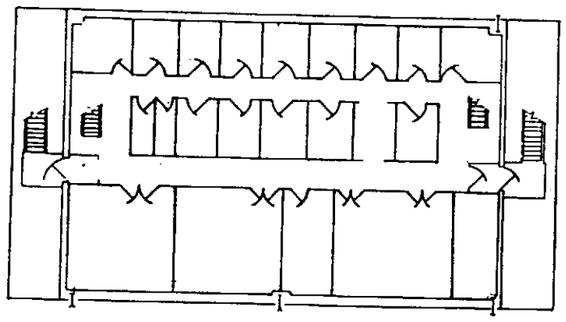
EQUIPMENT LOCATION

3.1.1 EQUIPMENT LOCATION – SERVICE DECK

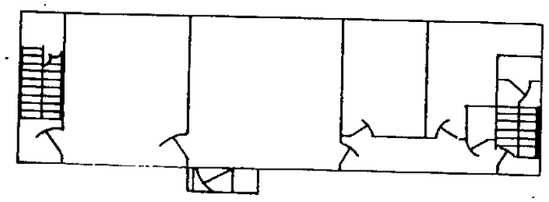
Equipment No	Description	Location
FA114	Slops tank	T2
FB100	Methanol tank	T1
FB105	Gas oil tank	T2
FB110	Soft water tank	T2
FB112	Sea water tank	T1
FD105A & B	Fuel oil filters	PH1
GA101A & S	Fuel oil pumps	PH1
GA102	Manually operated fuel oil pump	PH1
GA104	Slops pump	T2
GA105A & S	Soft water pumps	PH1
GA107A & B	Sea water pumps	PH1
GA108A & B	Sea water circulation pumps	PH1
GA110A, B & S	Methanol pumps	PH1
GA111A, B & S	Methanol pumps	PH1
GA114A & B	Methanol pumps	PH1
GA150A to Z	Methanol pumps	PH1
PA105	Corrosion inhibitor package	PH1
	Pushbutton station	SD2
	Type 900 foam generator	SD2
	Ace hoist winch	SD3
	Service winch	SD3
	Pirrelli winch	SD3
	Doris seal compressor	SD3
	Type 900 foam generator	SD3
	150t line winch	SD4
	Hydraulic package	Core
	Ace 3 man hoist	Core
G116A & B	Core water circulation pumps	Core



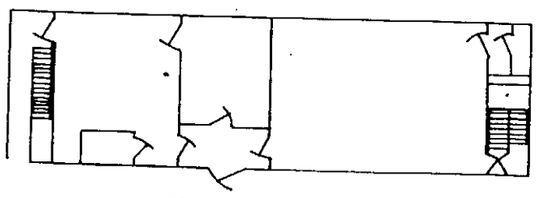
WEST ELEVATION



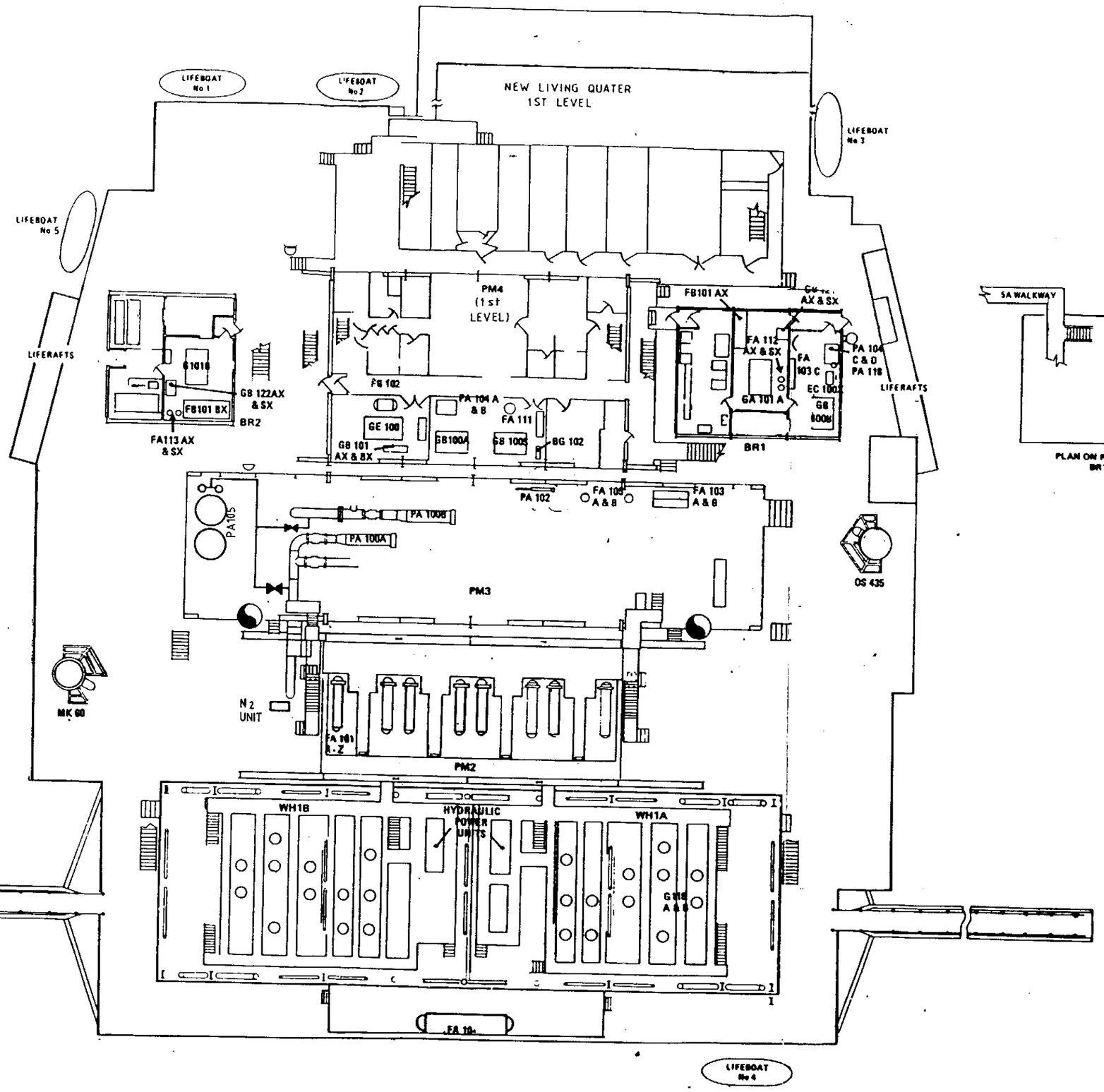
PM4 (2nd LEVEL)



NEW LIVING QUARTER (2nd LEVEL)



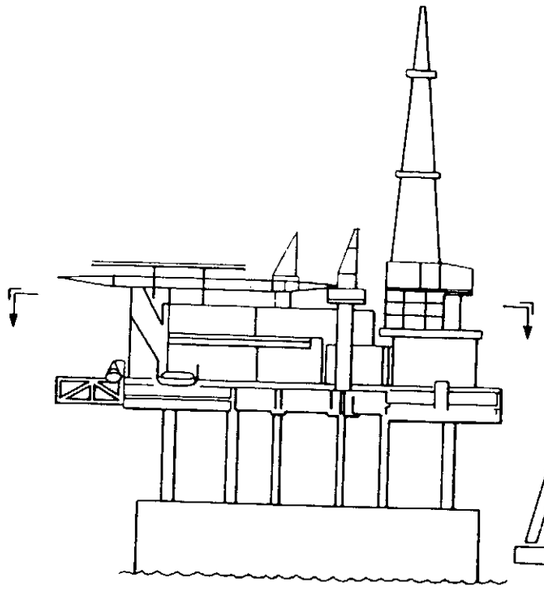
NEW LIVING QUARTER (3rd LEVEL)



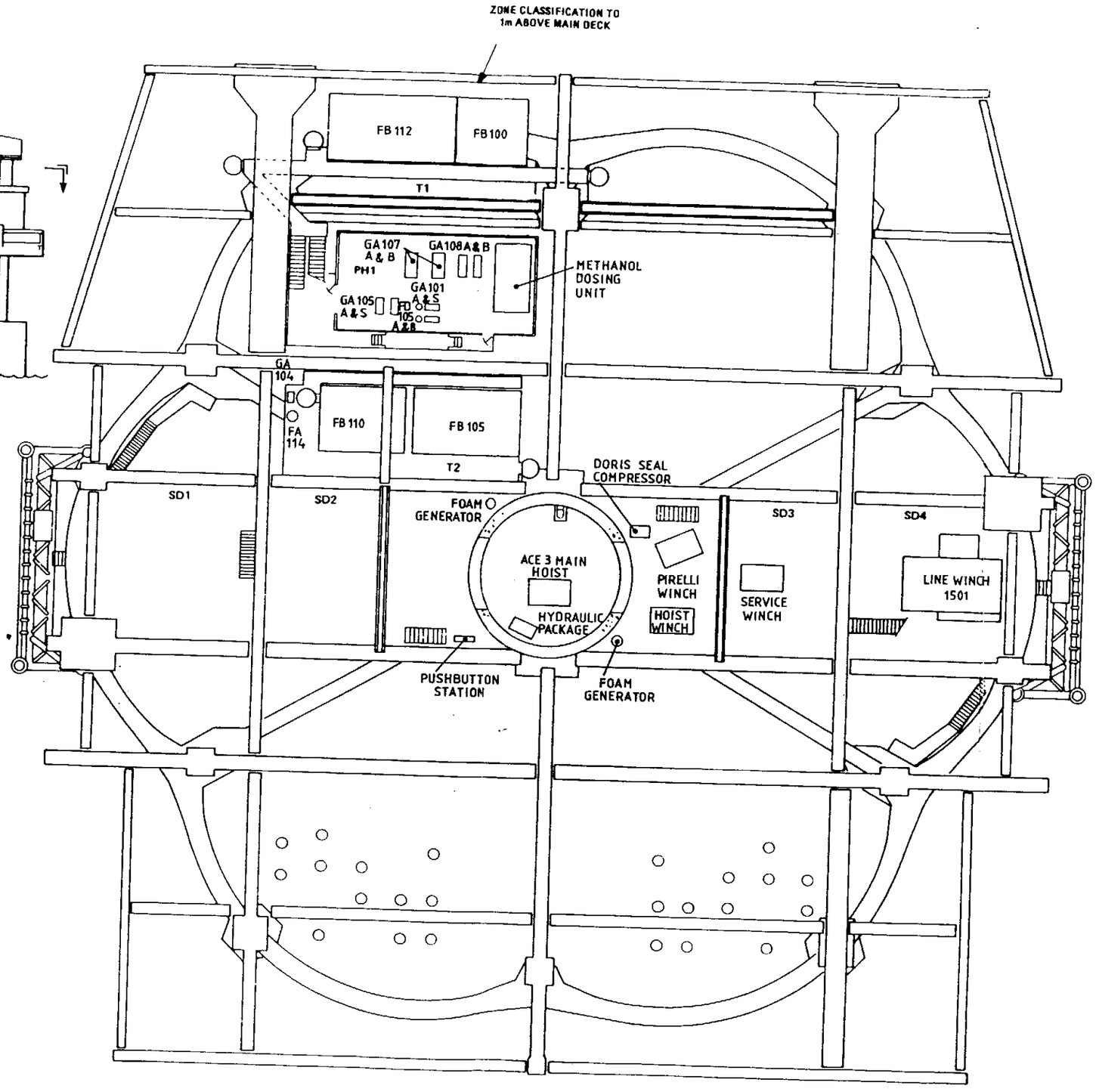
PLAN ON ROOF OF BR1

ISSUE 5,Oct.-88

EQUIPMENT LOCATION Production Deck | 3.1.2



WEST ELEVATION



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ISSUE 3 OCTOBER 1988

EQUIPMENT LOCATION Service Deck **3.1.1**

CHAPTER 4

DRILLING PACKAGE

CONTENTS

DIAGRAMS

INTRODUCTION

This chapter summarises principal information relating to the Saipem drilling package and its modules, living quarters and helideck.

It has been compiled from the Saipem Drilling Modules Operation Manual, which should be consulted on all matters of detail.

SUMMARY OF DRILLING PACKAGE

1 GENERAL

1.1 The Saipem drilling package comprises seven modules – Nos 1, 2A, 2B, 3, 4, 5A, 5B and the Living Quarters and Helideck, and includes an Emsco C–3 Type II drilling rig. The plot plans are shown on Diagrams 4.1.1 to 4.1.3.

1.2 Details of the drilling package and its systems are given in the Saipem Drilling Modules Operation Manual.

2 STORAGE CAPACITY

The following storage capacity is available:

(a)	Mud		310m^3
(b)	Industrial water		150m^3
(c)	Sea water		80m^3
(d)	Potable water		100m^3
(e)	Fuel		215m^3
(f)	Bulks:	Barite	240 tonnes total, in 3 x 34m^3 capacity silos
		Bentonite	60 tonnes total, in 2 x 34m^3 capacity silos
		Cement	180 tonnes total, in 5 x 34m^3 capacity silos
(g)	Sacks		110 tonnes
(h)	Piperacks (2) on roof of modules		700 tonnes at a maximum of 4 tonnes/m

3 DRILLING PACKAGE MODULES

3.1 The drilling package modules are as follows:

No 1: Derrick, Substructure and Skid Beam Structure.

No 2A: Mud Tanks and Cementing Unit.

No 2B: Reserve Mud Tanks.

No 3: Mud Suction Tank, Main Pumps and Bulks.

No 4: Power Plant.

No 5A: Additional Living Quarters, Geological Laboratory and AC Generators.

No 5B: Bulks.

No 6: Living Quarters, Helideck etc.

3.2 The principal content of each module is listed in Tables 4.1.1 to 4.1.8.

4 ESCAPE ROUTES

Escape routes are shown on Diagrams 10.13.4 to 10.13.6.

5 PRINCIPAL SYSTEMS

5.1 General

The principal systems within the drilling package are outlined below. All are self-contained. The systems are summarised in the order in which they are dealt with in the Saipem Operation Manual.

5.2 Mud and Cement System

This comprises high and low pressure mud systems and a cementation circuit, and includes the following:

(a) Drilling mud production unit:

(i) Active mud tank with mixing guns, mixers and hoppers.

(ii) Reserve mud tanks with mud guns and mixers.

(iii) Preparation mud tanks with mixing guns and mixers.

(b) Settling tank with shale shaker, desander, desilter, degasser and pumps.

(c) Mud pumps.

(d) Cementation circuit:

(i) Dowell Schlumberger cementing unit type R621 driven by two GM8V71 diesel engines, control unit, mixing tank, two water tanks with centrifugal pumps and surge tank.

(ii) Two 2in HP lines from the unit to the rig floor.

5.3 Pulverulents System

This system is concerned with the storage, handling and distribution of the following:

(a) Basic products: cement, barite and bentonite, stored in silos and handled by compressed air pipelines. (Separate diesel-driven air compressor.)

(b) Additives: starch, lime, CMC, FCL etc, stored in sacks and handled manually and/or by conveyor belt.

5.4 Compressed Air System

The system comprises two air compressors each with a 16.5 bar output and effective flow of 3.9m^3/min, one electrically driven and the other diesel driven, with five associated 1500-litre 15.8 bar air tanks, and one 300-litre air tank.

5.5 Gas Oil System

Provides fuel to all diesel engines (including cranes), the mud production (cementing) unit and the steam boiler. There are two fuel storage tanks with a total capacity of 208m^3 and two day tanks (total capacity 8.5m^3). The emergency dc-ac generator is supplied by a 24-hour capacity fuel tank.

5.6 Potable Water System

Potable water is held in a 100m^3 tank, filled from supply vessels or from two distillation units. A hydrophore and two circulating pumps supply cold water to living quarters and the steam boiler. An electric boiler provides hot water to living quarters. The potable water is sterilised by ultra-violet ray treatment.

5.7 Industrial Water System

A separate 100m^3 tank is filled by supply vessel, and has an associated 50m^3 drawworks and brake cooling water tank. Two industrial water pumps provide supplies around the drilling package, eg drill floor, shale shakers, desilters, desanders, cementing unit, mud pumps, geological laboratory, mud laboratory, distillation units and generator diesel heat exchangers.

5.8 Sea Water System

Sea water is provided by two 360m^3/h submerged pumps. There is an associated antifouling system and hydrophore. The system supplies the firefighting sea water tanks, generator diesel cooling water, all diesel engine exhaust pipe cooling, distillation units and air conditioning unit cooling.

5.9 Firewater System

The firewater system comprises a 1000-litres/min electrical pump supplying a 4in ring main for monitor cannons and hose connections. The system is cross-connected with the Production Deck Firewater System, and can be backed-up by the industrial water or sea water systems; see Section 4.6.

5.10 Steam Water System

Steam water (ie hot water) is generated by a 1.2 Mcal/h steam boiler distributing supplies to the derrick floor, Modules 2A, 3B, 3 and 5B, and 26 Aerotherm conditioning units in the living quarters.

5.11 Oil System

This is a low pressure system using a portable airdriven pump to distribute lubricating oil from storage drums in the engine room (Module 4) to all generator diesel engines.

6 WELL CONTROL EQUIPMENT

6.1 A Regan diverter system type KFDF (including control panel) is installed on the rig floor. A hydraulic packer around the drill pipes can be closed from this panel to divert contaminated mud to the treating system. This equipment will be used as a wellhead preventer until a 13.3/8in casing is cemented in.

6.2 An associated 160 gal 3000 psi (206.9 bar) automatic pump accumulator unit allows for all necessary operations on the blowout preventer stack. The main remote control panel is on the rig floor and an auxiliary remote control panel is sited in the Drillers Control Room. The 160-gallon volume of the accumulator unit furnishes sufficient fluid for two Close and Open blowout preventer operations if the pump is shut down.

7 POLLUTION

7.1 The piperack, helideck and fuel storage tank areas are surrounded by gutterways. The gutter system is connected by pipes to the production area system.

7.2 Spent engine sump oil should be centrifuged, proportionally added (5 per cent) to the fuel oil and burnt off.

7.3 A stock of 1000 litres of oil dispersant is stored on the platform.

8 PUBLIC ADDRESS SYSTEM AND COMMUNICATIONS

8.1 The Public Address System comprises loudspeakers covering all areas and is common with the production areas. Broadcasts can only be made from the following positions:

(a) Production Control Room.

(b) Drillers Control Room, using the internal telephone.

(c) Platform QP, using a telephone link.

8.2 In high noise areas, attention is drawn to the public address system loudspeakers by the use of a klaxon and a blue light. The light flashes during announcements.

8.3 A 9-station sound-powered telephone system, with common call line and talk line, is installed in the drilling package. The positions served are as follows:

Rig floor	Elf office
Pump room	Radio room
Cementing room	Mud laboratory
Engine room	Geological laboratory
Drillers control room	

8.4 A 10-station intercom (interphonic) system is also installed to serve the following positions:

Rig floor	Mess room
Pump room	Recreation room
Cementing unit	Piperack
Engine room	Wellhead module
Drillers control room	Elf office
Derrick bridge	

8.5 The interphone equipment installed in classified areas is explosion-proof.

8.6 Loudspeakers are provided in high noise areas.

9 CRANES

9.1 A National OS-435 crane, installed on the east side of the Main Deck, is also available for use in the drilling area. The crane has a boom length of 100 feet and the following lifting capacities.

Radius (Metres)	36.6 m Boom	
	Boom Angle (Degrees)	Load (Tonnes)
9.1	78	52.56
10.7	76	48.66
12.2	73	46.12
13.7	71	43.53
15.2	68	41.36
16.8	65	38.91
18.3	63	35.14
19.8	60	32.06
21.3	57	29.34
22.9	54	26.94
24.4	51	24.98
25.9	48	23.17
27.4	45	21.54
29.0	41	20.04
30.5	38	18.73
32.0	33	17.55
33.5	29	15.82
35.0	23	13.78
36.6	16	11.74

Whip hoist load performances at low and high speeds are as follows:

(a) Low speed: 7 tonnes at 9m to 36m radius.

(b) High speed: 5.8 tonnes at 9m to 36m radius.

9.2 A Bucyrus Erie Mk 60 crane is installed on the west side of the Main Deck. The crane has a boom length of 90 feet and the following load limits:

Radius (Metres)	36.6m Boom	
	Boom Angle (Degrees)	Load (Tonnes)
7.62	80	43.09
9.14	78	40.81
10.66	76	37.64
12.19	73	34.46
13.71	71	30.84
15.24	68	27.21
16.76	65	24.49
18.28	63	21.77
19.81	60	19.95
21.33	57	18.14
22.86	54	15.87
24.38	51	13.60
25.90	48	11.79
27.43	45	10.43
28.95	41	8.61
30.48	38	7.25
32.00	34	5.89
33.52	30	4.53
35.05	25	3.63
36.57	18	3.17
38.10	0	2.72

The maximum whip hoist load performance is 5 tonnes at 6.10m to 32.00m radius.

10 PRODUCTION DECK/DRILLING PACKAGE INTERFACE

Diargam 4.1.4 summarises the production/drilling interface requirements and fuctions.

TABLE 4.1.1 MODULE No 1 (17.5 x 17 x 54 ft)

DERRICK, SUBSTRUCTURE AND SKID BEAM STRUCTURE

Description	Qty	Dead Weight (tons)	Type	Overall dimensions (metres)		
				L	W	H
Crown block, L.C. Moore	1	6	500–7–56			
Derrick	1	45	147 x 30 ft	9.1	9.1	44.8
Derrick substructure	1	110		9.1	9.1	6.7
Skidding structure	1	30		17.37	9.1	1.37
Blowout preventer control, Payne	1	5	C160–3–20	8.0	1.2	1.8
Drawworks, Emsco 2000 hp	1	58	C3 type 2	7.88	5.5	2.98
Rotary table, National	1	15	C375	2.5	1.6	0.75
Swivel, Emsco	1	2	LA400			
Skidding hydraulic equip 100 ton	1 set	3	33in Stroke			
Schlumberger unit	1	15	OSU–C	4.9	2.9	2.95
Wire rope spooler	1	10		2.5	2.2	2.8
Wind wall	1	10				
Travelling block, Emsco	1	12	RA52–6	1.6	0.8	4.4
Manifold and standpipe	1	3				
Dead end. National	1	1	E	1.2	0.5	1.2
Air hoists, Ingersoll Rand	2	2	K6UL	1.1	0.6	1.1
Air hoists, Ingersoll Rand	2	0.500	K4U	1.1	0.6	1.1
Air hoist, Ingersoll Rand	1	0.131	D6U	1.1	0.6	1.1
Setback panel	1	1				
Cooling water tank	1	8	50m^3	4.5	2.4	2.4
Choke manifold, 5000 psi	1	6				
Water pumps	2	0.5				
Air tank	1	0.5		2.5	0.92	
Regan diverter system	1	1	KFDF			
Koomey water jet degasser	1	1			1.4	2.24
Shale shaker Hutchinson	1	4	4860 SU–DU	4.2	2.5	1.8
Mud tank, including centrifugal pump	1	10				
Warehouse	1	10				
Total Weight		370 tons				

TABLE 4.1.2 MODULE No 2A (16.6 x 7.8 x 5.7 ft)

MUD TANKS AND CEMENTING UNIT

Description	Qty	Dead Weight (tons)	Type	Overall dimensions (metres)		
				L	W	H
Steel structure with piperack section	1	98.5		16.6	7.8	5.7
Mud tank	1	10	120m^3	14.5	3.0	2.8
Shale shaker, Hutchinson Rumba	1	4	4860 SU–DU	4.2	2.5	1.8
Desander, Hunt/Agip	1	5		1.35	1.3	1.7
Desilters, Demco	2	5	416	2.2	0.8	1.3
Degasser, Gas Master Centrifuges	1	3		5.7	1.1	2.2
Electric mud mixers	3	2	324TEQ			
Cementing unit, Dowell-Schlumberger	1	15	R621	7.0	3.7	2.35
Cement surge tank	1	0.5	100 ft^3		0.71	
Crane unit, Mariner	1	20	Model 500			
Crane pedestal	1	12				
Centrifugal mud pumps; Mission	2		6 x 8 R	2.5	1.2	1.0
Total Weight		175 tons				

TABLE 4.1.3 MODULE No 2B (16.6 x 7.8 x 5.7 ft)

RESERVE MUD TANK						
Description	Qty	Dead Weight (tons)	Type	Overall dimensions (metres)		
				L	W	H
Steel structure with piperack section	1	98.5		16.6	7.8	5.7
Firefighting sea water tank	1	25	80m^3	4.5	3.75	5.0
Mud tank	1	20				
Centrifugal mud mixer pump, Mission	1	3.5				
Total Weight		147 tons				

TABLE 4.1.4 MODULE No 3 (21.24 x 12.24 x 5.7 ft)

MUD SUCTION TANK, MAIN PUMPS AND BULKS						
Description	Qty	Dead Weight (tons)	Type	Overall dimensions (metres)		
				L	W	H
Steel structure with piperack section	1	150.5		21.24	12.2	5.7
Active mud tank	1	15	70m^3	8.0	3.0	2.8
Mud pumps, Emsco	2	80	D1350	6.5	3.05	3.2
Centrifugal mud pumps, Mission	2	7	6 x 8 R	2.5	1.2	1.0
Electric mud mixers	2	1	324 TEQ			
Bulks storage silos	4	30			3.6	4.7
Mud surge tank	1	.1	3m^3		0.75	
Mud hoppers	2	0.5	6in			
Manifold pump 5000 psi working press	1 set	1	5in			
Conveyor belt for sacks	1	1		5.0	0.8	0.6
Sack storage area						
Mud laboratory (logging cabinet)	1	5	Pressurised	3.6	2.5	3.0
Total Weight		292 tons				

TABLE 4.1.5 MODULE No 4 (21.24 x 10.24 x 5.70 ft)

POWER PLANT

Description	Qty	Dead Weight (tons)	Type	Overall dimensions (metres)		
				L	W	H
Steel structure with piperack section	1	133.15		21.24	10.24	5.7
DC generators, driven by Caterpillar V12 D398 diesel engine	5	55	GE752 T1	4.9	1.52	2.41
AC generator with exciter, 440V 60Hz driven by Caterpillar V12 D398 diesel engine	1	12	5ATI/2248	5.8	1.52	2.41
DC–AC emergency generator with exciter, driven by Caterpillar V12 D398 diesel engine	1	14	GE752T1 DC 5AT1/2248 AC	7.9	1.52	2.41
Diesel air compressor, Ingersoll Rand	1	1	40H40			
Electric air compressor, Ingersoll Rand	1	1	40H40			
DC control panel	1	3	GECo	4.21	1.07	2.28
AC control panel	1	2				
AC emergency control panel	1	1				
Cement air compressor	1	3.5		3.5	1.9	1.6
Daily fuel tank	1	3	$8m^3$	4.0	2.0	1.0
Compressed air tanks	2	1		2.5	0.92	
Fuel (gas oil) pumps	2	0.05	D311 K87			
Centrifugal separator, Alfa Laval	1	0.2	104B20			
Air filter	1	0.1				
Pressurization system	1 set	10		14.0	1.25	2.0
Total Weight		240 tons				

TABLE 4.1.6 MODULE No 5A (15.84 x 11.96 x 5.70 ft)

ADDITIONAL LIVING QUARTERS, GEOLOGICAL LABORATORY AND AC GENERATORS

Description	Qty	Dead Weight (tons)	Type	Overall dimensions (metres)		
				L	W	H
Steel structure with piperack section	1	128		15.84	11.96	5.7
Industrial water tank	1	18	100m³	7.5	4.2	3.2
Fuel (gas oil) tank	1	20	140m³	7.5	5.8	3.2
Steam boiler, J. Thompson (1 280 000 cal/h)	1	7	Minipac Model 5	3.65	1.88	2.43
Distillation units, Meco	2	10	300 gal/h	2.25	2.0	2.11
AC generators, 440V, 60Hz with exciter, driven by 5.5kV electric motor rated at 687kVA	1	–	–	–	–	–
AC generator, 380V, 50Hz with exciter driven by Caterpillar V12 D398 diesel engine	1	12	SRCR M500			
Industrial water pumps	2	3		1.5	0.5	
Firewater pump	1		1000 litres/h			
Additional 10-men living quarters, with geological laboratory and air conditioning room		10		10	7.5	2.8
Centrifugal fuel pump	1	0.1	450 litres/m			
Total Weight		212 tons				

TABLE 4.1.7 MODULE No 5B (12.24 x 11.96 x 5.70 ft)

BULKS

Description	Qty	Dead Weight (tons)	Type	Overall dimensions (metres)		
				L	W	H
Steel structure with piperack	1	82		12.24	11.96	5.7
Bulks storage silos	6	50	Vertical		3.6	4.7
Sack storage area						
Conveyor belt for sacks	1	3		13	0.8	0.8
Total Weight		135 tons				

TABLE 4.1.8 MODULE No 6 (28.3 x 28.3 x 12.1 ft)

LIVING QUARTERS
Description (Total accommodation for 59 men)
Main Deck
Potable water tank 100m^3
Fuel (gas oil) tank 68m^3
Workshop
Water pressure tank (hydrophore) and pumps
Water heaters
Drillers stores (small drilling equipment, electrical material, and diesel engine material)
1st Deck
Locker rooms
Washrooms and WCs
Laundry
Air conditioning room
5 bedrooms (2-man) = 10 men
2nd Deck
13 bedrooms (2-man) = 26 men
Washroom and WCs
3rd Deck
4 bedrooms (2-man) = 8 men
5 bedroom (3-man) =15 men
Baths, washrooms and WCs
Drillers Control Room
Bond store
Helicopter deck, extreme (28.3m x 28.3m)
Firefighting system (for Sikorski S–61 or similar)
Total Weight 321 tons

TABLE 4.1.9 PM 4

LIVING QUARTERS

Description.
(Total accomodation for 28 men)

First level

Mess room

Galley

Cold room

2 bedrooms (2 - man) = 4 men

Generator room

Air compressor room

Workshop store

Transformer room

Second level

12 bedrooms (2 - man) = 24 men

Showers/WC

Laundry

Airconditioning room

Control room

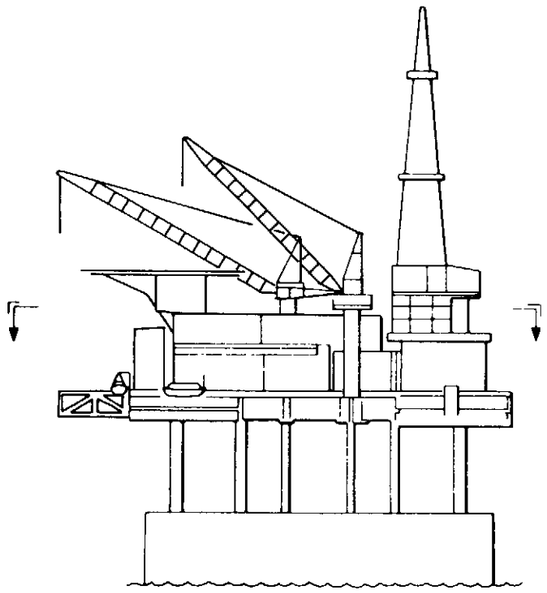
Telemetry room

Electrical room

Battery room

TABLE 4.1.10 NEW LIVING QUARTER

Description
First level.
Cold store
Freezer
Dry store
Mechanical workshop
Production workshop
Electr/instr. workshop
Technical room
Toilet
Second level.
Hospital with bath
Offices
Gymnasium
Third level.
Cinema
Pool room
Recreation room
Toilets.



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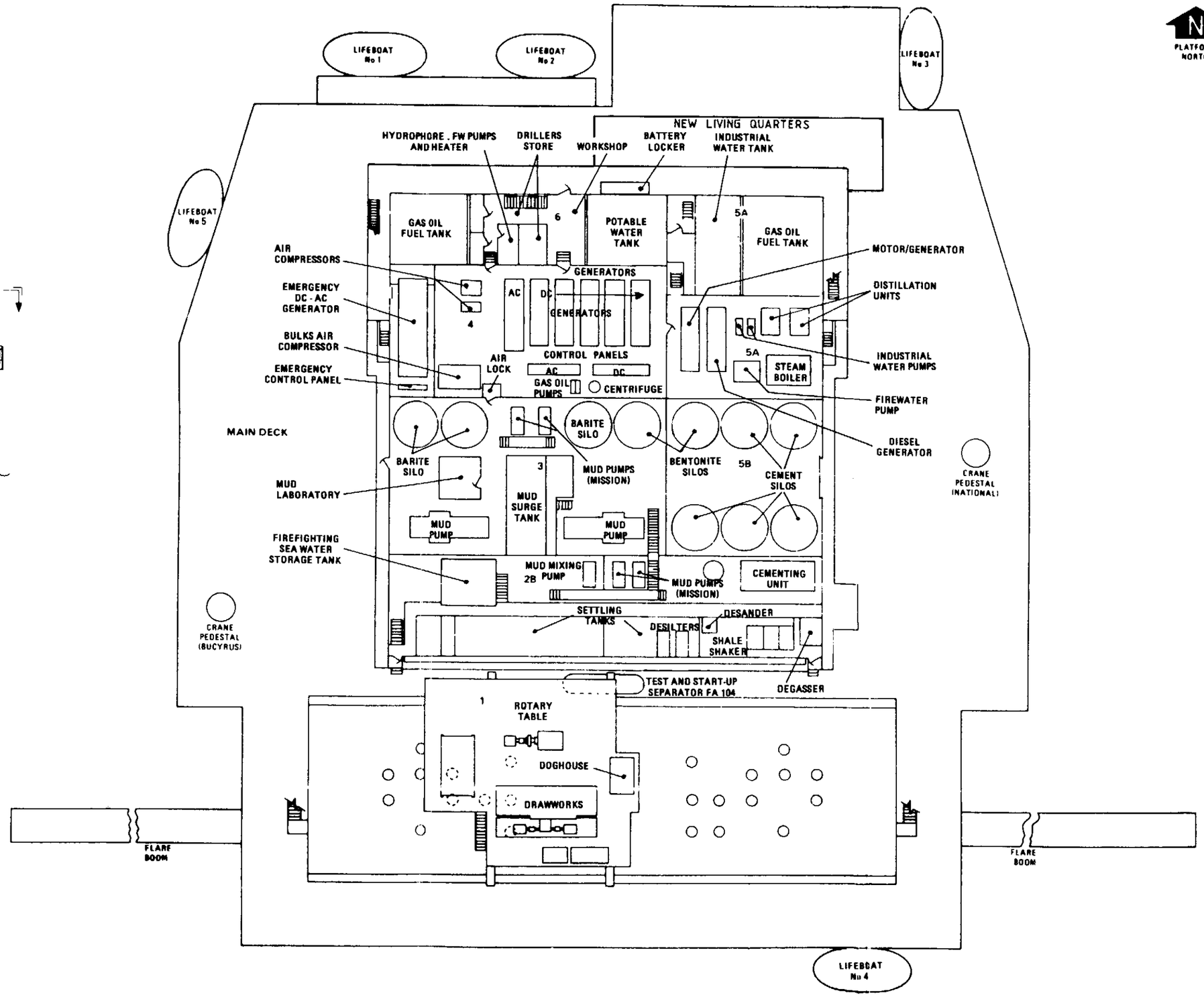
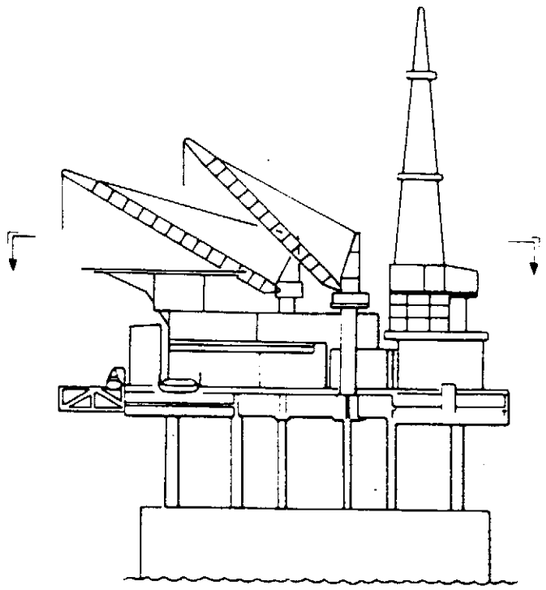


ISSUE 3 JUNE 1984

SUMMARY OF DRILLING PACKAGE
Upper Deck

4.1.1



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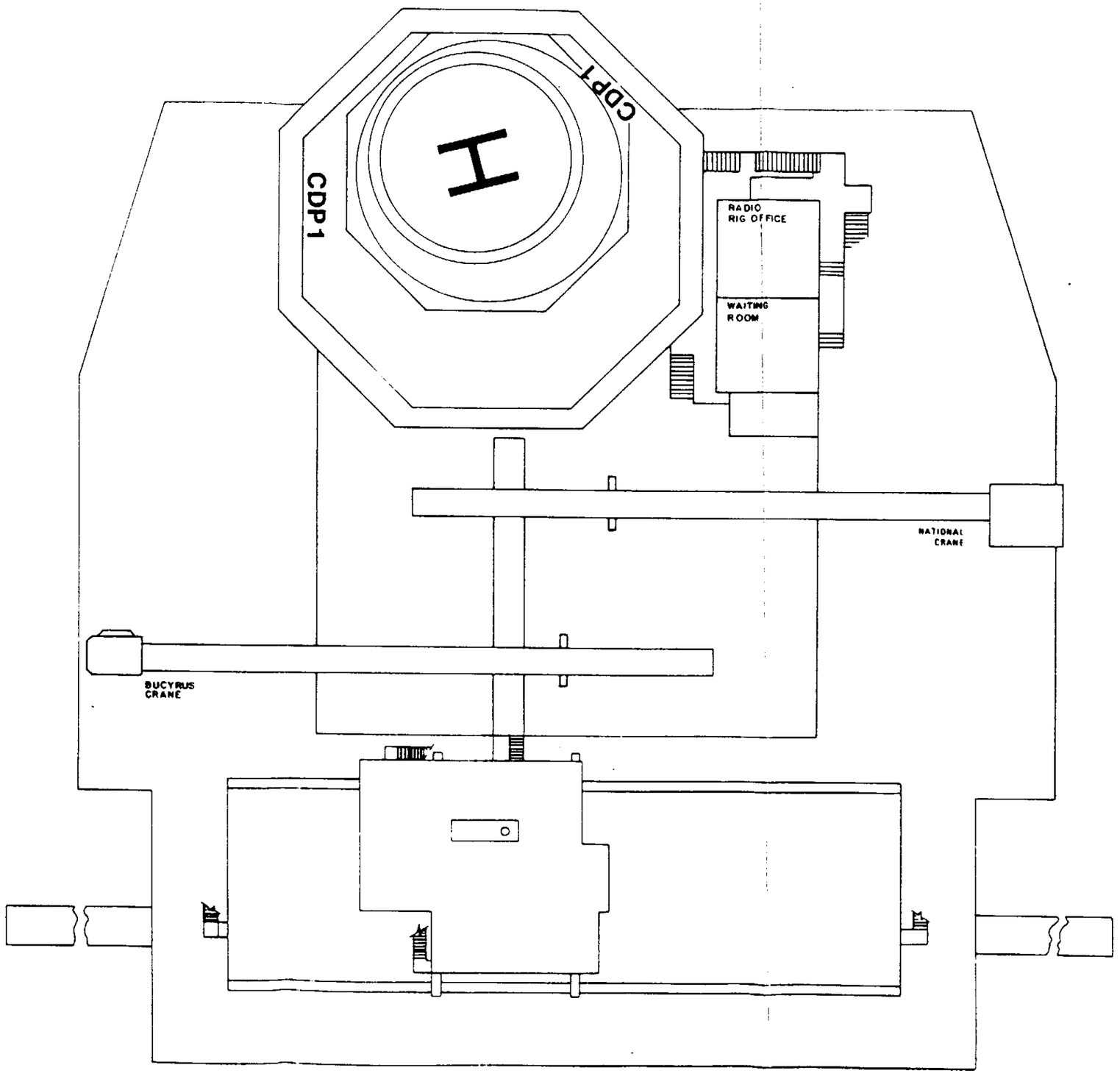
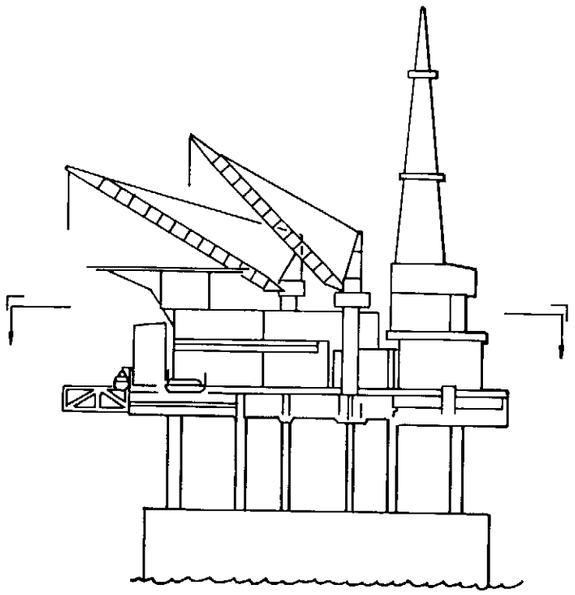


ISSUE 3 JUNE 1984

SUMMARY OF DRILLING PACKAGE
Helideck

4.1.2



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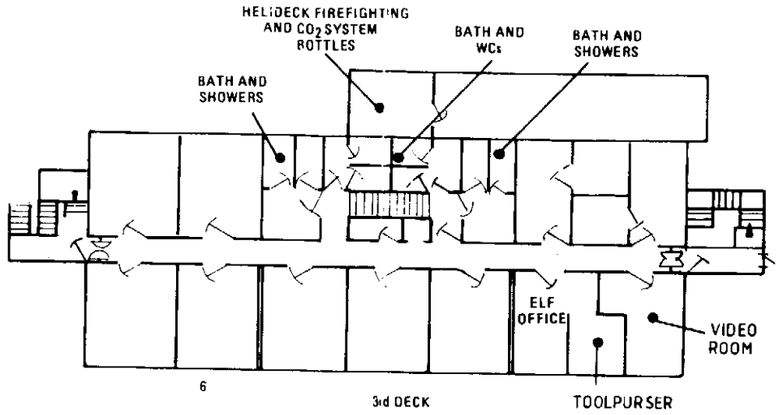
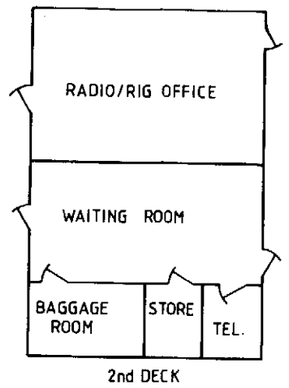
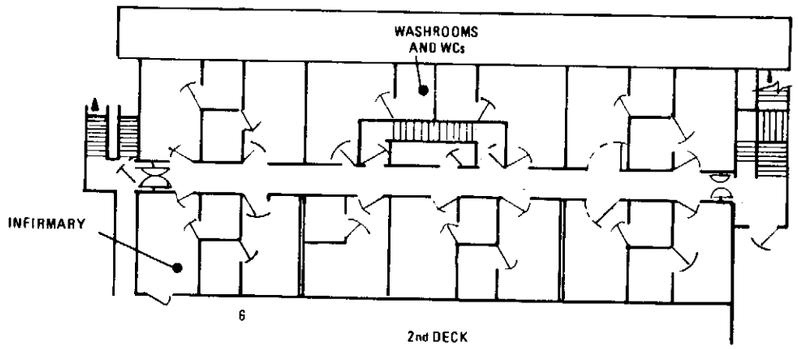
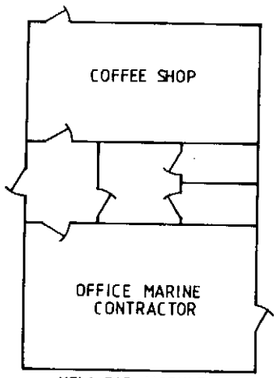


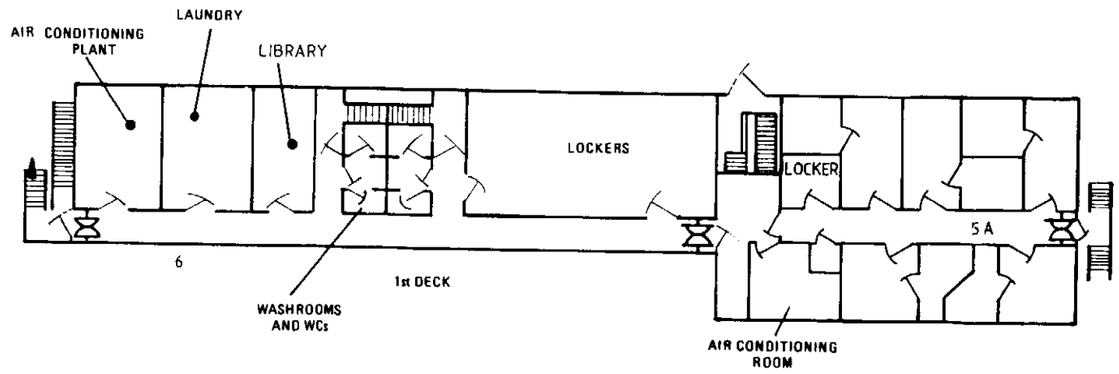


2nd DECK





NEW RIG MODULE
1st DECK



SYSTEM/FUNCTION	PRODUCTION	DRILLING
FIREWATER	REMOTE-OPERATED VALVES — INTERCONNECTIONS 6in; INTERCONNECTION 6in	FIREWATER SYSTEM
	DELUGE SYSTEM SUPPLIES — FW112(8in); FW112(8in)	WELLHEAD AREAS WH1A AND WH1B TEST AND START-UP SEPARATOR FA104
	FOAM SYSTEM SUPPLIES — FW151(6in); FW160(6in)	HELIDECK AUXILIARY FOAM SYSTEM
SEA WATER	PUMPS G114A/B (IN LIEU OF G112B/C WHILE DRILLING) — (8in)	
	'SPARE' PUMP OF G112A/B/C	STARTED FROM DRILL FLOOR
	PUMPS G107A/B — NW1008(8in)	WELLHEAD AREA WASHDOWN
METHANOL INJECTION	VIA PUMPS GA150A to Z — ML1002K(1.1/2in)	WELLHEAD INJECTION
	VIA PUMPS GA114A/B — ML1004A(1in)	METHANOL TANK FA104
COMPRESSED AIR	MANIFOLD AA–1005–A2A — (2in)	WELLHEAD VALVE HYDRAULIC POWER UNITS
	INSTRUMENT AIR RECEIVERS FA105A/B AND RESERVE N_2 SYSTEM — IA1002(2in)	WELLHEAD KILL, MASTER AND VENT VALVE
VENT AND FLARE SYSTEM	PILOT GAS SUPPLY — FG1000(1/2in)	PROPANE BOTTLES (NEAR FLARE BOOMS)
	COMPRESSED AIR SUPPLY — PA1003(2in)	COMPRESSED AIR SUPPLY
	WATER SCREEN SUPPLY — NW1036(3in)	SEA WATER SYSTEM
	VENTED GAS — NF1019(10in)	FROM TEST AND START-UP SEPARATOR FA104
GUTTERWAYS (POLLUTED)	POLLUTED WATER — GUTTERWAYS	HELIDECK FUEL STORAGE TANK SURROUNDS PIPERACK
ELECTRICAL POWER	LV SYSTEM, MCC 'C' — AUXILIARY	380V 50Hz FROM G9 (500kW)

SYSTEM/FUNCTION	PRODUCTION	DRILLING
GENERAL ALARM EMERGENCY SHUTDOWN (ESD) MUSTER ALARM DISASTER SHUTDOWN (DSO) (ABANDON PLATFORM)	PRODUCTION CONTROL ROOM PRODUCTION AREA BUTTONS QP REMOTE CONTROL ROOM (ESD AND DSO)	DRILLERS CONTROL ROOM RIG FLOOR CONSOLE DRILLING AREA BUTTONS (GENERAL ALARM)
GAS EMERGENCY	AUTOMATIC BY GAS DETECTOR	
FIRE EMERGENCY	AUTOMATIC BY FIRE DETECTORS	
PUBLIC ADDRESS SYSTEM (LOUDSPEAKERS THROUGHOUT PRODUCTION AND DRILLING)	PRODUCTION CONTROL ROOM QP REMOTE CONTROL ROOM	DRILLERS CONTROL ROOM (VIA TELEPHONE)

SUMMARY OF DRILLING PACKAGE
Production Deck/Drilling Package Interface

4.1.4

AREA CLASSIFICATION

1 GENERAL

1.1 The drilling package areas have been evaluated for risk using the Institute of Petroleum Model Codes of Safe Practice Part1:1965, and Part 8:1972 as shown in Table 4.2 and Diagrams 10.3 .1 to 4.

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

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.

1.3 Areas not included in a dangerous category as above are termed Unclassified, and are achieved as follows:

(a) Pressurising an enclosed space with air taken from an unclassified area; see Section 4.8.

(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; see Section 4.8. These areas are normally classified as Zone 2 if ventilation is shut down.

Note: The loss of forced ventilation in a room or enclosure in a Zone 2 area will result in that room or enclosure becoming a Zone 1 area.

TABLE 4.2 DRILLING PACKAGE MODULES — AREA CLASSIFICATION

Module/Area	Function/Main Equipment	Area Classification	Type of Ventilation
Module 1	Drilling module, traverses the whole area of the Wellhead Module (WH1A & B)	Zone 2	Natural
	Doghouse. Shale shaker	Zone 1	
Module 2A	Shale shaker. Cementing units, mud tanks	Zone 1	Forced vented under negative pressure
Module 2B	Drill support machinery	Zone 1	
Module 3	Barite storage tanks, mud tanks and pumps	Zone 1	Forced vented under negative pressure
Module 4	DC and AC generators and electrical control panels	Unclassified	Ventilated and pressurised
Module 5A	AC generators , steam boiler and water utilities Electrical firewater pump. 10-man additional living quarters	Unclassified	Ventilated and pressurised

Module/Area	Function/Main Equipment	Area Classification	Type of Ventilation
Module 5B	Bulk cement storage	Zone 1	Force vented under negative pressure
Module 6 Living Quarters	Main Deck: storage tanks, stores workshop. 1st, 2nd and 3rd Decks: accommodation for 44 men, Drillers Control Room	Unclassified	Ventilated and pressurised
Helideck	Helideck		

ALARMS AND SHUTDOWNS

1 GENERAL

1.1 The alarm system installed on platform CDP1 is standard for the Frigg Field and is as follows:

(a) Fire Alarm. Intermittent horn signal of one second and pause of one second, 400Hz frequency, and accompanied by red flashing lights in noisy areas of the platform.

(b) Muster Alarm. Continuous horn signal, 400Hz frequency, and accompanied by red flashing lights in noisy areas of the platform.

1.2 Table 4.3 summarises all alarms and shutdowns.

2 FIRE ALARM

2.1 The fire alarm signal is initiated either manually from the Production Control Room or automatically by the fire detection system.

2.2 An Alarm Cancel button is situated in the CDP1 Production Control Room.

2.3 Power for the alarm system is provided by a 48V battery which is capable of supplying enough power for 24 hours' operation.

2.4 Audible alarms are broadcast throughout the platform via the public address system.

3 MUSTER ALARM

3.1 The muster alarm is a pre-alarm for platform abandonment. It means that personnel assemble at prearranged muster (lifeboat) stations and prepare to abandon the platform.

3.2 The alarm is initiated by the Muster Alarm buttons in the Production Control Room, Drillers Control Room, and Rig Floor Console.

3.3 The order to abandon platform will be given verbally over the public address system.

TABLE 4.3 SUMMARY OF ALARMS AND SHUTDOWNS

Type of Emergency	Alarm	Source of Activation	Location of Activation Source
Fire alarm button	Alarm in control rooms and fire pump start	Manual fire alarm buttons (Pneumatic)	(a) Drillers Control Room (b) Rig floor (c) Drilling Modules 4, 5A 5A additional quarters, 6 (Main, 2nd & 3rd Decks) (d) Production areas (e) Automatic shutdown system (Production)
Gas Emergency	Alarm in control rooms	Automatic by gas detectors	Production and Drilling areas

Type of Emergency	Alarm	Source of Activation	Location of Activation Source
Emergency Shutdown (ESD)	Alarm in control rooms	Via Drillers Control Room from Production, or by manual shutdown button (Electrical)	(a) Production Control Room (b) Drillers Control Room (c) Rig floor console (d) Production area ESD buttons (e) Automatic shutdown system (Gas) (f) QP Control Room (g) TP1 interface room.
Fire Emergency	Intermittent horn over PA System. Red flashing lights in noisy areas	Automatic by fire detectors	Production and Drilling areas
Muster Alarm (Pre-alarm for Abandon Platform; muster at lifeboat stations)	Continuous horn over PA System. Red flashing lights in noisy areas	Manual Muster Alarm buttons. (Cancelled by pushbutton in Production Control Room)	(a) Production Control Room (b) Drillers Control Room (c) Rig floor console
Disaster Shutdown (DSD). (Abandon Platform)	Continuous horn and Red flashing lights as Muster Alarm. (All downhole valves automatically shut)	Manual Disaster buttons	(a) Production Control Room (b) Drillers Control Room (c) Rig floor console (d) Production area DSD buttons (e) QP Control Room
CO_2 Alarm	Continuous bell in applicable space (Modules 4 or 5A generators) with red light at access doors	CO_2 release handle. (30-second delay before gas emitted)	Module 6 exits: (a) Main Deck, south (b) 2nd Deck, west (c) 3rd Deck, south
Diesel Engine Shutdown		Manual buttons	Drilling areas: (a) Module 4 (Engine Room) (b) Rig floor (c) Drillers Control Room

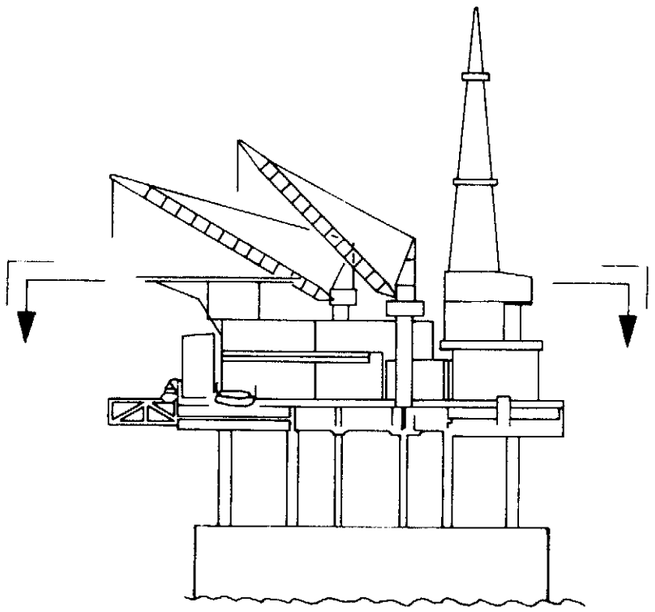
END

■	CO_2 EXTINGUISHER (5kg)
●	CO_2 EXTINGUISHER (10kg) WITH LONG HOSE
M	ASBESTOS FIRE BLANKET
N	FIREMAN'S EQUIPMENT, WITH BOTH HEAVY AND LIGHT ASBESTOS OVERALLS
SM	SAFETY EQUIPMENT STOWAGE CONTAINING: N C A B SB M
	STRETCHER
△	FIRE BOX WITH 45mm FIRE HOSE
	SEA WATER MONITOR CANNON
⊠	FIREFIGHTING SEA WATER STORAGE TANK ($80m^3$)
FP	FIREFIGHTING PUMP (1000 LITRES/MIN)
	TWIN-AGENT CANNON, HELIDECK FIREFIGHTING SYSTEM
	PORTABLE TWIN-AGENT GUN, HELIDECK FIREFIGHTING SYSTEM
	CONTROL PANEL FOR HELIDECK TWIN-AGENT FIREFIGHTING SYSTEM
MP	POWDER PRESSURE TANK (620 LITRE MONNEX) AND N_2 BOTTLES FOR HELIDECK FIREFIGHTING SYSTEM
LW	LIGHT WATER PRESSURE TANK (800 LITRES) AND N_2 BOTTLES FOR HELIDECK FIREFIGHTING SYSTEM
	HOSE FOR HELIDECK AUXILIARY FOAM FIREFIGHTING SYSTEM
FT	FOAM LIQUID TANK (250 LITRES) FOR HELIDECK AUXILIARY FOAM FIREFIGHTING SYSTEM
○ ○ ○ ○ ○ ○	CO_2 CYLINDERS FOR CO_2 DRENCHING SYSTEMS
▬	AREA PROTECTED BY HALON

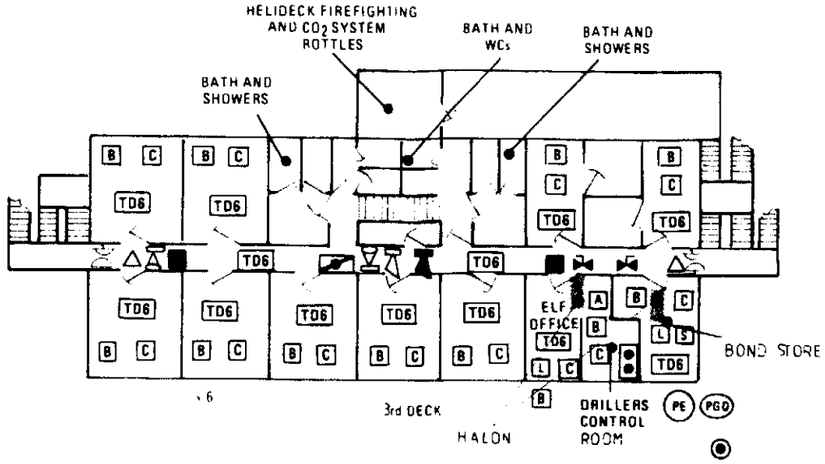
	CO_2 DRENCHING SYSTEM NOZZLE
	CO_2 OPERATED VENTILATION OPENING
	REMOTE CO_2 RELEASE HANDLE FOR ENGINE ROOM
	HALON RELEASE LEVER
GD	GAS DETECTOR
GD	GAS DETECTOR CONTROL PANEL
PGD	PORTABLE GAS DETECTOR
PE	PORTABLE EXPLOSIMETER
SD *	SMOKE DETECTOR
TD *	THERMOVELOCIMETRIC (HEAT RISE) DETECTOR
FD *	FLAME DETECTOR
FD	SMOKE, HEAT RISE AND FLAME DETECTOR CONTROL PANEL
	DIESEL ENGINE EMERGENCY STOP PUSH
	VENTILATION FAN STOP PUSH
	GENERAL ALARM SWITCH
	AUTOMATIC FIRE BREAK DOOR
	LOUDSPEAKER
	MICROPHONE

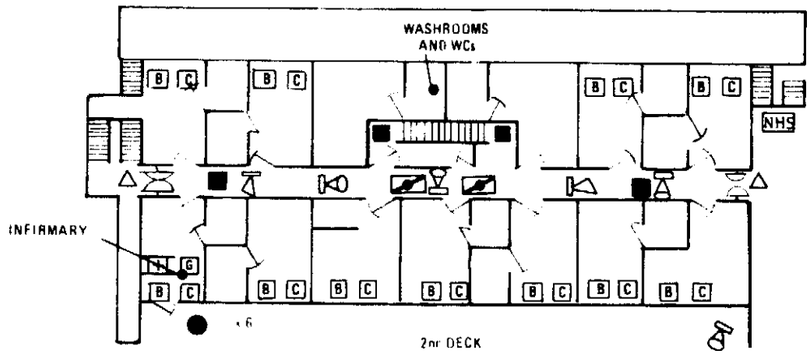
	PUBLIC ADDRESS
	GAS ALARM
	CO_2 DRENCHING SYSTEM ALARM
	GENERAL ALARM SIREN (AIR)
	DISASTER WARNING BELL (ELECTRIC)
NHS	MANUAL FIRE PUMP START
B	ANTI-GAS MASK
A	BREATHING APPARATUS
SB	SPARE BOTTLES FOR BREATHING APPARATUS
AC	AIR COMPRESSOR FOR BREATHING APPARATUS BOTTLES
C	LIFEJACKET
H	LIFEBUOY
H1	LIFEBUOY WITH SIGNAL LIGHT
H2	LIFEBUOY WITH 85m LIFELINE
H3	LIFEBUOY WITH LIGHT AND ORANGE SMOKE SIGNAL
L	HAND FLASHLIGHT
S	SIGNAL PYROTECHNICS AND ALDIS SIGNAL LAMP
G	REVIVAL EQUIPMENT

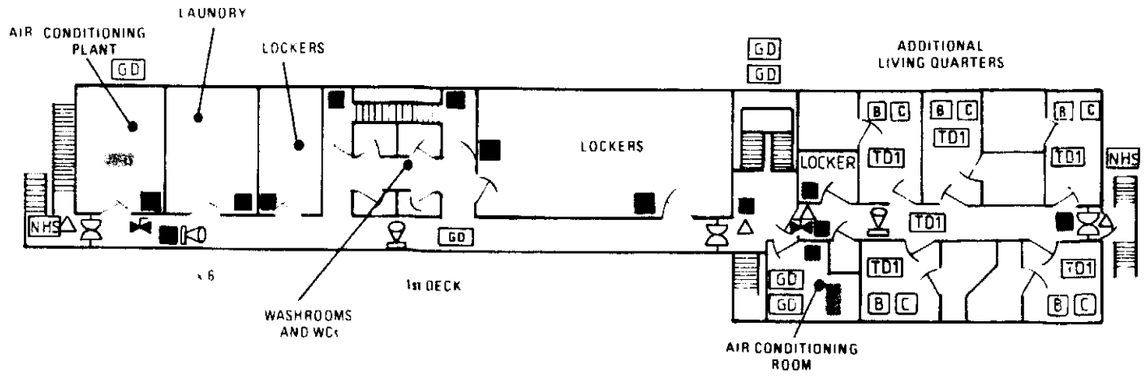
* NOTE: SUFFIX NUMBERS ON DIAGRAMS DENOTE CIRCUITS



WEST ELEVATION



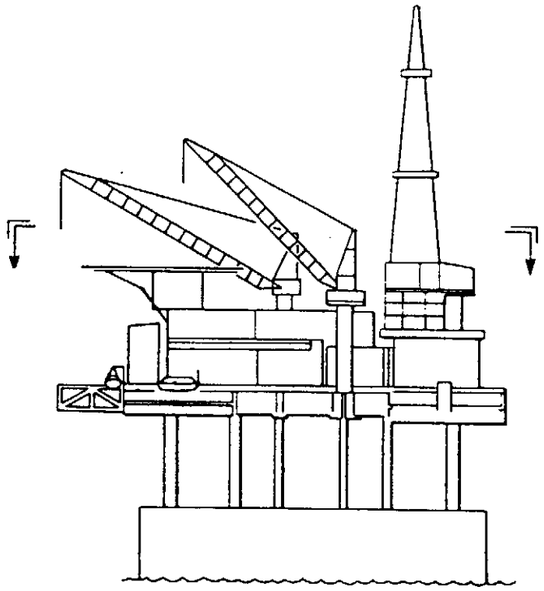




ISSUE ~~4 JUNE 1984~~ 5 Oct 88

FIREFIGHTING AND SAFETY EQUIPMENT
Living Quarters

4.4.2



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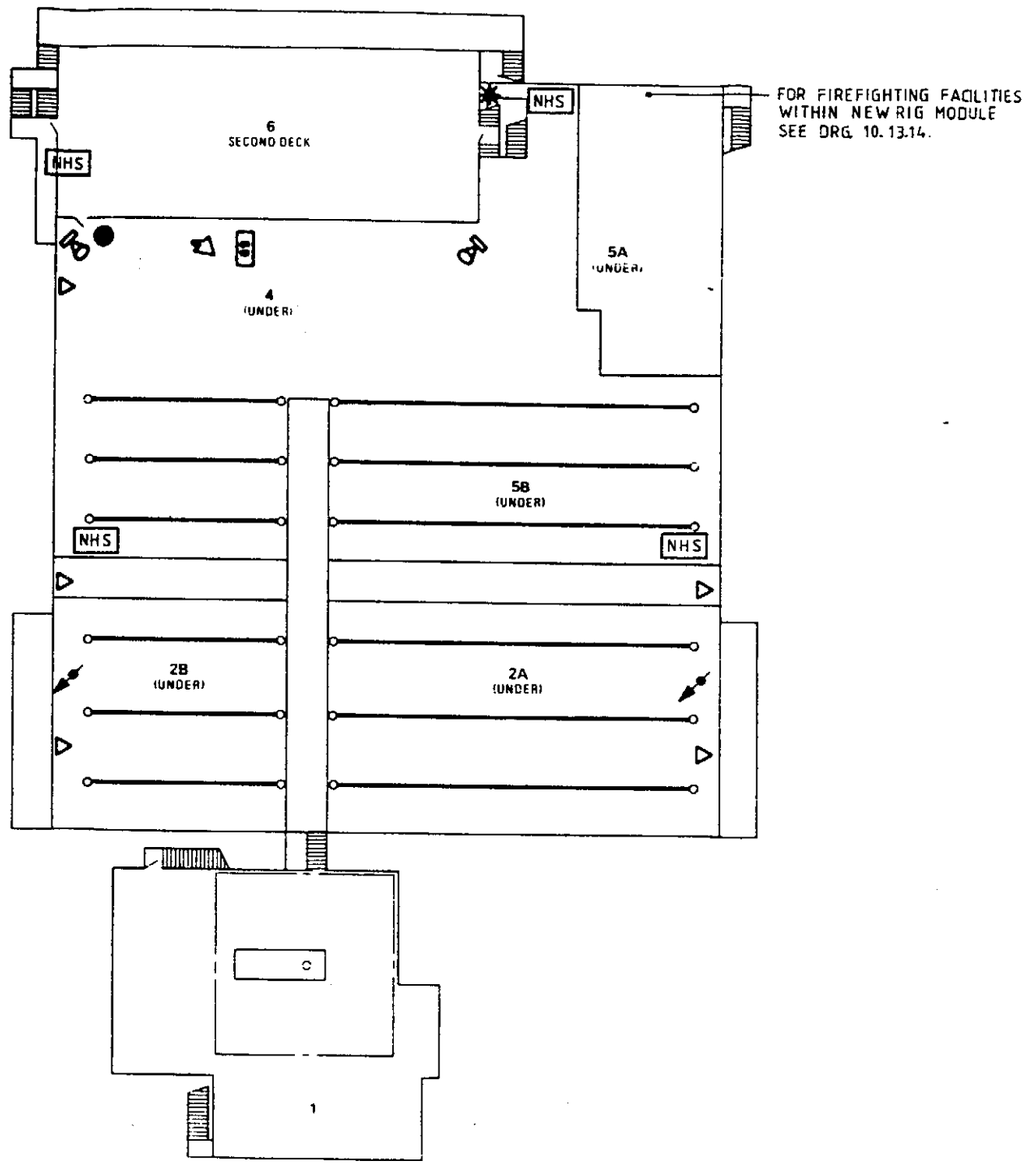

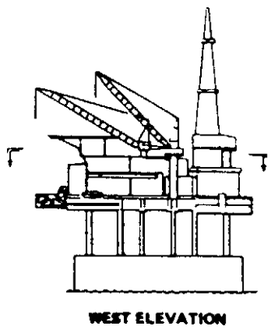

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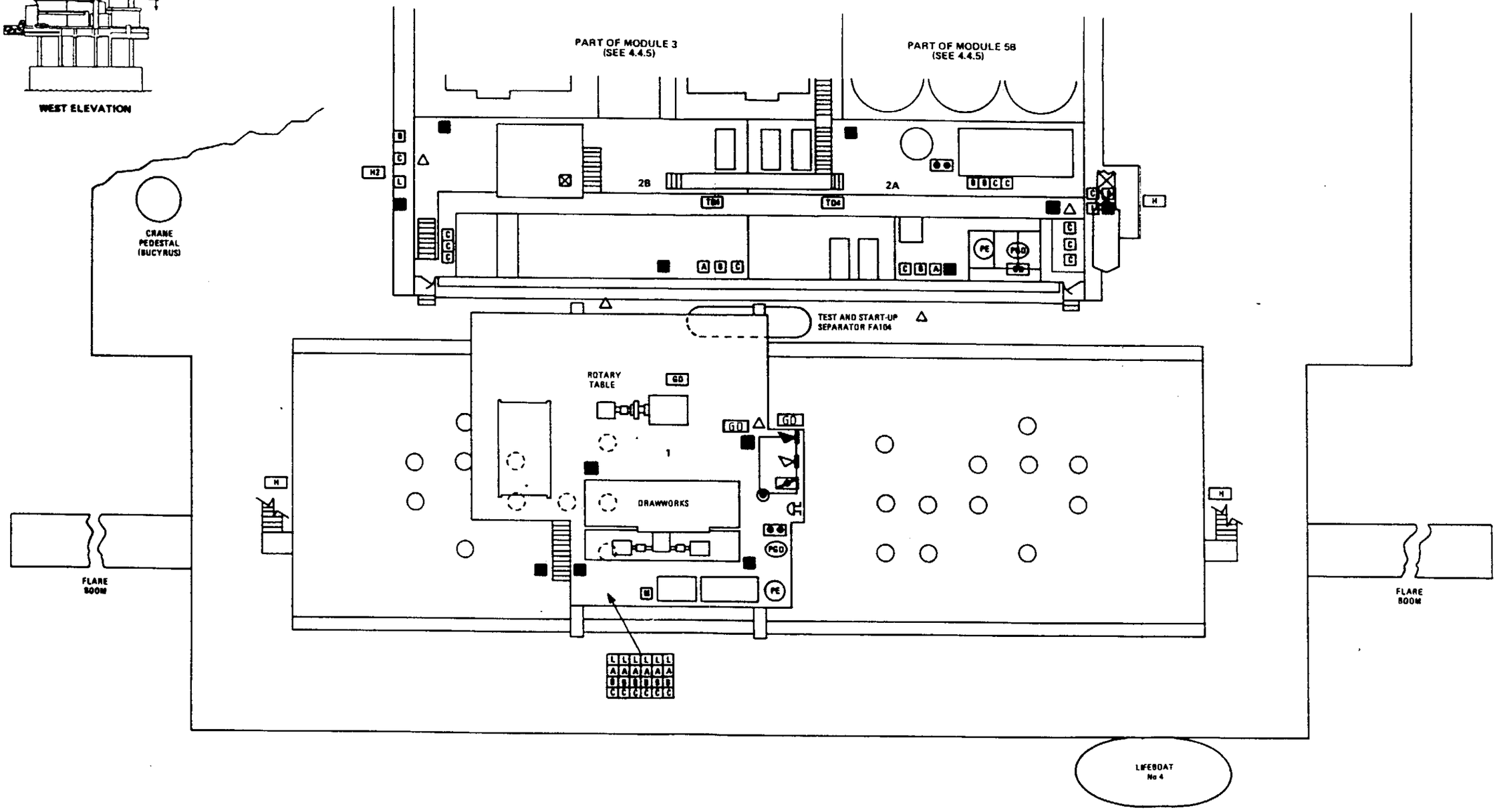
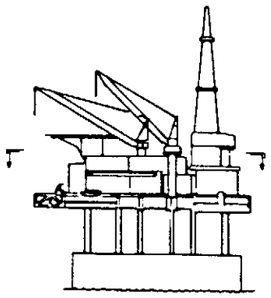




WEST ELEVATION

N
PLATFORM NORTH

LIFEBOAT No 1

LIFEBOAT No 2

LIFEBOAT No 3

LIFEBOAT No 6

NEW LIVING QUARTER

GAS OIL FUEL TANK

POTABLE WATER TANK 6

INDUSTRIAL WATER TANK

GAS OIL FUEL TANK

4

5A

3

5B

CRANE PEDESTAL (NATIONAL)

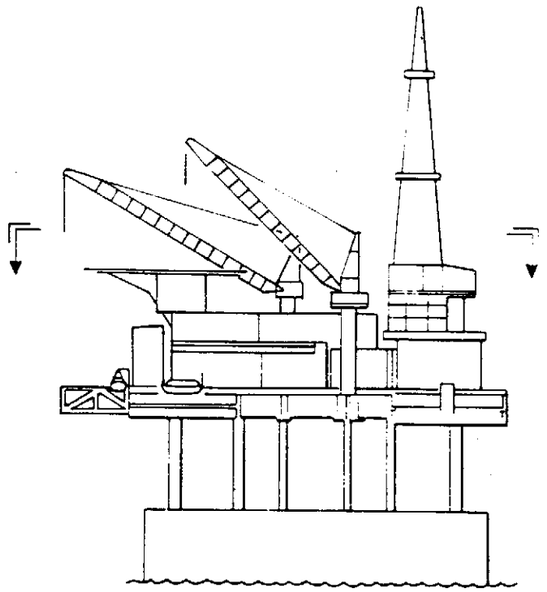
PART OF MODULE 2B (SEE 4.4.4)

PART OF MODULE 2A (SEE 4.4.4)

Issue 4,Oct,-88

FIREFIGHTING AND SAFETY EQUIPMENT
Upper Deck - Modules 3, 4, 5A, 5B, and 6

4.4.5



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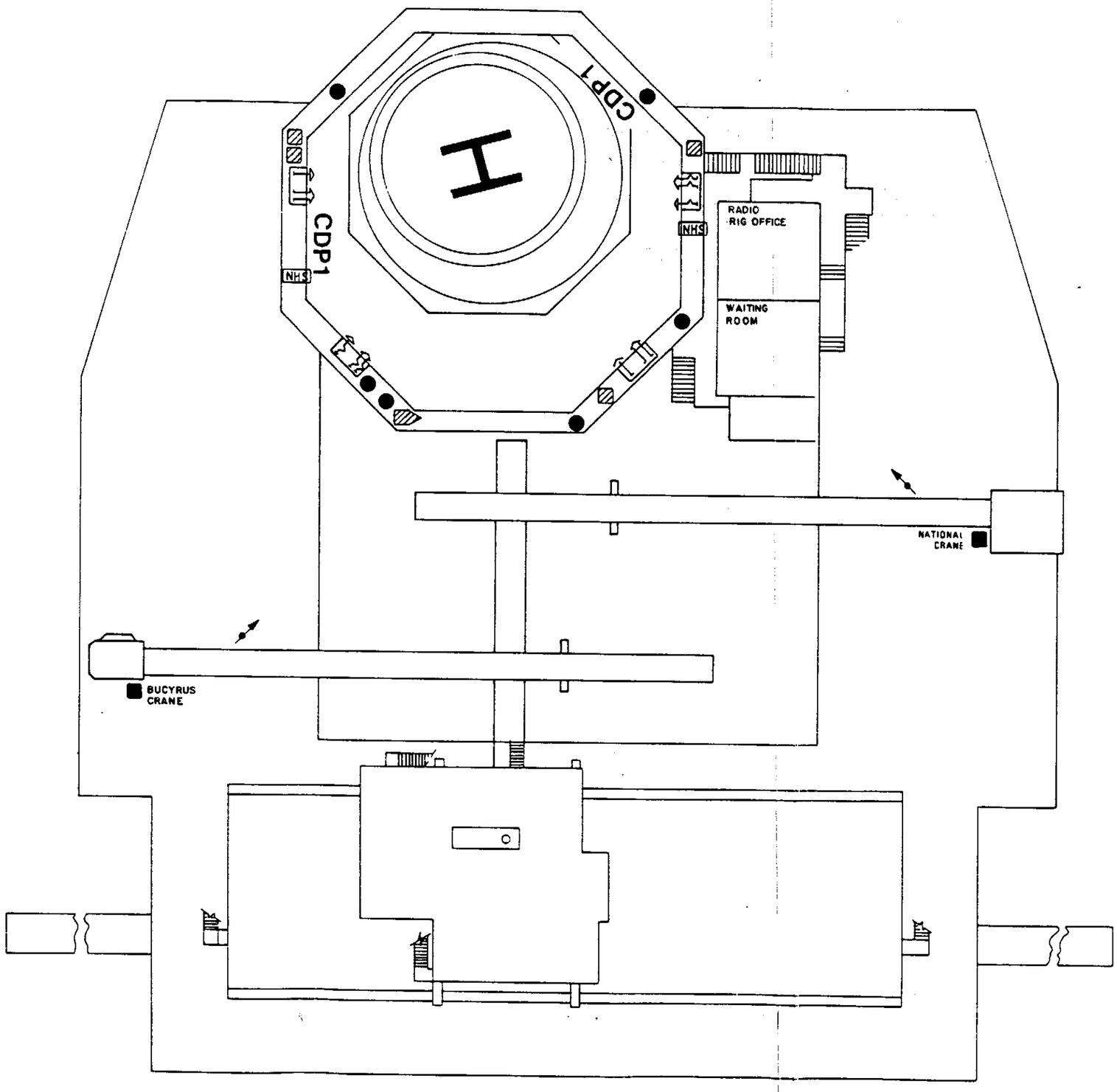


ISSUE 2 JUNE 1984

FIREFIGHTING AND SAFETY EQUIPMENT Helideck	4.4.6

GAS AND FIRE DETECTION

1 GENERAL

1.1 Four types of detectors are used in the Drilling Package gas and fire detection system ; they are as follows:

(a) Light gas detectors (9).

(b) Smoke detectors (7).

(c) Thermovelocimetric (heat rise) detectors (43). One of these acts as a flame detector, and 10 of them as 'rate of rise'. These are installed in Modules 2A, 2B, 3 and 5B.

(d) Fusible plugs (4).

1.2 The positions of all detectors, annunciators and control panels are shown on Diagrams 4.4.2 to 4.4.4.

1.3 Similar detection systems are used in the production areas and there is an associated common alarm and shutdown system.

2 GAS DETECTION SYSTEM

2.1 A Sieger gas detection system is installed. The control panel is located in PM4, safety room.

2.2 The gas detectors (sensors) work on the electrocatalytic principle and are adjusted to respond to the presence of light gas (methane). Each sensor and its line unit can be adjusted to alarm at between 0 and 100 per cent of lower explosive limit (LEL), and two alarm limits (minimum and maximum) and one zero point can be set at each line unit. The units are set to activate at 20 per cent LEL.

2.3 The nine sensors are sited as shown in Table 4.5.1.

3 SMOKE AND HEAT DETECTION SYSTEMS

3.1 General

3.1.1 A Cerberus smoke system and heat detection system is installed. The control panel is located in PM4, safety room.

3.1.2 The smoke and heat rise detectores are sited as shown in Table 4.5.2.

3.2 Fusible Plugs

3.2.1 Four fusible plugs are fitted to ventilation systems in the living quarters. They will automatically close their associated ventilation flaps when fire fuses a plug.

3.2.2 The fusible plugs are located at the galley ventilation inlets and outlets, and in the conditioned air intakes on each level.

FIREFIGHTING AND SAFETY

1 FIREFIGHTING

1.1 General

1.1.1 Provision for firefighting in the drilling package is as follows:

(a) Firewater system.

(b) CO_2 fire suppression systems.

(c) Helideck firefighting system.

(d) Portable firefighting equipment (see Table 4.6).

(e) Halon system.

1.1.2 For the location of firefighting and safety equipment see Diagrams 4.4.1 to 4.4.6.

1.2 Firewater System

1.2.1 The two submerged sea water system electric pumps, each with a capacity of 360m³/h at 90m head, deliver sea water to a 80m³ firefighting sea water storage tank situated in Module 2B. An electric firewater pump, with a capacity of 1000 litres/min at 90m head, delivers the water from the storage tank to a 4in firewater main which encircles the drilling package.

1.2.2 The firewater main supplies 28 fireboxes (each equipped with a 45mm dia hose) distributed throughout the drilling package, and two Silvani model BA7CM 1800-litres/min fire monitor cannons, one on top of each of Modules 2A and 2B (piperack).

1.2.3 If necessary, the firewater system can be supplied by the two industrial water pumps (in Module 5A), and there are also cross-connections with the industrial water system and the sea water system. In addition, there are two 6in cross-connections between the drilling package firewater system and the production deck firewater system; the isolating valves are remote-operated and are on the production side of the cross-connections. These valves open automatically when the fire pumps are started.

1.2.4 The fire pump will start on signals received from:

(a) Drillers Control Room.

(b) Rig Floor Console.

(c) Local start buttons.

(d) Fire detection systems.

(e) Manually controlled deluge systems.

(f) Fusible plug fire detectors.

(g) Gas detection system - 2nd.threshold.

1.2.5 Wellhead areas WH1A and B (Module 1) are fitted with salt water deluge systems, activated by fusible plug fire detectors and supplied from the Production Deck Firewater System (two 8in lines, FW112).

1.2.6 Mud room area is protected with a sprinkler system with heads equipped with frangible bulb. Water is supplied from 14" main fire water line.

1.3 CO2 Fire Suppression Systems

1.3.1 There are two seperate CO2 fire suppression systems provided, to drench the diesel engine areas in Modules 4 (Engine Room) and 5A to a level of 40 per cent. Both systems may be operated by manual release handles situated at the exits from Module 6 as follows:

(a) Main Deck level, north

(b) 2nd Deck level, east.

(c) 3rd Deck level, north (adjacent to CO2 bottle storage).

1.3.2 On operating any of the manual release handles, the following will occur:

(a) Immediately:

(i) CO2 release alarm bell rings continuously in applicable Module, 4 or 5A.

(ii) Red lights above applicable access doors illuminate. (A notice adjacent to each red light indicates that entry is not permissible while the light is on; CO2 discharged).

(iii) The power plant pressurisation system stops (six axial fans on the roof of Module 4).

(b) Thirty seconds after operation of a manual release handle (to allow personnel to clear the area), CO2 operated air flaps in the west boundary of Module 5A and/or east boundary of Module 4 will close.

1.3.3 CO2 discharge will be completed in the following approximate times:

(a) Module 4; 78 seconds.

(b) Module 5A; 52 seconds,

1.3.4 The CO2 bottles serving both systems are located in the same storage - outside Module 6 3rd Deck, south. The gas for Module 4 is stored in eighteen 45kg bottles and that for Module 5A in fourteen 30kg bottles.

1.4 Helideck Firefighting System

1.4.1 The primary firefighting system on the Helideck consist of an Ansul-Silvani twin agent system type 620/800, designed to deliver (either simultaneously or separately) powder and foam fire extinguishing agents to twin monitor cannons and/or portable twin agent guns.

1.4.2 The system comprises a powder set model PL620, consisting of a 620-litre tank and associated nitrogen-filled pressurisation bottles, and a light water (aerated foam/water mixture) set model LW800, consisting of an 800-litre tank and associated nitrogen-filled pressurisation bottles. Both sets are installed under the Helideck (Module 6, 3rd Deck, south). These powder and light water sets are permanently connected to two twin monitor cannons and to portable twin agent guns with 30m long rubber hoses on reels.

1.4.3 The monitor cannons are sited at the north-west and south-east edges of the Helideck, and the twin agent guns and hosereels are at the north-east and south-west edges. The western and eastern cannon/gun pairs are activated from separate control panels sited adjacent to the twin agent gun hosereels.

1.4.4 The system is specially designed for fighting hydrocarbon fires, using the monitor cannons as the primary means of attack. The portable twin agent guns are intended for dealing with small fires, or for any residual fires after the main action is complete.

1.4.5 The ranges and working times of the cannons and guns are as follows:

Firefighting Unit	Range		Working Time (One Unit Only)
	Powder	Foam	
Monitor Cannon	20m (65.6 ft)	20m (65.6 ft)	70 seconds
Portable Gun	8m (26.3 ft)	4 to 5m (13 to 16.4 ft)	250 seconds

NOTE
The Helideck width, edge-to-edge, is 25.3m (83 ft).

1.4.6 Back-up to the primary twin agent firefighting system is provided by two 250-litre light water tanks and associated nitrogen-filled pressurisation bottles (Module 6, 2nd Deck, north), permanently connected to 25m long hoses.

1.4.7 In addition to the above Helideck firefighting equipment, a 770-litre foam concentrate tank fitted with four foam eductors is installed under the Helideck. Four 3in lines feed the mixed foam to four hoses mounted on the Helideck. Water for mixing the foam is drawn from the drilling package firewater system.

1.4.8 Three portable 10kg CO_2 fire extinguishers, fitted with 25m long hoses, are stowed at the Helideck edges. Lockers containing rescue suits and equipment are sited under the Helideck (Module 6, 3rd Deck, north).

2 SAFETY EQUIPMENT

2.1 The following equipment is stored in lockers close to the Helideck:

(a) Two rescue suits, including asbestos overalls and breathing apparatus.

(b) Rescue equipment complete with pneumatic salvaging equipment (as used by the British Aviation Authority).

(c) Fire blanket (asbestos).

2.2 Additional living quarters (Module 5A) is equipped with a safety locker containing the following items:

(a) Fireman's outfit, including both heavy and light asbestos overalls, and rescue tools.

(b) 9kg portable powder extinguisher.

(c) Three 10-litre portable CO_2 extinguishers.

(d) Fire blanket (asbestos).

(e) Breathing apparatus and spare bottles.

(f) Anti-gas mask.

(g) Lifejacket.

2.3 The following safety equipment is strategically placed throughout the drilling package.

(a) Resuscitation equipment.

(b) First aid kits and stretchers.

(c) Portable explosimeters.

(d) Portable gas detectors.

(e) Breathing apparatus.

(f) Gas masks.

(g) Lifejackets.

(h) Explosion-proof handlamps.

(j) Anti-splash visors.

(k) Anti-acid gloves.

(l) Safety belts and anti-fall devices (derrickman).

(m) Geronimo derrickman escape device.

(n) Walkie-talkie radiotelephone.

2.4 The following escape craft are installed around the main deck:

(a) Five 50-man Watercraft Mk II lifeboats.

(b) Three 25-man RFD25MM Mk I liferafts.

(c) Fifteen lifebuoys.

For location of escape craft see Diagram 10.13.2.

TABLE 4.6 PORTABLE FIRE EXTINGUISHERS AND EQUIPMENT

Module	Portable Extinguishers		Fire Blanket (Asbestos)	Fireman's Equipment
	Powder (9kg)	CO_2 (5kg)		
1 (Rig floor)	4	3	1	0
2A	3	2, + 1 outside	0	0
2B	1	2, + 1 outside	0	0
3	1	1	0	0
4	5, + 1 outside	7	1	0
5A	6, + 1 outside	6	0	1
5A (Additional Living Quarters)	5	2	0	1
5B	0	0	0	0
6:				
Main Deck	1 outside	2, + 1 outside	0	1
1st Deck	0	3	1	0
2nd Deck	0	6	1 in galley	1
3rd Deck	0	3	1	2
Helideck	0	3 (10kg)	0	0
TOTALS	23	40 x 5kg 3 x 10kg	5	6

END

ELECTRICAL POWER SUPPLIES

1 GENERATING PLANT

1.1 The nine generator sets for use within the drilling package are as follows:

Safety/Output	Qty	Prime Mover	Generator	Indentity
Drilling DC Units				
800V dc	5	Caterpillar V12 diesel D398. 1000 hp at 1200 rev/min	GE752T1. 750 hp input continuous at 1200 rev/min	G1 to G5
AC Units				
440V 60Hz	1	Caterpillar V12 diesel D398 1000 hp at 1200 rev/min	5ATI/2248 500kW	G7
380V 50Hz	1	Caterpillar V12 diesel D398 1000 hp at 12 rev/min	Cat SRCR M500 TH3200, 500kW	G9
440V 60Hz	1	5.5kV Motor Driven Alternator		A3
DC–AC Emergency Unit				
600V dc, 125V dc, 440V 60Hz, 220V 60Hz	1	Caterpillar V12 diesel D398B 1000 hp at 1200 rev/min	DC: GE752 T1 as above 550kW AC: 5ATI/2248 as above 500kW	G6

1.2 Generators G1 to G7 are located in Module 4. Emergency generator G6 is isolated by a firewall and has its own fuel, air, cooling supplies and distribution panel. Generator G9 and the converter are located in Module 5A.

2 DIESEL ENGINE SHUTDOWN CONTROLS

2.1 All eight generator diesel engines can be shut down by a common engine shutdown system.

2.2 The stop governor group actuators, throttles and safety control shut-off groups will be actuated simultaneously by any of the following:

(a) Manual actuator push in Engine Room.

(b) Manual actuator push on Rig Floor.

(c) Manual actuator push in Drillers Control Room.

3 DC POWER ASSIGNMENT

DC generator assignment may be effected from the control panel on the Rig Floor as follows:

DC Motor Service	DC Generator G1	G2	G3	G4	G5	G6
Drawworks A	X		X		X	
Drawworks B		X		X		X
Mud pump 1A	X		X		X	
Mud pump 1B		X		X		X
Mud pump 2A	X		X		X	
Mud pump 2B		X		X		X
Rotary Table	X		X		X	

4 AC POWER ASSIGNMENT

4.1 The drillers electrical ac system comprises one 440V 60Hz generator and one 5500/440V 60Hz convertor for normal operation and one generator for emergency. The emergency switchboard is normally fed from the main generators, but during an emergency a manually operated change-over switch connects it to the emergency generator. The emergency generator has a 24-hour day tank for continuous operation.

4.2 The emergency switchboard also feeds, via rectifiers, a set of batteries which feed the emergency systems. These batteries have an autonomous capacity for 10 hours.

4.3 Average power load is 800kW.

5 EMERGENCY POWER SUPPLIES

5.1 G6 DC–AC emergency unit comprises a Caterpillar diesel prime mover driving both a 550kW dynamo producing 220V dc and a 500kW generator producing 440V 60Hz. Its starting air pressure tank allows for up to five starts.

5.2 The emergency generator provides power for the systems and utilities shown in Diagram 4.7.

6 EMERGENCY LIGHTING SYSTEM

6.1 Ten 72Ah 24V nickel-cadmium batteries supply an emergency lighting circuit via five automatic circuit breakers. The total load is some 1600W. Emergency lights, which are all of the explosion-proof type, are distributed as follows:

Location	Qty
Module 1	18
Module 2A	7
Module 2B	7
Module 3	3
Module 4	7
Module 5A	5
Module 5B	2
Module 6	24
Helideck	14
Escape routes	8

6.2 Emergency Exit signs are continuously illuminated.

6.3 The following circuits are also supplied from the 24V emergency lighting systems:

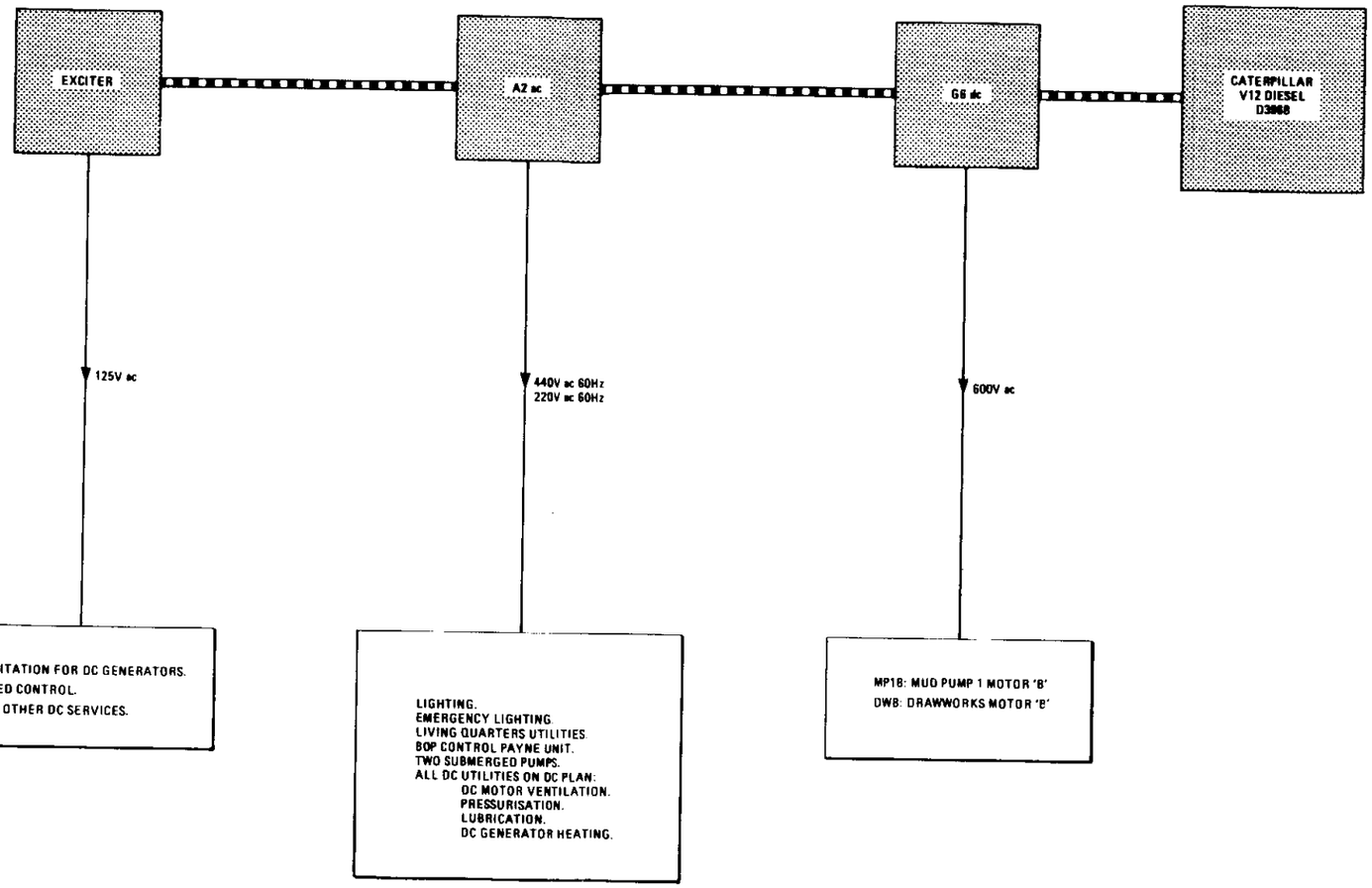
(a) Diesel engine emergency stop pushbutton in Drillers Control Room control panel.

(b) Diesel engine overtemperature circuit.

7 IDENTIFICATION AND OBSTRUCTION LIGHTS

7.1 The Helideck has 14 identification lights around its perimeter. In an emergency they are powered by the emergency lighting system.

7.2 Red obstruction lights are fitted to two opposite legs of the derrick and the crane booms.


EXCITER
A2 ac
G6 dc
CATERPILLAR
V12 DIESEL
D3968
125V ac
440V ac 60Hz
220V ac 60Hz
600V ac
EXCITATION FOR DC GENERATORS.
SPEED CONTROL.
ALL OTHER DC SERVICES.
LIGHTING.
EMERGENCY LIGHTING.
LIVING QUARTERS UTILITIES.
BOP CONTROL PAYNE UNIT.
TWO SUBMERGED PUMPS.
ALL DC UTILITIES ON DC PLAN:
DC MOTOR VENTILATION.
PRESSURISATION.
LUBRICATION.
DC GENERATOR HEATING.
MP1B: MUD PUMP 1 MOTOR 'B'
DWB: DRAWWORKS MOTOR 'B'

PRESSURISATION, VENTILATION AND AIR CONDITIONING

1 GENERAL

This section covers the following associated functions within the Drilling Package:

(a) Power Plant Pressurisation System – to prevent the ingress of any dangerous atmosphere.

(b) Force Vented System – to maintain negative pressure extraction.

(c) DC Motor Ventilation System – to ventilate dc motors.

(d) Living Quarters Air Conditioning System.

2 POWER PLANT PRESSURISATION SYSTEM

2.1 The Diesel Engine Room and Electrical Generator Room (Modules 4 and 5A) are maintained at an overpressure in order to prevent any ingress of dangerous atmosphere. Six axial fans (on the roof of Module 4) with associated intake grids, maintain the overpressure. Airlocks are fitted in the boundaries of the pressurised area.

2.2 An overpressure of 15mmWG is assured by a Mercoid Control differential pressure switch (adujstable between 0 and 50mm WG).

2.3 A further Mercoid Controle differential pressure switch continuously checks that the inside pressure is more than 5mm WG higher than outside atmospheric pressure. If the differential falls below 3mmWG, an audible and visible alarm system is activated.

2.4 The pressurisation system is automatically shut down if the CO_2 fire suppression systems are activated in Modules 4 and/or 5A; see Section 4.6.

3 FORCE VENTED SYSTEM

3.1 Modules 2A, 2B, 3 and 5B are maintained at a negative pressure with respect to atmosphere by four extraction fans. Two are mounted in each of the seaward walls of Modules 2A and 5B.

3.2 The total extraction flow is 29 000m^3/h; this achieves 14 air changes per hour.

4 DC MOTOR VENTILATION SYSTEM

4.1 The seven principal dc motors (mud pumps 1A, 1B, 2A and 2B, drawworks A and B, and rotary table) are supplied with ducted cooling air by individual supply fans sited in safe areas. The supply duct to drawworks A motor also supplies the drillers console on the rig floor.

4.2 The ducted fan supply to each of the four mud pumps is boosted by a locally mounted blower.

4.3 The exhuast air from each dc motor is ducted to an exhaust fan chamber sited in a safe area. The ducts from each pair of mud pump motors are connected – 1A to 1B, and 2A to 2B – so that from the seven motors only five ducts are led to the fan chamber.

4.4 All dc motor ventilation supply and exhaust ducts and the drillers console supply duct are fitted with pressure sensing switches. These 13 pressure sensors are connected to the switch-board in the Engine Room for interlocked dc motors and drillers console controllers. The dc motors will not run if supply and/or exhaust ventilation is not operating. Control and indication is via the main dc control panel, drillers console and monitoring panel, all located on the Rig Floor.

LIVING QUARTERS AIR CONDITIONING SYSTEM

5.1 Module 6 is provided with an air conditioning system (C1) which circulates cooled air to the 1st, 2nd and 3rd Decks. A proportion of the air from the 1st Deck is recirculated by fan RC1. Warmed ("thermo-vent") air is supplied by unit TV1 to certain spaces on the 1st Deck only. Exhaust fans E1 and E2 serve the 1st, 2nd and 3rd, and 1st and 2nd Decks respectively. E1 extraction air only is returned to the Air Conditioning Room.

5.2 The additional living quarters in Module 5A have a separate air conditioning system (C2) and exhaust fan (E1). A ventilation stop button is fitted outside the air conditioning space.

5.3 The laundry is provided with natural ventilation facilities.

5.4 The design parameters of the air conditioning plant are as follows:

	External		Internal	
	Temp (°C)	Relative Humidity	Temp (°C)	Relative Humidity
Maximum or Normal	+38 +32	90% 80%	+30 +25.5	55% 55%
Minimum	–20	90%	+20	45%

6 FUSIBLE PLUGS

6.1 Four fusible plugs are fitted in the living quarters ventilation systems, and are located as follows:

(a) Conditioned air intake for Module 6.

(b) Conditioned air intake for Module 5A additional living quarters.

6.2 The fusible plugs will automatically close their associated ventilation flaps when fire fuses the

END

CHAPTER 5

PRODUCTION FACILITIES

CONTENTS

DIAGRAMS

GAS PRODUCTION AND TREATMENT

1 GENERAL

1.1 The twenty-four wells drilled from CDP1 are grouped in two clusters of twelve. The wellheads are located in Modules WH1 and WH2, each cluster being separated by a fire-resistant partition wall.

2 WELLHEADS

2.1 Each well is equipped with a subsurface valve (ROV01) located approximately 60m below the mud line, a remote-operated master valve (ROV02) and a hand-operated master valve.

2.2 The wellhead valves comprise a 6in wing valve (ROV03) connected to the production line, a 3in gate valve isolating the combined kill and methanol injection line, and a 6in swab valve. The wing valve is equipped with a fail-safe hydraulic actuator.

2.3 The subsurface valve is operated from a 310 bar (4500 psi) hydraulic power unit. All other remote-operated well and wellhead valves are operated from a 207 bar (3000 psi) or 103 bar (1500 psi) hydraulic power unit as follows:

3000 psi	–	ROV05, 06A/B, 08A/B, 09, 11, 12, 14, 15, 16, 17, 18, 19, 20 and 23. (Valves actuated by France Operator Actuators).
1500 psi	–	ROV02, 03, 04 and 10. (Valves actuated by Axelson Actuators).

2.4 The hydraulic power units are powered by air-driven pumps operating at a pressure of 10 bar (145 psi); hand pump facilities are provided for emergency use.

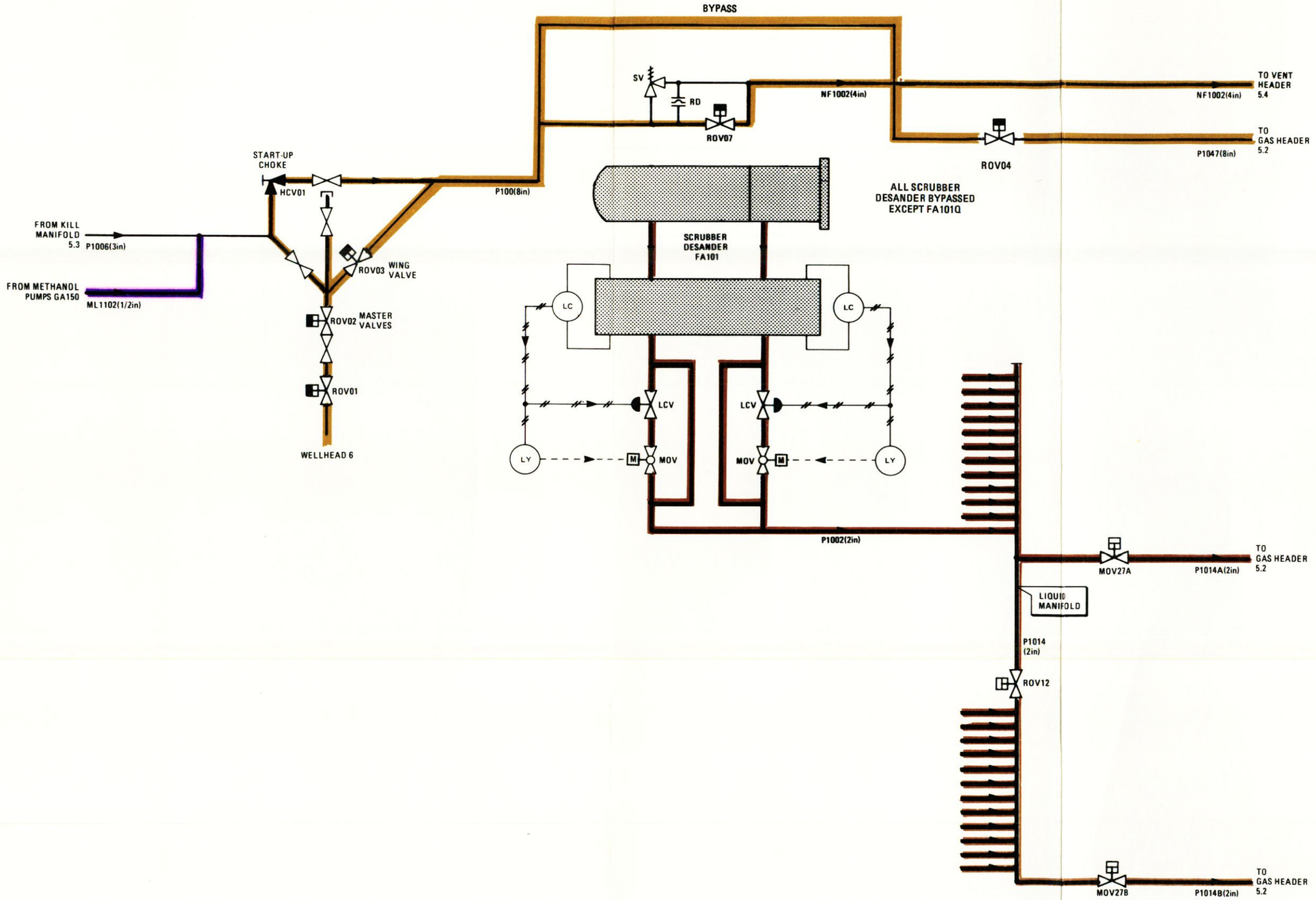
2.5 Gas from the well flows through the wing valve and hence to the scrubber desander. On start-up, the wing valve is closed and the scrubber desander is pressurised via manually operated choke valve HCV01 until the pressure across the wing valve equalises. The wing valve is then opened and the choke valve closed.

3 SCRUBBER DESANDERS

3.1 The twenty-four scrubber desanders FA101 (one dedicated to each well) are located in Module PM2. They are Peco Model 75H–13FG372 horizontal filter separators, each comprising a two-stage separator with filter elements incorporated in the first stage, three cyclotubes and a mist eliminator incorporated in the second, and a two-stage sump mounted below the separator.

3.2 The design pressure of the desanders is 187 bar with a rated gas capacity of 2 to 2.5 MMSCMD at a pressure of 172 bar and a temperature of 60°C. Each is capable of removing up to 100 litres/d of sand.

3.3 Each of the scrubber desanders has now been permanently bypassed except FA101Q which has been retained for observation purposes. It is a condition of the certificate of fitness that they should not be taken into service before a full internal inspection has been carried out.



ISSUE 2. OCTOBER 1982

GAS PRODUCTION AND TREATMENT	5.1

PRODUCED GAS SYSTEM

1 GENERAL

1.1 Initially scrubber desanders were provided for first stage treatment of the gas. Experience proved that these were not required and they have been isolated and bypassed, except for FA101 (Q) which has been retained for observation purposes.

2 GAS OUTLET

2.1 Each 8 inch scrubber bypass line and the scrubber outlet from FA115 incorporates measuring points for temperature, pressure and flow. These parameters are monitored and recorded in the control rooms on both CDP1 and QP. Provision is made for methanol injection into this line.

2.2 The flow from each well is controlled by a remote-operated choke valve (HCV02) in the discharge line. These choke valves are located in Module PM3 and are normally operated via a hydraulic pump. Power is provided for all 24 choke valves by a 100 bar (1450 psi) hydraulic power pack comprising two electrically driven pumps operating in parallel, a storage tank and three accumulators. In the event of power or control failure the choke valves close.

2.3 Downstream of the choke valve the line incoporates a remote-operated block valve (ROV04), a bleed point, a check valve and a manually operated isolating valve.

2.4 Each outlet line from the scrubber desander and the various bypasses are connected to the 24 inch gas header which discharges into the two 26 inch sea lines to TP1. ROV05 installed at the centre of the gas header is normally closed so that one well cluster feeds its associated sea line, but can be opened so that the flow from all on-stream wells can be fed to one sea line if necessary.

2.5 The pressure and temperature in each half of the gas header are measured for monitoring and recording in the control rooms.

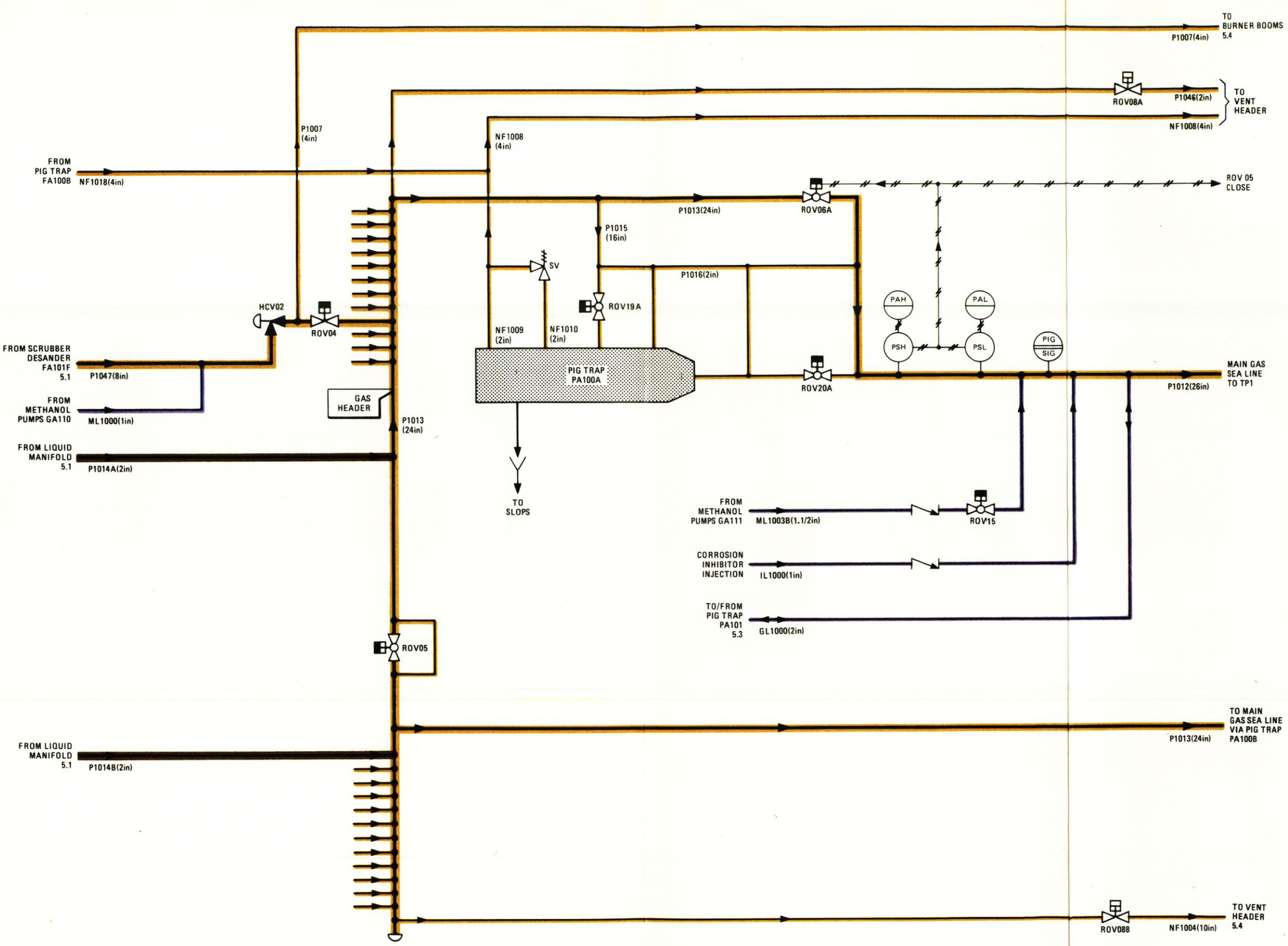
2.6 Either or both halves of the gas header can be vented if necessary by opening ROV08A and /or ROV08B.

2.7 Scraper pig traps PA100A and B are located at the entry to each 26 inch sea line in Module PM3. The gas normally bypasses the scraper trap via ROV06, but part of the flow can be diverted through the trap via inlet and outlet block valves ROV19 and ROV20 when pigging is necessary for line cleaning or liquid displacement.

2.8 Each sea line is fitted with high and low pressure switches. Operation of either switch will result in valves ROV06A or B and ROV05 closing to shut in the sea line, and will also initiate an alarm in the control rooms. A pig signal switch is also fitted to each sea line to indicate when a pig has passed.

2.9 Provision is made to inject corrosion inhibitor and/or methanol into each sea line. Methanol injection may be controlled remotely by the operation of ROV15 and/or ROV17 at each injection point. Corrosion inhibitor injection can be controlled locally by operating a manual isolating valve.

2.10 Mud can be injected into either sea line via a 2 inch line incoporating a remote-operated valve and a manually operated isolating valve at each connection point.



ISSUE 2. FEBRUARY 1981

PRODUCED GAS SYSTEM 5.2

WELL KILL SYSTEM

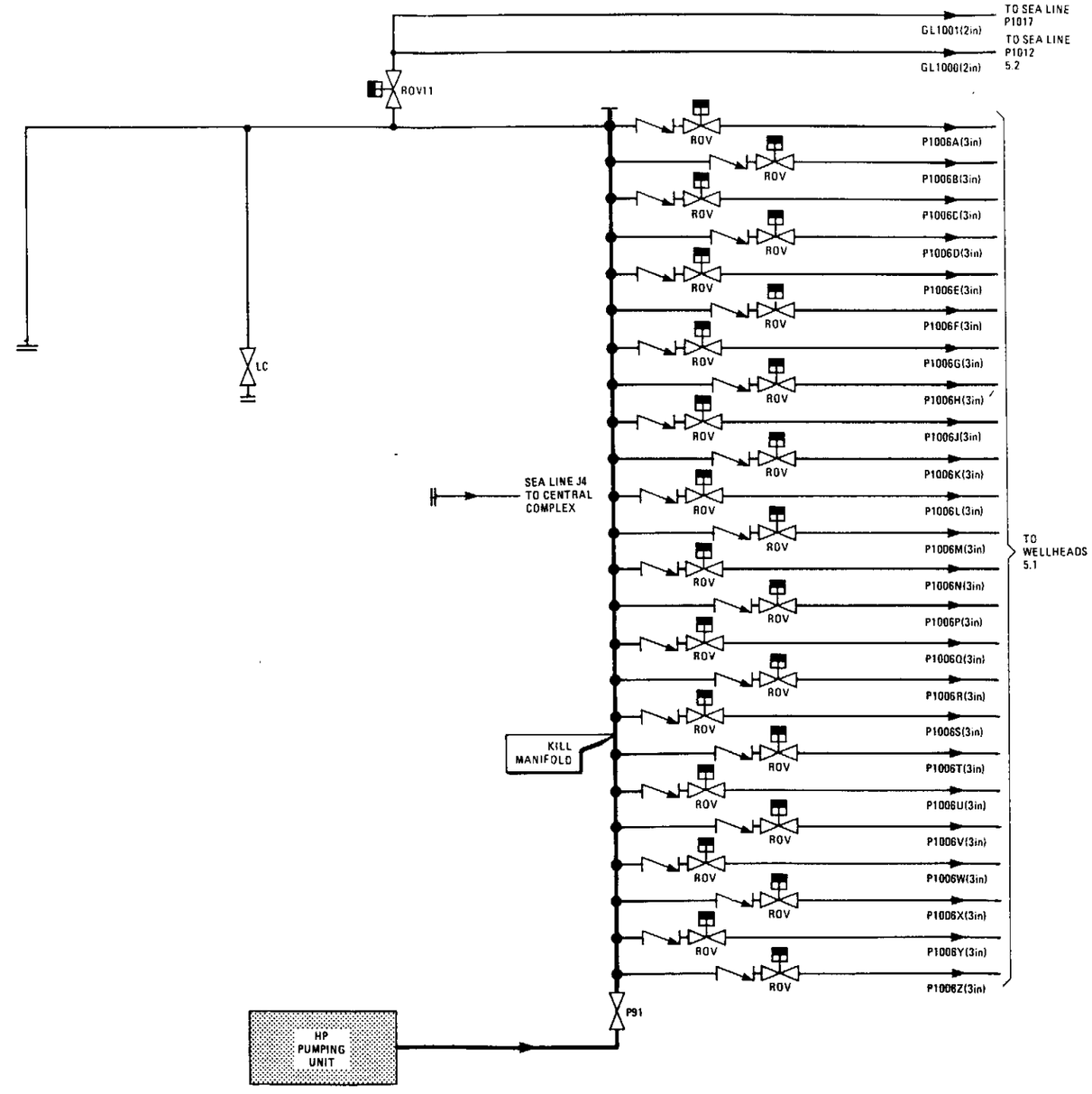
1 DESCRIPTION

1.1 The Well Kill System is provided to conduct diesel oil, sea water or mud at high pressure to a wellhead should the need arise to kill a well.

1.2 These liquids are pumped from the cementing unit located in the drilling modules (see Section 4.1) through a 2in chick-san line and valve P91 to the 4in kill line manifold.

1.3 Three-inch lines from the kill manifold to each of the 24 wellheads are isolated by remote-operated gate valves ROV10.1 to 24 and check valves CV2.1 to 24.

1.4 The 26in sea lines from the platform to TP1 may be filled with mud in order to isolate one platform from the other should a mechanical failure occur in either line. This is achieved by feeding the mud into the sea lines via ROV11 and 2in lines GL1000 and GL1001. A manual isolating valve is installed in each line at its entry to the sea line.


TO SEA LINE P1017
GL1001(2in)
TO SEA LINE P1012 5.2
GL1000(2in)
ROV11
ROV
P1006A(3in)
P1006B(3in)
P1006C(3in)
P1006D(3in)
P1006E(3in)
P1006F(3in)
P1006G(3in)
P1006H(3in)
P1006J(3in)
P1006K(3in)
P1006L(3in)
P1006M(3in)
P1006N(3in)
P1006P(3in)
P1006Q(3in)
P1006R(3in)
P1006S(3in)
P1006T(3in)
P1006U(3in)
P1006V(3in)
P1006W(3in)
P1006X(3in)
P1006Y(3in)
P1006Z(3in)
TO WELLHEADS 5.1
LC
SEA LINE J4 TO CENTRAL COMPLEX
KILL MANIFOLD
P91
HP PUMPING UNIT

VENT AND FLARE SYSTEMS

1 VENT SYSTEM

1.1 Discharge lines from equipment pressure relief devices, blowdown valves and pressure control valves combine into 10in vent header NF1004.

1.2 The header divides into two sub-headers, NF1004 and NF1026, one to each flare boom where they vent direct to atmosphere. These sub-headers are each equipped with a flame arrester and are valved to enable either to be used depending on wind direction.

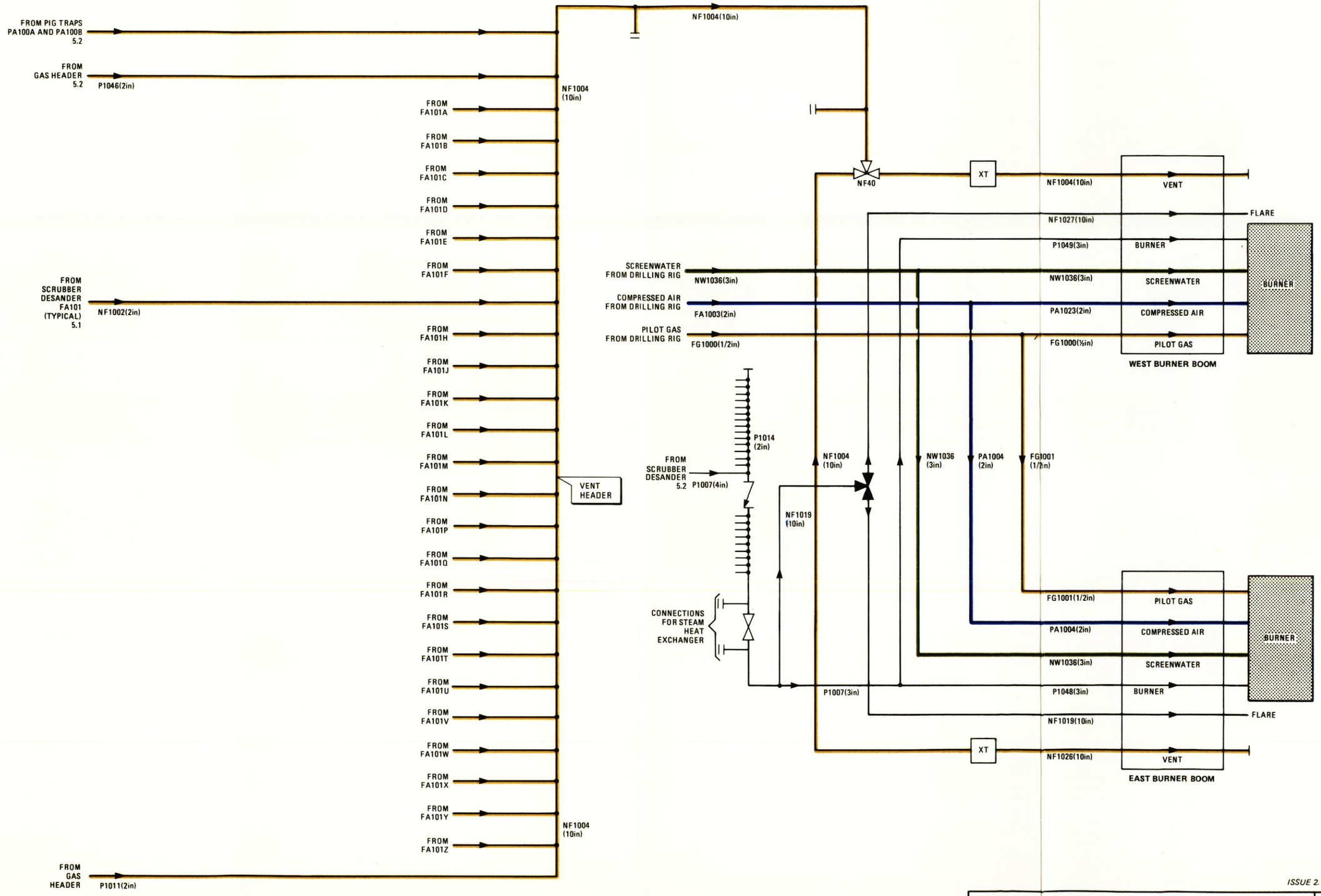
2 FLARE SYSTEM

2.1 Two flares, CB100A and B, are located on booms projecting 32m from the platform on the east and west sides of Modules WH1 and WH2.

2.2 Each flare comprises a Flopetrol burner which was used to burn the liquid effluent from the wells during start-up and test operations. The burner is equipped with a remote-controlled air-operated valve which adjusts the liquid orifice in accordance with the flowrate.

2.3 Pilot gas, compressed air and cooling water for the heat screens were supplied from the drilling package.

2.4 Since the test and start-up separator is now used as a methanol tank, the flares are no longer operational and cold venting only takes place.


FROM PIG TRAPS PA100A AND PA100B 5.2
FROM GAS HEADER 5.2
P1046(2in)
NF1004 (10in)
FROM FA101A
FROM FA101B
FROM FA101C
FROM FA101D
FROM FA101E
FROM FA101F
FROM SCRUBBER DESANDER FA101 (TYPICAL) 5.1
NF1002(2in)
FROM FA101H
FROM FA101J
FROM FA101K
FROM FA101L
FROM FA101M
FROM FA101N
FROM FA101P
FROM FA101Q
FROM FA101R
FROM FA101S
FROM FA101T
FROM FA101U
FROM FA101V
FROM FA101W
FROM FA101X
FROM FA101Y
FROM FA101Z
NF1004 (10in)
VENT HEADER
FROM GAS HEADER
P1011(2in)
NF1004(10in)
NF40
XT
NF1004(10in)
VENT
NF1027(10in)
FLARE
P1049(3in)
BURNER
SCREENWATER FROM DRILLING RIG
NW1036(3in)
NW1036(3in)
SCREENWATER
COMPRESSED AIR FROM DRILLING RIG
FA1003(2in)
PA1023(2in)
COMPRESSED AIR
PILOT GAS FROM DRILLING RIG
FG1000(1/2in)
FG1000(½in)
PILOT GAS
BURNER
WEST BURNER BOOM
P1014 (2in)
FROM SCRUBBER DESANDER 5.2
P1007(4in)
NF1004 (10in)
NW1036 (3in)
PA1004 (2in)
FG1001 (1/2in)
NF1019 (10in)
CONNECTIONS FOR STEAM HEAT EXCHANGER
FG1001(1/2in)
PILOT GAS
PA1004(2in)
COMPRESSED AIR
BURNER
NW1036(3in)
SCREENWATER
P1007(3in)
P1048(3in)
BURNER
FLARE
NF1019(10in)
XT
NF1026(10in)
VENT
EAST BURNER BOOM

METHANOLATED WATER

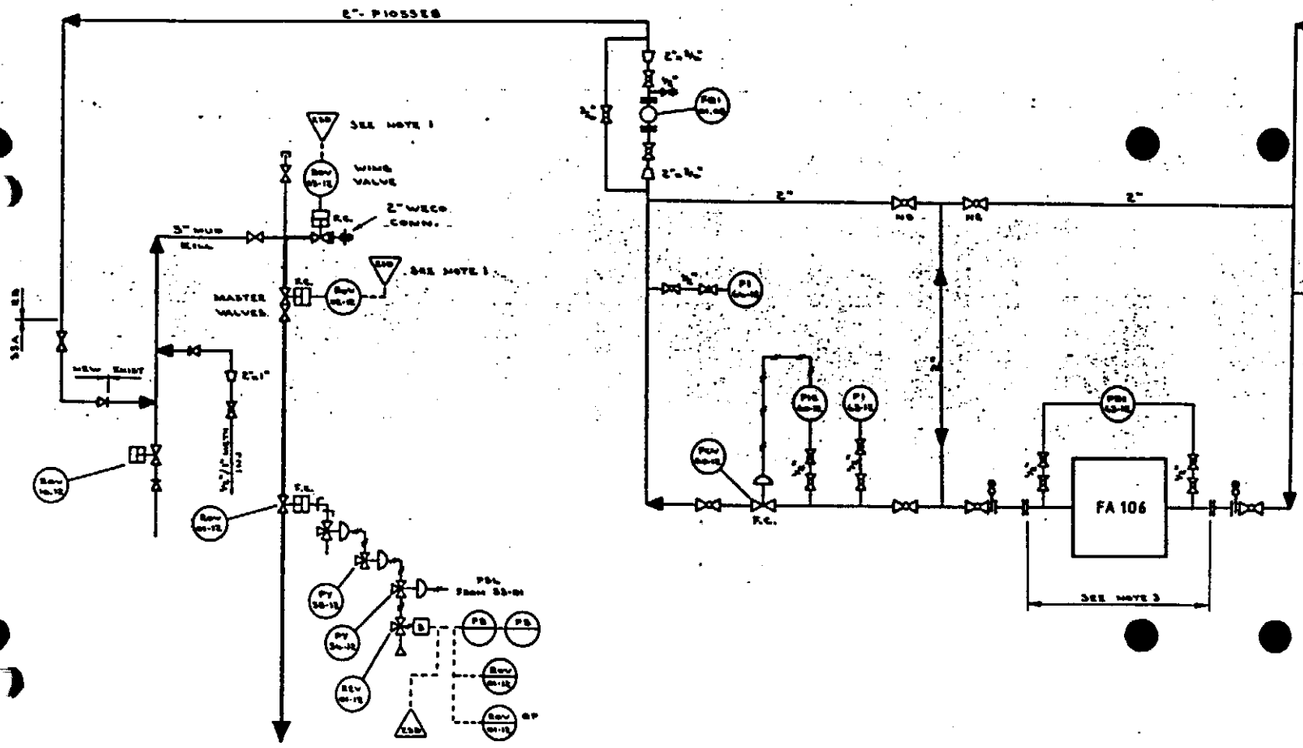
1. GENERAL

1.1 To reduce downtime due to well clogging on DP2, improved filtration and the facility to inject M.W. on CDP1 has been provided.

2. DESCRIPTION

2.2 M.W. from water tank CV9 on TCP2 can be routed to CDP1 via TP1 in the existing 4" sea line. This M.W. is injected down well 25 for detailed information, see Section 4.9c on TCP2.

SEE EXISTING P&ID's 5001 AND 5034 'MARKED-UP'.



FA 106

METHANOLATED WATER FILTER

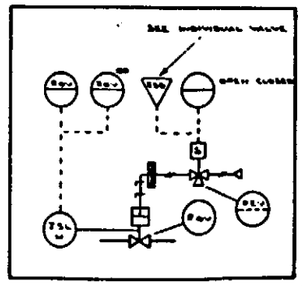
DESIGN TEMPERATURE = 50°C (MAX)
DESIGN PRESSURE = MAX 40 BAR G
OPERATING TEMPERATURE = 5°C
OPERATING PRESSURE = 15/20 BAR G

NOTES

3/ THIS FILTER WILL NORMALLY BE LOCATED ON BP2, HOWEVER IF THERE ARE PROBLEMS WITH WELL 22 ON BP2, THE FILTER WILL BE TRANSFERED TO COP1 TO BE INSTALLED AS SHOWN. METHANOLATED WATER CAN THEN BE INJECTED INTO WELL 25.

4/ PIPING AND VALVES TO 'ES' SPECIFICATION SEE MR. LEBMANN HUDSON MATERIALS SPEC FOR TP1, TCP2 AND G.P..

1/



2/ ROV 99, IS RETAGGED MOV 23 WITH ALL SHUTDOWN AND SIGNALISATION COMING FROM OLD MOV 23.

MR 90127 TASK 1

BLINDING / ISOLATION

2	MAY 97	WELL TIE-IN MODIFIED	DG	
1	APR 97	UPDATED	DG	
0	NOV 96	first issue	DG	RR
rev	date	DESCRIPTION	by	app

elf

elf aquitaine norge as

COP1 — METHANOLATED WATER INJ.

METHANOLATED WATER INJECTION ON COP1

Job no MR 90127 | Scale NTS | Drg no FF 91 00 54 5052 | Rev 2 | Sheet

FRIGG FIELD

SECTION 5.5

CHAPTER 6

UTILITIES

CONTENTS

DIAGRAMS

POWER GENERATION AND INTER-PLATFORM ELECTRICAL CONNECTORS

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, TCP2 and TP1 with platforms CDP1, DP2 and FP respectively.

1.2 Under normal operating conditions power for the whole complex is generated at 5.5kV by two 13.7MW gas turbine-driven generators in the TCP2 compression area augmented by three 1.4MW gas turbine-driven generators in the TCP2 treatment area and three 2.8MW gas turbine generators in TP1. Motor Control Centres on all the platforms are fed with 380V from 5500/ 380V transformers. Smaller diesel-driven generators on CDP1, DP2, QP and TCP2 compression areas provide 380V standby supplies, (CDP1, DP2) or emergency supplies (QP, TCP2).

1.3 Dual interconnections between TCP2 (compression), QP, TP1 and TCP2 (treatment) busbars are provided by 5.5kV radial feeders 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 QP and TCP2 5.5kV busbars respectively. The Flare Platform (FP) is normally fed at 380V by a 4-wire submarine cable from TP1, but due to a malfunction of this cable, power is currently being supplied through a multicore control cable. Special arrangements are provided for isolating and earthing-down all interconnecting cables between platforms.

2 DESCRIPTION

2.1 Generation

2.1.1 Main power is generated at 5.5kV, 3-phase, 50Hz by two gas turbines driving 13.7MW (17.15MVA) Stal-Laval/ASEA generators 52G01 A and B in Pancake 44. These are gas fuelled only. Only one machine is running at a time, and this is capable of supplying all the electrical power for the whole field.

2.1.2 Standby power is generated at 5.5kV, 3-phase, 50Hz by three Ruston gas turbines driving 2.8MW (3.5MVA) generators TA1, TA2 and TA3 on TP1 and three Kongsberg gas turbines driving 1.4MW (1.75MVA) generators TA4, TA5 and TA6 in TCP2 treatment area.

2.1.3 The 5.5kV system is earthed throughout 17 ohm neutral earthing resistors, one for each main or standby generator.

2.1.4 52G01 A and B, T3, T4, T5 and T6 are gas fuelled only. TA1 and TA2 are dual-fuelled, running on gas or diesel oil. The 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.

2.1.5 Generator sets TA1, TA2 and TA3 are started by diesel engines through torque convertors, the engines themselves being started electrically from local 24V batteries. Generator sets TA4, TA5 and TA6 are air-started from the plant air system. 52G01 A and B are air-started from self-contained air systems, one for each generator set.

2.1.6 All the main and standby generators are capable of being synchronised and operated in parallel if necessary, their combined fault level is 325MVA (34kA symmetrical) at 5.5kV . However, the number of generators running at the same time is limited to the peak value of the short circuit current.
Maximum possibilities
52G01 A (or B) + TA1 + TA2 + TA3 + TA4 + TA5 + TA6
or 52G01 A + 52G01 B + TA1 + TA2 + TA3

2.1.7 TA1, TA2 and TA3 can supply both TP1 and the TCP2 compression plant, but for the time being with the relatively low hotel load, three Ruston gas turbines or two Rustons plus two Kongsbergs can supply the whole field power requirements.

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) TCP2 Compression Area – Main Substation Module 32.

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

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

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

(e) CDP1 – Electrical Room, Module BR1.

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

2.2.2 The main 5.5kV switchgear has a design fault rating of 350MVA (37kA symmetrical) at 5.5kV for one second, but the actual fault level of the system with both main and all six standby generators running is approximately 325MVA.

2.2.3 The remaining switchboards have a service rating of 800A and a design symmetrical fault rating of 290MVA (30kA symmetrical) at 5.5kV; the actual fault level is about 120MVA.

2.2.4 The circuit breakers on the boards are of the air-break type; those on the main board are motor/spring operated, the remainder are solenoid operated. The tripping and closing coils operate on a 100V dc control supply from locally situated batteries and chargers.

2.2.5 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.

3 CONTROL

3.1 Control of the whole Frigg field electrical system is exercised from a central electrical control board in the MCC Room in TCP2 treatment areas.

3.2 A mimic diagram on the electrical control board represents the layout of the system and discrepancy switches, set in the mimic, control the various circuit breakers remotely.

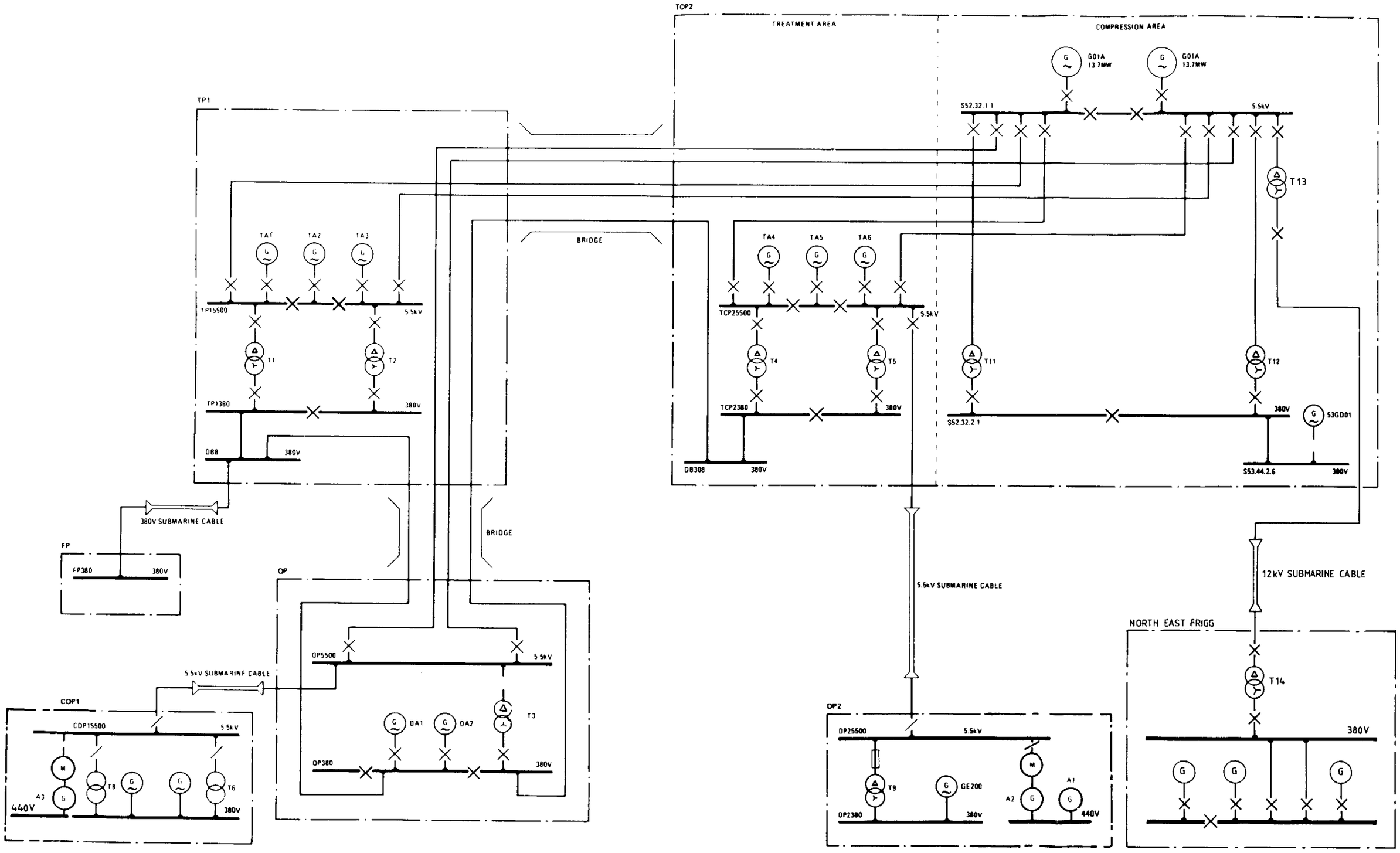
3.3 For each of the two main and six standby generator sets, a remote control unit is provided to start and stop the set and to provide the controls and indications necessary for its operation.

3.4 Synchronising of incoming generators is carried out automatically, or by manual control using a synchronising trolley at the associated switchboard. Where synchronising is carried out between different parts of the network (eg interconnector feeders) manual control at the switchgear is used. The synchronising trolley is equipped with a check synchroniser unit which permits the circuit breaker to be closed only when the frequency, voltage and phase angle of the incoming supply coincides with these values for the running supply.

3.5 The standby generators are normally controlled from the central electrical control board. The Generator Control Desk on TP1 is the alternative position for controlling the three gas turbine-driven generators on TP1 only.

3.6 Main and standby generator set gas turbines are monitored from local control rooms in their respective generator rooms. Each of the main and standby generators may be controlled from local control boards adjacent the generator sets.

3.7 Gas operator enclosures and gas fuel units are protected against fire by Halon systems which operate automatically or manually. Gas detection facilities are provided which will increase the ventilation rate if the gas is detected, or will stop the generator if a high gas concentration is detected.



ISSUE 5 OCTOBER 1988

ELECTRICAL POWER DISTRIBUTION

1 GENERAL

1.1 The principal items of plant and the main features of the distribution network are shown in Diagram 6.2.

1.2 During normal operation 1500kVA for platform power is supplied at 5.5kV by submarine link from platform QP. No power is consumed at 5.5kV, except the 687.5kVA, 5.5kV motor driving a 440V 60Hz generator. Power is transformed to 380V. This is the principal working voltage of the platform, and is distributed by way of a Motor Control Centre (MCC) comprising three switchboards (A, B and C).

1.3 Distribution for lighting, some heating and minor services is taken from step down transformers 380/220V

1.4 Two 380V diesel-driven auxiliary generators and a central battery system provides standby power (see Section 6.4) in the event of failure of the main 5.5kV supply.

2 DESCRIPTION

2.1 5.5kV Supplies

2.1.1 Switchboard CDP1 5500 (EE505) consists of four cubicles containing the submarine cable incomer, the two transformer rotary isolating switches, and the motor SF6 contactor. The two feeder switches are supplemented by HRC fuses. All three switches can break full load, but faults on the feeders are dealt with by the HRC fuses, the contactor is supplemented by HRC fuses and protection.

2.1.1 Transformers T6 and T8 are both rated at 100kVA and are delta-star connected. The secondary neutral is not earthed but is brought out to a spark gap to protect the secondary system against 5.5kV entering it through failure of the primary insulation.

2.1.3 The transformer is askarel-filled and hermetically sealed. Overpressure and overtemperature protection is provided.

2.2 380V Supplies

2.2.1 Outputs from transformers T6 and T8 are at 380V 3-wire and connected to the Motor Control Centre (MCC) CDP1 380, switchboards B and C respectively. Section A, though physically separated from Section B, is permanently connected electrically. An interconnector with a circuit breaker at each end links Sections B and C to give the system flexibility.

2.2.2 All three MCC switchboards consist of withdrawable air-break ciruit breaker incomer and interconnector units and interchangeable feeder units.

2.2.3 The outgoing feeders are all fuse-protected. Motor feeders have contactors provided with the normal overcurrent releases, but faults are dealt with by back-up fuse-switches, which also act as isolators. All contactors have an inherent undervoltage feature which causes them to drop off if voltage is lost. Other and larger static services are protected by moulded-case circuit breakers backed-up by fixed fuses. These MCCBs do not have undervoltage releases and stay closed after a loss of voltage.

2.3 220V Supplies

2.3.1 Lighting and many minor heating and other services are fed at 220V. Distribution is by sub-boards supplied from the 380V sections through small 50kVA and 30kVA 380/220V distribution transformers inside the MCCs. They are star/star connected, and the secondary neutrals are not earthed. Distribution is 3-wire, and the 220V services are line-to-line, balanced between the phases.

2.3.2 The four 220V switchboards form physically part of the MCC. Distribution Board BR2, fed from MCC 'C', supplies certain services in Module BR2.

2.3.3 The 220V feeders are controlled and protected by miniature circuit breakers provided with thermal magnetic overcurrent trips. They do not trip on loss of voltage.

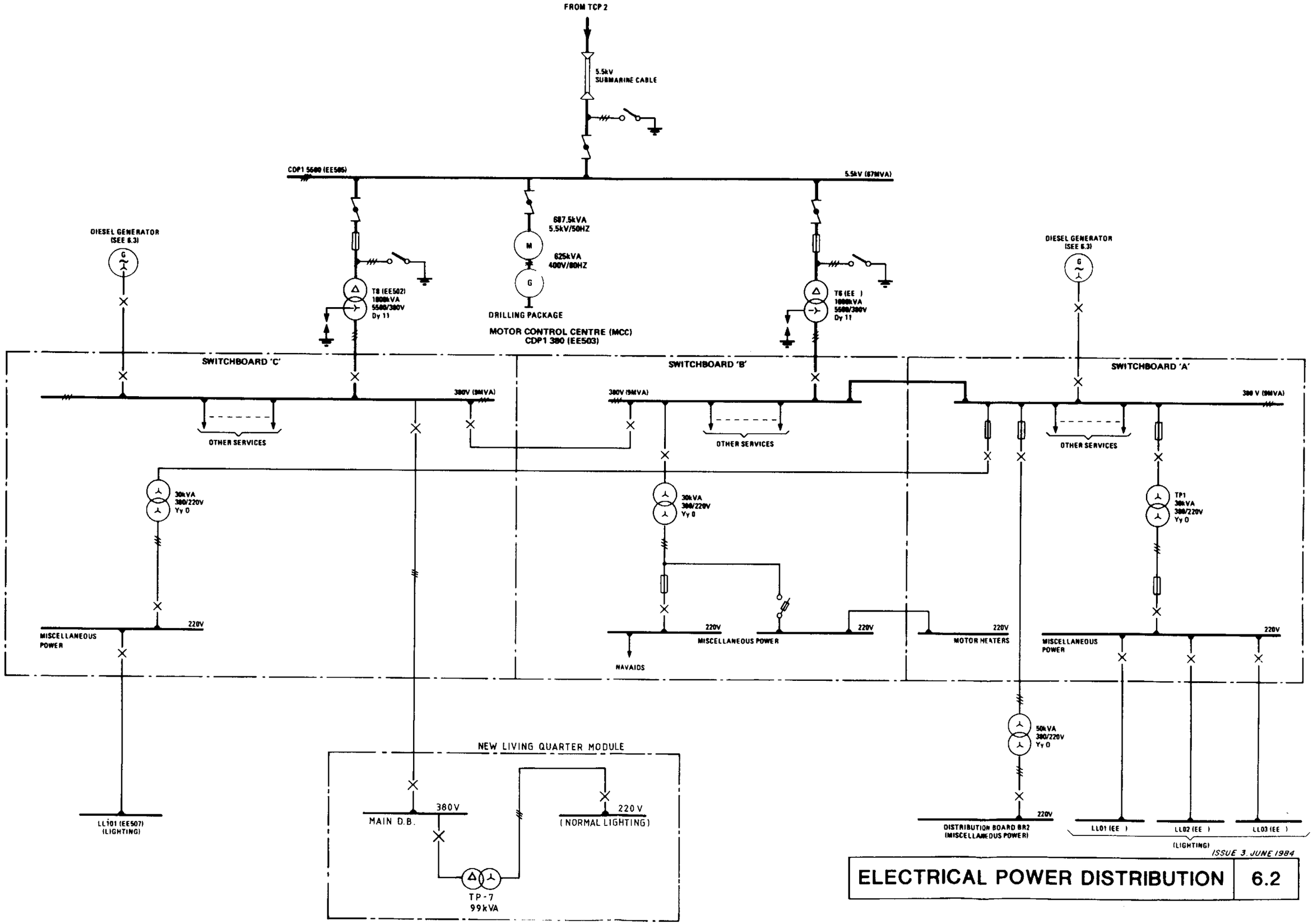
3 SYSTEM CONTROL

3.1 The 5.5kV incomer transformer feeder rotary switches and motor contactor, are closed and tripped manually and also tripped automatically by their protection devices. Their status only is monitored on TCP2 and CDP1 Mimic Control Panels.

3.2 The 380V incomer and section breakers on CDP1 are not controlled from TP1. However, their status is monitored on TP1, TCP2 and QP.

4 CIRCUIT PROTECTION

Generator, busbar, feeder, transformer, 5.5kV motor and load protection is provided by conventional means with intertripping where necessary.



ISSUE 3. JUNE 1984

ELECTRICAL POWER DISTRIBUTION | 6.2

STANDBY SUPPLIES

1 GENERAL

1.1 Platform CDP1 is equipped with two diesel-driven generators which supply power at 380V in the event of main supply failure.

1.2 One generator starts automatically on detection of main supply failure and connects itself to the 380V Motor Control Centre (MCC). The second generator supplies switchboard C only, which supplies the less important platform production services and must be started and stopped by hand.

1.3 Battery-supported supplies are also provided for those services requiring an uninterrupted supply. These are covered in Section 6.4.

2 DESCRIPTION

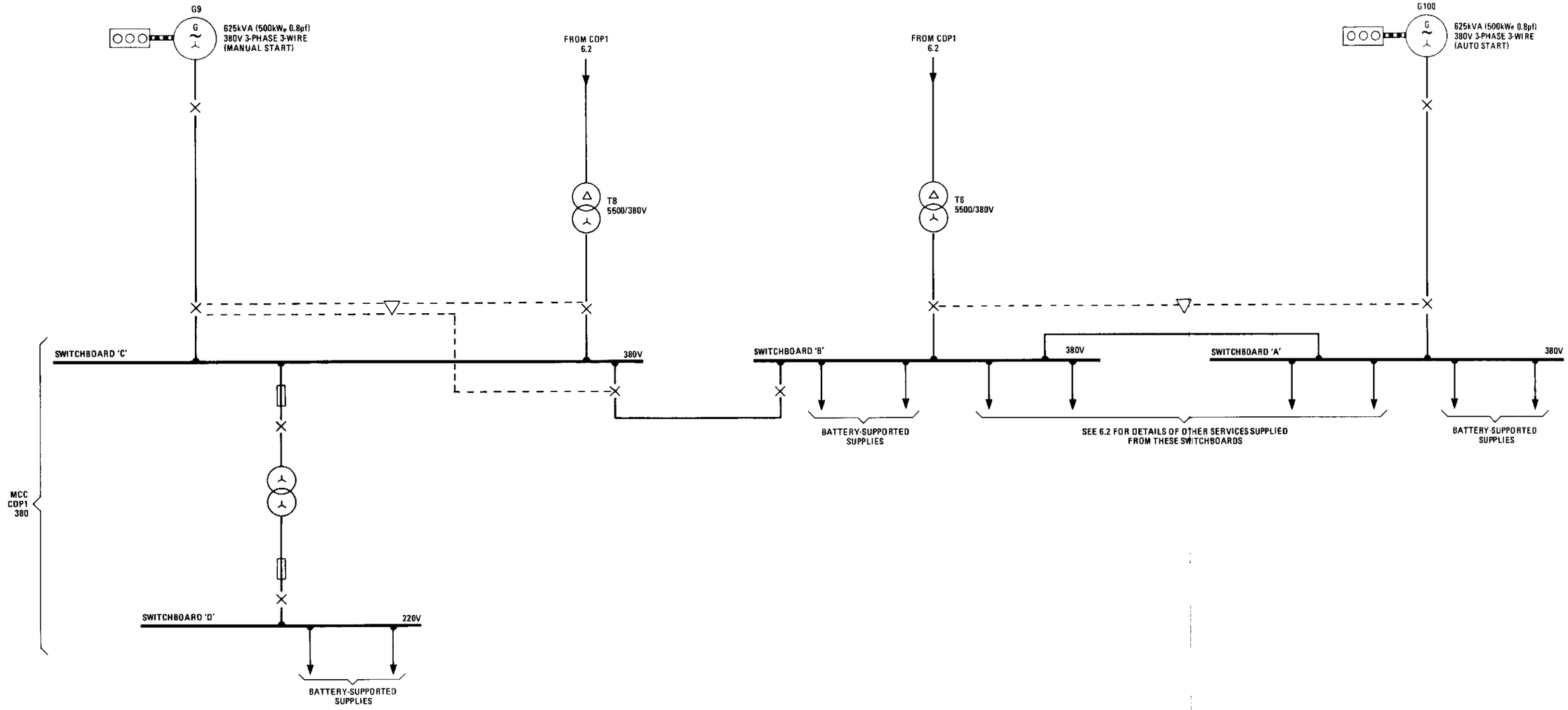
2.1 Diesel-driven generator G100 starts automatically on detection of supply failure from transformer T6, and automatically connects itself to switchboard A of MCC CDP1 380.

2.2 Generator G9 must be started by hand and its supply breaker must be manually closed. An interlock ensures that closure of this breaker causes the switchboard C/B interconnector breaker to open first, thus leaving generator G9 supplying switchboard C only.

2.3 Generators G9 and G100 cannot operate in parallel. A load-shedding system prevents generator G100 becoming overloaded by shutting down minor circuits such as heating and air conditioning and delaying the restarting of air compressors in order to reduce the starting current demand. However, the pressurisation is maintained in Modules BR1, BR2 and PM4.

2.4 On restoration of the main supply the G100 supply breaker will open automatically and the diesel will run down.

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



ISSUE 1. JULY 1980

STANDBY SUPPLIES	6.3

BATTERY-SUPPORTED SUPPLIES

1. GENERAL

1.1 Platform CDP1 is equipped with alternative supplies used in the event of normal 5.5kV supply failure. These supplies are grouped as follows:

(a) Standby Supplies.

(b) Battery-supported DC Supplies.

(c) Battery-supported AC Supplies.

1.2 Battery-supported supplies are required for the following categories of loads:

(a) Those loads that cannot tolerate a short interruption of their power supplies.

(b) Those 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 standby generation.

1.3 Some maintained supplies are used under emergency conditions.

2. DESCRIPTION

2.1 Battery-supported DC Supplies

2.1.1 Three separate central dc systems on Platform CDP1 supply Modules BR1 and BR2. All three systems are basically similar, though differ in detail. In the case of systems in BR1 and BR2 they consist of two separate 380V ac supplies from Motor Control Centre Switchboard A, each feeding an input circuit breaker and a transformer-rectifier unit with a fused dc output at 48V. In PM4 a third charger (No 3) is fed from the MCC. These outputs are each led, through dc input breakers, to busbars in a dc distribution board.

2.1.2 On each half-system floats a 48V nickel-cadmium battery consisting of up to four parallel groups. The battery capacity differs for the different systems. In BR1 and PM4 each battery is connected to the rectifier output through 400A fuses; this is the normal mode of operation for both charge and discharge. If however a fuse should blow, it triggers a pair of contactors so that the battery becomes directly connected to the load and the rectifier is disconnected. This can also be simulated by a TEST button. In PM4 the third (spare) charger can be manually switched to either Battery 1 or 2 in place of their own units.

2.1.3 The arrangement in BR2 is different. Both the rectifier and the battery feed through fuses and separate incomer breakers into the dc distribution board. Both are normally kept closed so that the battieries float at all times.

2.1.4 In all six rectifier output circuits there are normally closed contacts of 'shut down' contactors. Under Disaster (but not Emergency) Shutdown these contacts open, and in BR1 and PM4 they isolate both batteries and rectifiers from the loads. If however a battery fuse has blown and the alternative battery path is in use, the battery is not isolated; this however is an abnormal condition. In BR2 only the rectifiers are isolated and the batteries remain connected.

2.1.5 Opening of any rectifier ac input breaker, or blowing of any rectifier dc output fuse, causes a CHARGER FAULT alarm to indicate at the Utility Panel in PM4. The presence of earth leakage on any dc busbar will also cause an EARTH LEAKAGE alarm to indicate at that panel.

2.1.6 The three dc distribution boards are of ironclad (explosion-proof) construction for use in a hazardous area. Each consists of two pairs of duplicate busbars, each pair (positive and negative) being fed from one of the rectifiers or batteries of its system. The number of output feeders differs between the three boards, but each circuit consists of a busbar selector switch, an isolating hand-operated fuse-switch and 'cut-off' contactor timing contacts. These contacts are normally held closed. If there is a loss of ac output from MCC switchboard A, the battery alone immediately takes over the full dc load without interruption and the contactors start to time, opening after a preset period. The time delays are pre-selected by links at the dc distribution boards.

2.1.7 Exceptionally the circuit emergency ventilation on PM4 board does not have a timed cut-off. The contactor is remotely operated and the circuit is available at all times while the dc distribution board is energised.

2.1.8 The circuits on BR1 board controlling the lifeboat and boat landing emergency lights are provided with additional timers. Their contacts are remotely closed by switches at the boat stations and remain closed only for the stated times (15 or 10 minutes), after which they open again. This is to ensure that the powerful 400W floodlights are not left on unnecessarily to discharge the batteries. They are available throughout the 24-hour period allowed by the cut-off contactor, but only for short times. They must be reswitched if required again after the local timer has operated.

2.1.9 In addition to the three central dc systems there are two others, these being dedicated supplies for radio and navigation equipment.

2.1.10 The ac power supply to the Radio Cabin is at 220V single-phase through a 6kW regulator unit. The limited amount of dc needed is derived from the ac through an 'Autronica' transformer-rectifier charger unit supported by a 24V nickel-cadmium battery in or adjoining the Radio Cabin feeding a 24V dc fusebox.

2.1.11 A transformer-rectifier charger is fed from a 220/120V transformer and provides a common power supply to the 12V dc navigation lights and the foghorns and their controlling electronics. Under normal conditions it provides also a trickle charge to the battery to keep it fully charged. On failure of the ac supply the battery takes over the full dc load without interruption, and the loss of the ac supply gives an alarm in the Control Room. The battery group consists of four nickel-cadmium batteries in parallel with sufficient capacity to keep the 12V lights and main foghorns operating for four days. On restoration of the ac supply the charger automatically recharges the batteries at full rate as well as supplying the dc load.

2.1.12 A Volar dc voltage regulator maintains the dc level at 12V irrespective of the state of charge of the batteries. It can deal with inputs varying from 11 to 14V.

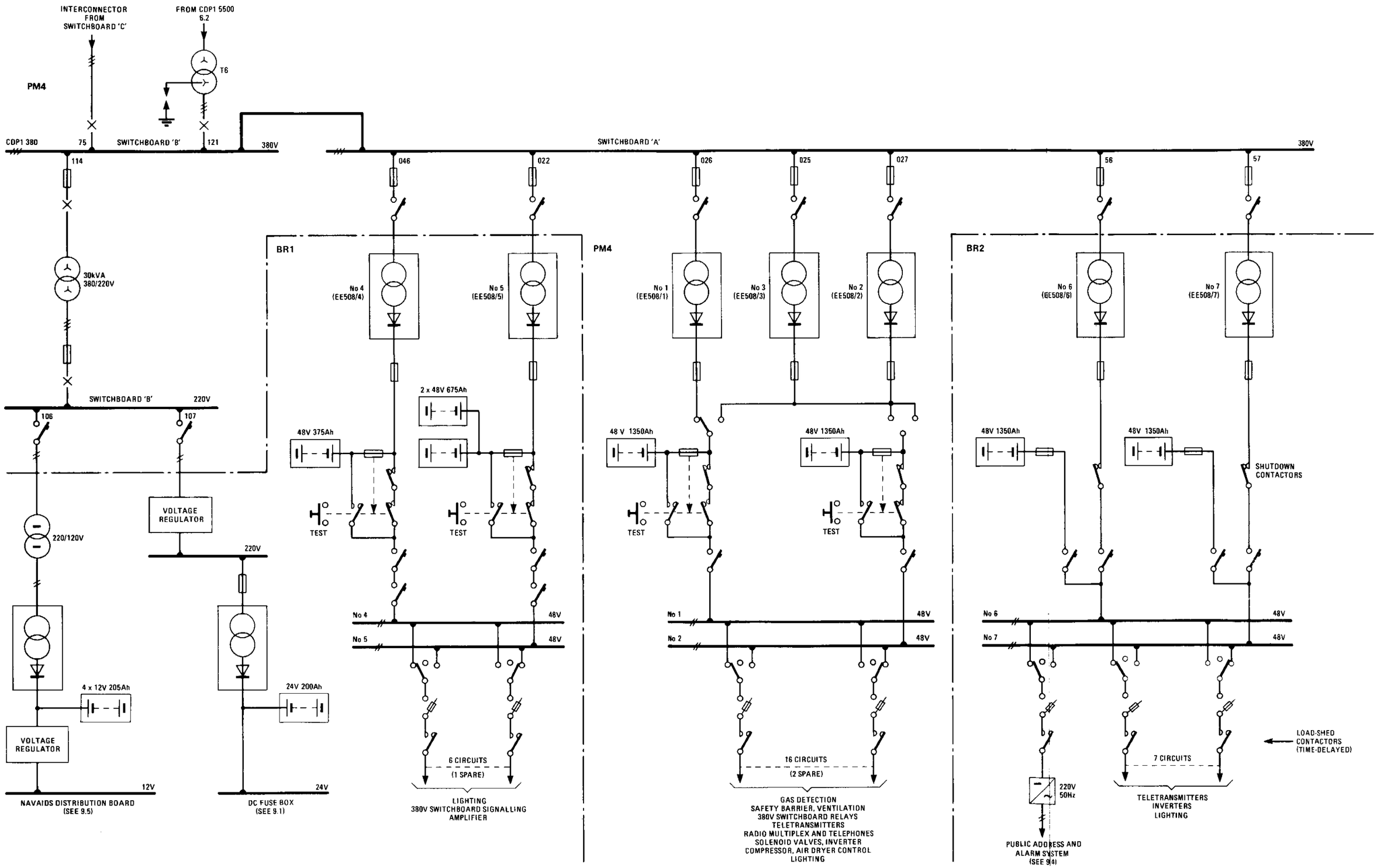
2.2 Battery-maintained AC Systems

2.2.1 One battery-maintained ac power source is provided for the Public Address and Alarm System.

2.2.2 Normally power is at 220V ac through an invertor from the 48V dc switchboard in BR2. This is automatically backed-up by a 220V supply from MCC B through B104; 48V dc power for the Alarm Horn system is taken from the same board. Both remain available for 24 hours after failure of the main ac system. All the flashing lights (blue and red) operate at 48V dc.

2.3 Lighting

Reference should be made to Section 10.14 for details of lighting supplied from the battery-maintained dc system.



ISSUE 1. JULY 1980

BATTERY-SUPPORTED SUPPLIES

SEA WATER SYSTEM

1 GENERAL

The Sea Water System supplies sea water under pressure to the firewater ring main, flare radiant-heat waterscreen, Module PM4 air conditioning unit cooling water system, and to various hose-reels.

2 SEA WATER SUBMERGED PUMPS

2.1 Three submersible pumps GA112A B and C are installed in stilling tube E. Pumps B and C supply the normal platform sea water system, whilst pump A augments this supply when the drilling rig is in operation. This pump is connected to the 440V 60Hz drilling package electrical supply.

3 CHLORINATOR (REMOVED)

4 STORAGE TANK

4.1 The chlorinated sea water is stored in tank FB112 located in Module T1 tank area. FB112 has a capacity of 100m^3. An electrical heating coil maintains a minimum water temperature of 5°C in the tank.

4.2 FB112 is connected to the 10in suction manifold of pumps GA107A and B and GA108A and S.

5 SEA WATER PUMPS

5.1 Pumps GA107A and B, located in Module PH1, supply the sea water requirements of the wash-down hosereels and the firewall sprinkler systems. These are centrifugal pumps each driven by a 37kW electric motor and with a rated discharge of 60m^3/h against a head of 85m.

5.2 The pumps are usually run with one duty and one standby; a selector switch is provided for alternating pump duty.

5.3 The pressure in the discharge header is regulated to between 7.0 and 8.5 bar.

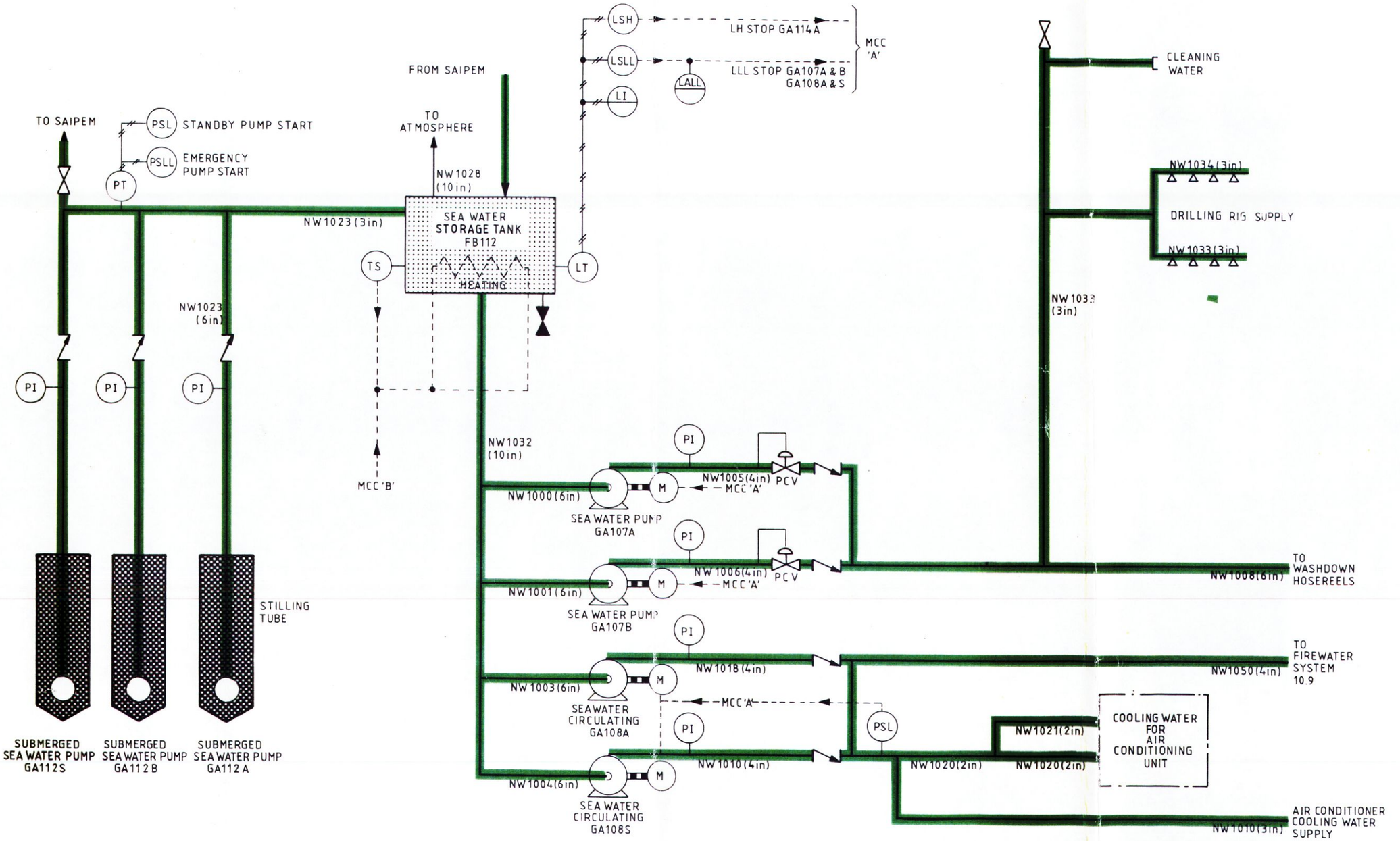
6 CIRCULATING PUMPS

6.1 Pumps GA108A and S, located in Module PH1, supply the cooling water requirements of the air conditioning unit, and maintain a pressure in the firewater ring main of 2.5 bar. These are centrifugal pumps each driven by a 15kW electric motor and with a rated discharge of 65m^3/h against a head of 46m.

6.2 The pumps are usually run with one duty and one standby; a selector switch is provided for alternating pump duty.

6.3 A pressure switch will start the standby pump at 4.5 bar falling and stop it at 5.2 bar rising.

6.4 The supply to the firemain passes through a fixed orifice plate.



ISSUE 4 JAN.-88

SEA WATER SYSTEM	6.5

SOFT WATER SYSTEM

1 GENERAL

The soft Water System is provided to satisfy the requirements of the platforms's fresh water consumers. It comprises a Chlorination unit,storage tank, two centrifugal pumps, an ultraviolet treatment unit and a pressurised potable water receiver.

2 STORAGE TANK

2.1 Soft water is stored in tank FB110 which has a capacity of 68m3 and is situated in Module T2. The tank is filled from a service vessel by means of flexible hoses. The water is disinfected by a chlorination unit before entering the storage tank.

2.2 An electrical heating coil maintains a minimum water temperature of 5 Degrees C in the tank.

2.3 The tank is provided with temperature and level indication. Level switches initiate alarm annunciation at tank low level and stop the duty soft water pump at extra-low level.

3 SOFT WATER PUMPS

3.1 Pumps GA105A and S, situated in Module PH1, provide soft water under pressure to the consumers. They are centrifugal pumps driven by 7.5kW electric motors and each has a capacity of 22m3/h at the system's normal working pressure of 2 bar.

3.2 The pumps are normally run with one duty and one standby. The duty pump takes suction from FB110 and discharges to potable water receiver FA111 through ultraviolet treatment unit BG102.

3.3 Level switches in FA111 stop and start the duty pump.

4 ULTRAVIOLET TREATMENT UNIT

4.1 Unit BG102, located in Module Pm4, treats the water to make it suitable for domestic use, and has a capacity of 20m3/h.

4.2 Water passing through the unit is exposed to ultraviolet radiation; this sterilises the water by destroying any micro-organisms present without altering its chemical composition.

4.3 From the unit the treated water flows to potable water receiver FA111, BG102 can be bypassed if necessary for maintenance or repair. A failure of BG 102 will initiate an alarm and will stop the duty soft water pump.

5 SOFT WATER RECEIVER

5.1 Receiver FA111, located in Module Pm4, serves as an accumulator. Air at a nominal 2 bar pressure is supplied to the top of the vessel while the water level is maintained by level switches which start and stop the duty soft water pump.

5.2 The receiver is protected against overpressurisation by a relief valve set to lift at 2,5 bar.

5.3 From the receiver, pressurised soft water is distributed to the living quarters, and to the hospital deck toilet and coffee container.

END

FOR LAMP COLOUR
SEE TABLE

RELAY BOX

FOR RELAY BOX
CONNECTION
REF VENDOR DATA

P-3305

POWER SUPPLY
220V
50HZ

MAN AUTO

PUMP
RUNNING

POWER
ON

PUMP
OPERATION

I

UV
STERILIZER
20 M3/H

TO DRILLING
PACKAGE

POTABLE WATER
NETWORK

PRESSURE
DRUM
$1M^3$

PH
RECTIFIER

CHLORINATION
UNIT

LI
104

C-4002

CHLOR
TANK
100 C

LAL
104

LSL
104

ALARM
WINDOW
IN CONTROL
ROOM

P

DOSING
PUMP

POTABLE WATER
STORAGE TANK

$100\,M^3$

P

P

4"DW-FROM SAIPEM

SAIPEM
EAN

4"DW-TO SAIPEM H2X

DELETED

PRESSURE
DRUM
$1M^3$

TO CDP 1
POTABLE
WATER
NETWORK

IMPULSE

FQI
104

FE
104

FE

4" DW-1000 H2X

4" DW-1000 H2X

TO CORROSION
INHIBITOR

POTABLE WATER
STORAGE TANK

$65M^3$

HEATING

FB110

UV
STERILZER
$20\,M^3/H$

BG102

P

GA105 A

P

GA 105 B

PH
RECTIFIER

BOAT LANDING
FLOW-RATE $100M^3/HR$

DESCRIPTION	LAMP COLOUR
POWER ON	WHITE
PUMP RUNNING	GREEN

I NOTE
PUMP CONTROL LOGIC (TIMER CIRCUITRY AND PUMP CONTACTOR) THE STOP/START FREQUENCY OF THE DOSING PUMP WILL BE CONTROLLED ACCORDING TO MEASURED FLOW-RATE.

ISSUE 3 JUNE 1984

SOFT WATER SYSTEM | 6.6

GAS OIL SYSTEM

1 GENERAL

1.1 The system provides the requirements of the following gas oil consumers:

(a) Auxiliary generator GE100.

(b) Start-up air compressor GB101BX.

(c) Fire pumps G101A and B.

(d) East and west cranes.

(e) Lifeboats.

1.2 System equipment includes a strainer, pumps, filters and ready-use storage tanks.

2 STORAGE TANK FB105

2.1 Gas oil is stored in tank FB105 located in Module T2. The tank has a capacity of 100m^3 and is filled through hose connections, one each on the roof of Modules BR1 and BR2, and a filling manifold.

2.2 From the filling manifold an additional line is led to the drilling package gas oil storage tank.

2.3 FB105 is protected against overpressurisation by three safety valves, each set to relieve at 15 mbar, and a natural vent, all led to atmosphere and each terminating in a flame arrester.

2.4 The temperature of the tank contents is maintained at a minimum of 5°C by means of an electrical heating coil. The temperature is indicated locally.

2.5 A level transmitter enables the following:

(a) Tank level indication in the Control Room.

(b) An audible alarm at the filling positions and a visual alarm in the Control Room at high level.

(c) Visual alarm in the Control Room at low level.

(d) Duty gas oil pump trip at low-low level.

3 GAS OIL STRAINER

3.1 The duty gas oil pump GA101A or S takes suction from tank FB105 through strainer FD104 which has a capacity of 12m^3/h and removes particles greater than 15 micron.

3.2 A locally mounted differential pressure indicator is provided to indicate the requirement for maintenance.

4 GAS OIL PUMPS

4.1 Two positive displacement pumps, GA101A and S, are provided in Module PH1; each is driven by a 1.1kW electric motor and has a rated output of $2m^3/h$ against a 13.7m head.

4.2 The pumps usually operate with one duty and the other standby. The duty pump discharges through water/separator filter FD105A or B to the discharge manifold. Pump discharge pressure is indicated locally. Each pump is protected by an integral pressure relief valve.

4.3 A manually operated semi-rotary pump, GA102, located in Module PH1 is provided for use should the electrically driven pumps be out of action. It has a capacity of 15 litres/min when worked at 80 strokes/min.

5 FILTER UNITS

5.1 Units FD105A and B, located in Module PH1, are provided to filter particles down to 5 micron size, and to remove water entrained in the gas oil. Each unit has a capacity of $6m^3/h$ and operates at a pressure of 2 bar. Operation is usually one unit in line and one standby.

5.2 Water collected in the bottom of the unit is discharged to the Drainage System by an integral automatic drain trap. This water can also be evacuated manually.

5.3 Air or gas collected in the top of the unit is automatically discharged to atmosphere. Filtered and water-free gas oil from either unit is discharged through control valve CV7610.

6 CONTROL

6.1 Control of gas oil distribution is effected by CV7610 actuated by level switches in storage tank FB102 and arranged to give preferential delivery to FB102.

6.2 A bypass arrangement is provided so that distribution can still be made should CV7610 be out of service.

7 STORAGE TANK FB102

7.1 This tank, located in Module PM4, is a ready-use day tank serving diesel-driven auxiliary generator GE100 and its engine's start-up air compressor GB101BX. It has a capacity of $0.53m^3$. A balancing line is provided between tanks FB102 and FB105.

7.2 FB102 is provided with local level indication and with level switches which operate CV7610 to direct gas oil flow to or from the tank at low and high levels respectively.

8 STORAGE TANKS FB101AX and BX

8.1 FB101AX, located in Module BR1, is a 24-hour ready-use tank serving diesel-driven fire pump GA101A, and has a capacity of $3.17m^3$.

8.2 FB101BX is a similar tank located in Module BR2 serving diesel-driven fire pump GA101B.

8.3 A pressure switch in either tank will start the duty gas oil pump on low tank level. Flow of gas oil into the tanks is regulated by level control valves. The duty pump will be stopped by the actuation of the high level pressure switch in both tanks.

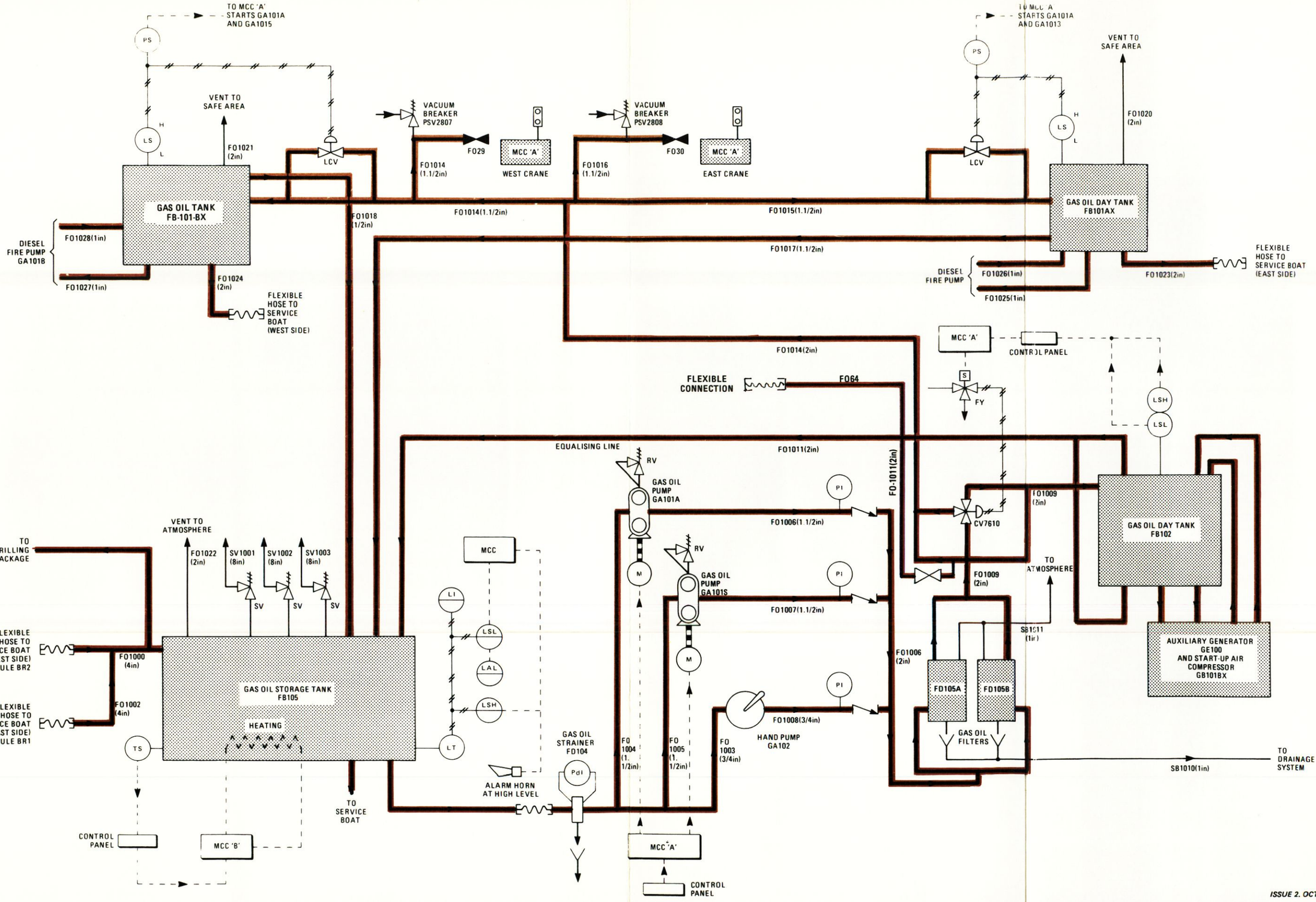
9 STORAGE TANK FB117X

Tank FB117X, located on the service deck east, is provided for future use. It has a capacity of $1.8m^3$ and can be filled from the gas oil system under level control.

10 CRANES

10.1 Supplies are led to hose connections on the crane platforms to facilitate filling crane ready-use tanks. The duty gas oil pump can be started and stopped using locally mounted pushbuttons at each crane position.

10.2 Lines to the crane positions are fitted with vacuum breakers.



ISSUE 2. OCTOBER 1982

GAS OIL SYSTEM	6.7

COMPRESSED AIR

1 GENERAL

1.1 Three compressors are provided to supply the platform with plant and instrument air: GB100A and S located in Module PM4, and GB100B in Module BR1. The compressors are identical and each one is driven by a 75kW electric motor through a 2:1 reduction gear giving an output of 570m^3/h at 11.5 bara when driven at 730 rev/min.

1.2 Compressors are normally run with one duty, one standby and one in reserve. When in AUTO the duty compressor will run continuously, loading and unloading in response to pressure switches. If the duty compressor fails to meet system demands or if it stops, falling system pressure will initiate start-up of the standby compressor.

2 COMPRESSORS

2.1 The compressors are fresh water cooled. Each has an integral fresh water system comprising a make-up/expansion tank, a radiator, and a 0.75kW electrically driven circulating pump which supplies the intercooler and aftercooler with fresh water at 2.5 bar. Water passing through the radiator is cooled by a 3kW fan.

2.2 Air is discharged from compressors GB100A and S to a pair of air dryers, PA104A and B, and from GB100B to PA104C and D.

3 AIR DRYERS

3.1 Air dryers contain activated alumina as a drying agent. The dryers in each pair are used alternately, one in operation with the other in its regeneration cycle.

3.2 During regeneration, previously absorbed water is removed so that the desiccant is reactivated.

4 PLANT AIR RECEIVERS

4.1 Air is discharged from dryers PA104A and B to a pair of 2.5m^3 capacity plant air receivers FA103A and B mounted horizontally in Module PM3.

4.2 Air is discharged from dryers PA104C and D to plant air receiver FA103C which is vertically mounted in Module BR1 and has a capacity of 3.5m^3.

4.3 Each plant air receiver is protected against over-pressurisation by a relief valve set at 11.5 barg.

4.4 From the plant air receivers air passes to consumers at a pressure of 10 barg.

5 INSTRUMENT AIR RECEIVERS

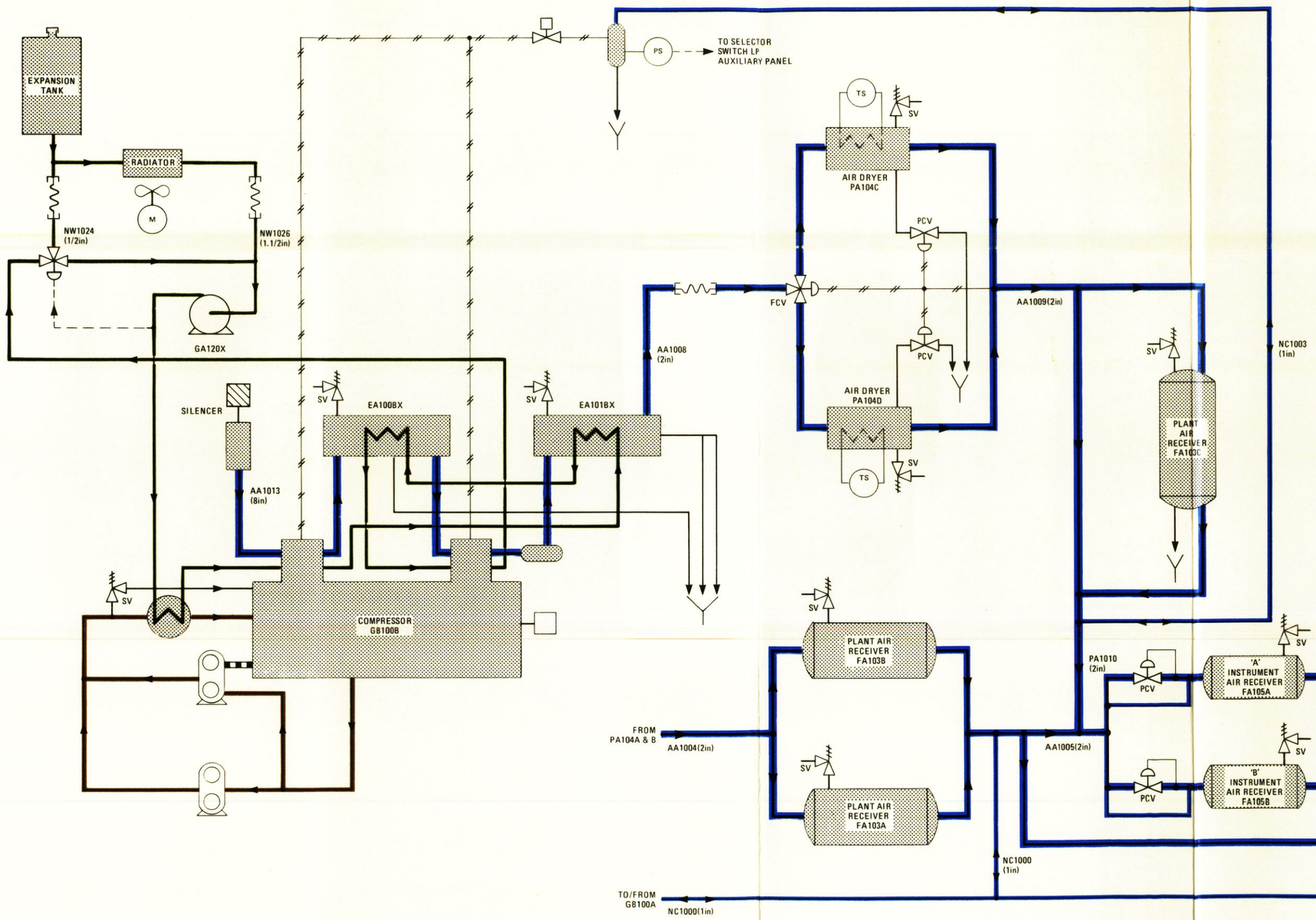
Air from the plant air receivers is reduced in pressure to 2.0 barg and supplied to two instrument air receivers FA105A and B mounted vertically in Module PM3. Each instrument air receiver has a capacity of 300 litres and is protected against overpressurisation by a relief valve set at 2.8 barg.

6 NITROGEN BACK-UP

6.1 A pair of $3m^3$ capacity bottles of nitrogen are provided as an emergency back-up for the instrument air supplies to the wellheads. The bottles are isolated by ROV22 which can be operated from QP or TP1.

6.2 When discharged, the nitrogen pressure is reduced to 3 barg. The bottles discharge sequentially. When the first bottle pressure drops below 3 barg an automatic changeover switch releases gas from the second bottle.

END



ISSUE 1. JULY 1980

COMPRESSED AIR
Compression and Treatment

6.8.1

FROM TP1 AND QP

ROV

NG1001(1in) PCV ROV IA1002(1in)

IA1002(1in) WELL KILL VALVES

NITROGEN BOTTLES

ROV

IA1005(1in) IA1005(1in)

FROM FA105A & B 6.8.1 IA1002(1in)

IA1005 (1in)

IA1000A(2in)

MODULE PM2

MODULE WHIA/B

FROM FA105A & B 6.8.1 IA1000(2in)

IA1000B(2in)

FROM FA103A, B & C 6.8.1 NC1000(1in)

PCV

NC1000(1in) TO POTABLE WATER RECEIVER FA111 6.6

PA1002 (1.1/2in)

AIR (10 BAR) TO WORKSHOP UTILITIES PA1001(1.1/2in)

PA1005 (1in) PA1006 (1in) PA1007 (1in) PA1008 (1in) PA1011 (1in) PA1012 (1in)

AIR (10 BAR) TO HYDRAULIC POWER UNITS PA1001(1.1/2in)

FROM FA103A, B & C 6.8.1 PA1000(2in)

CRANE EAST

TO JET FUEL PUMP GA121X PA1013(1in)

PA1011(1in)

PCV

CRANE WEST

CA117(2in)

TYPICAL FOR 9 PLATFORMS

CA108 (3in)

CA110(1.1/2in)

CA109(1.1/2in)

CA106(1.1/2in)

CA111(1.1/2in)

CA112(1.1/2in)

CA107(1.1/2in)

CA118 (1in) TO SUMP PUMP G109A

CA115 (1in) TO SUMP PUMP G109B

CA122 (1in) TO SUMP PUMP G109E

CA123 (1in) TO SUMP PUMP G109F

FIRE ALARM CIRCUIT CA120(1in)

EMERGENCY ALARM VALVE AT EACH OF 10 PLATFORMS

ALARM VALVE

CA116 (1in)

CA113 (1in)

ALARM VALVE

ALARM VALVE

CA114(1in)

ALARM VALVE

CA115(1in)

ALARM VALVE

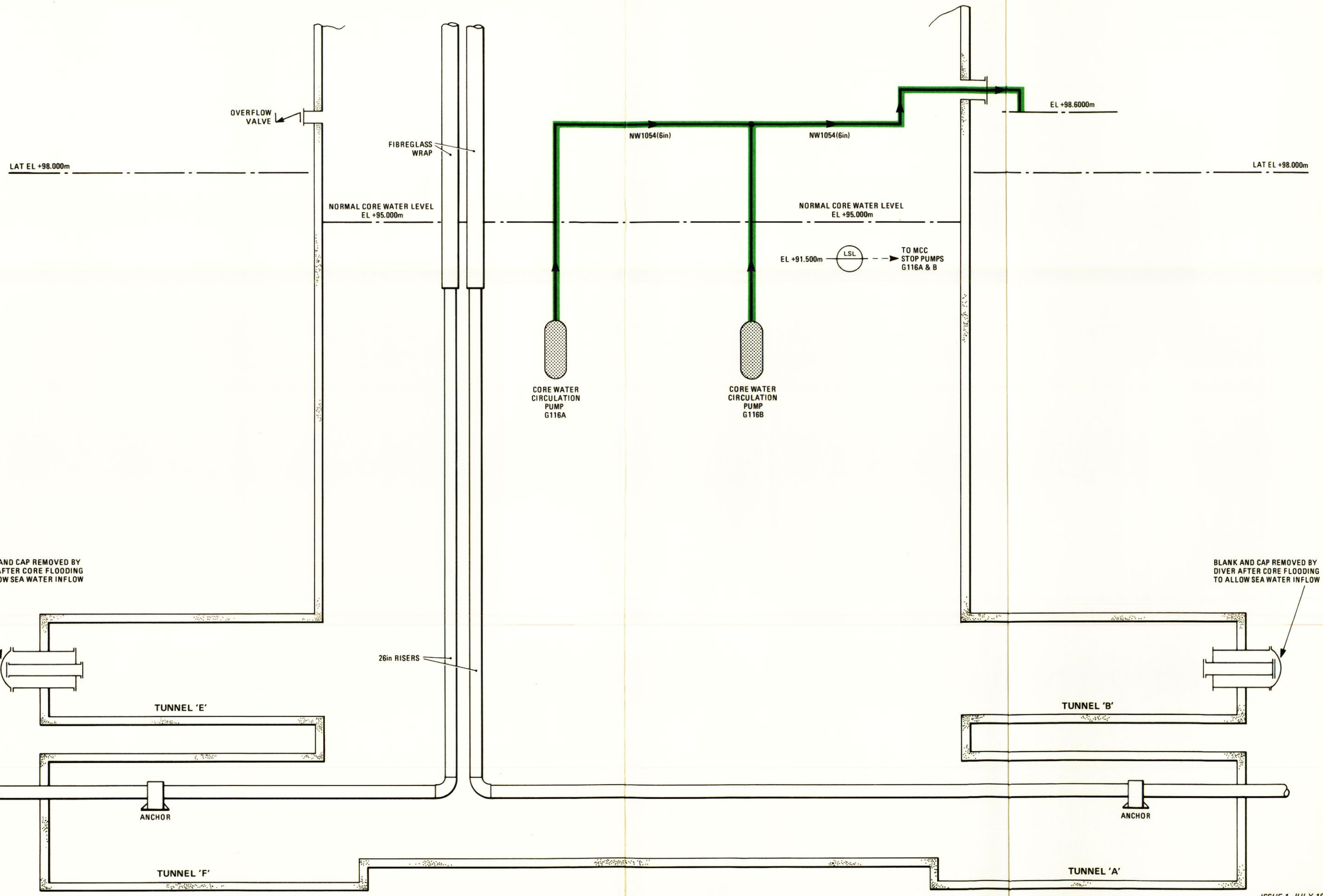
ISSUE 2 JUNE 1984

COMPRESSED AIR Distribution | **6.8.2**

CORE WATER CIRCULATION

1. The core is permanently dry.

E N D



ISSUE 1. JULY 1980

CORE WATER CIRCULATION | 6.9

VENTILATION SYSTEMS

1 GENERAL

1.1 The ventilation system comprises six self-contained subsystems providing ventilation for

(a) The Centre Core.

(b) Module PM4.

(c) Module BR1.

(d) Module BR2.

(e) New living quarters module.

(f) Rig office module

1.2 The ventilation arrangements for the drilling package are described in Section 4.1.

1.3 Fire detection in any module will cause the ventilation system in that module to be shut down.

2 DESCRIPTION

2.1 Central Core Ventilation System

2.1.1 Two axial flow fans, one duty and one standby, located in Module SD3 supply 8.58m³/s of air to the core. The fans are electrically connected in such a manner that failure of the duty fan will initiate starting of the standby fan.

2.1.2 A fan located in Module SD3 extracts 1.42m³/s from the core and discharges through the module to atmosphere. The extract duct runs vertically down the core and terminates at about the +7m level.

2.1.3 All fans are provided with integral backflow dampers. The supply fan inlets are provided with gas detectors which are set to initiate fan shutdown if the gas concentration reaches 60 per cent LEL.

2.2 Module PM4 Ventilation System

2.2.1 A centrifugal fan supplies air from a safe area to the cabins on both levels and the dining and lounge areas through an automatic cooling system. Air is discharged into the individual compartments through ceiling diffusers. Further temperature control is by individual room thermostats controlling room heaters. The supply fans will be shut down if gas concentration at the inlet reaches 40 per cent LEL.

2.2.2 The control, radio, electrical, battery rooms and workshop store are provided with conditioned air from an air conditioning unit similar to the one serving the living quarters. Battery rooms have essentially supplied extract fans to prevent the build-up of hydrogen gas.

2.2.3 An emergency fan is provided for the ventilation of the air conditioned spaces.

2.2.4 The kitchen is ventilated by two separate suply fans, one duty and one standby, through automatically operated dampers with a preheater temperature-controlled from within the kitchen. It is also provided with an extractor fan discharging to the outside of the module. The fans will shut down, fire damper will close and Halon will be released should the heat detectors in the extraction system operate.

2.2.5 Air heaters are provided in the toilet and shower rooms. Air for them is drawn from outside the module. These rooms are also provided with extractor fans.

2.2.6 All rooms, excluding the toilet and shower rooms, can be purged by a 48V battery-operated extractor fan. This fan draws air from both supply and extractor ducting, discharging to the outside of the module through a manually operated louvre.

2.2.7 The compressor, generator and transformer rooms are each served by two separate induction fans which discharge through manually operated dampers.

2.2.8 Air is extracted from the electrical room by two fans, one duty and one standby.

2.3 Module BR1 Ventilation System

2.3.1 This system is designed to pressurise and ventilate the switchgear, fire pump, compressor, battery and radio rooms. Two axial flow supply fans, one duty and one standby, are provided. Each fan has a capacity of $2m^3/s$ and will supply a minimum of 12 air changes per hour. The supply fans take suction from a safe area outside the module, and discharge air via ducting provided with a thermostatically controlled electric heater. Supply air to the air locks is ducted from upstream of the electric heater.

2.3.2 Pressure within the module is controlled by motorised pressurisation dampers at the module walls. The motorised dampers operate in response to differential pressure switches. Air from the battery room is discharged separately through a motorised damper which operates in response to a differential pressure switch. The switch is set to operate to maintain a lower pressure in the battery room than that of the remainder of the modules.

2.3.3 The supply fans are electrically connected so that the standby fan will be automatically started if the duty fan fails. The supply fans will be shut down if the gas concentration at the inlet reaches 60 per cent LEL.

2.3.4 Loss of pressure in the supply duct will be sensed by a low pressure switch which will initiate starting of an auxiliary extractor fan and opening of the battery room motorised damper. When pressure is restored, the auxiliary extractor fan will be stopped and control of the motorised damper will revert to the differential pressure switch.

2.3.5 Air is ducted from inside Module BR1 fire pump room through the east wall to pressurise and ventilate the radio room positioned at the south-east corner of BR1 roof. Air is exhausted from the radio room through a mechanically operated pressurisation damper.

2.4 Module BR2 Ventilation System

2.4.1 The purpose of this system is to pressurise and ventilate the fire pump, compressor and electrical rooms, giving a minimim of 12 air changes per hour. There are two pressurisation axial flow fans, one duty and one standby, each of $2.3m^3/s$ capacity, taking suction from outside the module through an inlet plenum. Each fan is fitted with integral backflow dampers. Two ducts are led off the main discharge ducting to air locks at the module entrance doors. The remainder of the air passes through ducting fitted with outlet grilles into the module areas.

2.4.2 Heating elements, each of 102kW, capacity, are installed in the main trunking duct, supplying air to the fire pump room, compressor room, electrical room and air locks. The quantity of air for each section of Module BR2 and pumphouse is controlled by volume control dampers. The ducting which supplies air to the electrical room continues outside the module to the pumphouse module through a fire damper connection; this external length of ducting is lagged.

2.4.3 Pressure control within the module is achieved in a similar manner to that of BR1.

2.4.4 Fan changeover and shutdown is achieved in a similar manner to that of BR1.

2.5 NEW LIVING QUARTER MODULE.

2.5.1 The system is a dual duct system with two supply ducts, one for cold and one for warm air. To reduce the electric heating and cooling requirement, the system is designed for approximately 50 % return air.

2.5.2 The supply air is heated up to about 16 Degrees C (cold supply). One reheater will increase the warm supply air to about 32 Degrees C during winter and 23 Degrees C during summer.

2.5.3 Three seperate cooling systems are installed, one for living areas, one for cold room and one for freezer, (-18 Degrees C)

2.5.4 The humidifying system exist of a steam humidifying, located in the air handling unit (after preheating). Relative humidity 60 % RH 50 % RH at 0 Degrees C outside.

2.5.5 All HVAC equipment are located in the L.Q. technical room.

2.5.6 All heating and ventilation system is designed to shutdown, in the event of emergency. Supply and extract system are interlinked with the main emergency shut down (E.S.D.) system of the platform.

2.5.7 Automatic fire dampers are manually operatable from either side of the bulkhead. Fire dampers automatically shut on:

1. Destruction of a fusible link located within the airstream at 68 Degrees C.

2. Signal from platform E.S.D via HVAC panel

3. Instrument air pressure failure.

Closure of a fire damper will be via a microswitch, stop the associated fan and alarm in the control room.

2.5.8 TECHNICAL DATA - NEW LIVING QUARTER

Air Condition	The HVAC-plant is calculated to maintain the following conditions: Winter Outside: -9 Degrees C,90 % RH Inside : +22 Degrees C,50 %RH Summer Outside: +22 Degrees C,79 % RH Inside : +24 Degrees C, 60 % RH
Total air flow	3,13 m^3/s
Preheating capacity	45 kW
Reheating capacity	45 kW
Cooling capacity	77 kW
Humidifier capacity	26kg/h
Mixing ratio	33 % return air, 67 % outside air
Cooling capacity	Freezer 2,5 kW, Cold store 2,1 kW

2.6 NEW RIG MODULE VENTILATION SYSTEM

2.6.1 The system is a single line duct system. The air handling unit is located externally and has a weatherproof casing. The air handling unit is equipped with one complete spare fan motor unit.

2.6.2 The supply air is heated up to 17 Degrees C as a maximum. The additional ventilation heat loss and the transmission heat loss is covered by terminal reheaters in each room, controlled by locally mounted room thermostats.

2.6.3 The cooling system consists of a refigeration, equipment package for the supply air evaporator mounted close to the air handling unit outside.

2.6.4 The humidifying system consists of a steam humidifier, located in the air handling unit (after preheating). Relative humidify 60 % RH, 50 % RH at 0 Degrees C outside.

2.6.5 All heating and ventilation system is designed to shutdown, in the event of emergency. Supply and extract system is interlinked with the main emergency shutdown (E.S.D.) system of the platform.

2.6.6 Automatic fire dampers are manually operable from eitner side of the bulkhead. Fire dampers automatically shut on:

1. Destruction of a fusible link located within the airstream at 68 Degrees C.

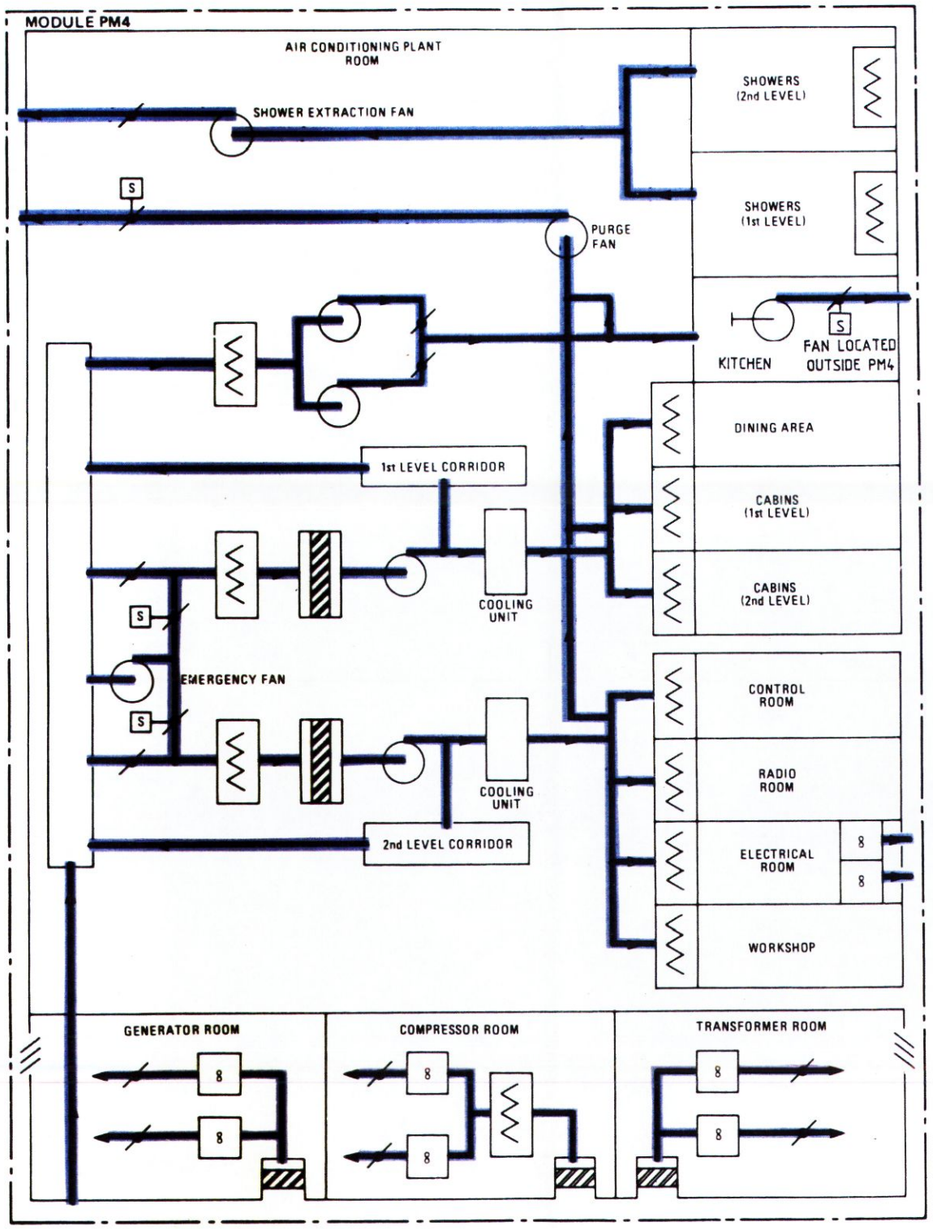
2. Signal from platform E.S.D. via HVAC panel.

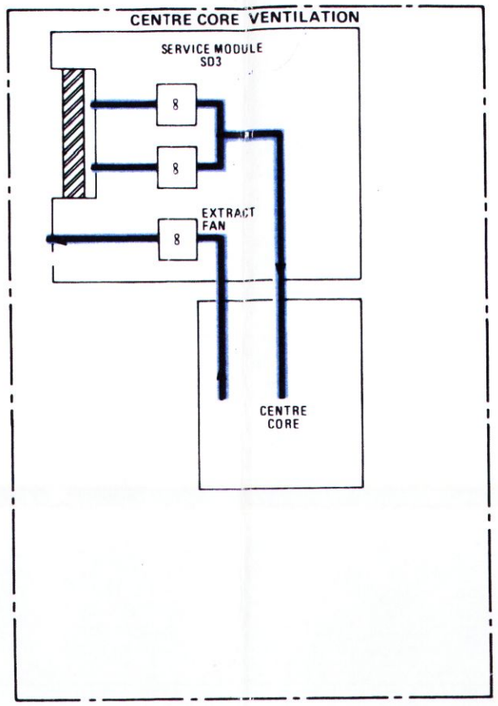
3. Instrument air pressure failure.

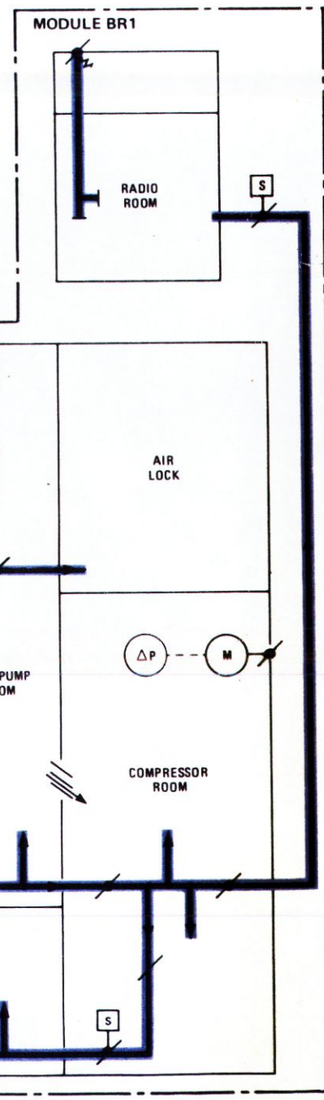
Closure of a fire damper will via a microswitch, stop the associated fan and alarm in the control room.

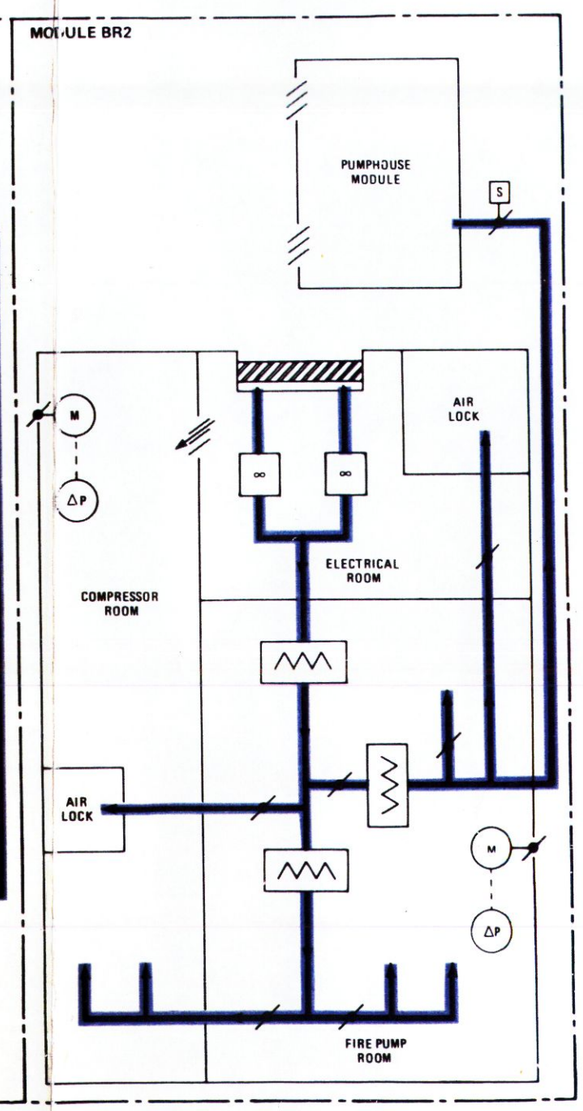
2.6.7 TECHNICAL DATA - NEW RIG MODULE

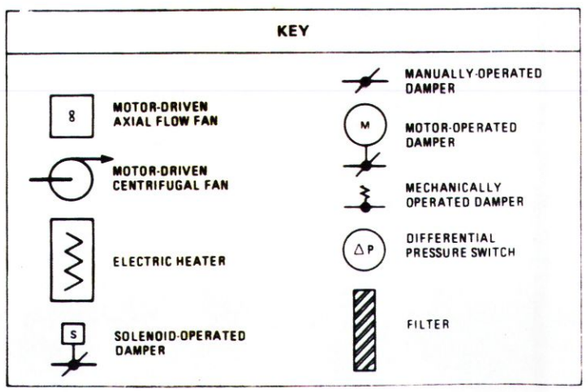
Air Conditions	See New Living Quarter
Total air flow	0,79 m^3/s
Preheating capacity	11kW
Reheating capacity	12kW
Cooling capacity	18,5 kW
Humidifier capacity	7,5 kg/h
Mixing ratio	50 % return air 50 % outside air





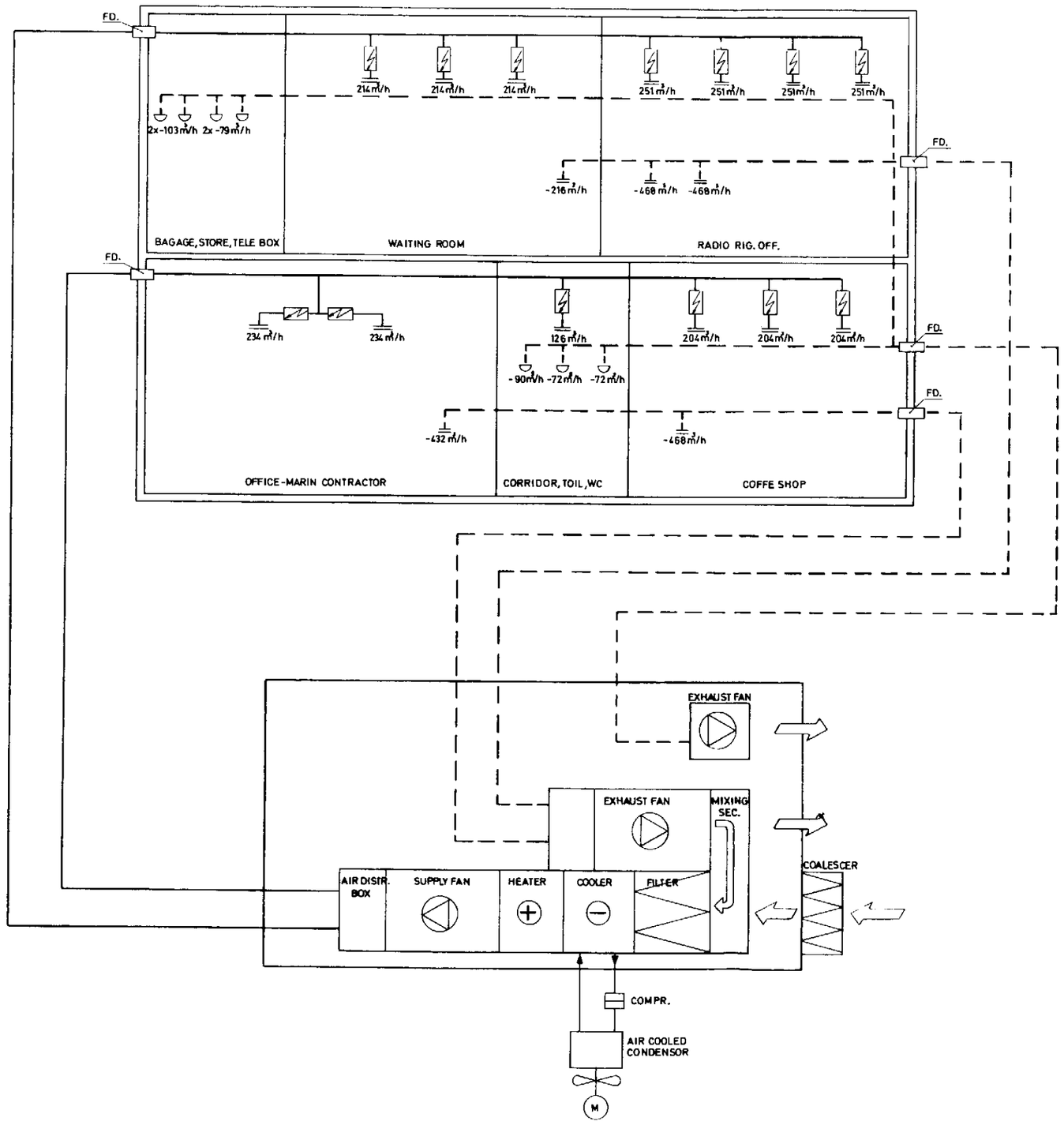






ISSUE 4 JAN.-88

VENTILATION SYSTEMS 6.10.1

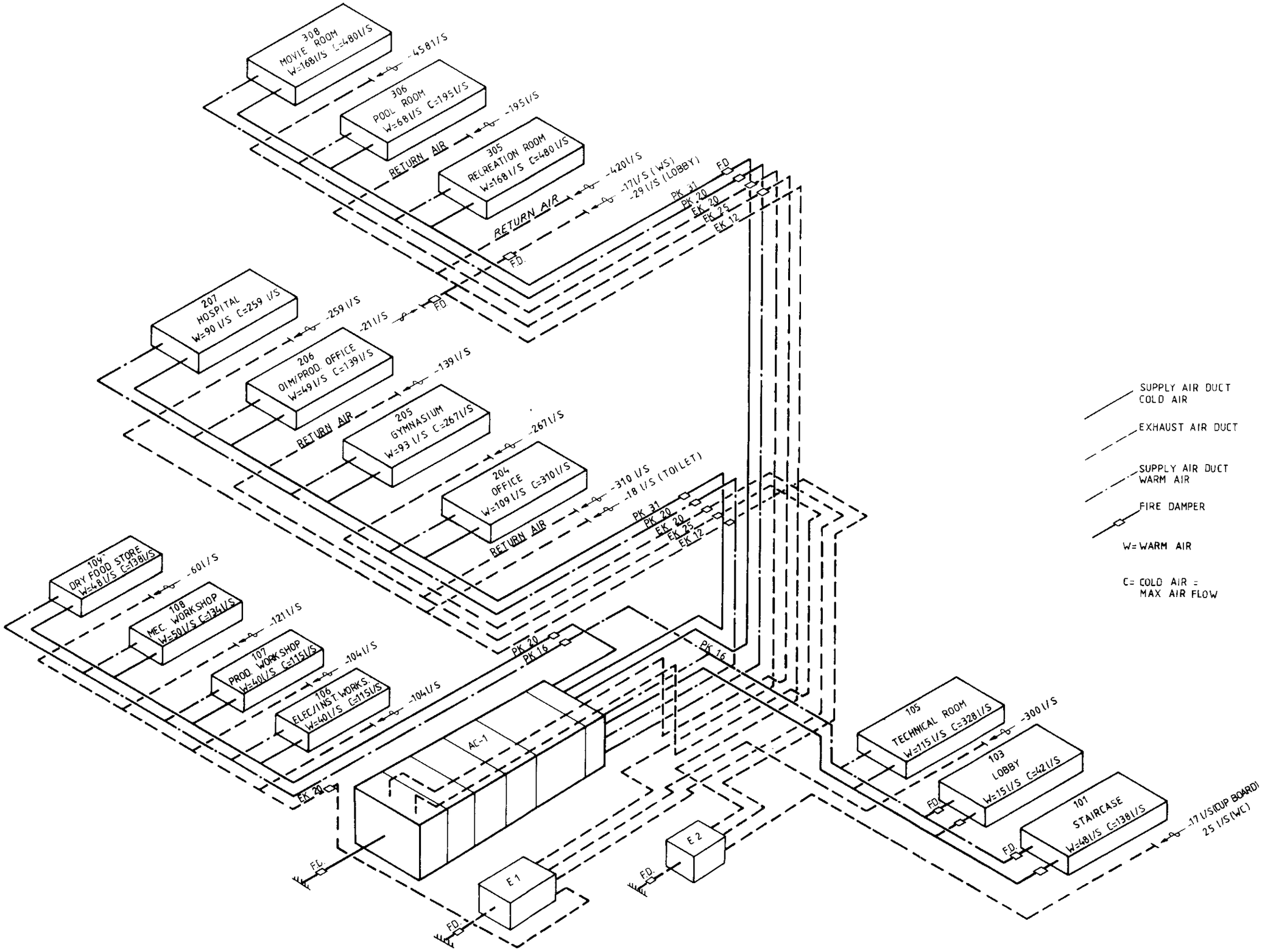


NOTES

- SUPPLY AIR
- EXHAUST AIR
- CABIN UNIT WITH REHEATING UNIT
- EXHAUST DEVICE
- EXHAUST DEVICE
- F.D. FIRE DAMPER

ISSUE 1 JUNE 1984

VENTILATION SYSTEMS NEW RIG MODULE	6.10.2



ISSUE 1 JUNE 1984

VENTILATION SYSTEM
NEW LIVING QUATERS

6.10.3

DRAINAGE SYSTEMS

1 DECK DRAINS

1.1 All rainwater, washdown water and deck spillage from the drilling and production decks is piped through an open drain system.

1.2 Inlets to the drains are protected by liquid seals which must be frequently inspected and topped up as necessary.

1.3 Rodding points are provided at strategic positions to facilitate maintenance.

2 PROCESS EQUIPMENT DRAINAGE

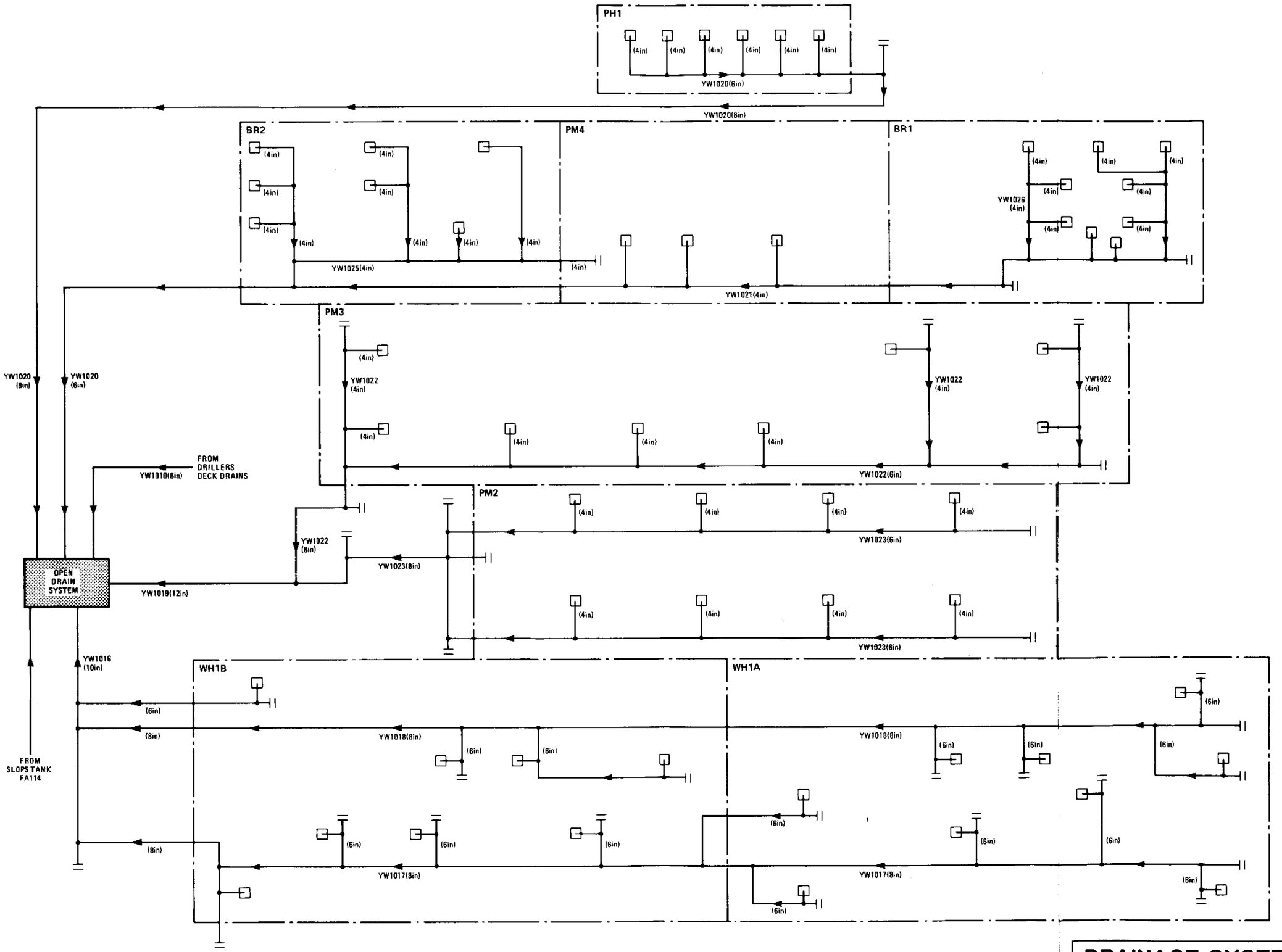
Liquids which contain hydrocarbons are collected from the following sources in a closed drain system and piped to slops tank FA114:

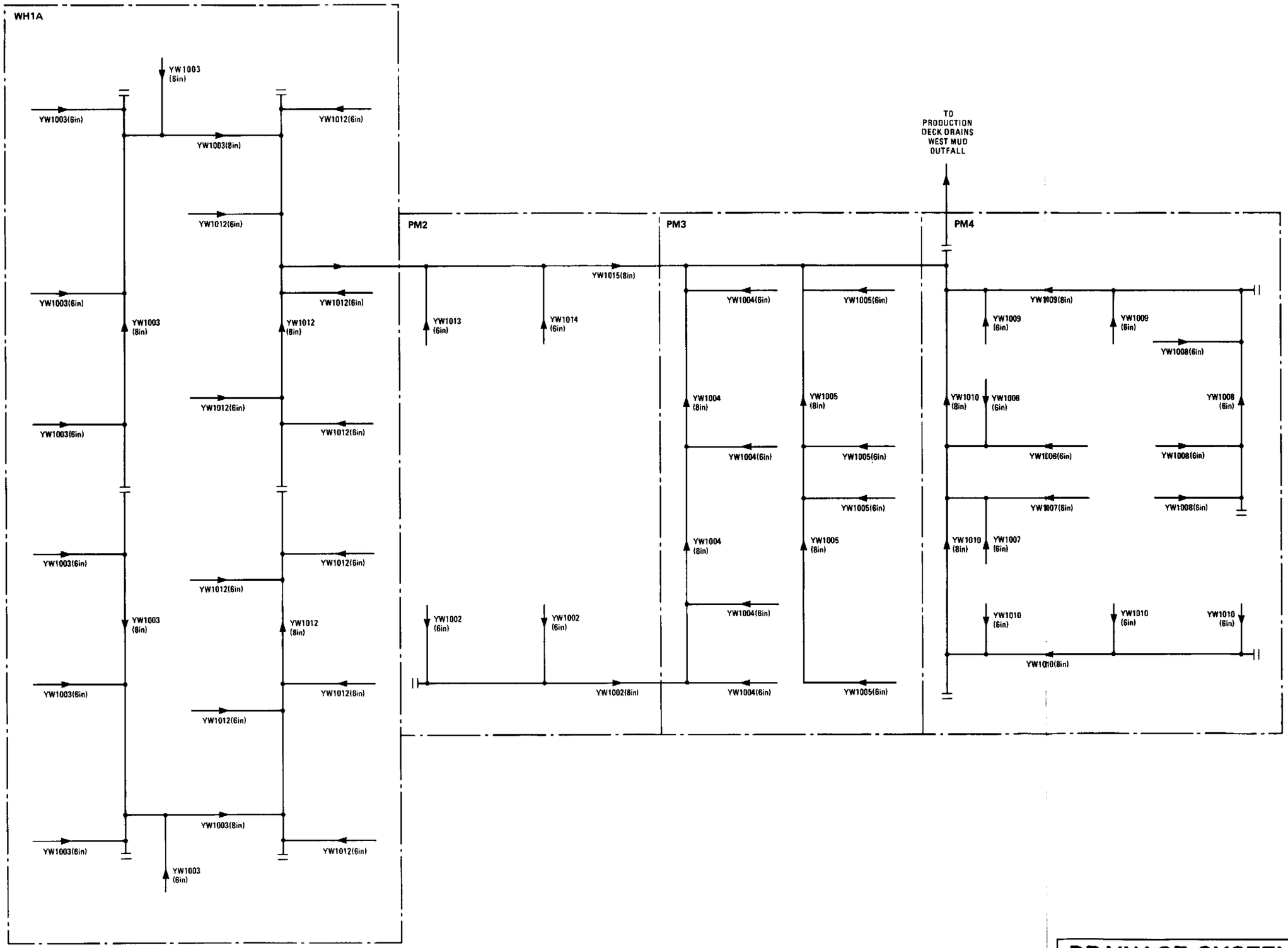
(a) Scraper Traps PA100A and PA102.

(b) Floor Drains in Module PM4 compressor and generator rooms.

3 DOMESTIC SEWAGE AND WASTE WATER

Domestic sewage and waste water from the Accommodation Modules is collected in a 4in line and discharged overboard via the 30in slops outlet.


PH1
(4in)
YW1020(6in)
YW1020(8in)
BR2
PM4
BR1
YW1026 (4in)
YW1025(4in)
YW1021(4in)
PM3
YW1022 (4in)
YW1022(6in)
YW1020 (8in)
YW1020 (6in)
FROM DRILLERS DECK DRAINS
YW1010(8in)
PM2
YW1022 (8in)
YW1023(8in)
YW1023(6in)
OPEN DRAIN SYSTEM
YW1019(12in)
YW1016 (10in)
WH1B
WH1A
YW1018(8in)
YW1017(8in)
FROM SLOPS TANK FA114


WH1A
PM2
PM3
PM4
TO PRODUCTION DECK DRAINS WEST MUD OUTFALL
YW1003 (6in)
YW1003(6in)
YW1003(8in)
YW1012(6in)
YW1012(6in)
YW1003(6in)
YW1003 (8in)
YW1012 (8in)
YW1012(6in)
YW1003(6in)
YW1012(6in)
YW1003(8in)
YW1003(6in)
YW1012(6in)
YW1003 (6in)
YW1015(8in)
YW1013 (6in)
YW1014 (6in)
YW1004(6in)
YW1005(6in)
YW1004 (8in)
YW1005 (8in)
YW1004(6in)
YW1005(6in)
YW1002 (6in)
YW1002 (6in)
YW1002(8in)
YW1004(6in)
YW1005(6in)
YW1009(8in)
YW1009 (6in)
YW1009 (6in)
YW1008(6in)
YW1010 (8in)
YW1006 (6in)
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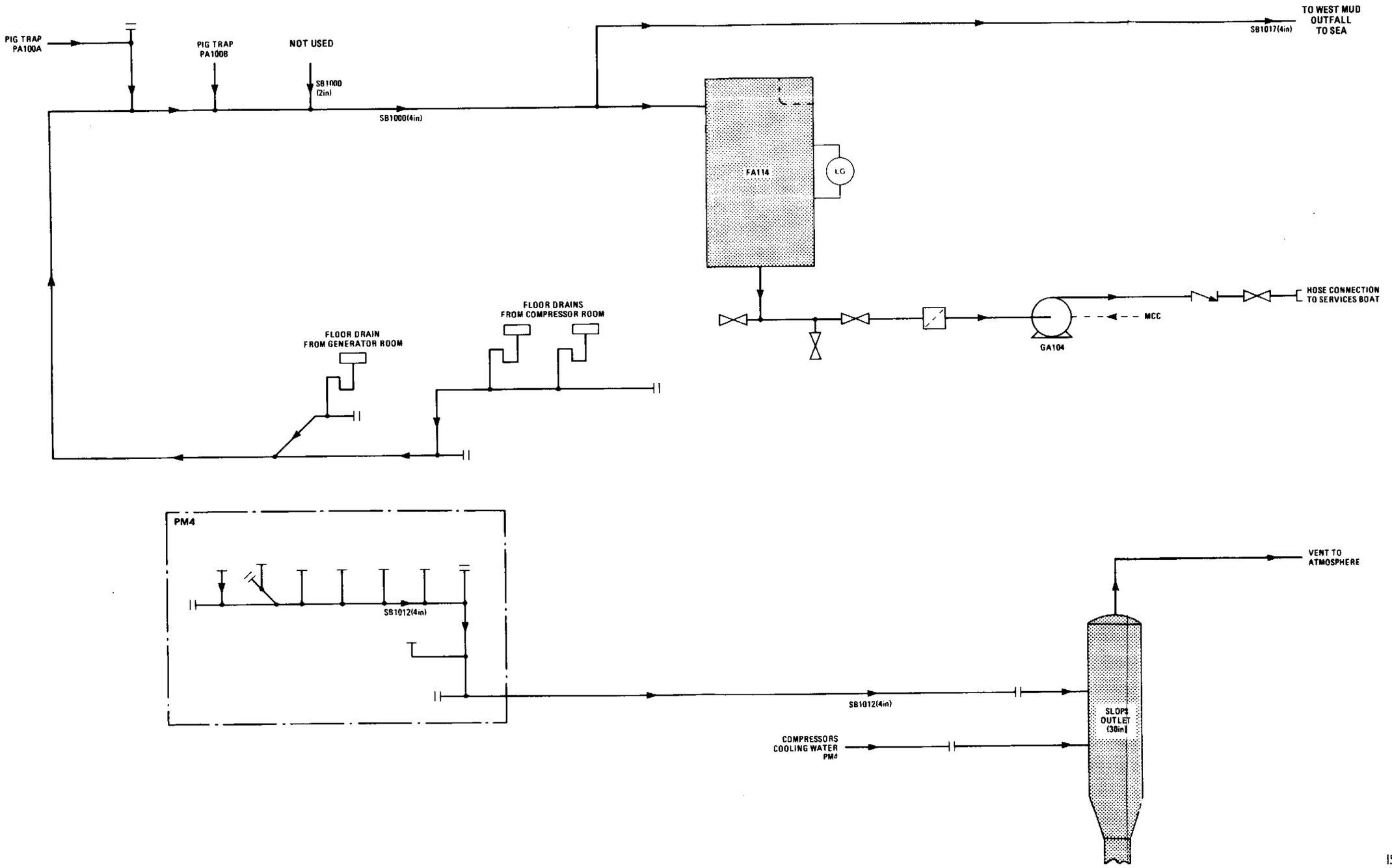
YW1007(6in)
YW1010 (8in)
YW1007 (6in)
YW1010 (6in)
YW1010 (6in)
YW1010 (6in)
YW1010(8in)


PIG TRAP
PA100A
PIG TRAP
PA1008
NOT USED
SB1000
(2in)
SB1000(4in)
SB1017(4in)
TO WEST MUD
OUTFALL
TO SEA
FA114
LG
HOSE CONNECTION
TO SERVICES BOAT
MCC
GA104
FLOOR DRAINS
FROM COMPRESSOR ROOM
FLOOR DRAIN
FROM GENERATOR ROOM
PM4
SB1012(4in)
SB1012(4in)
VENT TO
ATMOSPHERE
SLOPS
OUTLET
(30in)
COMPRESSORS
COOLING WATER
PM4

WELLHEAD HYDRAULIC SYSTEMS (CAMERON)

1 GENERAL

1.1 Each well cluster is provided with a Cameron hydraulic unit to power the remote-operated valves associated with that cluster. Each power unit has two separate hydraulic systems, one 310 bar system for the subsurface valves, and one 207/103 bar system for the other valves, with a common 1136-litre reservoir. The systems in both units are cross-connected to provide power in the event of a unit failure.

1.2 In addition, an emergency accumulator bank is provided to supply sufficient hydraulic power to operate the master and kill valves for one well cluster in the event of failure of both hydraulic units.

2 HIGH PRESSURE SYSTEMS (310 bar)

2.1 Each system includes two air-driven pumps operating in parallel and an emergency hand pump, all pumps being fed from a 1136-litre reservoir via a suction manifold. A tapping from the discharge line from each set of pumps is led to a pump governor which varies the pump speed accordingly. Both discharge lines incorporate pressure safety valves which relieve excess pressure into the reservoir.

2.2 The lines to each subsurface valve are provided with a 1.9-litre capacity piston-type accumulator and check valve. These are provided to maintain pressure to the valve while another is being opened and to absorb pressure variations due to temperature changes.

2.3 Thirteen fail-safe hydraulic pilot valves are provided, one to control the operation of each of the downhole valves, and one in the common line for the cluster shut-in of the downhole valves. Each valve is air-operated with spring return and incorporates a bypass.

3 LOW PRESSURE SYSTEM (207/103 bar)

3.1 This is similar to the 310 bar system, comprising two air-driven pumps (with a combined capacity of 21.2-litres/min), a pump governor, an emergency hand pump and four accumulators. The accumulators are cylindrical with a unit capacity of 102 litres and store sufficient fluid to open up one well with a pressure drop of not more than 69 bar.

3.2 Pressure reducers installed in the lines downstream from the accumulators reduce the pressure to 103 bar. (Valves equipped with Axelson actuators: ROV02, 03, 04, 07 and 10).

3.3 The pumps will take approximately 2.5 minutes to recharge the accumulators after a well has been opened, therefore this is the minimum time delay between opening wells. Valve operation is via pilot valves similar to those installed in the 310 bar system.

4 EMERGENCY ACCUMULATOR BANK

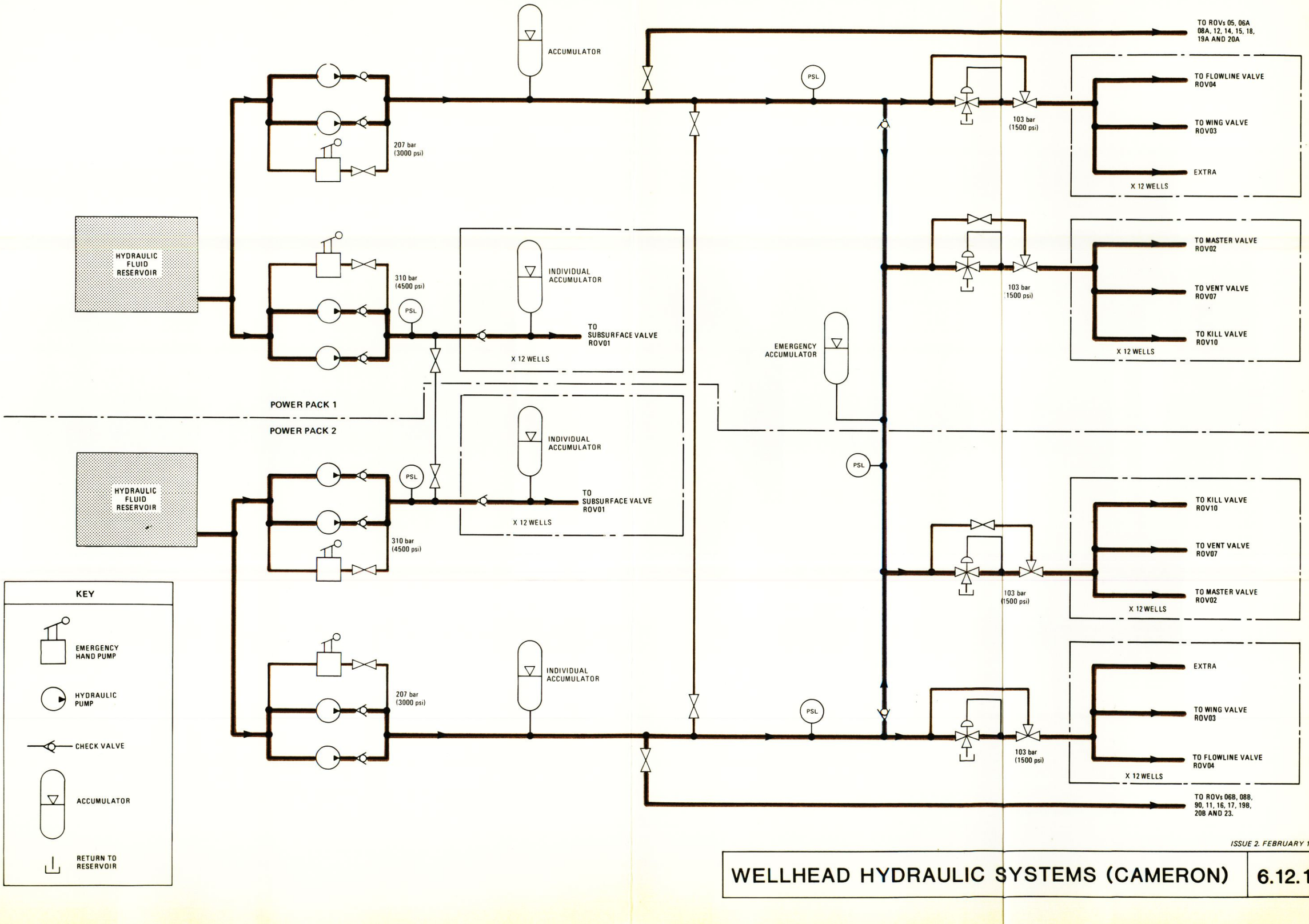
4.1 This unit comprises five 303-litre spherical accumulators, two check valves, a filter, a manifold with inlet and outlet isolating valves, and a pilot valve for initiating an alarm in the event of accumulator low pressure.

4.2 Connected to the 207 bar emergency headers of units 1 and 2 the emergency accumulators provide sufficient storage capacity to operate all valves (ROV02, ROV07 and ROV10) in one cluster should the power unit fail.

5 POWER AND CONTROL SYSTEMS (207 and 414 bar)

Power for the air motors is provided from the 10 bar plant air system. The pilot valves are supplied from the 3 bar instrument air system. A nitrogen supply is installed for emergency use.

END



ISSUE 2. FEBRUARY 1981

WELLHEAD HYDRAULIC SYSTEMS (CAMERON) 6.12.1

WELLHEAD HYDRAULIC SYSTEM (MASONEILAN)

1 GENERAL

Power for the 24 wellhead choke and control valves is supplied by a Masoneilan hydraulic system.

2 CHOKE VALVE SYSTEM

2.1 Power is provided by two pumps, GA116AX and BX, operating in parallel. Each pump has a capacity of 38 litres/min at 100 bar discharge pressure, and is driven by a 7.5kW electric motor operating at 1430 rev/min. Both pumps are provided with suction and discharge filters.

2.2 Both pumps run continuously, with one pump pressurising the system and the other as a back-up. At a system pressure of 65 bar or above, the back-up pump relieves into the reservoir, and at a pressure of 100 bar the main pump relieves into the reservoir. The combined relief line incorporates a heat exchanger to limit the temperature of the oil when recycling.

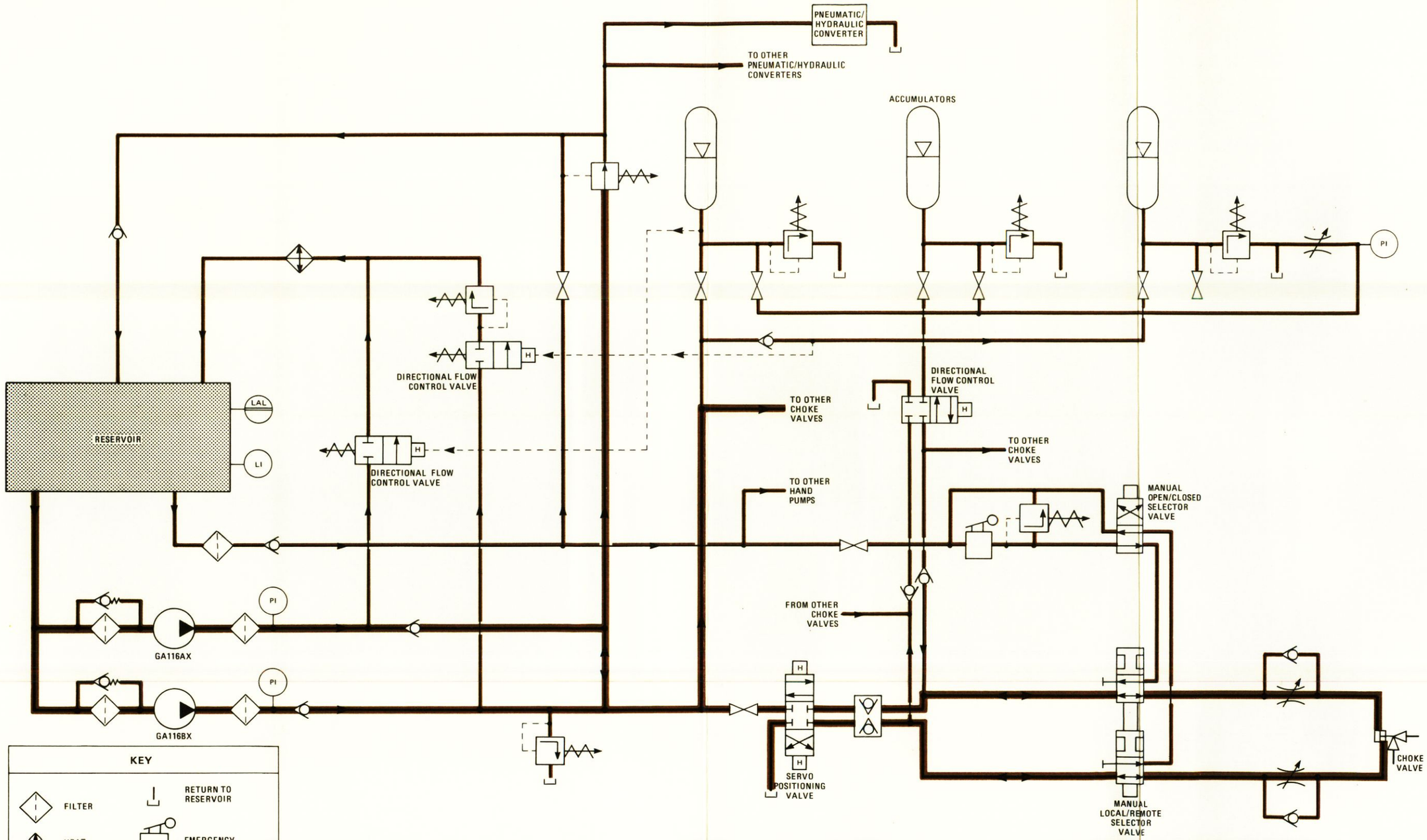
2.3 Three hydraulic accumulators are incorporated in the system. Two, each of 30 litres capacity, provide sufficient reserve capacity to shut all choke valves in the event of pump failure, and the third, of 10 litres capacity, acts as a normal system accumulator. The reserve accumulators are normally isolated from the choke valve control line by a control valve.

2.4 The reservoir is of 290 litres maximum capacity. A level switch installed in the tank stops the pumps at low level and initiates an alarm in the Platform Control Room and in the Main Control Room on QP.

2.5 Control of each choke valve is via a servo positioning valve, which receives signals from the choke valve controller and from a feedback positioner on the choke valve, via a pneumatic/hydraulic converter. Any discrepancy in the signals results in the servo valve moving in the appropriate direction to reposition the choke valve and thus equalise the signals. Power for the servo valve is provided from the pumps' discharge line via a 30 bar pressure-reducing valve.

2.6 A standby hand pump of 0.02 litre capacity per double stroke and a selector valve are installed in a local control box for each valve. These enable each choke valve to be operated manually should complete failure of the power unit occur. The hand pump can take its suction from the return side of the valve actuating cylinder to permit the pump to operate in the event of complete fluid loss from the reservoir, isolation of the normal suction line being by a hand valve.

END



KEY

- FILTER
- HEAT EXCHANGER
- RELIEF VALVE
- PRESSURE CONTROL VALVE
- RETURN TO RESERVOIR
- EMERGENCY HAND PUMP
- THROTTLE VALVE
- PILOT-CONTROLLED CHECK VALVE
- CHECK VALVE
- SPRING-LOADED CHECK VALVE

ISSUE 1. JULY 1980

WELLHEAD HYDRAULIC SYSTEM (MASONEILAN) 6.12.2

METHANOL STORAGE AND INJECTION

1 GENERAL

1.1 Methanol injection facilities are provided to prevent the formation of hydrates in the wellheads and in the sub-sea gas lines. Methanol for these two applications is taken from a common storage tank with additional surge storage provided for wellhead injection.

2 METHANOL STORAGE

2.1 Methanol storage tank FB100 is a fixed rectangualr vessel of 65m^3 capacity located in area T1 of the service deck.

2.2 The tank is protected against overpressurisation by two pressure relief valves relieving to atmosphere through flame traps. Normal tank venting is to atmosphere through a 2 inch line incorporating a flame trap.

2.3 Tank filling is from 9m^3 capacity portable tanks located at the east and west sides of the platform.

2.4 Additional surge storage for wellhead injection is provided by FA104. This vessel has been converted from its original duty as a test separator to form the atmospheric pressure surge tank. It is fitted with a level gauge, level transmitter and an atmospheric vent incorporating a flame trap. FA104 is located on the south side of CDP1 adjacent to modules WH1A and WH1B.

3 METHANOL INJECTION

3.1 The 24 methanol injection pumps, GA150 A–Z, used for wellhead injection are mounted below FA104. Each pump injects methanol to one wellhead. The pumps are arranged in six sets of four, each set being driven by an electric motor. They take suction by gravity from FA104. If low level is reached in FA104 the injection pumps are stopped.

3.2 Three pumps, GA111 A, B and S are provided to inject methanol into the sea lines through four remote-operated valves, ROV214, 215, 216 and 217. These valves are arranged so that one, two or three pumps feed either sea line, or one pump can supply one line while two pumps feed the other line.

3.3 Two injection pumps, GA114 A and S, are arranged to supply methanol from the storage tank FB100 to the surge tank FA104. Should the need arise, a manifold connecting the discharge lines from the 24 wellhead injection pumps with GA114 A and S enables a selected well to receive a high methanol flow rate from GA114 A and S. Level control on FA104 starts and stops GA114 A and S to maintain the liquid level.

3.4 Three injection pumps GA110 A, B and S are no longer in service, but remain installed. They were used for wellhead and scrubber-desander methanol injection. The scrubber-desanders are no longer in use and wellhead injection is provided by the 24 separate pumps to give accurate control of injection rates to each wellhead.

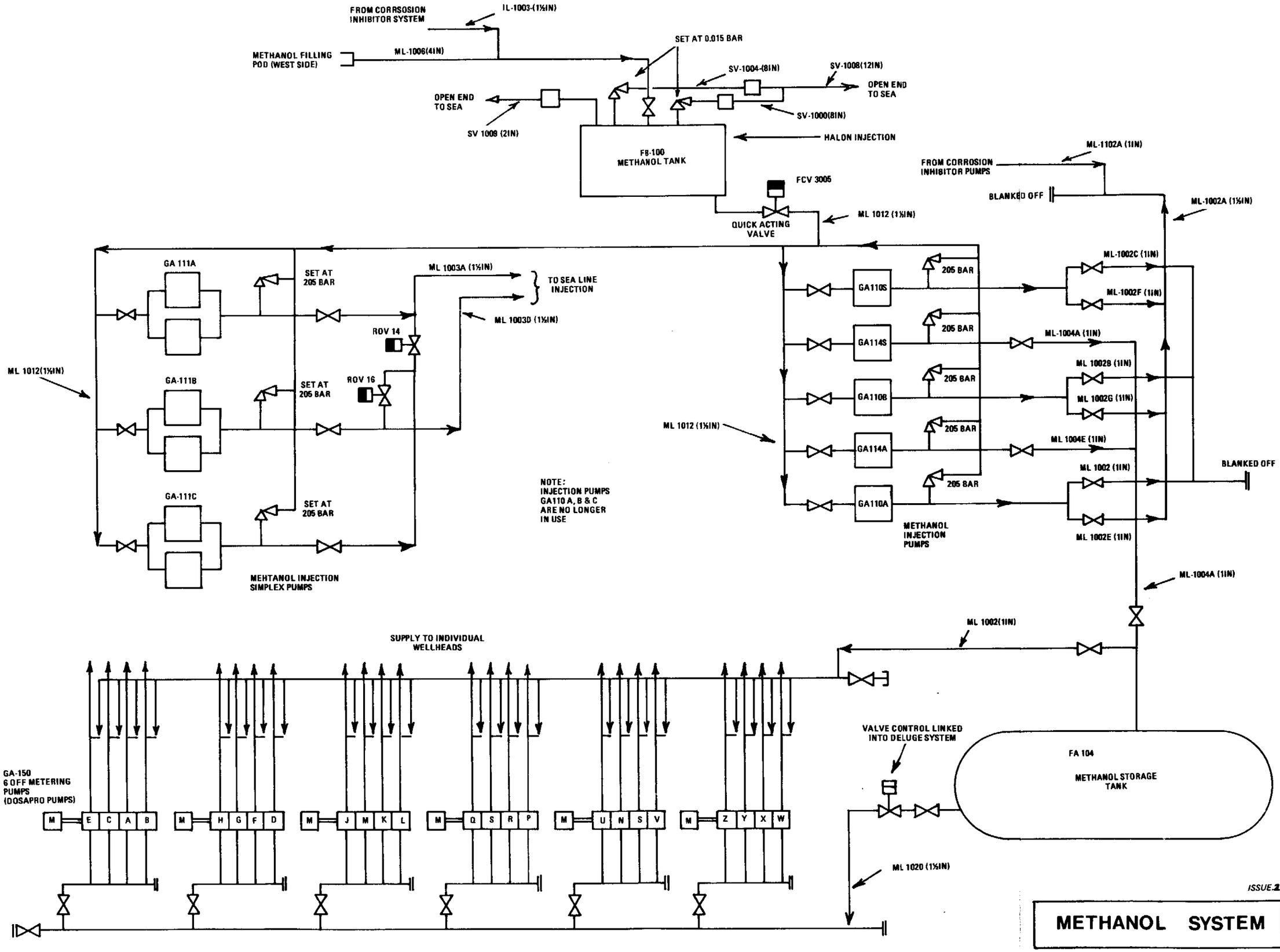
4 CONTROL

4.1 The remote-operated valves in the injection lines are controlled from either the Platform Control Room or QP Control Room. Power for the operation of these valves is provided from the 207 bar hydraulic system; all other valves in the Methanol System are hand operated. Outlet lines from the methanol tank FB100 and the methanol surge tank FA104 are provided with quick closing valves manually activated locally or from the control room, and automatically by fire detection in the wellhead modules.

4.2 Methanol pumps GA111 A, B and S, and GA114 A and S are controlled via pushbuttons located in the MCC room, CDP1 control room, QP control room and the local control panel. Transfer/ injection pumps GA114 A and S are controlled in a similar manner. Additionally these two pumps are switched by the level controller on FA104. If high level in FA104 is reached, pumps GA114 A and S are stopped and an alarm is annunciated in CDP1 and QP control rooms, if low level is reached, the injection pumps GA150 are stopped and alarmed in CDP1 and QP control rooms.

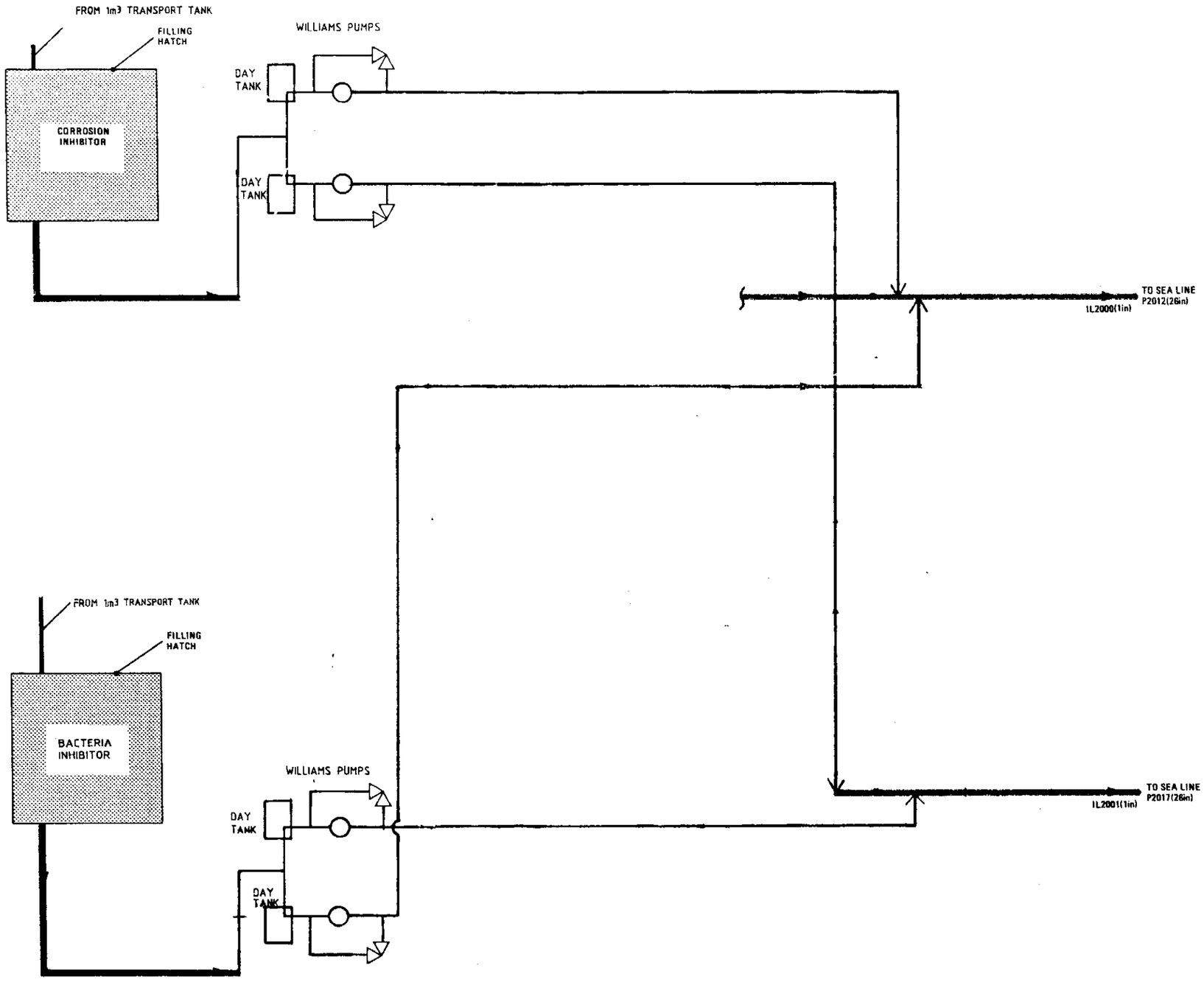
4.3. Pumps GA111 A B and S and GA114 A and S cannot be set for automatic changeover for duty and standby. If an operating pump fails its replacement must be started manually.

4.4 Fire detection or low liquid level in methanol storage tank FB100 will initiate shutdown of all injection pumps.



ISSUE 2 OCTOBER 1982

METHANOL SYSTEM	6.13


FROM 1m3 TRANSPORT TANK
FILLING HATCH
CORROSION INHIBITOR
WILLIAMS PUMPS
DAY TANK
DAY TANK
TO SEA LINE P2012(26in)
1L2000(1in)
FROM 1m3 TRANSPORT TANK
FILLING HATCH
BACTERIA INHIBITOR
WILLIAMS PUMPS
DAY TANK
DAY TANK
TO SEA LINE P2017(26in)
1L2001(1in)

CORROSION / BACTERIA INHIBITOR

1. GENERAL

1.1 The inhibitor system is located outside PM3 on the east side.

The system comprises two $1m^3$ transportation tanks, one for corrosion inhibitor and one for bacteria inhibitor. Each tank is connected to a storage tank, and the inhibitors are injected by 4 William pumps into their rspective sealines. The injection rate is set to 3 litres/day.

1.2 The corrosion/bacteria inhibitor is injected into each sealine via an 1" line which incorporates a manual isolating valve at the injection point.

E N D

NORMAL LIGHTING

1 GENERAL

1.1 Lighting on CDP1 is of the following three types:

(a)	Normal lighting	Supplied at 220V ac single-phase from distribution boards LL101, LL01, LL02 and LL03 which are fed from MCC switchboards A and B.
(b)	Emergency lighting	Supplied at 48V dc from the platform central dc supply.
(c)	Emergency maintained lighting	Normal 220V ac luminaires provided with rechargeable batteries and automatic changeover facilities.

1.2 Only (a) above is dealt with in this section and reference should be made to Section 10.14 for Emergency Lighting.

2 DESCRIPTION

2.1 Distribution

2.1.1 Four distribution boards control the lighting supplies at 220V ac; the main features are shown in Diagram 6.15. A few outlets supply small power consumers but these are treated here as part of the lighting system.

2.1.2 The boards are fed from across the output lines of the 380/220V transformers and balanced between pairs of phases. Some outlets incorporate a contactor in series with the controlling MCCB.

2.1.3 Certain lighting circuits come on automatically through their contactors during hours of darkness. The contactors are operated together by an 'electric eye' or sunswitch. Other lighting circuits are switched on manually in groups by pushbuttons, although only those whose MCCBs have previously been left closed will in fact come on. Each pushbutton has an internal indicating lamp. A few services (those without contactors) are energised as soon as the input and feeder MCCBs are closed.

2.1.4 Normal lighting is available as long as either the 5.5kV input via submarine cable from QP or the standby 380V supply is present. If both of these should fail, the only lighting available is the emergency lighting described in Section 10.14.

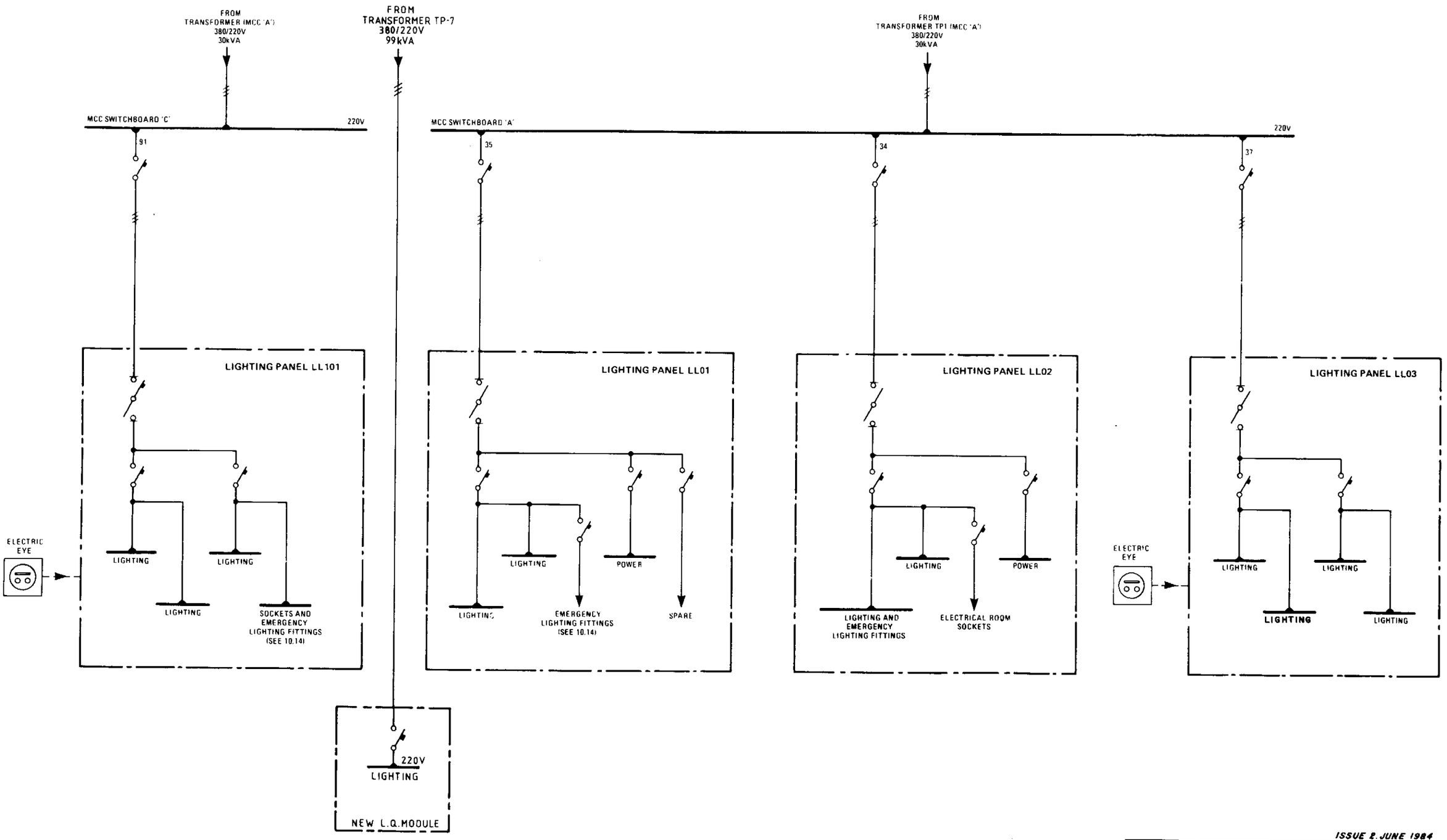
2.2 Lighting Fittings

The following types of lamps are fitted:

(a)	Modules PM4, BR1, BR2:	Fluorescent, cold-cathode, tubular.
(b)	Modules WH1, PM2, PM3:	Fluorescent, cold-cathode, tubular. Low-pressure sodium vapour.
(c)	Outside areas:	Mercury vapour. High-pressure sodium vapour.

Except in the Quarters areas, all fittings are enclosed for Division 1 conditions.

END


FROM
TRANSFORMER (MCC 'A')
380/220V
30kVA
FROM
TRANSFORMER TP-7
380/220V
99kVA
FROM
TRANSFORMER TP1 (MCC 'A')
380/220V
30kVA
MCC SWITCHBOARD 'C'
220V
91
MCC SWITCHBOARD 'A'
35
34
37
220V
LIGHTING PANEL LL101
LIGHTING
LIGHTING
LIGHTING
SOCKETS AND
EMERGENCY
LIGHTING FITTINGS
(SEE 10.14)
ELECTRIC
EYE
LIGHTING PANEL LL01
LIGHTING
LIGHTING
EMERGENCY
LIGHTING FITTINGS
(SEE 10.14)
POWER
SPARE
LIGHTING PANEL LL02
LIGHTING
POWER
LIGHTING AND
EMERGENCY
LIGHTING FITTINGS
ELECTRICAL ROOM
SOCKETS
LIGHTING PANEL LL03
ELECTRIC
EYE
LIGHTING
LIGHTING
LIGHTING
LIGHTING
220V
LIGHTING
NEW L.Q.MODULE

HEAVY PORTABLE EQUIPMENT

1. GENERAL

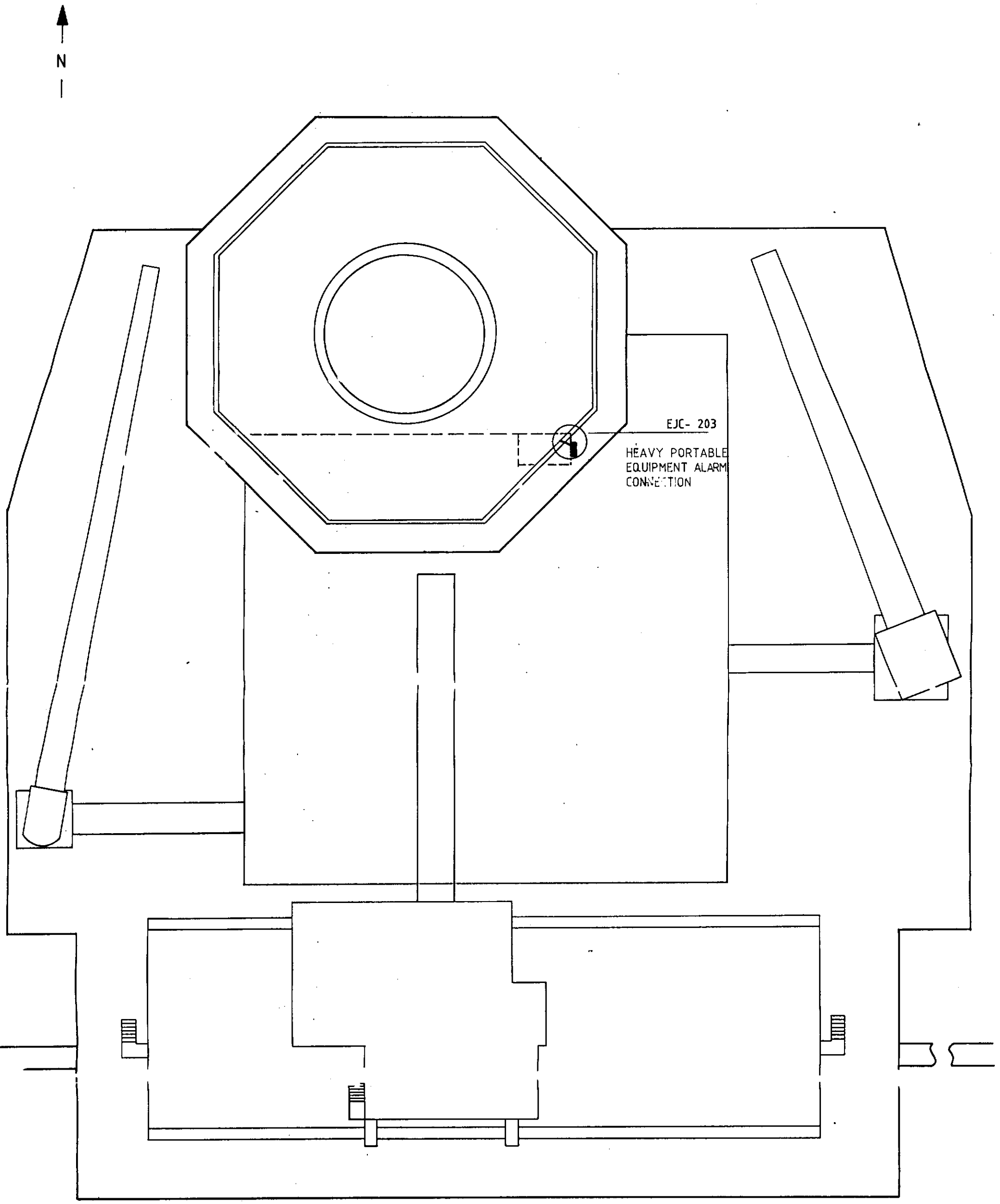
This is a system that provides alarm/power connection for equipment needed temporarily on the platform.
(For location of the connection point see layout diagram 6.15, page 1 and 2)

1.1 Alarm and shut-down

If an alarm is activated on the temporary equipment this will be transmitted to the central control room on the platform (alarm only). Also if an emergency situation takes place on the platform the temporary equipment will be shut down by the shut-down system.

1.2 Electrical

Electrical power supply - 3 x 380 V, 50 Hz - is taken from MCC-C/66-68, and is a four-core 70 sq.mm cable ending in junction box ROV JB nos. 1 and 2. External termination must be done in the junction box. (E.g. heavy equipment such as ROV containers.)



Rev.	Date	DESCRIPTION	by	app.
0	1.3.84	First issue	FS	

Contractor

EU CONSULTANTS A/S
SANDNES NORWAY

elf aquitaine norge a/s
P.O. Box 168
4001 Stavanger

FRIGG FIELD

Job no. 91176
Scale /

Installation CDP1

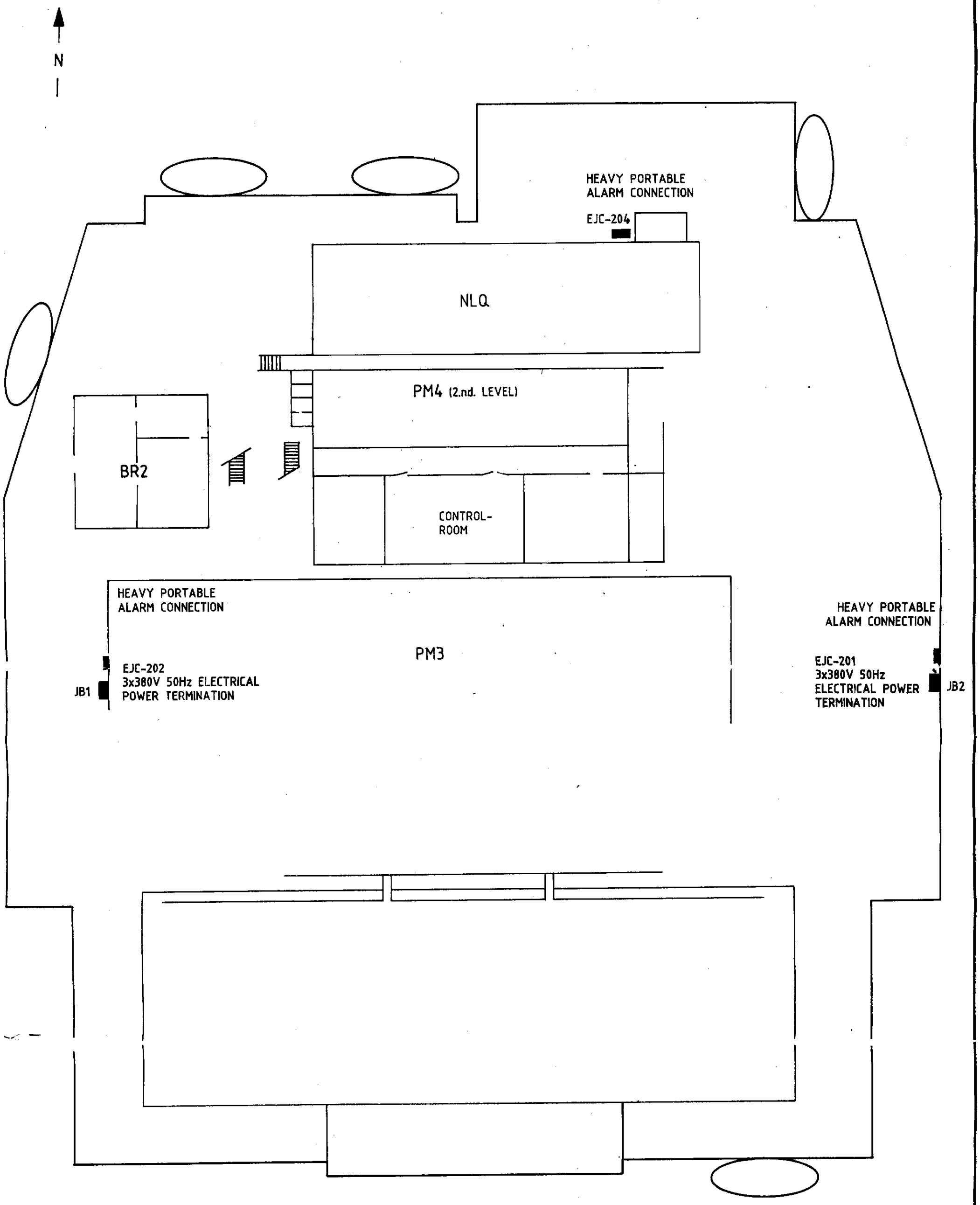
System

HEAVY PORTABLE
EQUIPMENT LAYOUT
PIPE RACK DECK

Drwg. no. FF 6.15

Rev. 0

Sheet 1



0	1.3.84	First issue	FS	
P ··	Date	DESCRIPTION	by	appr.

Contractor

EU CONSULTANTS A/S
SANDNES NORWAY

elf aquitaine norge a/s
P.O. Box 168
4001 Stavanger

FRIGG FIELD

Installation: CDP1
System:
Job no. 91176
Scale /
HEAVY PORTABLE EQUIPMENT LAYOUT PRODUCTION DECK
Drwg. no. FF ___ ___ ___ ___ 6.15 ___
Rev. 0
Sheet 2

CHAPTER 7

TRANSPORT FACILITIES

CONTENTS

DIAGRAM

SUPPLY VESSELS

1 GENERAL

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

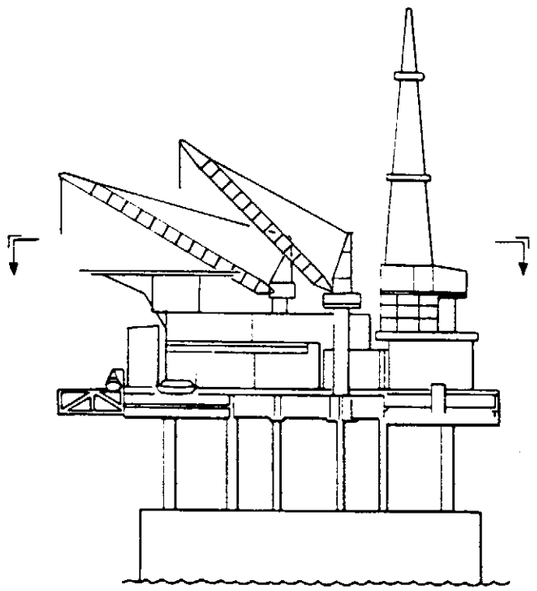
1.2 The table covers relevant data concerning the supply vessels' dimensions and capabilities.

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
'LORD SUPPLIER'	65,60m	15,50m	4,97m	1823	40x12,5m	1000T	978T	—	741T	739m³	Head 80m 160m³/h	Head 80m 162m³/h	Head 80m 162m³/h	—
'TENDER FIGHTER'	69,30m	15,50m	5,70m	2075	40x12,5m	1000T	1000T	6000cbf.	730T	500m³	Head 80m 150m³/h	Head 80m 150m³/h	Head 80m 170m³/h	50 Tonn/h

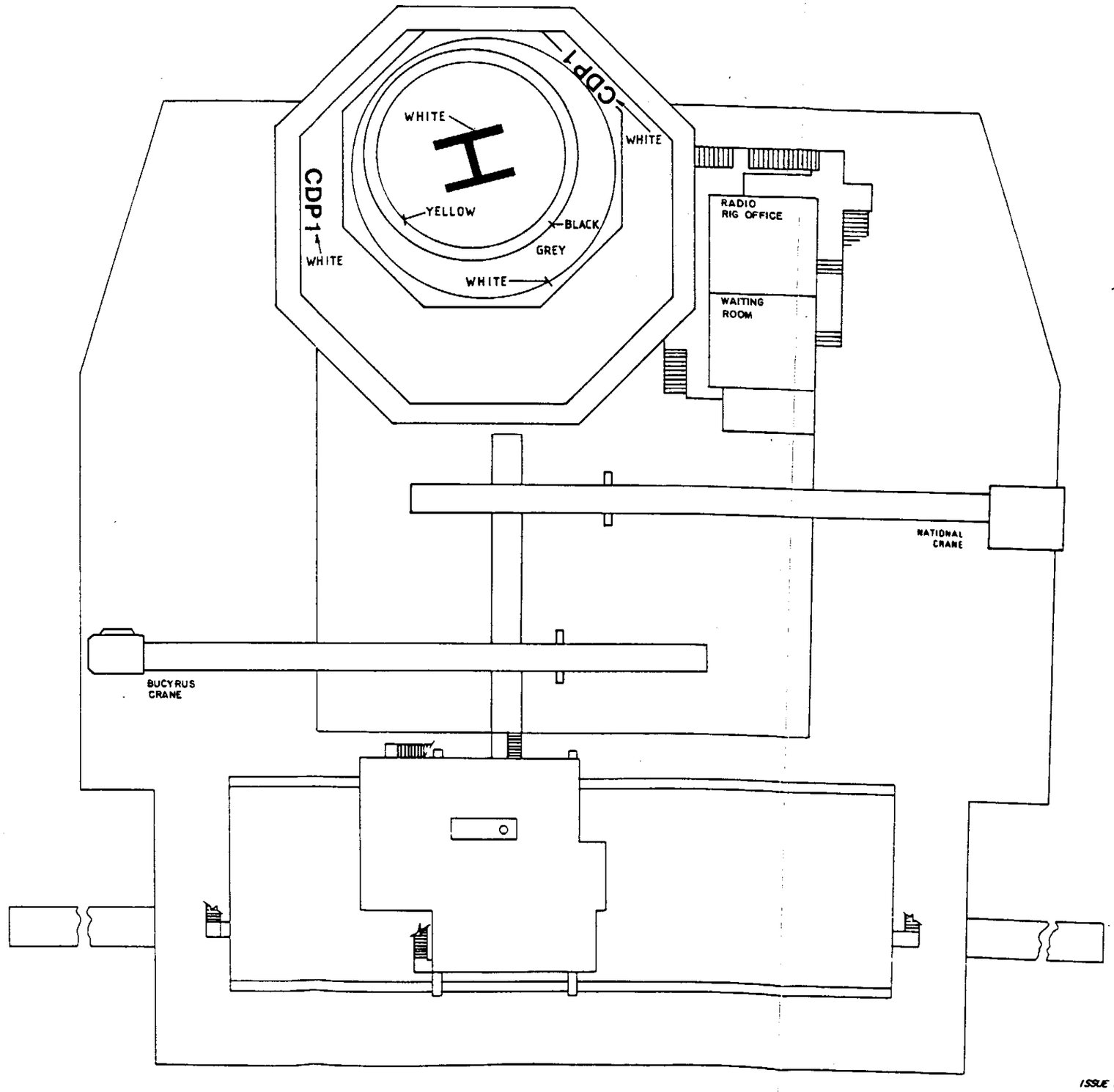
NOTE

'LORD SUPPLIER' AND 'TENDER FIGHTER' ARE EQUIPPED AS FI-FI CLASS II VESSELS.

END



WEST ELEVATION



ISSUE 3. JUNE 1984

HELIDECK	7.2

CHAPTER 8
MATERIALS HANDLING
CONTENTS

DIAGRAMS

CRANES

1 GENERAL

Two pedestal mounted cranes are provided for supply and general lifting duties on the platform; a Bucyrus-Erie Mk 60 marine crane on the west side and a National OS–435 crane on the east side.

2 BUCYRUS-ERIE Mk 60

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

2.2 The boom is 36.6m long and operates within the range 80° above to 12° below horizontal.

2.3 Two cargo handling hoists are fitted to the crane boom, a main hoist and a whip hoist. The main hoist is used to support and handle the loading boom and for general cargo handling. The whip hoist is used for high speed handling of light loads. Protection of the whip hoist is ensured by hydraulic relief at a load of 5.08 tonnes.

2.4 An adjustable boom hoist limit device enables the boom to be stopped at given angles. Actuating pins, located on the boom foot, trip a microswitch which controls the operation of the boom hoist hydraulic motors. An override button located in the operator's cab enables the boom to be operated beyond the set limits.

2.5 An anti two block warning device operates when either hoist hook reaches a predetermined distance from the boom hoist sheaves to initiate a warning bell and to stop the hoist motion.

2.6 The maximum main hoist load performance of the crane at 0° list is as follows:

Radius (Metres)	36.6m Boom	
	Boom Angle (Degrees)	Load (Tonnes)
7.62	80	43.09
9.14	78	40.81
10.66	76	37.64
12.19	73	34.46
13.71	71	30.84
15.24	68	27.21
16.76	65	24.49
18.28	63	21.77
19.81	60	19.95
21.33	57	18.14
22.86	54	15.87
24.38	51	13.60
25.90	48	11.79
27.43	45	10.43
28.95	41	8.61
30.48	38	7.25
32.00	34	5.89
33.52	30	4.53
35.05	25	3.63
36.57	18	3.17
38.10	0	2.72

2.7 The maximum whip hoist load performance is 5 tonnes at 6.10m to 32.00m radius.

3 NATIONAL OS–435

3.1 The National OS–435 crane is powered by a General Motors 12V–71 diesel engine via hydraulic transmission.

3.2 The rotating frame is an all-welded, deep beam construction with an enclosed machinery compartment. Access to machinery is from the cab.

3.3 The lattice type boom is 36.6m long and of tubular steel construction. It operates within a range of 0° to 79° above the horizontal.

3.4 Two cargo handling hoists are fitted to the crane boom, a main hoist for general cargo handling and a whip hoist for high speed handling of light loads.

3.5 An adjustable boom angle limiter enables the boom to be stopped at a predetermined angle, both high and low. The two limiting devices operate independently of each other, thus permitting the boom to be lowered when the high limit is reached and raised when the low limit is reached. An override valve in the operator's cab enables the unloaded boom to be lowered beyond the horizontal.

3.6 A line travel limiting device operates when either hoist hook reaches a predetermined distance from the boom hoist sheaves to stop the hoist motion.

3.7 The maximum main hoist load performance of the crane at 0° list is as follows:

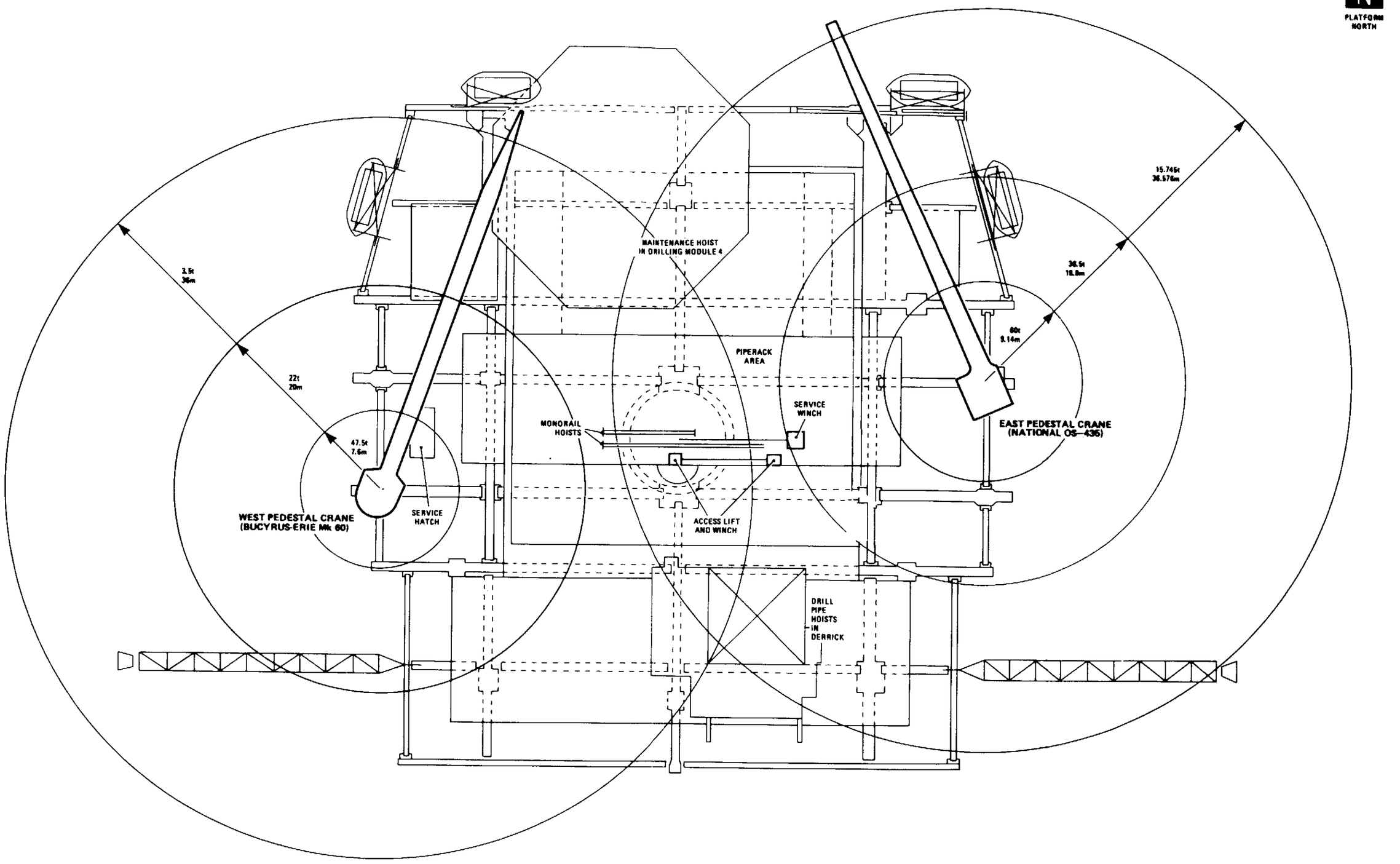
Radius (Metres)	36.6m Boom	
	Boom Angle (Degrees)	Load (Tonnes)
9.1	78	52.56
10.7	76	48.66
12.2	73	46.12
13.7	71	43.53
15.2	68	41.36
16.8	65	38.91
18.3	63	35.14
19.8	60	32.06
21.3	57	29.34
22.9	54	26.93
24.4	51	24.98
25.9	48	23.17
27.4	45	21.54
29.0	41	20.04
30.5	38	18.73
32.0	33	17.55
33.5	29	15.82
35.0	23	13.78
36.6	16	11.74

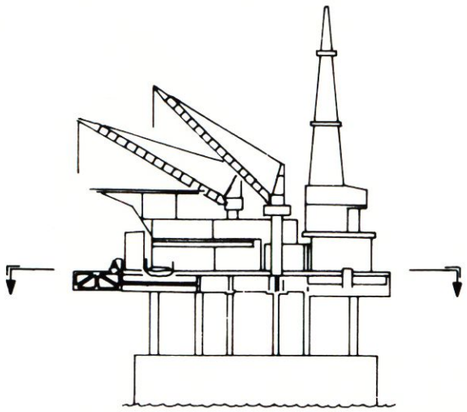
3.8 Whip hoist load performances at low and high speeds are as follows:

(a) Low speed: 7 tonnes at 9m to 36m radius.

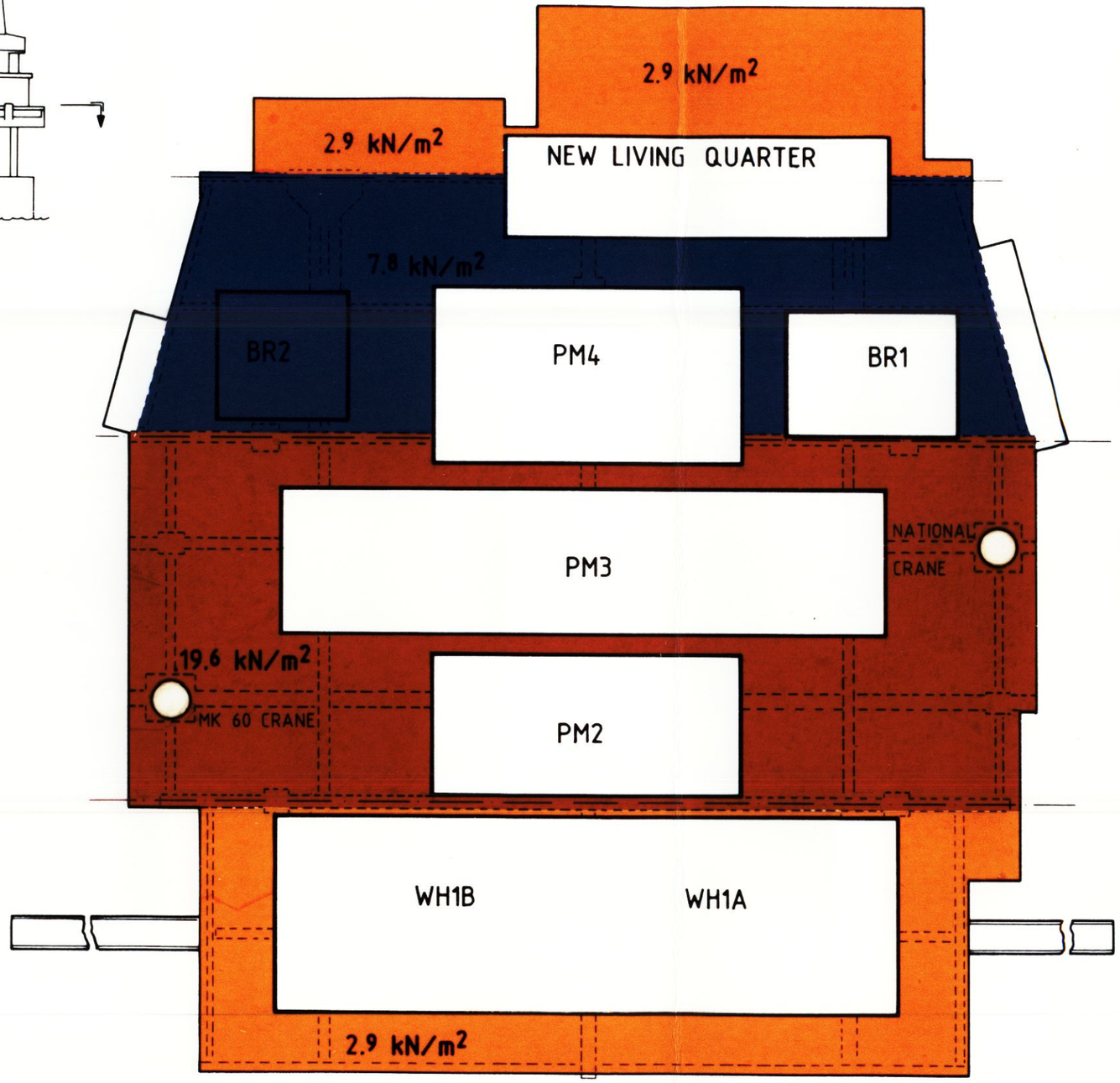
(b) High speed: 5.8 tonnes at 9m to 36m radius.

END


N
PLATFORM NORTH
MAINTENANCE HOIST IN DRILLING MODULE 4
PIPERACK AREA
SERVICE WINCH
MONORAIL HOISTS
EAST PEDESTAL CRANE (NATIONAL OS-436)
15.74St 36.57m
36.5t 16.8m
60t 9.14m
35t 30m
22t 20m
47.5t 7.6m
WEST PEDESTAL CRANE (BUCYRUS-ERIE Mk 60)
SERVICE HATCH
ACCESS LIFT AND WINCH
DRILL PIPE HOISTS IN DERRICK



WEST ELEVATION



MAIN DECK

ALLOWABLE LIVE LOAD

N

PLATFORM NORTH

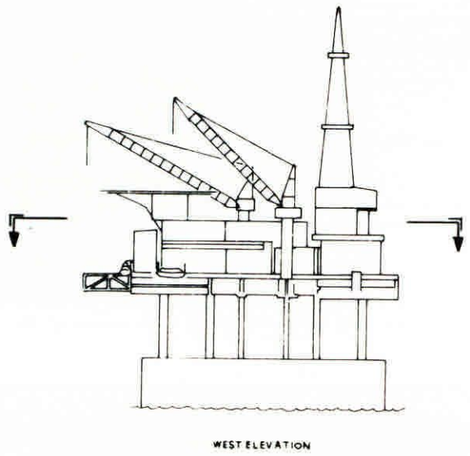
2.9 kN/m2
0.3 T/m2

7.8 kN/m2
0.8 T/m2

19.6 kN/m2
2.0 T/m2

ISSUE 1. JUNE 1984

LIVE LOAD ON OPEN DECKAREA Main deck	8.1.2



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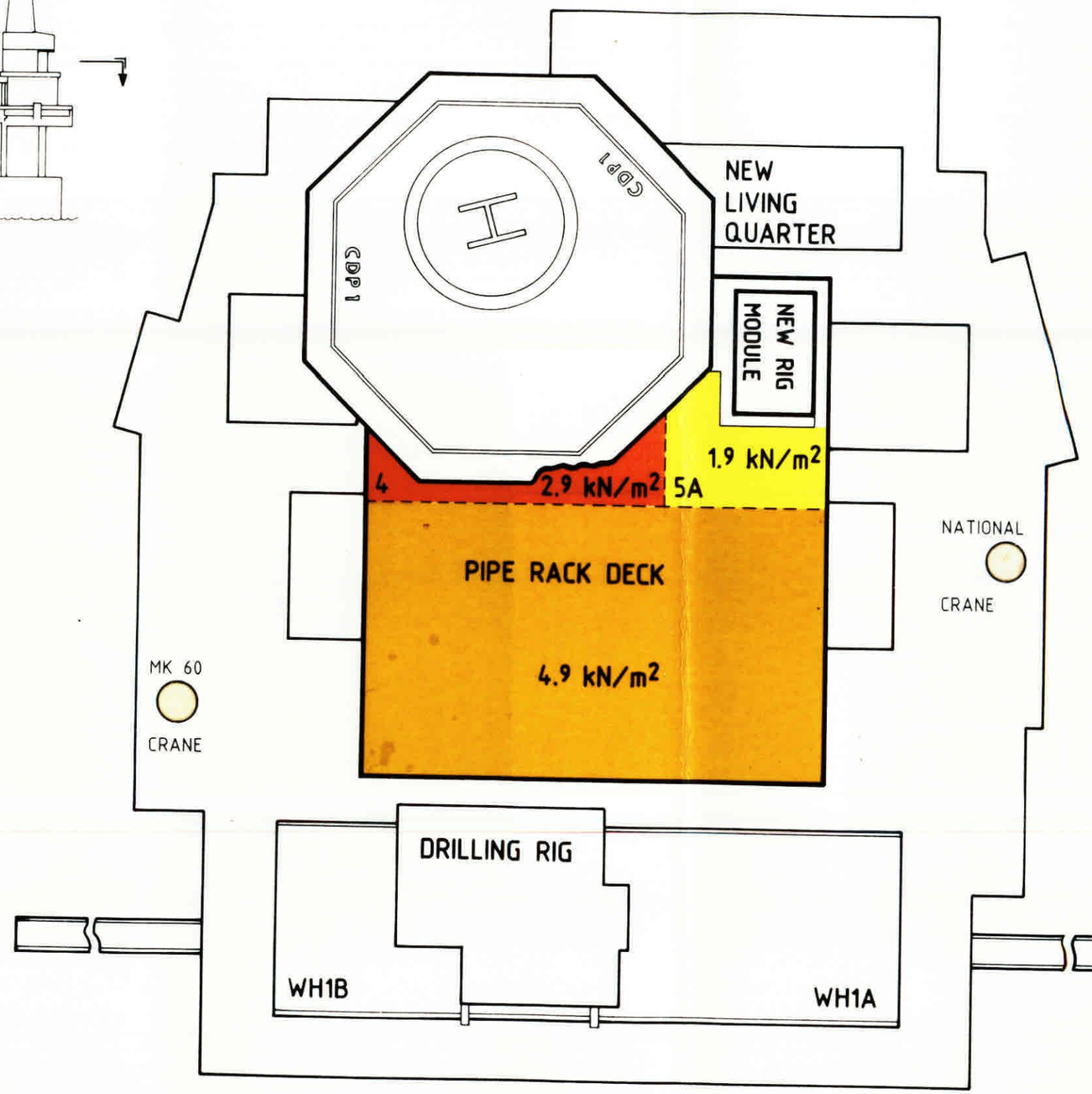
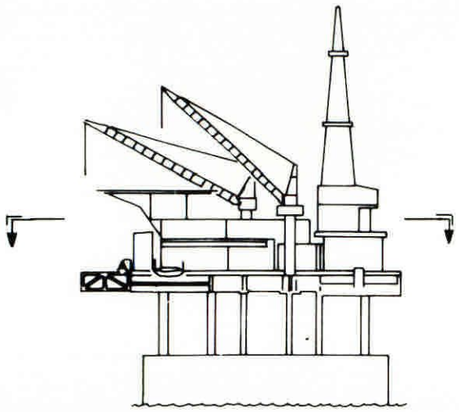


PIPE RACK DECK

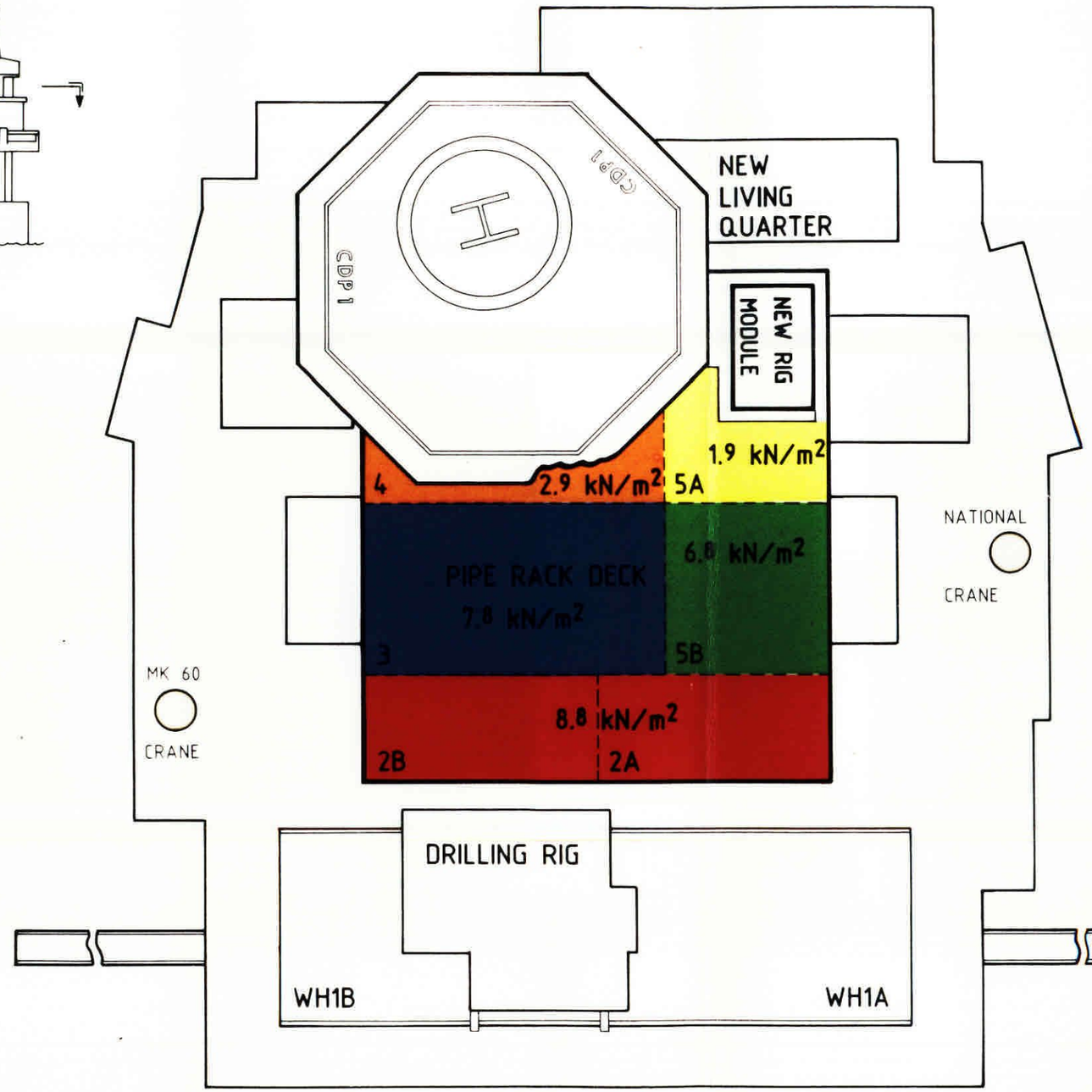
ALLOWABLE LIVE LOAD

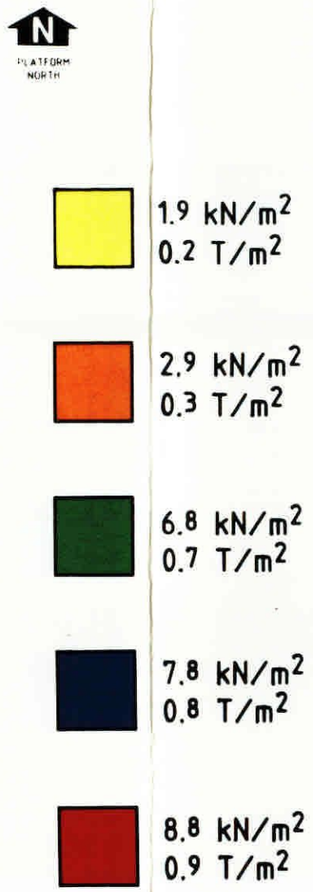
ISSUE 1. JUNE 1984

LIVE LOAD ON OPEN DECKAREA Pipe rack deck	8.1.3



WEST ELEVATION





PIPE RACK DECK

ALLOWABLE LIVE LOAD

SUPPORTED BY PIPE RACK RAILS

ISSUE 1 JUNE 1984

LIVE LOAD ON OPEN DECKAREA 8.1.4

Pipe rack deck rails

LIFTING EQUIPMENT

1 GENERAL

The following lifting equipment is installed:

(a) Monorail system.

(b) Service winch.

(c) Access lift.

(d) Chain hoists.

(e) Dusterloh - winch

2 MONORAIL SYSTEM

2.1 The twin monorail system suspended under the core cap provides the facility for transporting construction and maintenance materials across Service Deck No 2 to the core.

2.2 Each monorail beam is 21m long and carries two trolley mounted chain hoists.

2.3 The hoists are each rated at 5 tonnes. The total lifting capacity of the monorail system when using the four hoists is 20 tonnes.

2.4 The hand-operated hoists operate through a vertical lifting distance of 4m.

2.5 Materials are initially loaded on pallets and lowered by crane through the main deck access hatch to Service Deck Area SD1. The pallets are then raised by the 5-tonne hoists and transported along the monorails which terminate above the core. Materials required in the core are then transferred to the service winch.

3 SERVICE WINCH

3.1 The three-speed service winch, located in Module SD3, provides a 20-tonne lifting facility for the transfer of construction and maintenance materials down the core.

3.2 The 5-tonne capacity winch carries 539.5m of 6.5mm diameter cable on its winch drum.

3.3 A pad eye and pin located in the core cap is used to suspend the double sheave blocks through which the cable is reeved into a four-line system which enables a 20-tonne load to be raised.

3.4 Pallets are initially loaded outside the core area and transported with the use of a 5-tonne travelling hoist suspended from the monorails which terminate above the core position. The pallets are then transferred to the power winch lower sheave hook and suspended by 20-tonne capacity rope slings.

4 ACCESS LIFT

4.1 The access lift installed in the core has a loading capacity of 500 kg or three men.

4.2 The lift travels 110m, from the top to the bottom of the core.

4.3 The lift cage is approximately 850mm x 1400mm in floor area. The loading and cage gates are interlocked for safety reasons.

4.4 **The lift winch, Düsterloh, is located in module SD3.**

4.5 To facilitate visual inspection of the core, the hoist cage may be started and stopped at any point in it's travel.

(a) An escape hatch in the cage roof and floor which gives access to the hoist guide rails which can be used to climb to the next intermediate platform.

5 HOISTS AND RUNWAYS

5.1 To assist in the servicing of the various items of equipment, overhead runways have been installed.

5.2 The following four hand-operated chain hoists are supplied for use on the various overhead runways:

Quantity	Type	Height of Lift
1	3-tonne chain hoist with travelling trolley	3,04m
1	1/2-tonne chain hoist with travelling trolley	3,04m
2	2-tonne chain hoist on hook suspension	3,04m

6 DUSTERLOH WINCH

6.1 Design code
6.2 Description
6.3 General data
6.4 Main data
6.5 Performance system
6.6 Equalizing system

- DRAWINGS

60 - 1222 rev 1 LEVAHN

DÜSTERLOH WINCH

6.1. DESIGN CODE

Norwegian Mining regulations (Gruveheisforskriftene)
German Design code for personnel lifting underground
T.A.S.S. 15020 Design code
Rules for lifting appliances 1980.

Working class: V2 (4000H)
Safe working load: 15 KN

6.2. DESCRIPTION

The winch consists of a double-barrel drum with Lebus grooves. The drum is connected to a steel frame.

The winch is equipped with a reduction gear.

There are two brakes, one Multi-disc brake and one double shoe brake with lifting cylinder.

6.3. GENERAL DATA

The purpose of this winch is lifting/lowering a guided cage inside Central core of CDP1 for visual inspection of core and risers.

6.4. MAIN DATA

- Air motor type: DM08: 12,3 KW at 2000 rpm.
  Working air pressure: 6 bars
  Air consumption : 11,7 Nm^3/mn

- Reduction gear type RAF 50
  Max static torque : 8000 Nm
  Gear ratio : 70,51

- Shoe brake on drum
  Braking torque : 12.250 Nm

- Multi-disc brake
  Braking torque : 12.200 Nm

- Safety factor : 3

- Drum capacity : 2 x 122 m in 5 layer

6.5 PERFORMANCE DATA

At 1st layer : force : 18431N
speed : 0,63 m/s
At 5th layer : force : 15000N
speed : 0,77 m/s

6.6 EQUALIZING SYSTEM

6.6.1 Design code

Norwegian Mining regulations (Gruveheisforskriftene)
NS5514 - Cranes and Crane machinery
EAN spec.: Material spec. FF 1021 S002
spec.: Fabrication spec. FF 1021 S003
spec.: Painting spec. FF 1021 S004/005

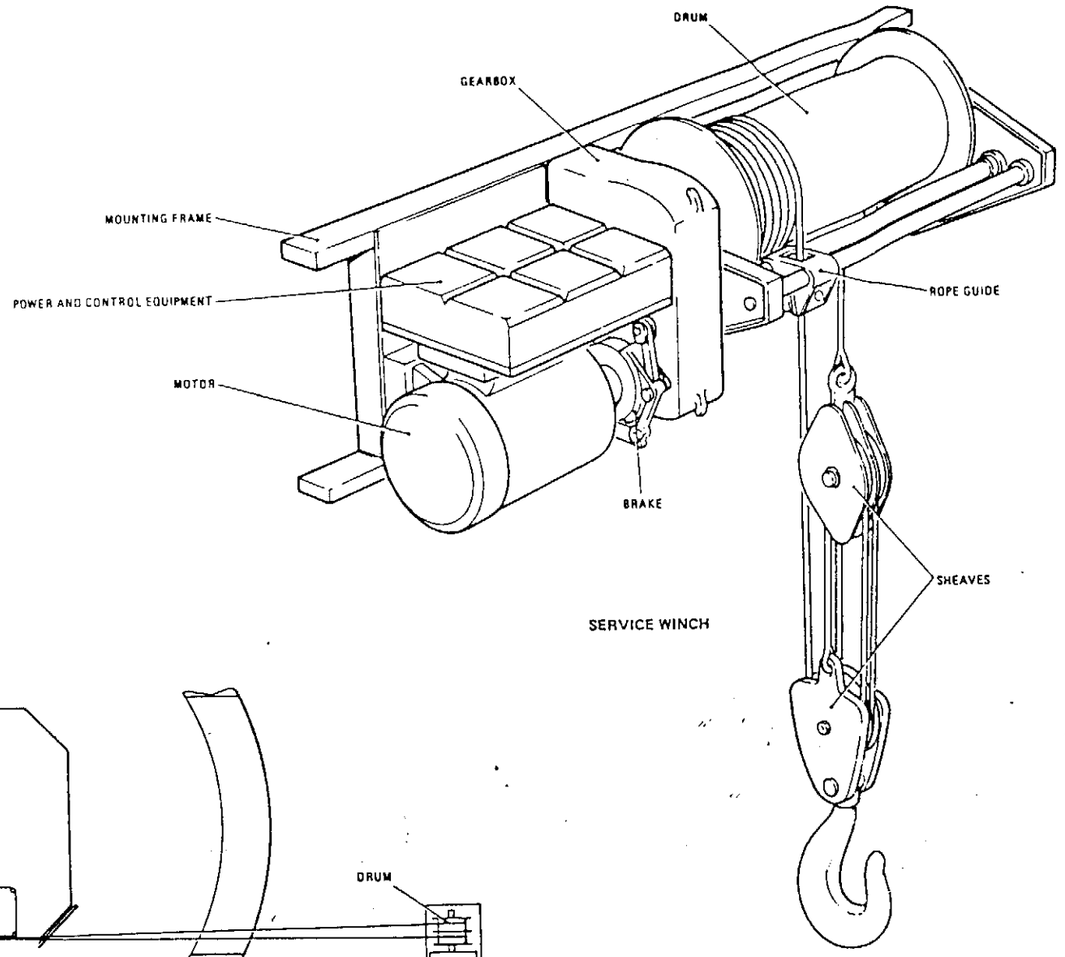
Safe working load: 15 KN

6.6.2 Description

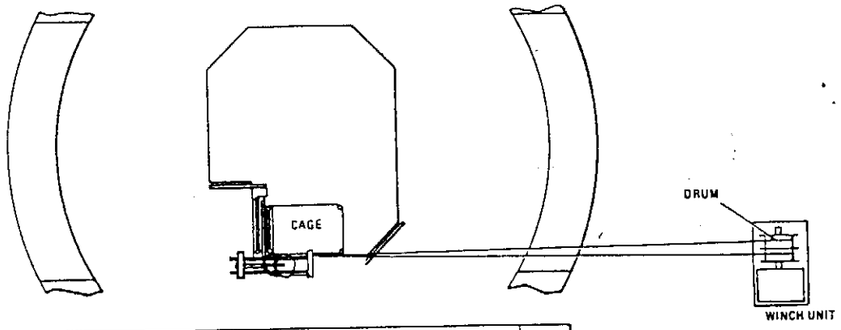
The equalizing system consists of a pair of hydraulically balanced wire sheaves.

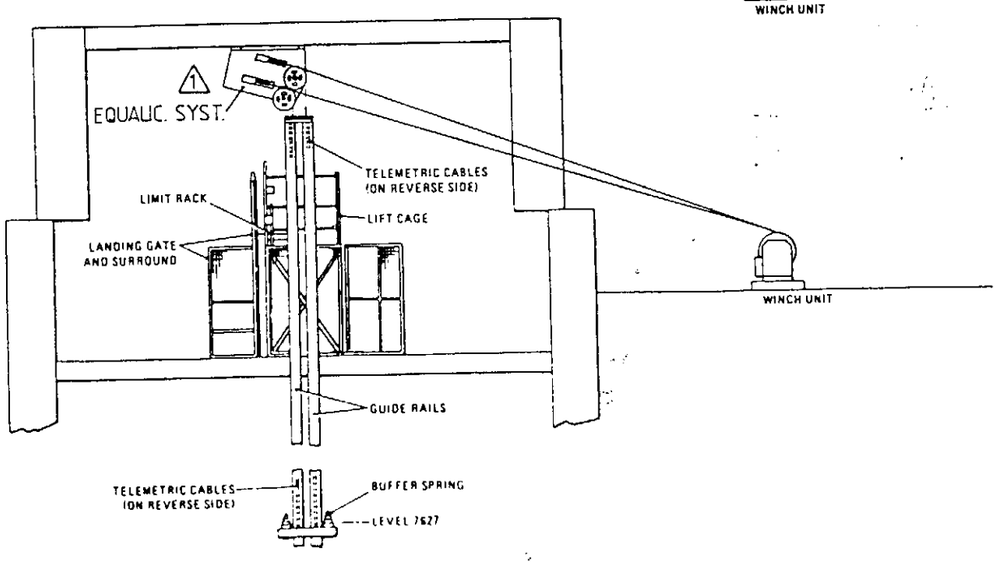
The system will balance a difference in wirelength between the two wires of approx. 1000mm.

In case of failure of one wire, the load will have a gentle transfer to the remaining wire because of the restriction of the oil flow between the pairs of cylinders.

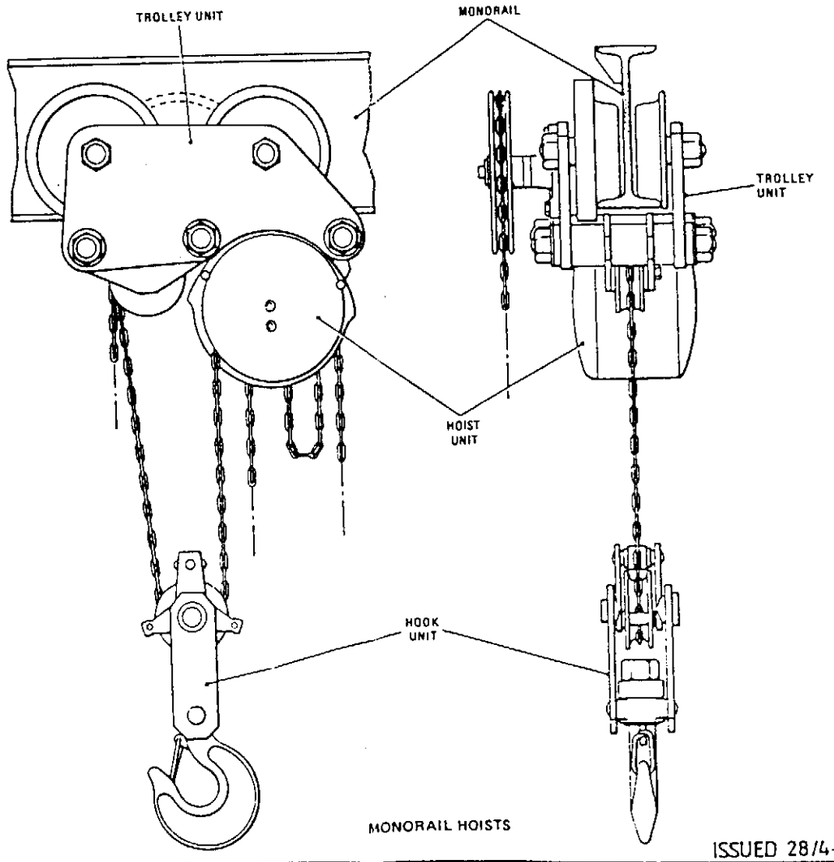


SERVICE WINCH





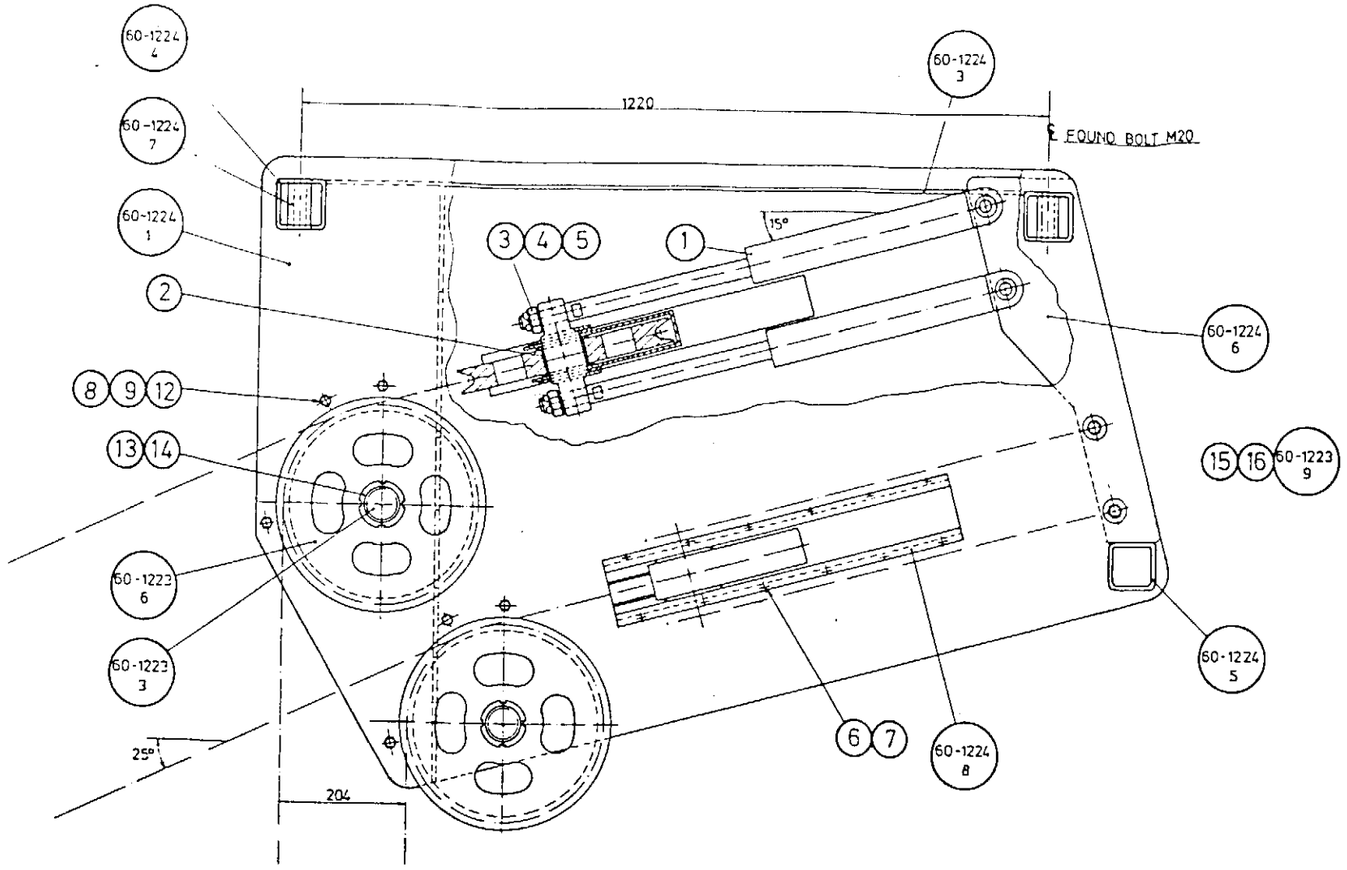
ACCESS LIFT

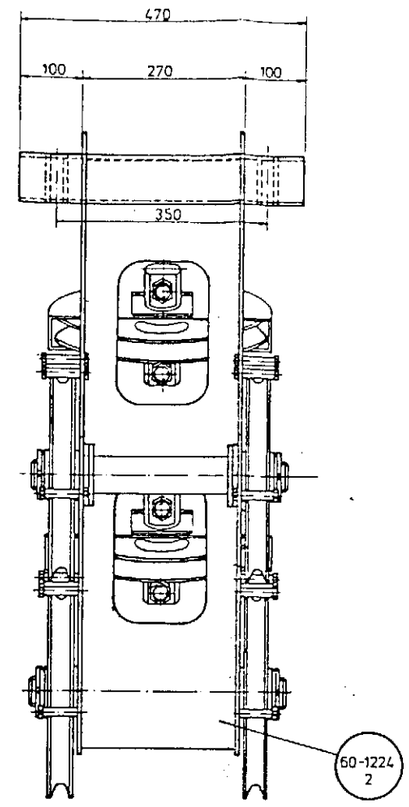


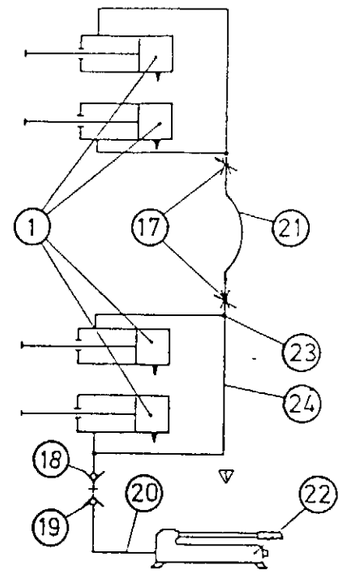
MONORAIL HOISTS

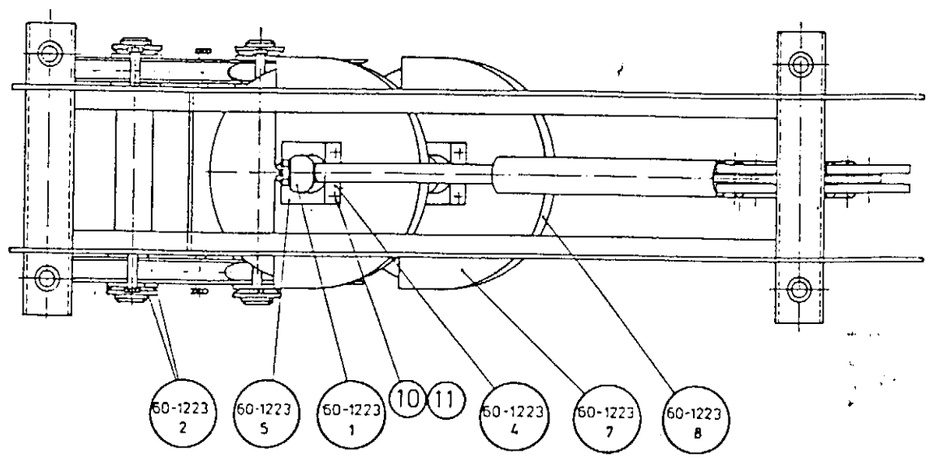
ISSUED 28/4-86

elf	elf aquitaine norge a/s p.o.box 168 – 4001 Stavanger	
	~~Contract~~ LIFTING EQUIPMENT	8.2
FRIGG FIELD	Dwgr. no FF 91 21 26 9007	Rev. 1 / Sheet /









				24	PIPE ϕ12 ~ 800	Stainless		
		3	3	23	PIPE FITTING evT 12L FM			HYDROSCAN
		1	1	22	HANDPUMP ENERPACK P18		A/S STORM MARTEN
		1	1	21	HOSE SAE 100 R1T-3/8"-600MM+KUPL.3/8"-3/8"	BSP UTV GJ	HYDROSCAN
		1	1	20	HOSE SAE 100 R1T-3/8"-4000MM+KUPL.3/8"-3/8"	BSP UTV GJ	"
		1	1	19	RAPID COUPLING 3/8" NO 5558-03-06 FEMALE		"
		1	1	18	RAPID COUPLING 3/8" NO 5558-02-06 MALE		HYDROSCAN
		2	2	17	TROTTLE VALVE TYPE MG8 G10/V		REXROTH
		4	4	16	WASHER M16	St	GALV
		4	4	15	HEX NUT M16 NYLOC	8	GALV
		4	4	14	LOCK WASHER MB 11		SKF
		4	4	13	NUT M55 KM 11		SKF
		6	6	12	PIPE ϕ16/12 – 50	AISI 316		
		16	16	11	SPRING WASHER M8	St		GALV
		16	16	10	HEX BOLT M8×20	8 8		"
		6	6	9	HEX.NUT M10 NYLOC	8		"
		6	6	8	HEX BOLT M10×70 W/WASHER	8 8		"
		24	24	7	HEX NUT M6 NYLOC	8		"
		24	24	6	HEX BOLT M6×25 W/WASHER	8 8		"
		4	4	5	SPLIT PIN ϕ4×50	St		"
		4	4	4	WASHER M20	St		"
		4	4	3	CASTLE NUT M20	8		GALV
		6	6	2	BEARING GLYCODUR GLYPG60 65 40F		0,15	SKF
		4	4	1	HYDR.CYL.: COMPACT 50/30-260			HARMEK
		Pos. nr.			Main type dimension	Material	Vekt	Anm.

1	REVISED	
0	ORIGINAL	

4.10.85 | 1:5

LEVAHN
Mek. Verksted A/s – Oslo

DOUBLE TENSION EQUALIZER
GENERAL ASSEMBLY

60-1222 | 1

EQUALIZER

WELDING	60-1224
DETAILS	60-1223

8.4 OVERLOAD PROTECTION FOR MK - 60 CRANES

8.4.1 General

Crane Safe model 88B is manufactured by Reg-Tek prosess-Teknikk A/S in Norway. Crane Safe is an overload-protection system, using a static data memory for storage and generation of the crane's load moment curve.

8.4.2 Description

The Crane Safe System consists of the following main components:

- Pendulum potentiometer for measurement of the outreach.
- Loadcells for measurement of load in the hook.
- Electronic unit with an indicator panel

CHAPTER 9

COMMUNICATIONS

CONTENTS

DIAGRAMS

RADIO LINKS

1 GENERAL

1.1 The main radio communication to shore (UK and Norway) for the whole Frigg Field is from Platform QP via a tropospheric scatter or satellite communications system, as shown on Diagram 9,1 Platform CDP1 is linked with QP by an undersea communications cable with an alternative microwave link. However, in order to comply with the UK regulations which require certain direct radio communication systems on Platform CDP1 itself, independent equipment is installed.

2 DESCRIPTION

2.1 Equipment

2.1.1 The radio and associated equipments is located as follows:

(a) In Radio room in new rig module

MAIN TRANSMITTER M/F, H/F - ST 350C

MAIN RECEIVER M/F, H/F - ST 3020 A

RESERVE TRANSMITTER/RECEIVER M/F, H/F - SKANTI TRP400

RECEIVER M/F, H/F (RESERVE) - DRAKE RR2

WATCHKEEPING RECEIVER 2182 KHZ - DANCOM D.C. 301

V.H.F. TRANSCEIVER - S.R.A. M.E. 70 (MARINE BANDS)

HELICOPTER V.H.F. - BECKER A.R. 2009/25

PORTABLE HELICOPTER VHF - COMCO 733

TELEX - PHILLIPS PACT 220

TELEFAX - ITT 3535

There is also an omnidirectional helicopter beacon, TELERAD RBT 2050, operating on 367 KHZ and battery charger made by ELTEK.

(b) In battery box (beside the Radio Cabin):
24V, 200Ah nickel-cadmium battery

(c) In Telemetry Room in Module PM4 (in addition to telemetry equipment):
Telex STB 75
Microwave equipment

(d) In each lifeboat:
Transmitter/receiver, VHF Emergency Boat Radio Telephone
DANCOM RT408

JOTRON "TRON-1C" Floating Emergency Radio Beacon

2.1.2 The JOTRON 'TRON–1C' is a self-contained radio beacon which transmits at 250mW on two frequencies, 121.5 and 243MHz. The beacon floats upright when placed in the water and contains its own sealed non-rechargeable battery.

2.1.3 There are a number of small, portable MOTOROLA walkie-talkie radio transceivers which are used by personnel throughout and within the platform, mainly for maintenance purposes. They operate on a limited number of fixed frequencies which can be set on the instrument. Although of short range, they provide clear point-to-point communication anywhere on the platform, and screening is negligible.

2.2 Inter-platform Links

2.2.1 The link between CDP1 and QP is normally by submarine cable with a microwave link available as a standby.

2.2.2 Associated with each cable/microwave link is a multiplex unit which combines, or separates, the telemetry, telephone and interphone signals which use the link. There is also a switching unit at each end which automatically diverts the signal to the radio path if the cable link should fail. Reversion from radio to cable, however, must be carried out manually unless the radio path fails, in which case reversion to cable is automatic. An override switch can be used to lock the system to the radio path regardless of its state.

2.3 Platform-to-Shore Links

Communication to the shore, Norway or the UK, are made from QP and are covered in the QP Manual under Radio Links.

2.4 Power Supplies

2.4.1 Most of the radio sets and equipment operate on ac only, but a few (eg the standby transmitter/receiver, the aeromobile set and the aerial selector) use only dc; see Section 6.4. Exceptionally the watch receiver operates normally on ac but transfers automatically to dc on failure of ac.

2.4.2 The main VHF lifeboat sets have no external power supply but operate from the engine starter battery.

2.4.3 The 'walkie-talkie' sets have self-contained batteries and must be returned to the Radio Room and inserted into a vacant slot in a multiple charger. This automatically recharges the battery and stops the charge when complete.

END

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 9.1 where its position in relation to other inter-platform communications is shown.

2 DESCRIPTION

2.1 Exchanges

2.1.1 The principal automatic exchange on QP is a Mitel SX200. The exchange has a maximum of 208 lines available for internal, inter-platform and satellite communication with Norway.
A second exchange, Mitel SX10, is provided for use with the UK tropospheric-scatter radio link.

2.1.2 The exchange on CDP1, DP2 and TCP2 are Mitel SX100 exchanges. These have a maximum of 104 lines each for internal or inter-platform communication.

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 208-line main exchange is also used for satellite communication with Norway (Stavanger), for which 5 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 Mitel SX-10 [illegible] to which are connected 10 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 9.1

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 (phase to-neutral). This is taken to a local transformer/rectifier which converts it to 48V dc. A battery floats on the dc side and has sufficient capacity to maintain the whole telephone system operational for 24 hours after complete loss of ac supply.

VIA PTT GREAT BRETAIN

VIA NTA

ST. FERGUS VIA SCOUSBOURGH

BERYL

RISER 16/11S

EIK

STAVANGER

TIME PLEXER

NORWEGIAN DATA TELEX NETWORK

NORWEGIAN TELEPH. NETWORK

EIK EARTH SATELLITE STATION

NTA. LEASED LINES

PABX DUSAVIK

STAVANGER TRUNK EXCH.

SATELLITE

TROPO SPHERE

TELEX

TELEPRINTER PNT- PNT

TELEMETRY

TELEPHONE EXCH.

MULTIPLEX

TROPO SCATTER

TROPO SCATTER

RADIO LINK

TELEPRINTER

TELEPH EXCH. OTS.

SATELLITE STATION

QP

ODIN

BYGNES

PCM & MUX

TELEPHON EXCH.

TELEX

TELEMETRY

TELEPHONES OTS

TELEMETRY

TELEX SWITCH

TELEPRINTER

HEIMDAL

TELEMETRY

STATPIPE

EXCH. OTS

STATPIPE

TELEPRINTER

STATPIPE

MITEL TELEPHONE EXCH.

OMNIBUS TELEPH.

TELEM. VOICE

BRAE

STENTOFON EXCH.

MIS

PLATFORM-MANAGER.

CONTROL ROOM

RADIO ROOM

TELEX P/P

TELEX PUBLIC

TROPO SCATTER

RADIO LINK

TELEPH. EXCH.

TELEX

TELEPRINTER P/P

ST. FERGUS

UK PUBLIC

MULTIPLEX

COMPUTER

TELEMETRY

MULTIPLEX DP-2

MULTIPLEX CDP-1

STENTOFON EXCH.

TELEPHONE EXCH.

9600 BAUD

TIMEPLEXER

TELEX PNT-PNT

TELEX PUBLIC

MIS

MIMIC PANEL

TELEMETRY ODIN

SATELLITE STATION

DIM

TELECOM

PROD. INT.

CONTROL ROOM

RADIO ROOM

RADIO LINK

SUBMARINE CABLE

RADIO LINK

MULTIPLEX

TELEX

STENTOFON EXCH.

TELEPH. EXCH.

TELEMETRY

STENTOFON

CDP-1

MIS

TELEX

STENTOFON EXCH.

TELEPH. EXCH.

TELEMETRY

STENTOFON

TP-1

TELEMETRY

STENTOFON

TELEPHONE

TCP-2

TELEMETRY

STENTOFON

TELEPHONE

TELEMETRY EXTENTION

MIMIC PANEL

TELEMETRY TCP-2 EXTENTION

DP-2

MIS

TELEX

STENTOFON EXCH.

MULTIPLEX

TELEMETRY

TELEPH EXCH.

STENTOFON

CONTROL ROOM

RADIO LINK

RADIO LINK

SUBMARINE CABLE

SSTV SLOWSCAN

POINT TO POINT CONTROL ROOM

MUX N.E. FRIGG

MIMIC PANEL

TELEMETRY N.E. FRIGG

N.E. FRIGG.

RADIO LINK

RADIO LINK

SUBMARINE CABLE

RADIO LINK

RADIO LINK

MULTIPLEX

POINT TO POINT CONTR. ROOM QP (SERV. CH)

TELEPH.EXCH.QP

STENTOFON

SLOW SCAN TV.CAMERAS

TELEMETRY

rev	date	description	by	app
2	15.6.88	UPDATED	E.Ry.	S.R
1	6.8.85.	UPDATED TO COMMENTS	LHW	
0	3.6.85	first issue	LHW	

elf aquitaine norge as p.o box 168 4001 Stavanger

A	Installation	System
		COMMUNICATION
	Job no.	FRIGG FIELD COMMUNICATION NETWORK
	Scale	

FRIGG FIELD

Dwg no. FF 00 16 00 0013 | Rev. 2 | Sheet 1/1

INTERCOM SYSTEM

1 GENERAL

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

1.2 A main exchange is installed on QP with satellite 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 extensions which are voice controlled or push to talk.

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

1.4 The full Intercom network is shown in Block form in diagram 9.3, where its position in relation to the othe Inter platform communications 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 exchanges 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.

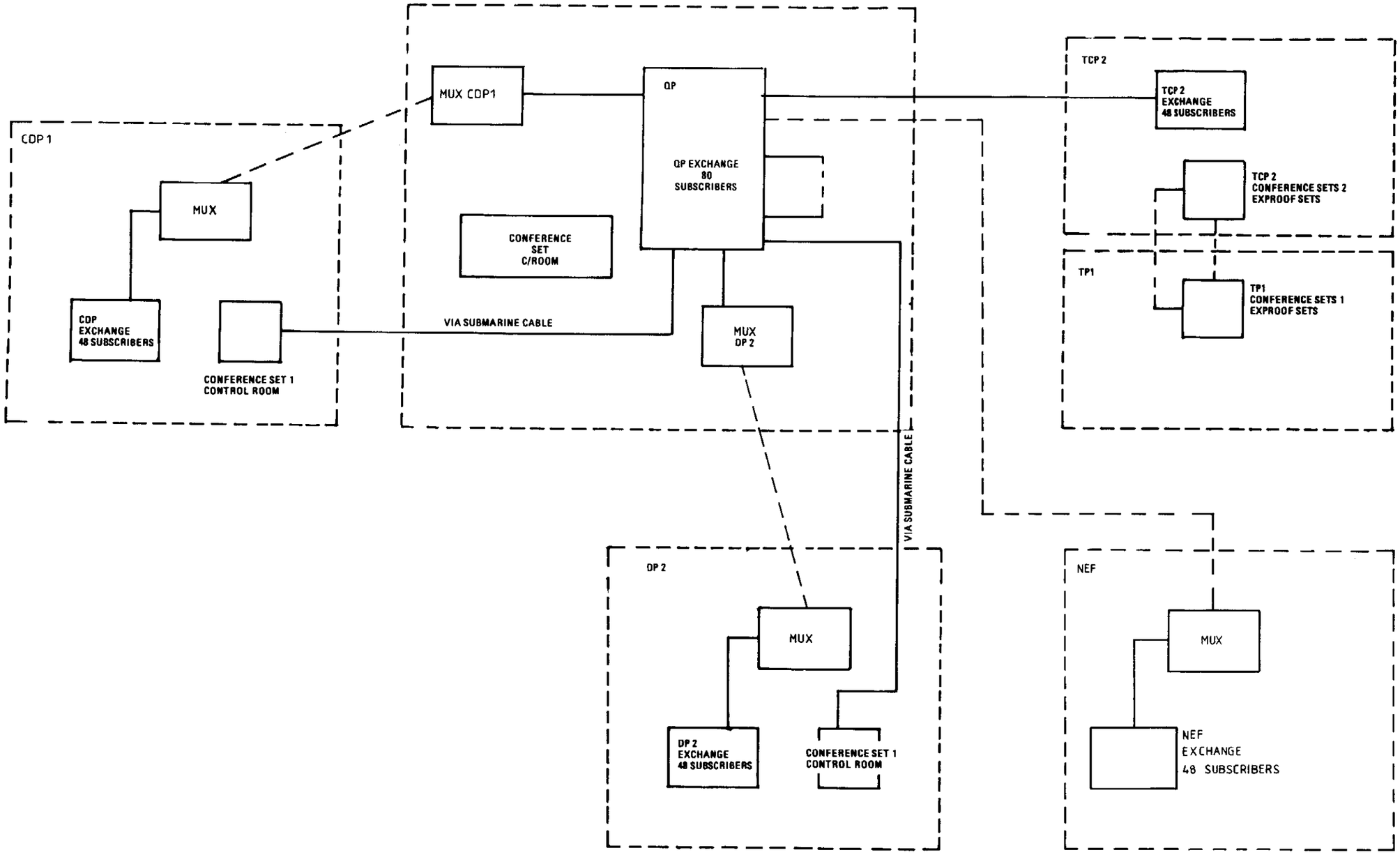
2.3 The QP exchange is capable of setting up a conference group with the TP1 interface room 1, TCP2 interface room, control room compression, CDP1 control room, DP2 control room and QP control room. Further more, the QP control room, QP radio, QP rig office and QP telecom are capable of using the general 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 on this cut off.

2.5 The normal desksets are loudspeaking with a built-in loudspeaker. The set can be used as a semi-duplex voice control set in the 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 semi-duplex 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.


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

PUBLIC ADDRESS AND ALARM SYSTEM

1 GENERAL

1.1 A Public Address (PA) system, comprising microphones, two amplifiers and loudspeakers distributed throughout the production and drilling modules, is provided for broadcasting instructions and information throughout the platform.

1.2 It is activated by microphones in the Production Control Room. Access to the system can also be obtained from microphone systems near lifeboats.

1.3 A seperate system comprising alarm horns, controlled by pushbuttons and a relaying system, are located throughout the platform in the production and driller's modules. The fire alarm is actuated manually or automatically by widely distributed detectors. The gas alarm is actuated manually (see Section 10.4 para 2.1(d).

2 DESCRIPTION

2.1 Public Address

2.1.1 The main items, namely the PA amplifiers and the power supply inverter, are situated in Module PM4.

2.1.2 The amplifiers are normally powered at 220V ac from the MCC, but on failure of this an alternative supply from the 48V dc system through an inverter is automatically switched-in.
This gives the amplifier 24 hours' further operation.

2 Fire Alarm

2.2.1 An intermittent horn signal is emitted on detection of fire either by break-glass/pneumatic manual pushbutton or by the various automatic detection systems. In high noise areas such as Modules PM2, PM3 and WH1 there are also red flashing lights which operate from any of the above alarms.

2.2.2 A buzzer system gives local warning in the relevant area before the disharge of Halon in the event of fire.

2.3 Muster (Panic) Alarm

A continuous horn signal is emitted on initiation by pushbuttons in the Production and Driller's Control Rooms and the Driller's Floor Console. Personnel muster and prepare to abandon platform. The actual order to abandon platform is given verbally either over the PA system or by the person in charge at the muster station.

2.4 Core Alarm System

2.4.1 When the central core and tunnels are pumped out, alarm horns will be fitted at the airline connection points provided for testing purposes. Before reflooding, the horns will be removed and stored.

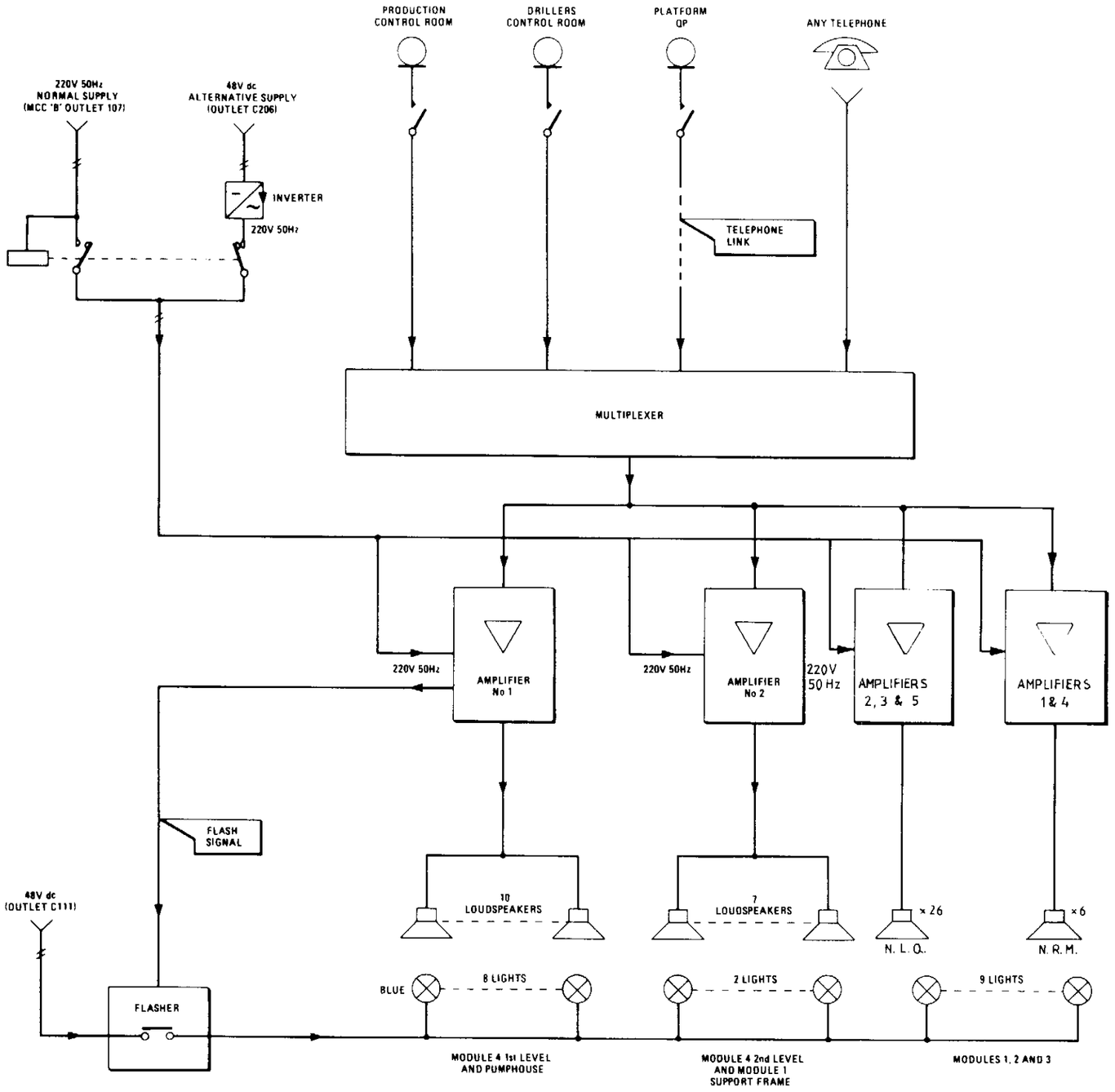
2.4.2 These horns are pneumatically operated and sound if any of the following conditions occur:

Fire Alarm
Muster Alarm
Gas Alarm
Emergency Shutdown (ESD)
Disaster Shutdown (DSD)

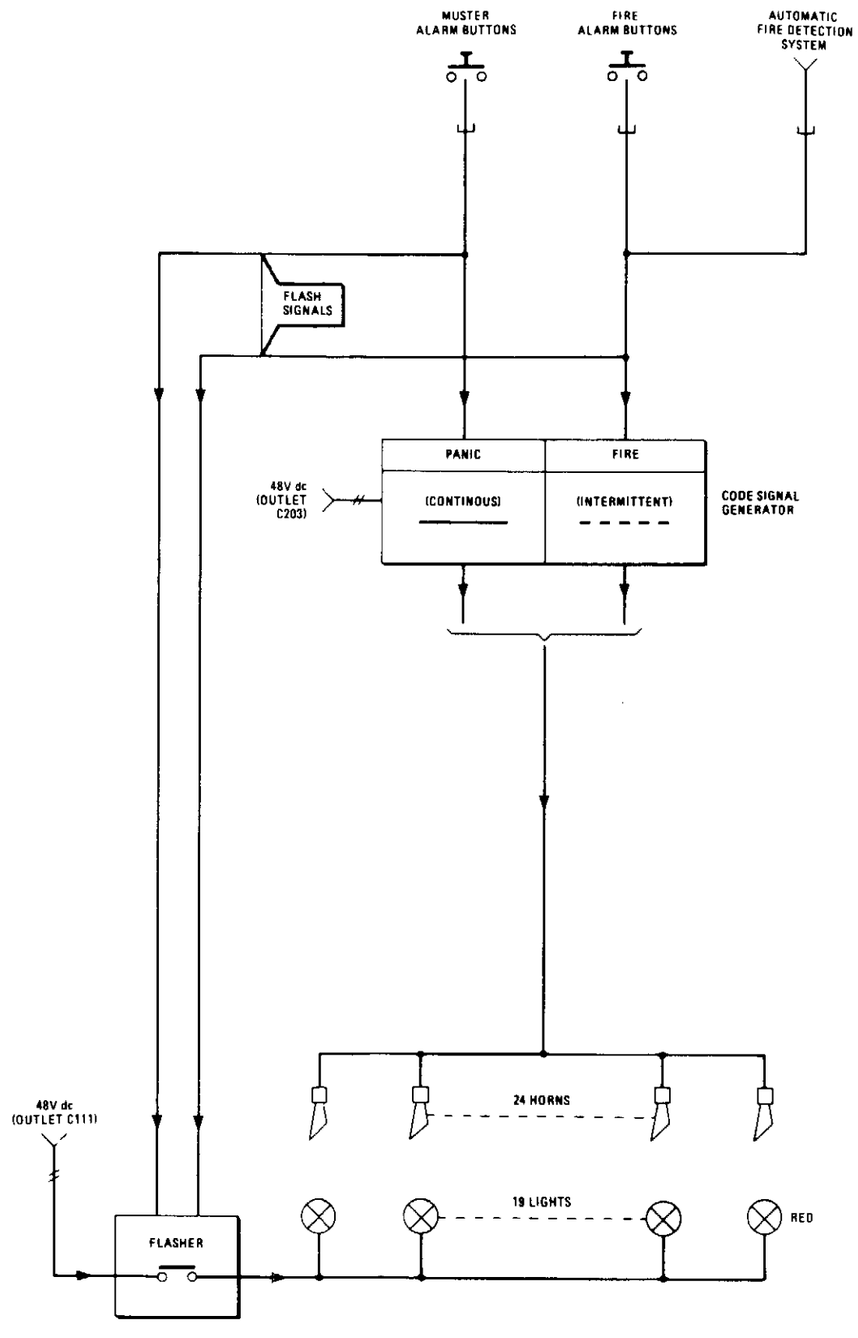
2.4.3 The core alarm horns can also be sounded from Alarm Stations at the core levels and in the tunnels and lift cage. This alarm system must be reset manually from the control panel in Module SD3.

2.4.4 The pneumatic signals are relayed electrically using the platform 48V dc system.

PUBLIC ADDRESS



ALARM HORNS



ISSUE 3 JUNE 1984

PUBLIC ADDRESS AND ALARM SYSTEM	9.4

NAVIGATIONAL AIDS

1 GENERAL

1.1 Navigation equipment installed on Platform CDP1 complies with the requirements of the UK Department of Trade (Marine Division) January 1976 'Standard Marking Schedule for Offshore Installations', and with 'Regulations for Marking of Production Platforms' issued by the Norwegian Coast Directorate.

1.2 The following navigational aids are installed:

(a) Navigation lights.

(b) Foghorns.

(c) Obstruction lights.

(d) Helideck lighting.

2 DESCRIPTION

2.1 Navigation Lights

2.1.1 The Tideland navigation light system consists of the following equipment:

(a) Two 1000W, 120V main white tungsten-halogen flashing lights with a range of 15 sea-miles (28km) at night in clear weather. Light output is 14 000 candelas minimum when mounted inside the lens. Each lamp is mounted on a motor-operated two-place lamp changer which automatically substitutes a second lamp if the first fails. The lantern enclosure is cooled by a built-in fan in the base, exhausting through a chimney at the top. Each lantern contains its own flasher unit.

(b) Two secondary 23W, 12V white tungsten filament flashing lights with a range of 10 sea-miles (18km) at night in clear weather. The lamps are mounted on a six-place lamp changer and, together with the main lights, form a Bi-form mounting with the main light at the top. The lanterns are situated at the north-east and south-west corners of the Main Deck. A flasher unit is incorporated in the base.

(c) Two subsidiary 6W, 12V red tungsten filament flashing lights with a range of 3 sea-miles (5km) at night in clear weather. The lamps are mounted on a six-place lamp changer in separate lanterns mounted on the north-west and south-east corners of the Main Deck. Each lantern has its own flasher in its base.

2.1.2 If the supply to the main lamp fails or if the second main lamp fails completely or fails to flash steadily, the secondary lamp will automatically come into use after a one-minute delay. Simultaneously an alarm is given in the Control Room.

2.1.3 A sunswitch or electric eye switches the lamp on at dusk and off at dawn.

2.1.4 The electronic flasher units within the lanterns cause them to flash the morse letter 'U' in synchronism every 15 seconds.

2.2 Foghorns

2.2.1 The Tideland foghorn systems consist of the following equipment:

(a) Two main foghorn arrays (Type AB—860), each with a range of 2 sea-miles (3.2km) over a 360° arc in still weather. They are installed (with the subsidiary red navigation lights) on the north-west and south-east corners of the platform at Main Deck Level. Acoustic frequency is 645Hz, powered at 12V dc from a central set of batteries common with the navigation lights.

(b) Two secondary foghorns (Type AB—26), each with a range of half a sea-mile (0.8km) over a 360° arc in still weather. They are installed with the main horns on the same corners of the platform (north-west and south-east). Acoustic frequency is 660Hz, powered at 12V dc from the same common battery as powers the main horns. This secondary system acts as a back-up to the main foghorn arrays.

2.2.2 Two electronic control units (TOC860) are mounted in the bases of the horn arrays. Each contains an oscillator to convert the 12V dc to ac to produce the acoustic emission frequency, a coder and separate output fuses to each of the emitters.

2.2.3 Each main horn consists of a vertical array of eight emitters, 14 ft high. These emitters, when operating in parallel, produce an all-round near-horizontal beam of sound. Each consists of a dc moving-coil 'driver' connected to a diaphragm in a resonant cavity. All operate in parallel but are separately fused (in the base) to assist the finding of a faulty unit. The fuse, rated 2A, also protects the driver against damage due to an internal fault but permits the other seven emitters to continue operation.

2.2.4 Each secondary horn consists of a single driver unit connected to two diaphragms in two resonant cavities. It should be noted that the frequency (660Hz) is slightly higher than that of the main horns, enabling the difference to be detected by a keen ear. Both main and secondary horns are synchronised and coded to emit the morse letter 'U' every 30 seconds.

2.2.5 The output of the main horns is monitored. If it or its control circuit should fail, or if the output should fall to such a level that its range is down to half a mile or less, the associated secondary horn is automatically activated and an alarm is given. Main and secondary foghorns are switched manually from the Radio Room.

2.3 Obstruction Lights

2.3.1 Protection of aircraft in the vicinity of the platform is given by the following:

(a) Red 25W aircraft obstruction lights, which are steadily illuminated. They are located on the drilling derrick, crane boom and other obstructions. The vertical distance between lights is approximately 10m.

(b) Floodlighting of the two burner booms from the Main Deck with 400W floodlights.

2.3.2 These lights are automatically switched on and off at sunset and sunrise by a sunswitch.

2.4 Helideck Lighting

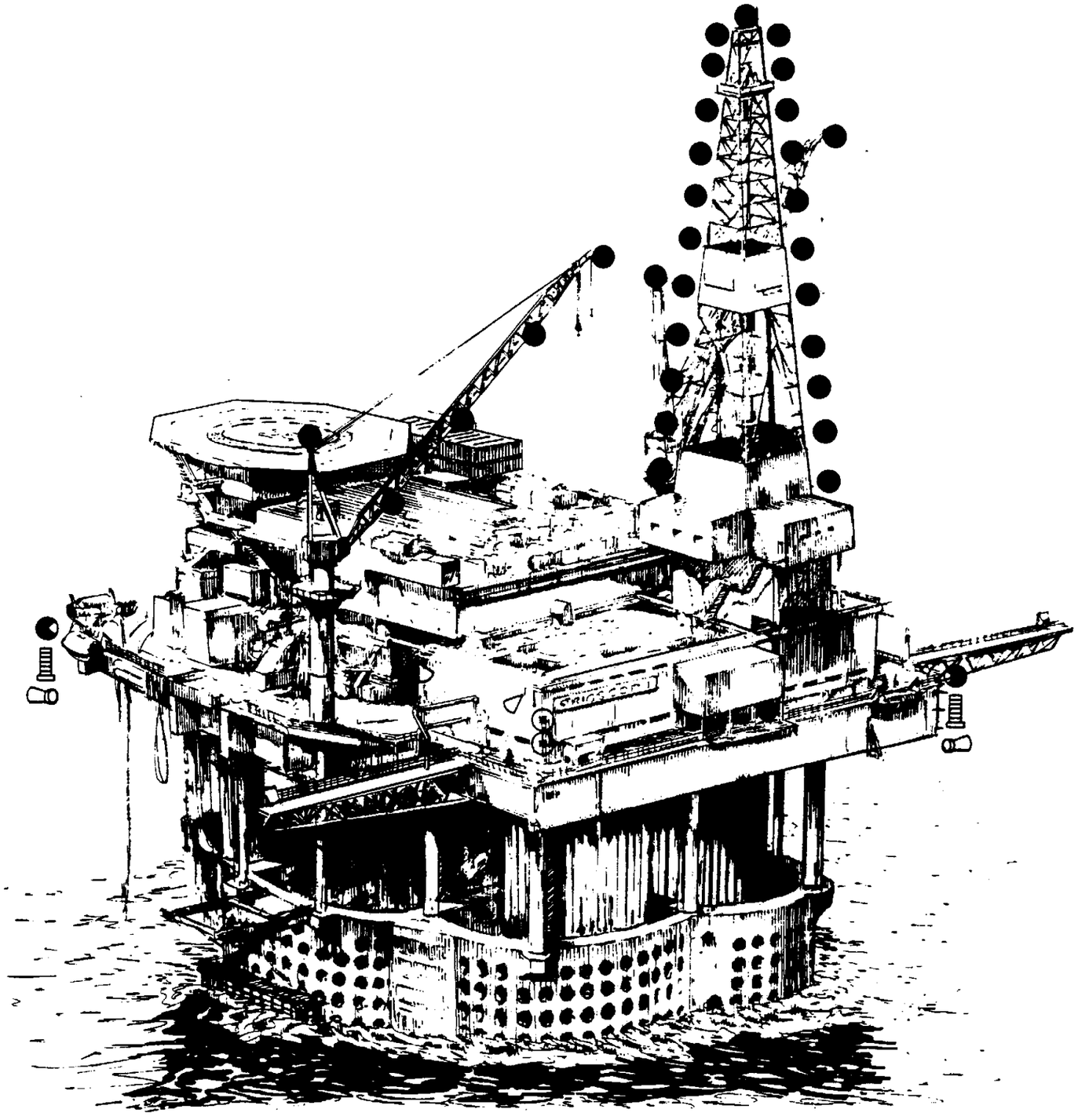
The perimeter of the Helideck is marked by a circle of 30 flush-mounted 25W deck lights, alternately yellow and blue approximately 3m apart.

2.5 Power Supplies

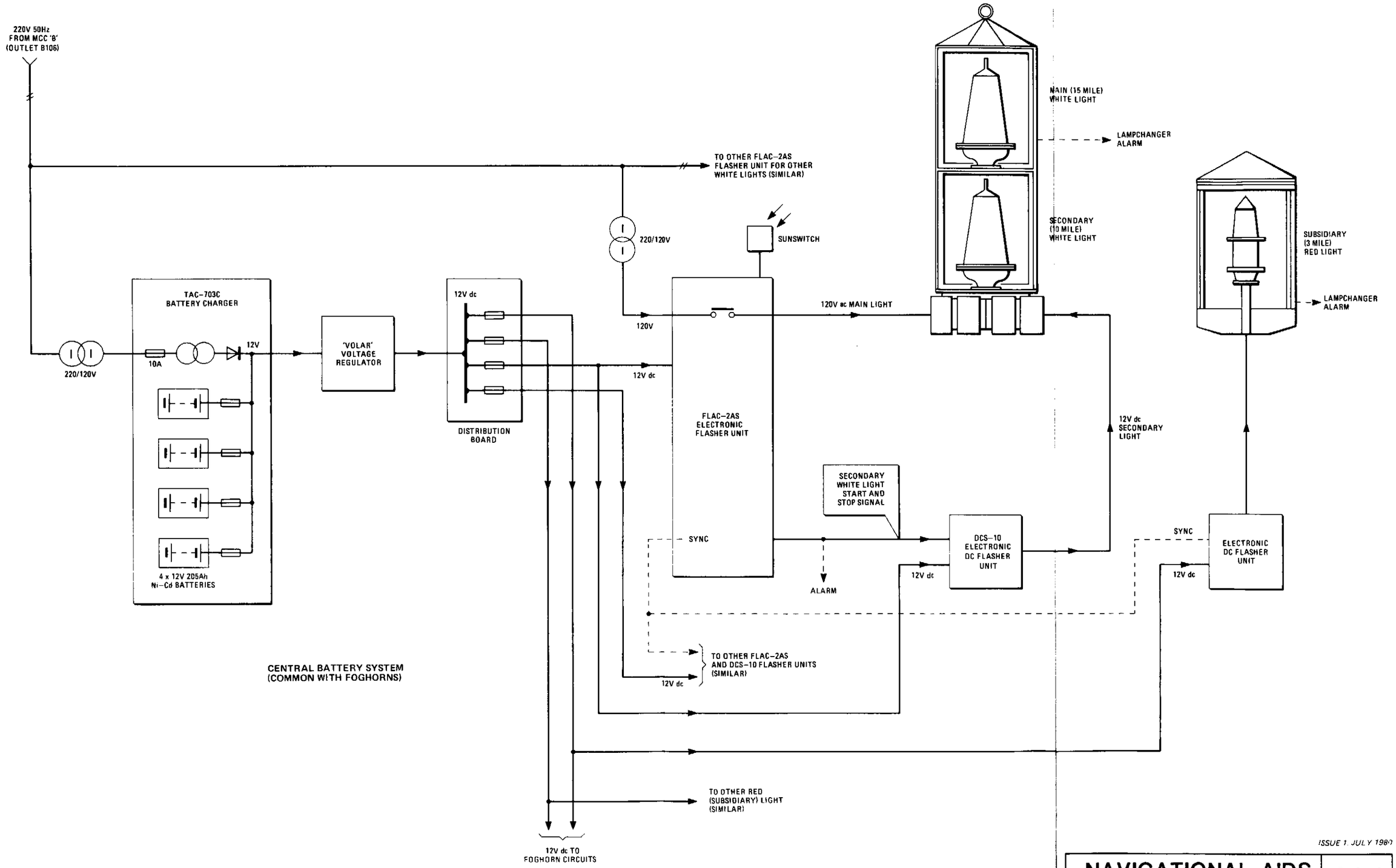
2.5.1 A central battery system (see Section 6.4) provides power at 12V for all navaid equipment except the main navigation and Helideck lights. The main navigation lights derive their supply via a 220/120V transformer from the 220V section of MCC switchboard 'B'. The associated battery charger is supplied from the same switchboard outlet (10G).

2.5.2 The yellow and blue Helideck perimeter lights are fed by two separately fused circuits supplied at 24V dc from a 700Ah battery and charger in the Drilling Package. The charger itself is fed from the 220V 60Hz switchboard in that area. The separate circuits ensure that loss of either one will not leave the perimeter unmarked.

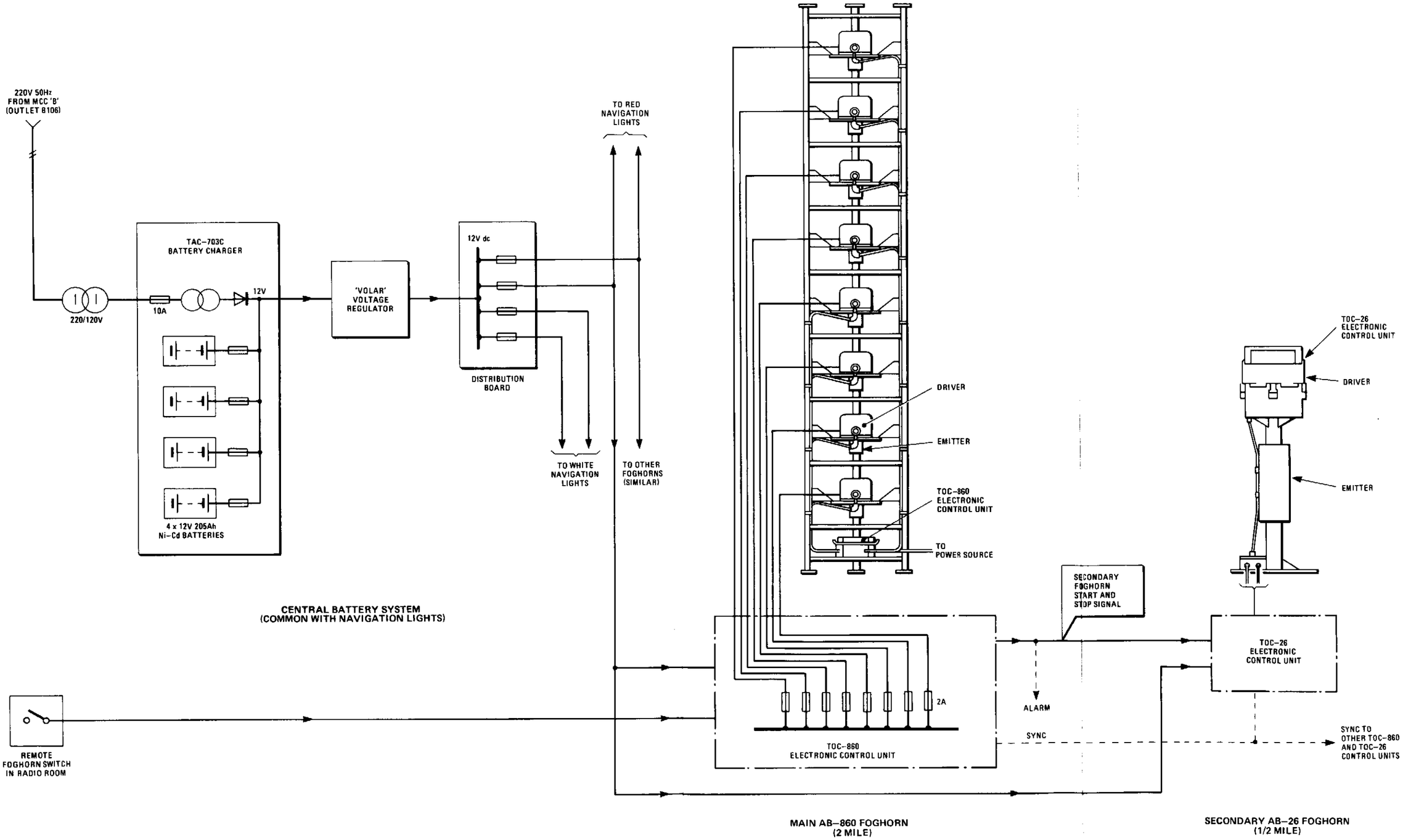
2.5.3 The distribution of power supplies to the various items of navaid equipment is shown in Diagrams 9.5.2 and 9.5.3.



KEY	
	FOGHORN (MAIN) – 2 MILES
	FOGHORN (SECONDARY) – 1/2 MILE
15	WHITE LIGHT (MAIN) – 15 MILES
10	WHITE LIGHT (SECONDARY) – 10 MILES
	SUBSIDIARY (RED) LIGHT – 3 MILES
	AIRCRAFT OBSTRUCTION LIGHT
	BURNER BOOM 400W FLOODLIGHTS



CENTRAL BATTERY SYSTEM
(COMMON WITH FOGHORNS)



ISSUE 1. JULY 1980

NAVIGATIONAL AIDS
Foghorn Power Supplies

9.5.3

CHAPTER 10

SAFETY

CONTENTS

DIAGRAMS

OFFSHORE EMERGENCY ORGANIZATION

1. GENERAL

The muster list gives a brief description of the emergency organization, and what to be done by individuals in case of an emergency situation, types of emergency alarms and special warning/danger, distributions to lifeboats and a sketch of lifeboats/muster stations.

1.1 It is issued by the safety department and can be revised only by agreement with the department.

1.2 A copy of the muster list is posted at the following locations :

Safety Office	**Rig office/waiting room**
Corridor outside mess room	**Corridor outside control room**
Corridor outside rec. room	

2. INSTRUCTION AND DUTIES

2.1 Emergency teams are established to cope with the various emergency situations.

2.2 The Offshore Installation Manager (OIM) take command in the control room/ emergency center, assisted by one production operator.

2.3 The safety supervisor assist the OIM in coordination of the teams and relevant emergency actions.

2.4 The fire/intervention team, production operators ON and OFF duty, are leaded by senior operator ON duty.

The fire/intervention team are responsible for the immediate and direct action with regards to rescue of personnel, fire fighting, cooling etc., as well as intervention on process system.

2.5 The technical team is led by the maintenance supervisor.

The technical team is responsible for the immediate and safe technical intervention on the electrical system, fire pumps operations, emergency generators and other technical interventions also to act as back up fire team.

2.6 First aid team led by medical nurse.

The medical nurse with the trained first aid team is responsible for medical treatment.

2.7 Helideck team - led by helicopter landing officer is responsible for actions related to helicopter operation.

2.8 Search team - led by camp boss is responsible for checking that living quarter is clear of personnel, and report to the rig office.

2.9 Lifeboat crews : for each lifeboat in use, a team of 3, led by commander is responsible for safe evacuations of personnel.

2.10 The radio operator/rig office is responsible for relaying information to/from the platform, and keep the account of personnel onboard.

3. ABANDON PLATFORM

3.1 The order to abandon platform will be given by the OIM.

MUSTER LIST*

PLATFORM

MUSTER ALARM : CONTINUOUS HORN (RED FLASHING LIGHTS IN NOISY AREAS) ——————
(GO TO LIFEBOAT STATIONS)

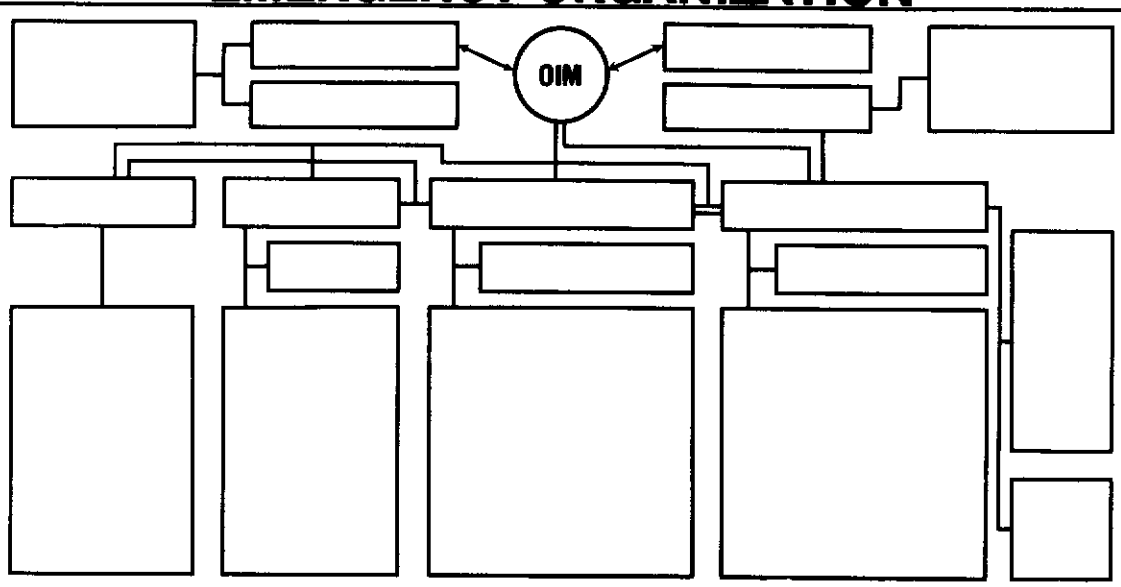
FIRE ALARM : INTERMITTANT HORN (RED FLASHING LIGHTS IN NOISY AREAS) - - - - - - - -
(GO TO FIRE STATIONS)

ABANDON PLATFORM : PUBLIC ADDRESS AND/OR DIRECT ORDER (RED OR BLUE FLASHING LIGHT IN NOISY AREA)

GAS EMERGENCY ETC. : PUBLIC ADDRESS: "GAS ALARM" -"GAS ALARM" (RED OR BLUE FLASHING LIGHT IN NOISY AREA)

MAN OVERBOARD : SHOUT 'MAN OVERBOARD': PUBLIC ADDRESS (BLUE FLASHING LIGHTS IN NOISY AREAS)

EMERGENCY ORGANIZATION



SPECIAL WARNING/DANGER

FIRE

Any person discovering a fire should
A) Raise the alarm
B) Without endangering himself, try to put out the fire using the nearest suitable fire fighting equipment. Fixed fire fighting systems should not be operated by unauthorized personnel
C) Continue calling for assistance

GAS ALARM

When a «Gas Alarm» is sounded
A) All work to be stopped immidiately
B) All personnel to proceed to safe area
C) Or act as per special instruction

HALON SYSTEM IN MODULES

1) Released automatically upon fire detection if in automatic position (amber light outside door)
30 seconds time delay with buzze warning. **Get out!**
2) To be released manually when in manually position (green light)
3) White flashing light outside door indicates fire detection
4) Red light outside door indicates halon filled room
Do not enter without breathing apparatus and fire equipment

MUSTER-DRILLS

All personnel remain in their stations until all stations have been checked and permission is given to leave their station

LIFEJACKETS

One for each bed in cabin. Lifejackets are to be worn when reporting to the lifeboat station after the alarm is given

FIRE ALARM

When fire alarm is given all personnel go to their allocated stations

MAN OVERBOARD

The person discovering that a man has gone overboard should shout «Man Overboard» keep man in sight and throw a life buoy overboard

DISTRIBUTION OF LIFEBOATS

LIFEBOAT No. 1	LIFEBOAT No. 2	LIFEBOAT No. 3	LIFEBOAT No. 4	LIFEBOAT No. 5	LIFEBOAT No. 6

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:

Fire/Explosion
Escape of gas
Helicopter crash on platform
Helicopter ditch
Damage to auxiliary vessel
Man overboard
Loss of well control
Abandon platform
Storm or severe weather
Diving accident
Medical emergency
Oil spill
Radiation leak
Criminal act
Sea-bed movement
Collision
Structural failure
Failure of equipment affecting safety
Emergency on NEF

END

AREA CLASSIFICATION

1 GENERAL

1.1 Platform areas have been evaluated for risk using the Institute of Petroleum Model Code of Safe Practice, Part1:1965, and Part 8:1972, 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 1 and Zone 2 or Unclassified as defined in Paragraph 2.

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

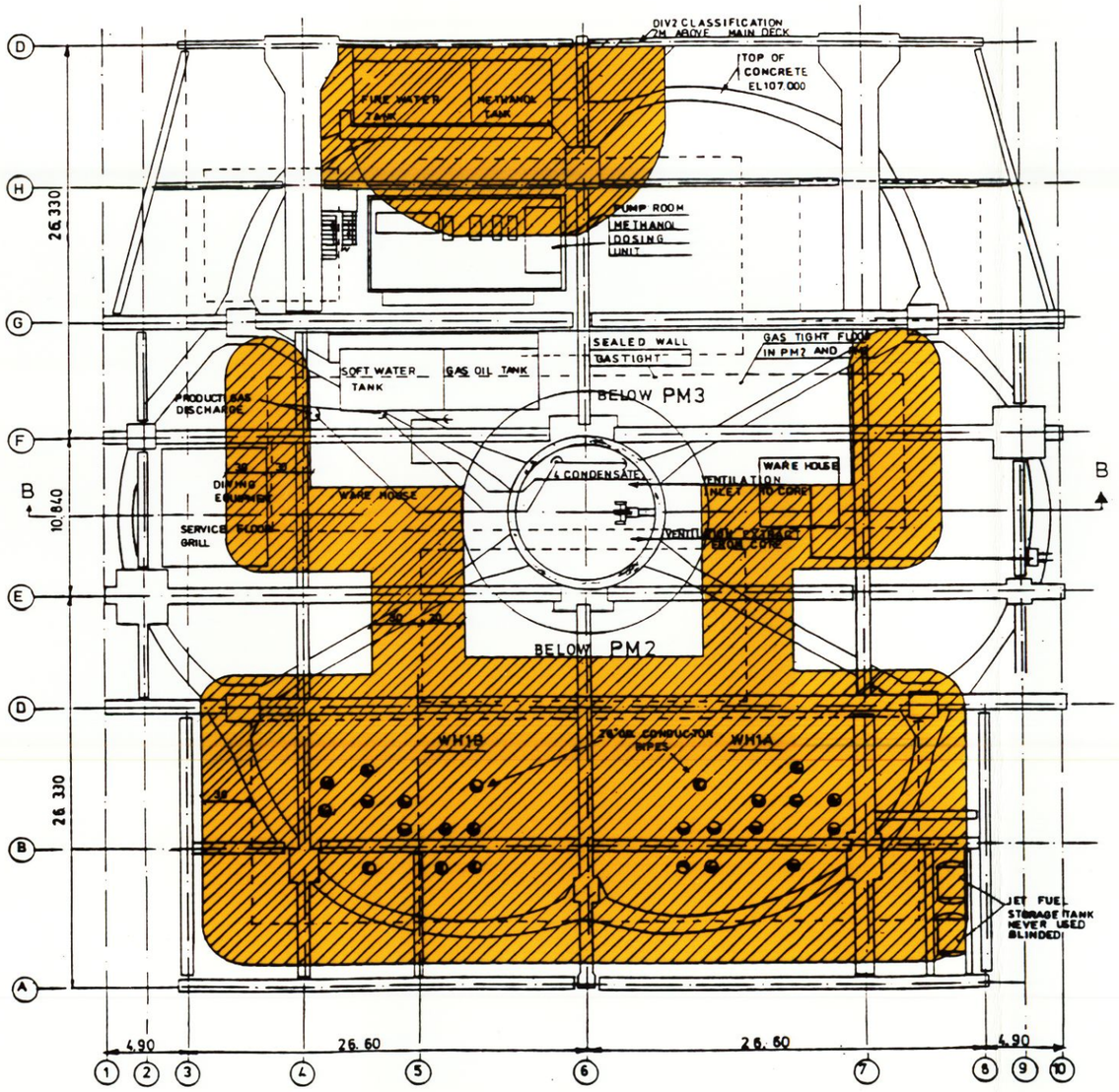
2.1 These are areas not included in the 'dangerous' category and, on CDP1, are achieved as follows:

(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.

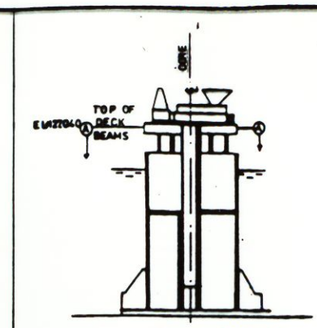
(c) Force vented areas which have a high rate of ventilation with air coming from an unclassified area. These areas are normally classified as Zone 2 if ventilation is shut down.

Note: The loss of forced ventilation in a room or enclosure in a Zone 2 area will result in that room or enclosure becoming a Zone 1 area.



PLAN VIEW A-A EL+127.040M (SCALE 1:200)

FOR SECTION B-B
SEE DWG NO.: FF 912321 0324



KEY ELEVATION

LEGEND

AREA CLASSIFICATION ACCORDING TO IP ELECTRICAL CODE FOR DRILLING & PRODUCTION IN MARINE AREAS PAER 1 & 8

AREA CLASSIFICATION ZONE 1

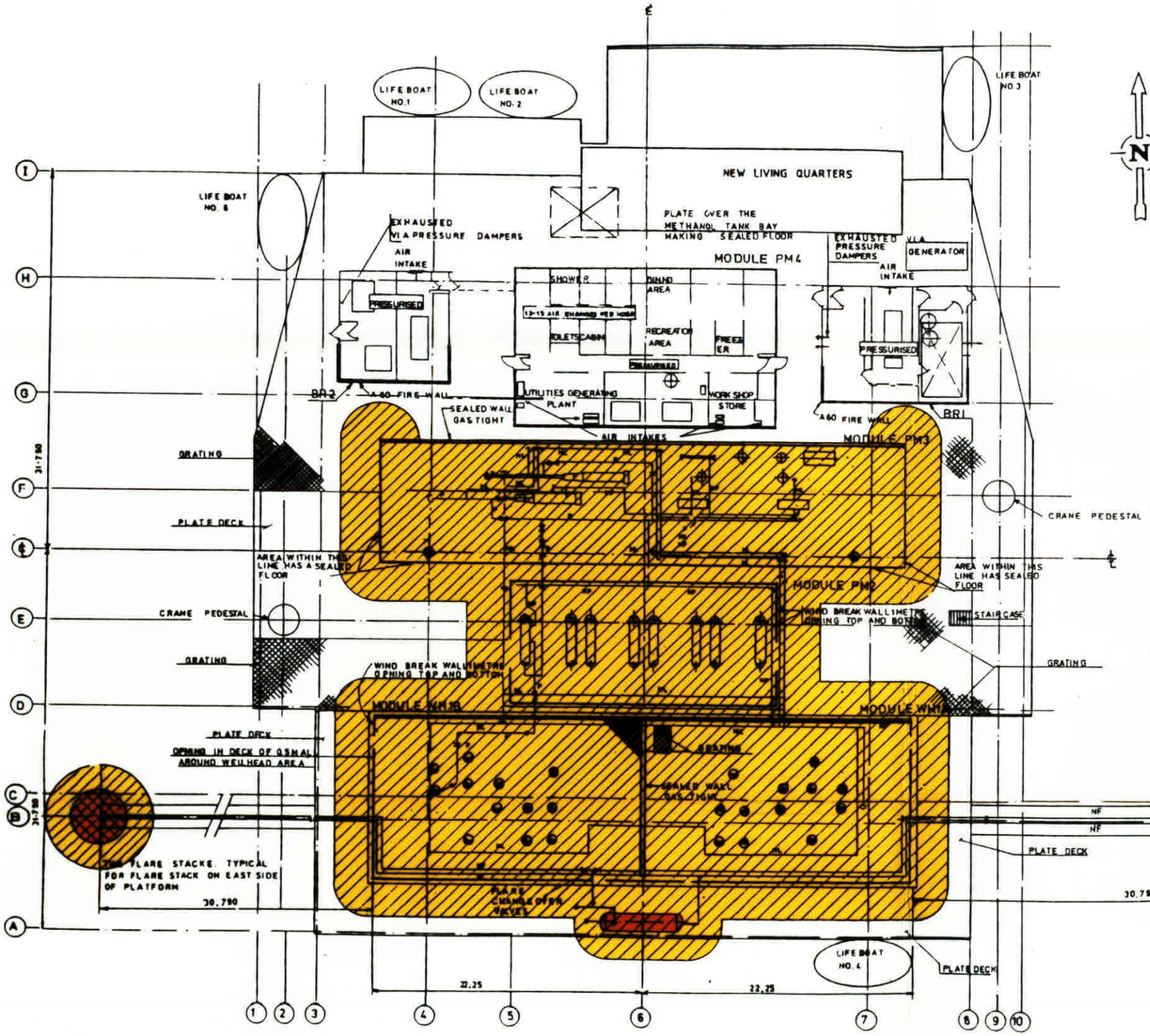
AREA CLASSIFICATION ZONE 2 NATURALLY VENTILATED

REFERENCE DRAWINGS	
DWG. NO	TITLE
FF 912321 0324	EAST EL AND SECTION EL OF CORE
FF 912321 0325	MAIN DECK EL:130.0
FF 912321 0327	SAIPEM MODULES EAST AND WEST VIEW
FF 912321 0328	DRILLING DECK

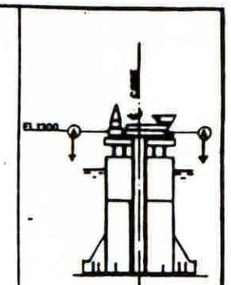
ISSUE 5. AUGUST 1985

AREA CLASSIFICATION
Service Deck

10.3.1



PLAN ON A-A
EL-130.000



REFERENCE DWG.	
DWG. NO.	TITLE
FF 9123 21 0324	EAST EL. AND SECTION EL. OF CORE
FF 9123 21 0326	TOP OF DECK BEAMS EL+127.04
FF 9123 21 0327	SAIPEM MODULES EAST AND WEST VIEW
FF 9123 21 0328	DRILLING DECK.

LEGEND

AREA CLASSIFICATION ACCORDING TO IP ELECTRICAL CODE FOR DRILLING & PRODUCTION IN MARINE AREAS PAER 1 88

AREA CLASSIFICATION ZONE 1

AREA CLASSIFICATION ZONE 2 NATURALLY VENTILATED

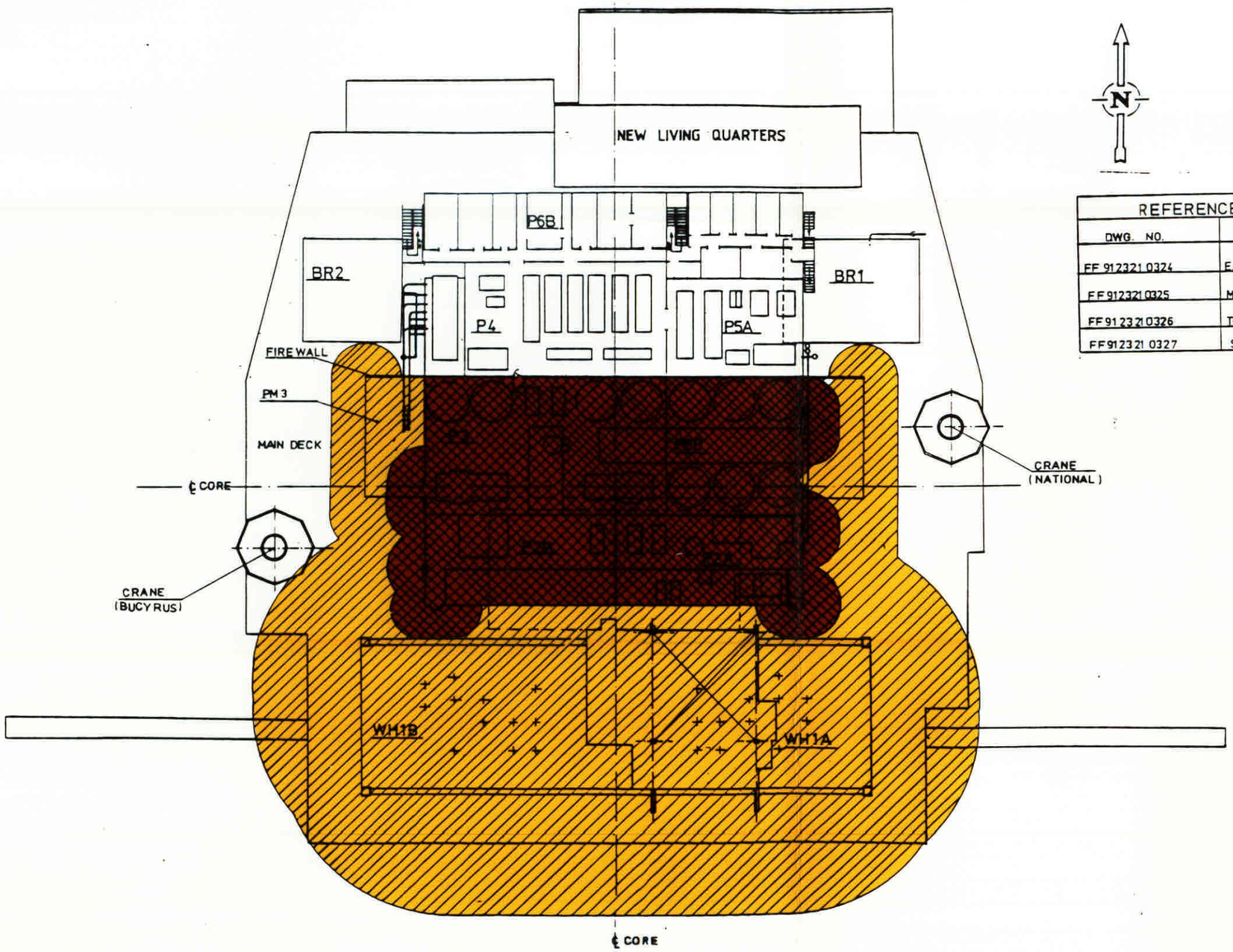
ABBREVIATIONS

P : PRODUCT GAS METHANE
ML: METHANOL
NF FLARE GAS

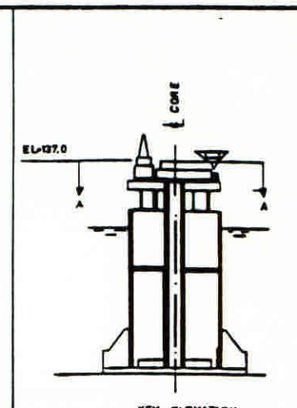
ISSUE 6 . AUGUST 1986

AREA CLASSIFICATION
Production Deck

10.3.2



PLAN SECTION A-A EL+13.0



REFERENCE DWG.	
DWG. NO.	TITLE EL
FF 912321 0324	EAST EL AND SECTION EL OF CORE
FF 912321 0325	MAIN DECK EL+13.0.0
FF 912321 0326	TOP OF DECK BEAMS EL+17.0.0
FF 912321 0327	SAIPEM MODULES EAST AND WEST VIEW

LEGEND

AREA CLASSIFICATION ACCORDING TO IP ELECTRICAL CODE FOR DRILL & PRODUCTION IN MARINE AREAS PAER 1 & 8

AREA CLASSIFICATION ZONE 1

AREA CLASSIFICATION ZONE 2 NATURALLY VENTILATED

PACKAGE FUNCTION/MAIN EQUIPM

P2A – SHALE SHAKER; CEMENT UNIT MUD TANKS.

P2B – DRILLING SUPPORT MACHINE

P3 – BARITE STORAGE TANKS, MUD T AND PUMPS.

P4 – DC AND AC GENERATORS A ELECTRICAL CONTROL PANEL

5A – AC GENERATORS, STEAM BOIL AND WATER UTILITIES. ELECTRICAL FIREWATER PUM PART OF LIVING QUARTERS.

5B – BULK CEMENT STORAGE.

6B – LIVING QUARTERS.

PM3 – PRODUCTION MODULE NO.3, MAIN DECK.

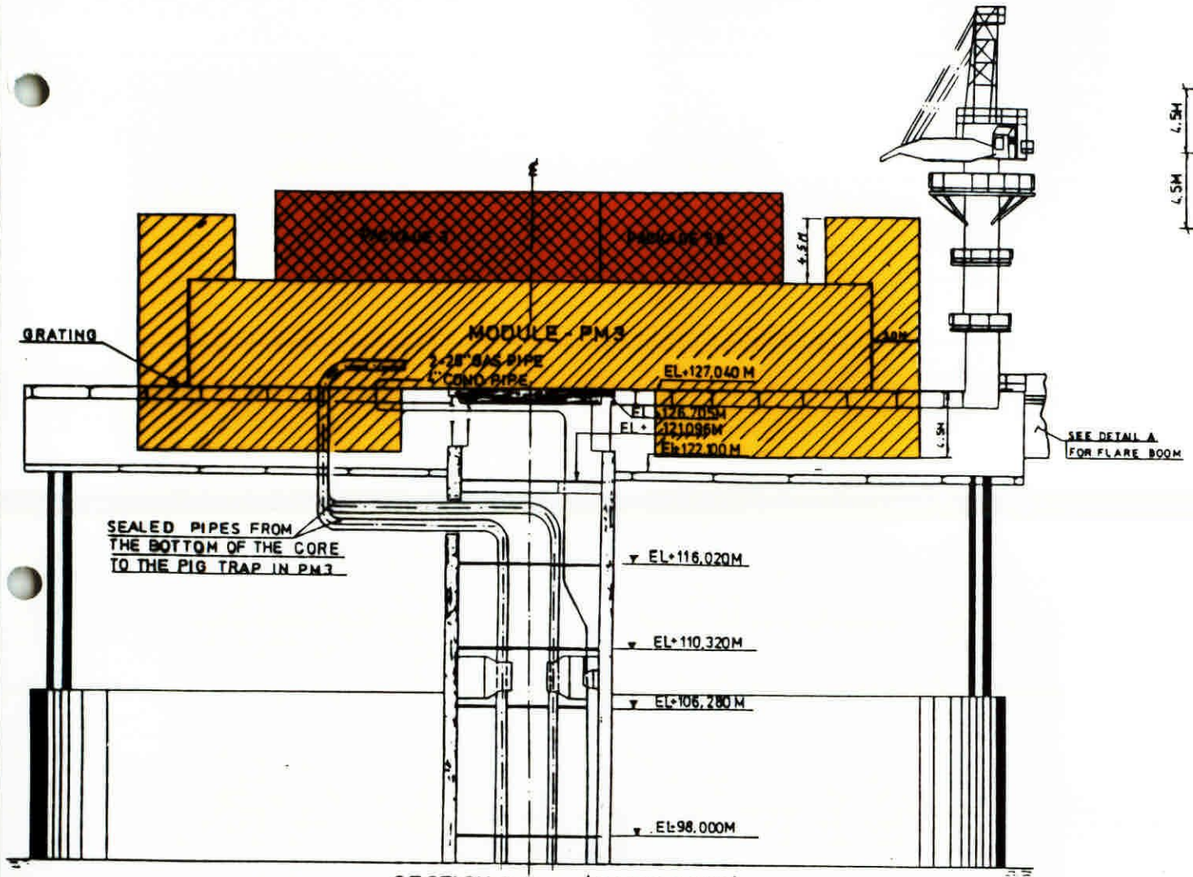
WH1A – WELL HEAD MODULE NO.1A MAIN DECK.

WH1B – WELL HEAD MODULE NO.1B MAIN DECK.

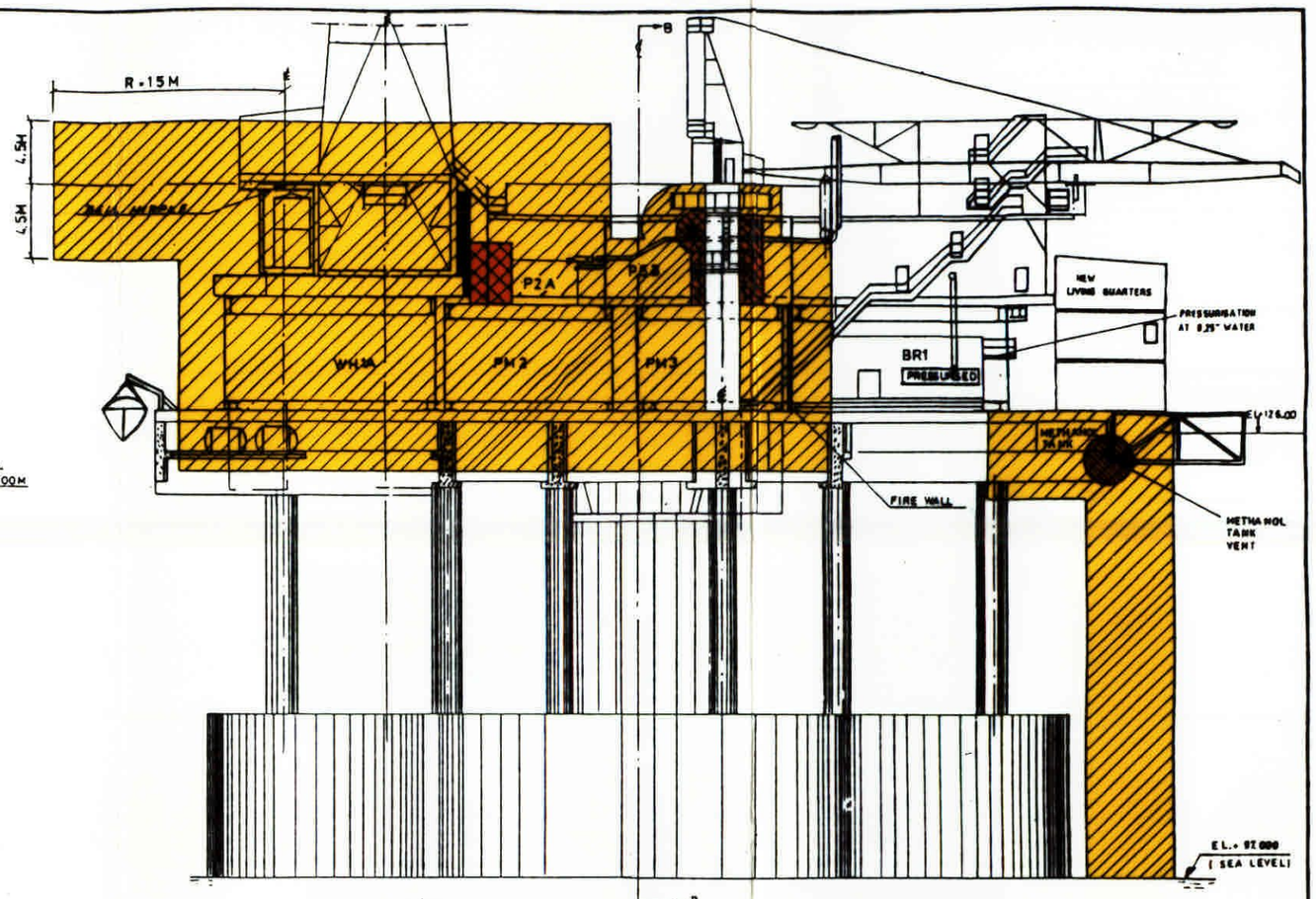
ISSUE 4 AUGUST 1985

AREA CLASSIFICATION Upper Deck

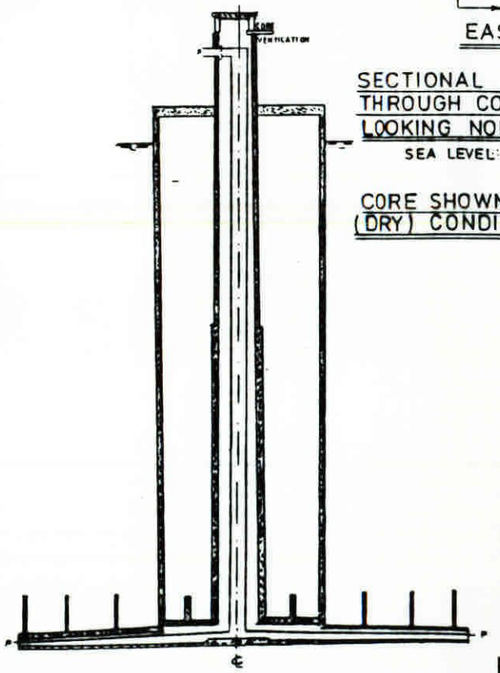
10.3.3



SECTION B-B (SCALE 1:200)



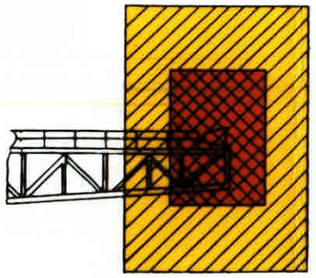
EAST ELEVATION (SCALE 1:200)



SECTIONAL ELEVATION THROUGH CORE LOOKING NORTH (NOT TO SCALE)

SEA LEVEL: EL+97.00

CORE SHOWN IN NORMAL OPERATING (DRY) CONDITION



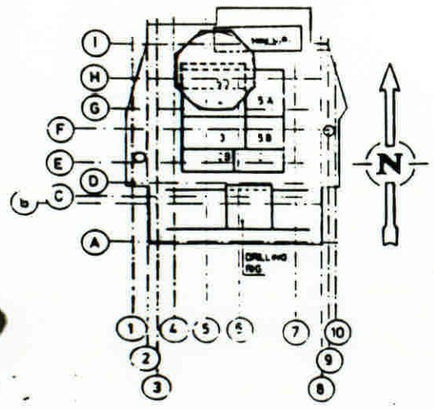
VIEW ON END OF FLARE BOOM
DETAIL A : (SCALE 1:200)

LEGEND

AREA CLASSIFICATION ACCORDING TO IP ELECTRICAL CODE FOR DRILLING & PRODUCTION IN MARINE AREAS PAER 1&8

- AREA CLASSIFICATION ZONE 1
- AREA CLASSIFICATION ZONE 2 NATURALLY VENTILATE

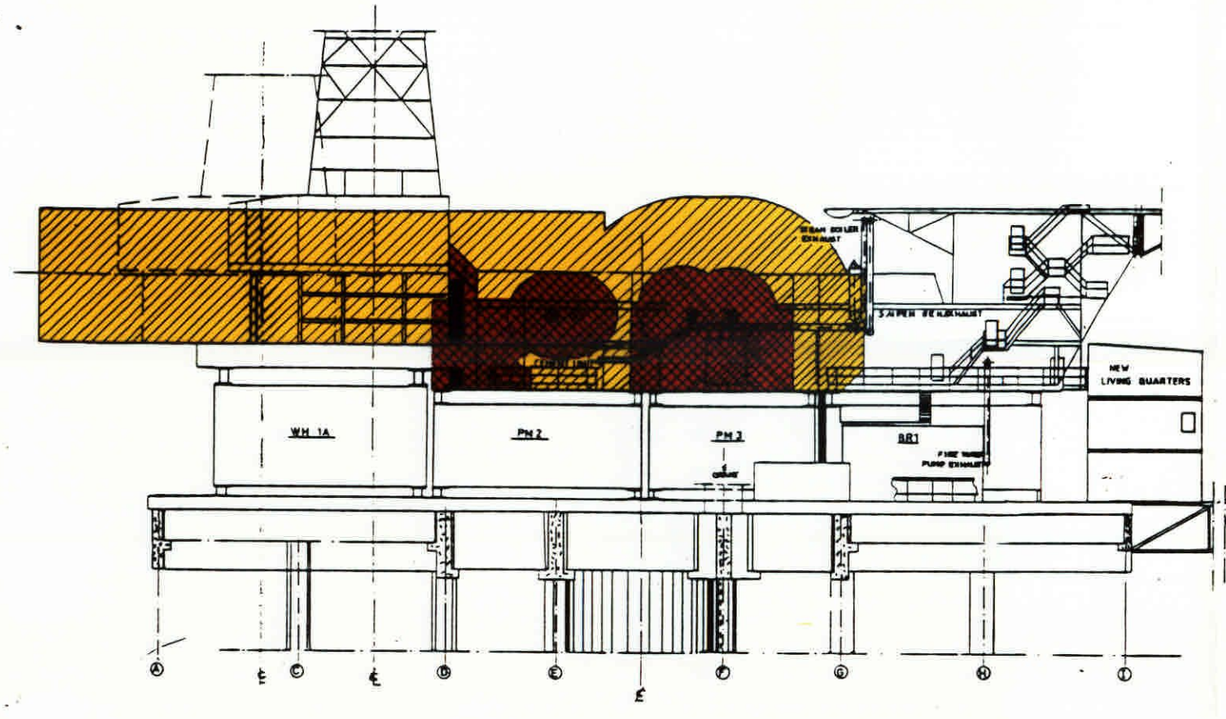
KEY PLAN CDP1 DRILLING DECK



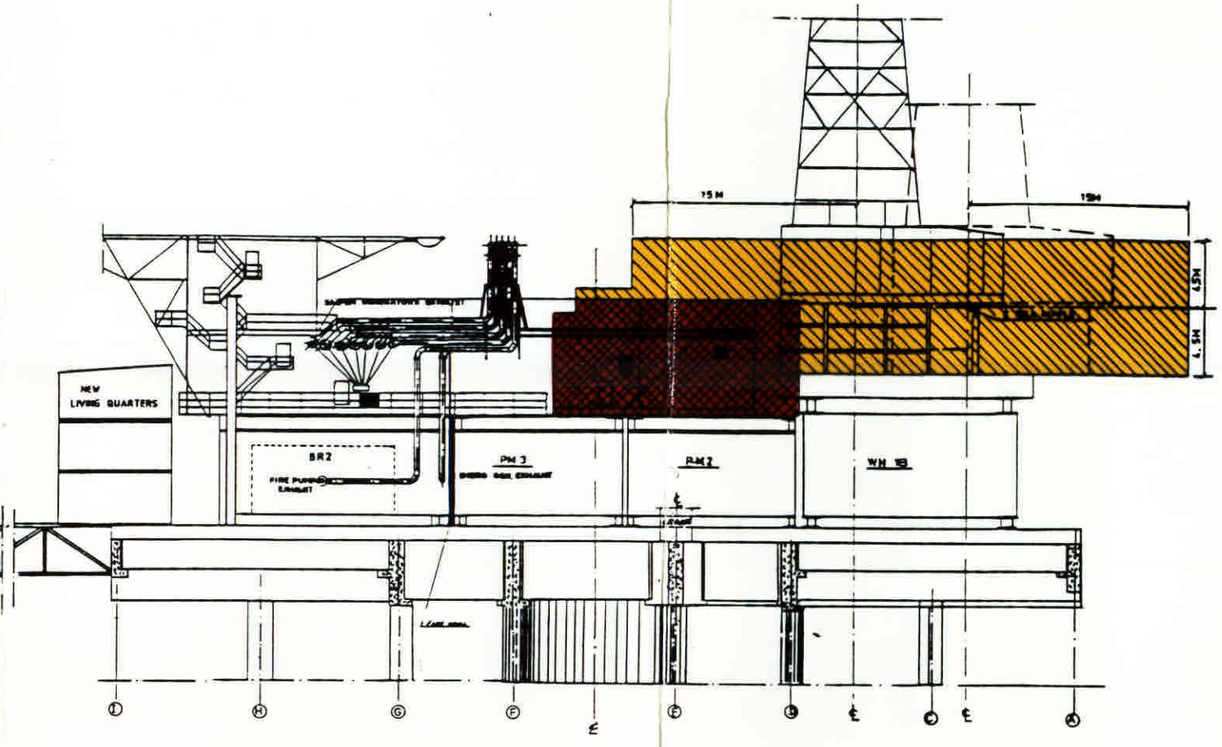
REFERENCE DWG.	
DWG. NO.	TITLE
FF 9123210325	MAIN DECK EL+130.0
FF 9123210326	TOP OF DECK BEAMS EL+127.04
FF 9123210327	SAIPEM MODULES EAST AND WEST VIEW
FF 9123210328	DRILLING DECK

ISSUE 5. AUGUST 1986

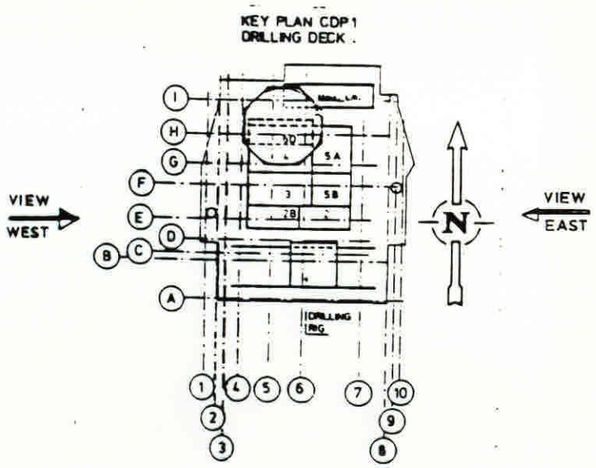
AREA CLASSIFICATION
EAST- Elevations
10.3.4



EAST SIDE VIEW



WEST SIDE VIEW

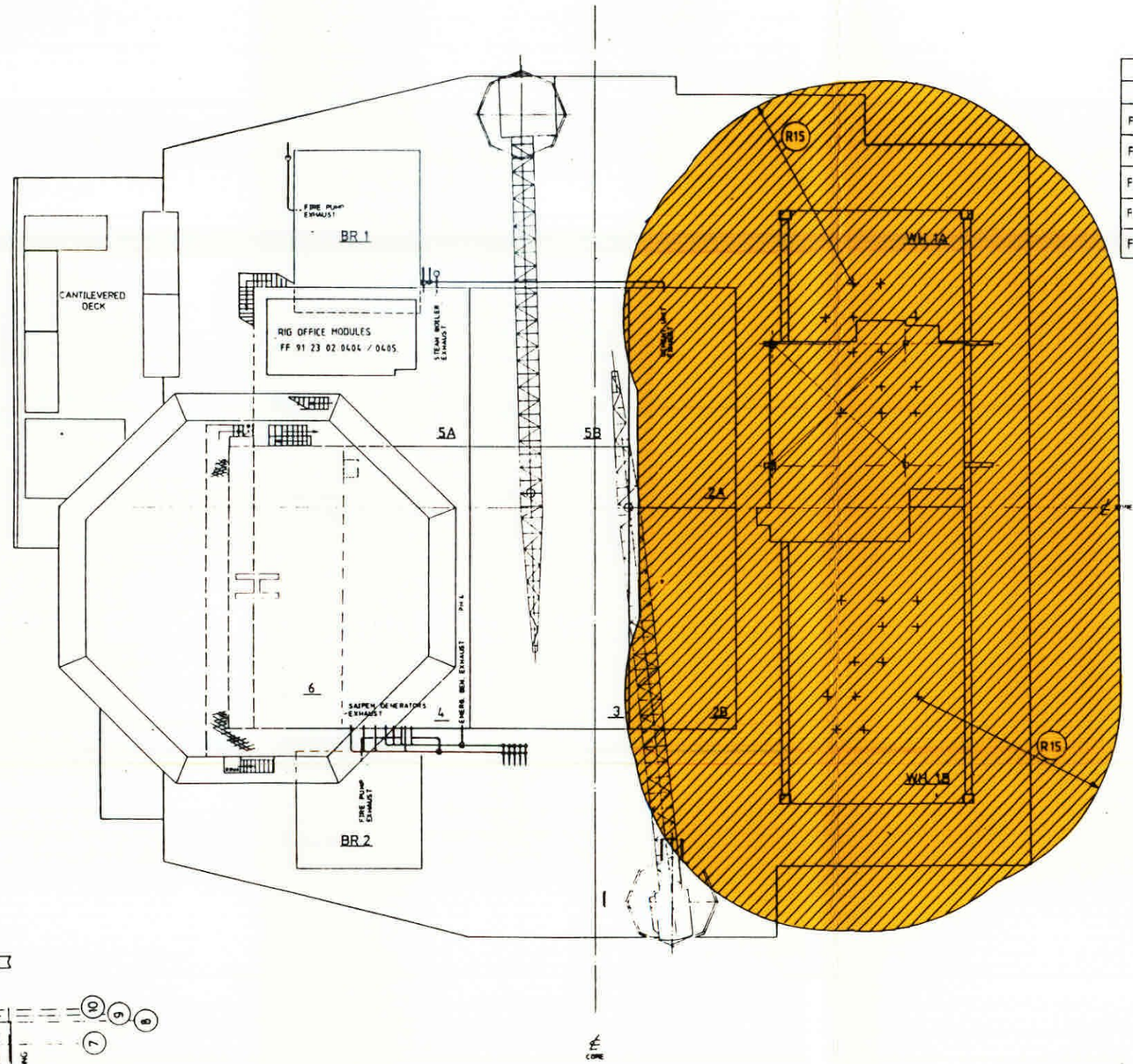


LEGEND
AREA CLASSIFICATION ACCORDING TO IP ELECTRICAL CODE FOR DRILLING & PRODUCTION IN MARINE AREAS PART 1 & 8
AREA CLASSIFICATION ZONE 1
AREA CLASSIFICATION ZONE 2 NATURALLY VENTILATED

REFERENCE DWG.	
DWG. NO.	TITLE
FF9123210324	EAST EL. AND SECTION EL. OF CORE
FF9123210325	MAIN DECK EL.+130.0
FF9123210326	TOP OF DECK BEAMS EL.+127.04
FF9123210328	DRILLING DECK.

ISSUE 1 AUGUST 1985

AREA CLASSIFICATION
EAST & WEST VIEW. SAIPEM MODULES | **10.3.5**



REFERENCE DWG.	
DWG.NO.	TITLE EL.
FF 91 23 21 0324	EAST EL. AND SECTION EL OF CORE.
FF 91 23 21 0325	MAIN DECK EL.+ 130.0
FF 91 23 21 0326	TOP OF DECK BEAMS EL.+ 127.04
FF 91 23 21 0327	SAIPEM MODULES EAST AND WEST VIEW.
FF 91 23 21 0328	AREA CLASSIFICATION OF DRILLING DECK

LEGEND

AREA CLASSIFICATION ACCORDING TO IP ELECTRICAL CODE FOR DRILLING & PRODUCTION IN MARINE AREAS PAER 1 & 8.

AREA CLASSIFICATION ZONE 1.

AREA CLASSIFICATION ZONE 2 NATURALLY VENTILATED.

DRILLING PACKAGE MODULES.

THE DRILLING PACKAGE MODULES ARE AS FOLLOWS:

WH.1A : WELLHEAD 1A.
WH.1B WELLHEAD 1B.

NO.2A: MUD TANKS AND CEMENTING UNIT.

NO.2B: RESERVE MUD TANKS.

NO.3 : MUD SUCTION TANK, MAIN PUMPS AND BULKS.

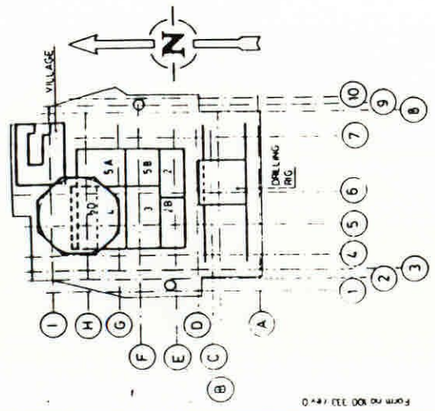
NO.4 : POWER PLANT.

NO.5A: ADDITIONAL LIVING QUARTERS, GEOLOGICAL LABORATORY AND AC. GENERATORS.

NO.5B: BULKS.

NO.6 : LIVING QUARTERS , HELIDECK ETC.

KEY PLAN COP1
DRILLING DECK.



ISSUE 1 AUGUST 1985

AREA CLASSIFICATION
PIPE RACK DECK

10.3.6

AUDIBLE AND VISUAL ALARMS

1 GENERAL

1.1 Audible and visual alarms provide platform personnel with information on the safety status of the platform.

1.2 Audible alarms are broadcast by the public address system loudspeakers.

1.3 Visual alarms are provided in selected platform areas, comprising:

(a) Red lights which flash when the fire and muster alarm is sounded.

(b) Blue lights which flash when the public address system is in operation.

(c) Red lights outside individual compartments which burn steadily when Halon has been released into the compartment. For details of halon lamps,see sect.10.10.

2 DESCRIPTION

2.1 Alarms are of the following types:

(a) Abandon Alarm — Will be verbally broadcast over the public address system.

(b) Muster Alarm — Will be signalled by a continuous tone broadcast via fire and muster alarm system.

(c) Fire Alarm — Will be signalled by an intermittent tone broadcast via the fire and muster alarm system as a series of sound pulses of one second duration, each sound pulse separated by a period of silence of one second duration.

(d) Gas Alarm — Starts as a fire alarm; after 5 seconds the words 'gas alarm' are repeated several times.

2.2 Automatic priority ranking of the alarms is provided as follows:

(a) Priority 1 — Abandon alarm.

(b) Priority 2 — Muster alarm.

(c) Priority 3 — Fire alarm.

(d) Priority 4 — Gas alarm.

The highest priority alarm will override any other alarm, eg if a Fire Alarm is being broadcast and a Muster Alarm is initiated, the Muster Alarm will override. The public address system as distinct from the Abandon Alarm will override any alarm tone for a period of 10 seconds.

3 INITIATION OF ALARMS

3.1 A Muster Alarm may be initiated manually from any of the platform alarm control panels and from certain safety panels. A Fire Alarm may be initiated manually by operation of any of the fire alarm pushbuttons located at various points throughout the platform or automatically by operation of the fire detection system. A Fire Alarm may also be initiated by operation of certain of the platform shutdown systems. An Abandon Alarm may be initiated at QP Control Room or at CDP1 Production Control Room.

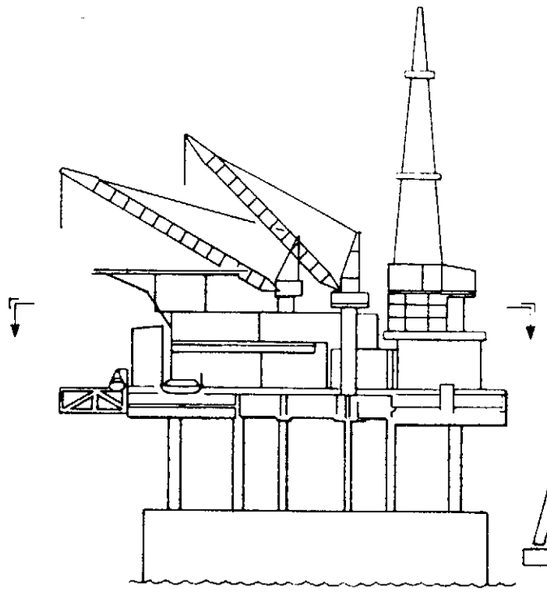
3.2 Muster and Fire Alarms may be cancelled by operation of a cancel pushbutton at the panel at which the alarm was initiated.

4 ACTION TO BE TAKEN ON HEARING ALARMS

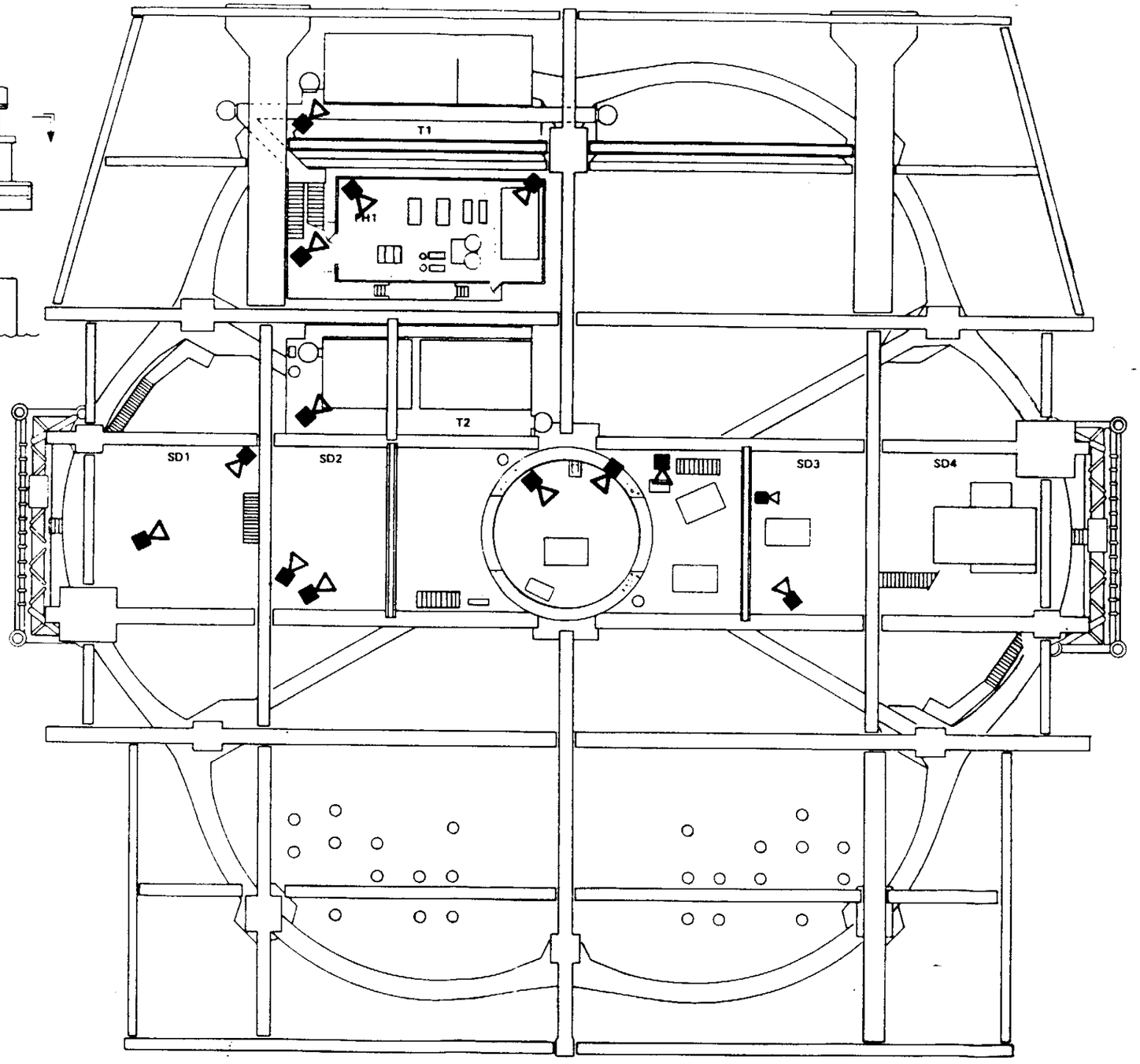
4.1 Muster Alarm – All personnel proceed to their lifeboat stations and await further instructions.

4.2 Fire Alarm – All personnel assigned to a fire party are to gather their designated equipment and assemble at their fire stations. All other personnel are to proceed to their lifeboat stations and await further instructions.

END



WEST ELEVATION



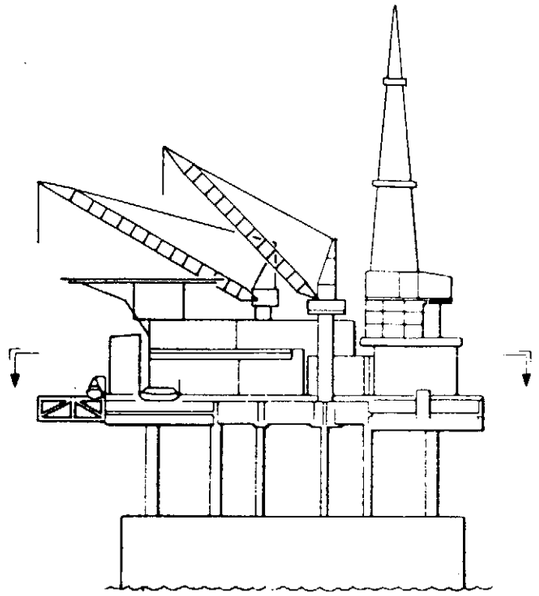
KEY

PUBLIC ADDRESS LOUSPEAKER AND FIRE/MUSTER

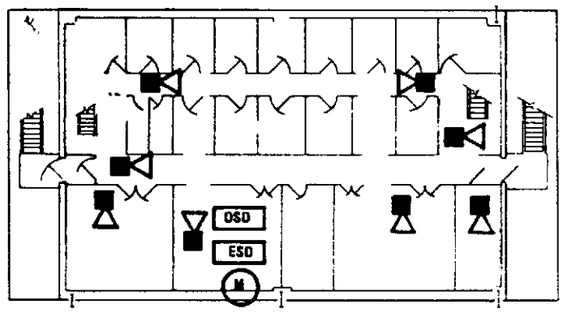
ISSUE 4 OCT. 1988

AUDIBLE AND VISUAL ALARMS
Service Deck

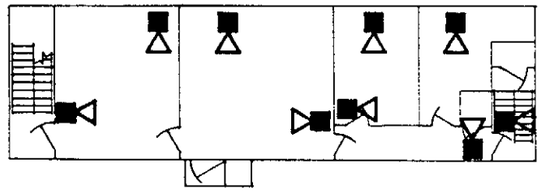
10.4.1



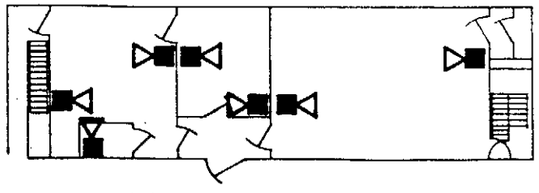
WEST ELEVATION



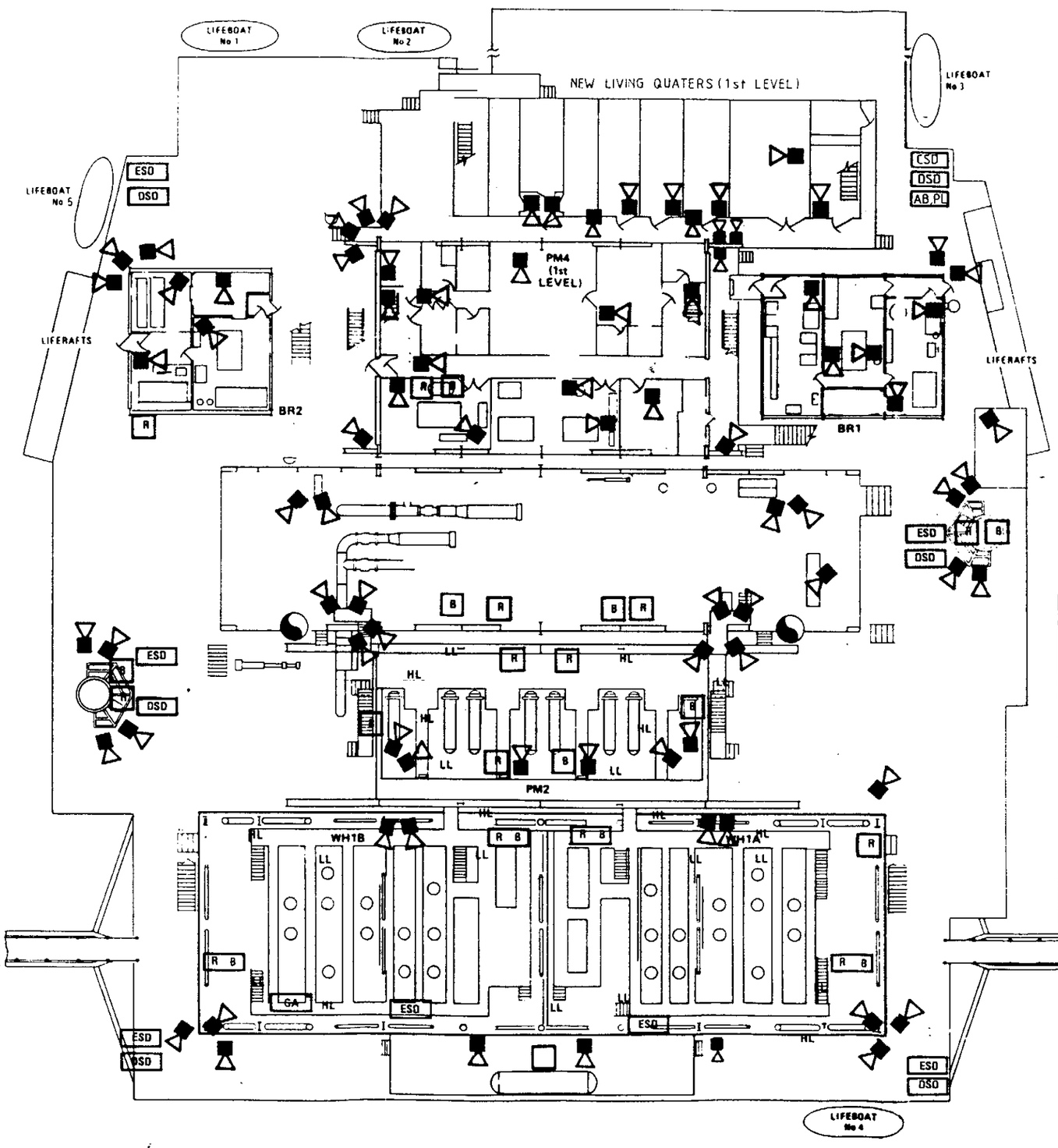
PM4 (2nd LEVEL)

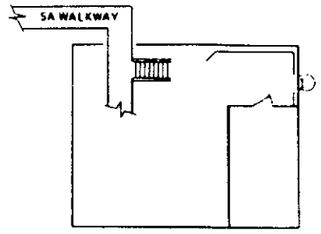


NEW LIVING QUARTER (2nd LEVEL)



NEW LIVING QUARTER (3rd LEVEL)





PLAN ON ROOF OF BR1

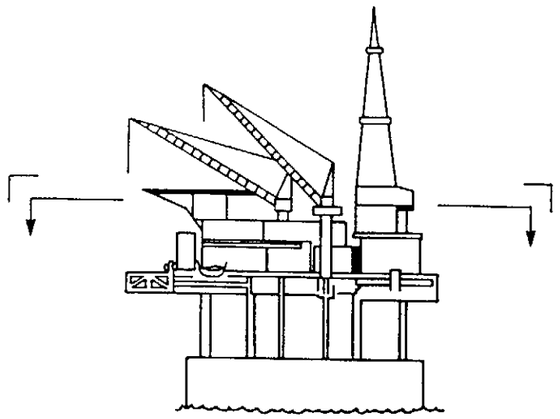
N
PLATFORM NORTH

KEY	
ESD	EMERGENCY SHUTDOWN PUSHBUTTON
DSD	DISASTER SHUTDOWN PUSHBUTTON
M	MUSTER ALARM PUSHBUTTON
	PUBLIC ADDRESS LOUDSPEAKER *HELIDECK AND SAIPEM FIRE MUSTER
R B	RED AND BLUE FLASHING LIGHTS. RED-FIRE ALARM BLUE-PA ALARM

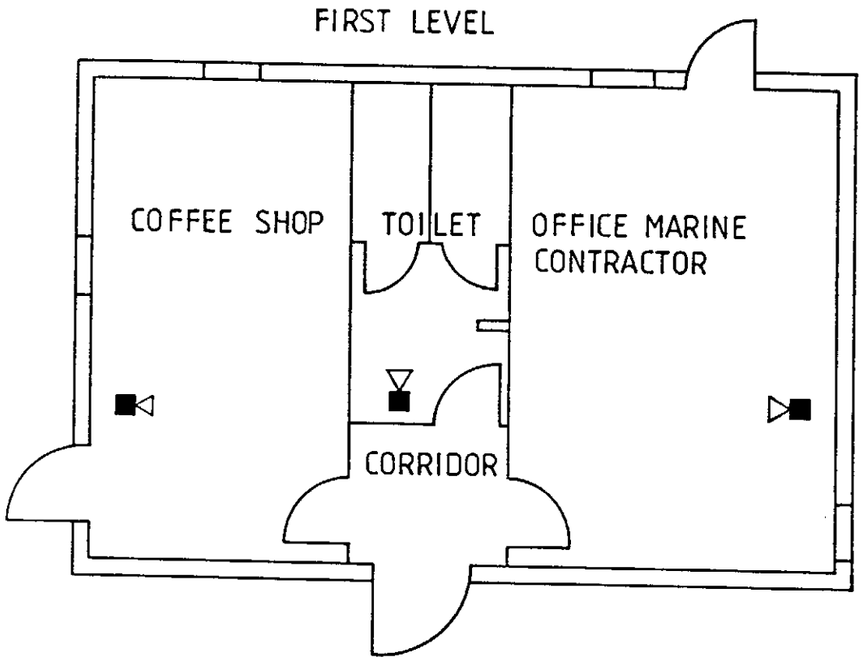
ISSUE 5 OCT. 1988

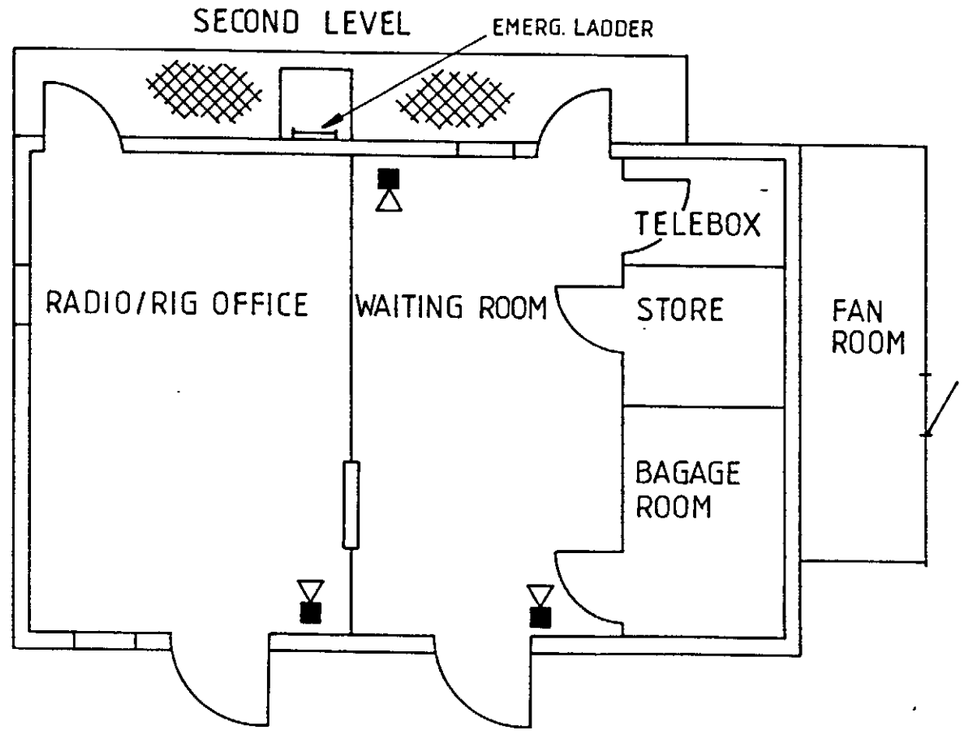
AUDIBLE AND VISUAL ALARMS. Production Deck

10.4.2



WEST ELEVATION





KEY
PUBLIC ADDRESS LOUDSPEAKER AND FIREMUSTER

Issue 2, Oct.88

AUDIBLE AND VISUAL ALARMS New rig module	10.4.3

SHUTDOWNS

1 GENERAL

1.1 The major objectives of the CDP1 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 at 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 CDP1 first level shutdown is initiated by operation of any of the FSD or DSD pushbuttons, located as follows:

(a) FSD pushbutton

QP Control Room

(b) DSD pushbuttons:

Crane east
Crane west
Production control room
Lifeboat station noth-east corner
Main deck south-east corner
Lifeboat station north-west corner
Main deck south west corner
Helideck
Doghouse-rig
Toolpusher's office

2.1.2 The effects of a CDP1 First Level Shutdown are:

(a) A complete process shutdown.

(b) Loss of the 5.5kV power supply from the Quarters Platform, and the 380V supply from the auxiliary generators.

(c) Simultaneous load shedding after a delay of 30 minutes.

(d) The methanol and utilities pumps stop, and the ventilation systems shut down.

(e) The fire pumps start and the deluge valves open.

(f) The warning horns sound in the Core Area.

(g) The muster alarm is sounded.

(h) The relevant alarm annunciators operate in the Production Control Room, QP Control Room, Doghouse & Toolpusher's office.

2.2 Second Level Shutdown

2.2.1 CDP1 second level shutdown is initiated by:

(a) Operation of any of the ESD pushbuttons, located as follows:
TP1 Interface Room
QP Control Room
Production Control Room
Lifeboat Station north-east corner
Crane east
Main Deck south-east corner
Lifeboat Station north-west corner
Crane west
Main Deck south-west corner
Helideck
Doghouse-rig
Toolpushers office
Mod. WHIA
Mod. WHIB

(b) Detection of gas at a level of 40 per cent LEL in the ventilation ducts of Module PM4, New rig Module and New L. quarters. or at a level of 60 per cent LEL in modules BR1 or BR2, Saipem Eng. Room or Standby Gen. Room.

(c) 1st Level Shutdown

2.2.2 The effects of a Second Level Shutdown are, except where otherwise stated:

(a) A complete process shutdown

(b) Loss of the 5.5kV power from the Quarters Platform, and the 380V supply from the auxiliary generators.

(c) Progressive load shedding. Note that on failure of the 380V auxiliary power supply, there is a delay of seven minutes before the load shedding starts.

(d) The methanol and utilities pumps stop, and the ventilation systems shut down.

(e) The fire pumps start.

(f) The relevant alarm annunciators operate in the Production Control Room , QP Control Room, Toolpushers Office & Doghouse

(g) Shutdown Ventilation (Relevant area for Fire and Gas only.)

2.3 Third Level Shutdown

2.3.1 CDP1 third level shutdown is initiated by:

(a) Second threshold detection of fire.

(b) Detection of gas at a level of 40/60 per cent LEL

(c) Low instrument air pressure.

(d) Low hydraulic fluid pressure in the 3000 PSI hydraulic system.

2.3.2 The effects of a Third Level Shutdown are:

a) A complete process shutdown.

b) The methanol pumps stop.

c) The gas oil,soft water and sea water pumps stop.

d) The fire pumps start.

e) The deluge valves open on fire detection in the Process Areas and Modules PH1, T1 or T2 only.

f) The warning horns sound in the Core Area on fire detection only.

g) The relevant alarm annunciators operate in the Production Control Room, QP Control Room,Doghouse-rig,Toolpusher's office.

2.4 Fourth, Fifth and Sixth Shutdown Levels.

2.4.1 Fourth level shutdown is initiated by:

(a) Low hydraulic fluid pressure (6000 PSI) system to downhole).

(b) Low hydraulic fluid pressure (3000 PSI) system to wellhead).

2.4.2 The effects of a Fourth level shutdown are:

(a) The methanol pumps stop (GA 150 only)

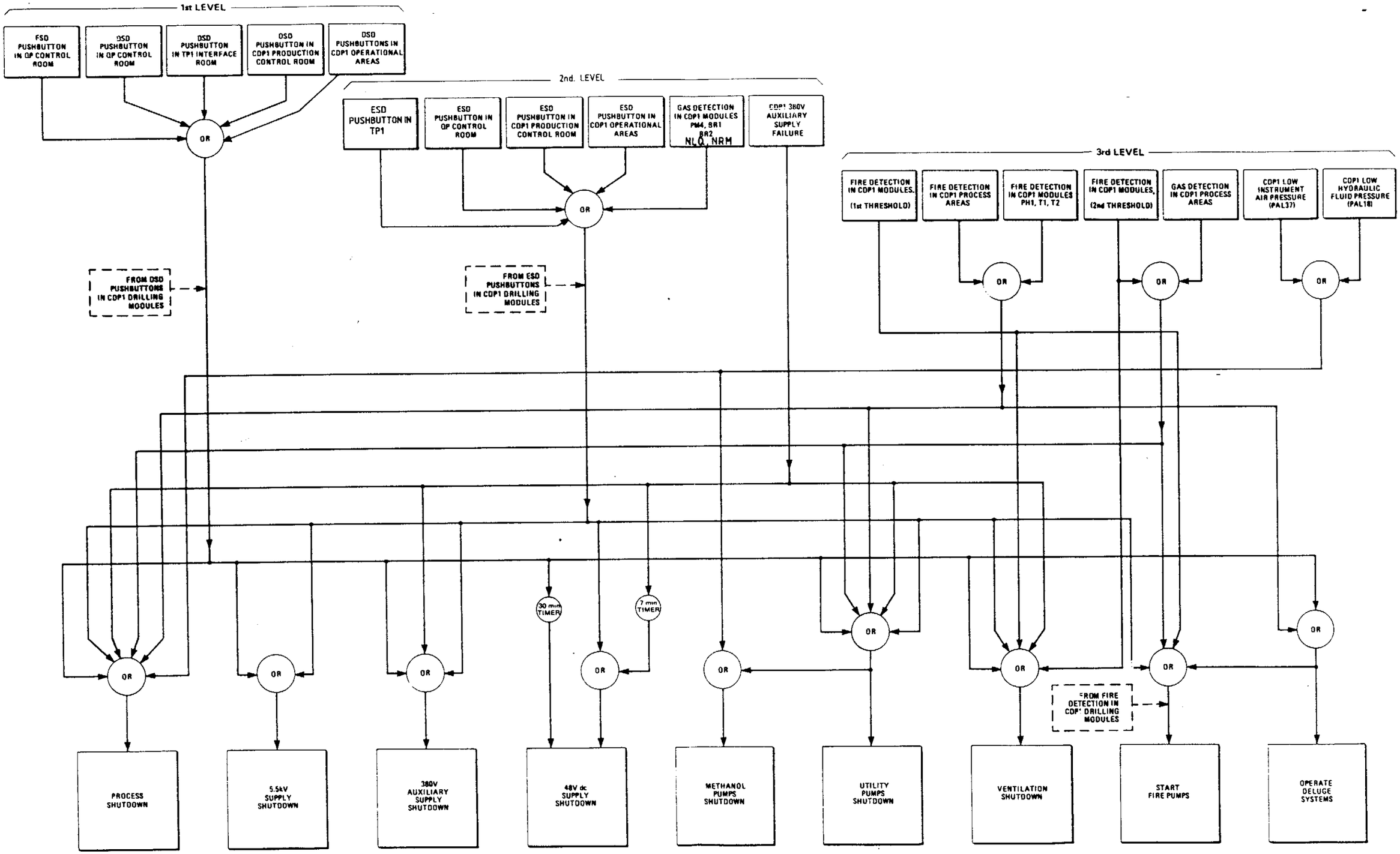
(b) Wellhead cluster valves ROV02, ROV03, ROV04, ROV05, ROV06, MOV21, MOV25, MOV26 and MOV27 close.

2.4.3 Fifth level shutdown is initiated by:

(a) High differential pressure across scrubber desander filter elements, which result in closure of ROV3, ROV4, MOV25 and MOV26 (individual gas stream shutdown). This is for scrubber FA-101Q (#15) only. All other scrubbers have been disconnected.

(b) High output through a scrubber desander, which results in closure of ROV2, ROV3, ROV4, MOV25 and MOV26 (individual gas stream shutdown). (FA-101Q(# 15) only).

END



ISSUE 3 OCT. 1988

SHUTDOWNS Logic	10.5.1

NOTES:
WARNING HORNS & LOUDSPEAKERS
CONTINUOUS NOTE: ABANDON PLATFORM STATIONS
INTERMITTENT NOTE: FIRE
(60) INDICATES TIME DELAY IN SECONDS
[5] INDICATES TIME DELAY IN MINUTES
◁ DENOTES GROUPING OF SIGNALS ON SINGLE WINDOW OF ANNUNCIATOR

NOTES:
1 INDIVIDUALLY FOR EACH WELL
2 INDIVIDUALLY FOR EACH SEA LINE
3 INDIVIDUALLY FOR EACH CLUSTER
4 OVERIDES SHUTDOWN FUNCTION FOR AIR INTAKE FIRE DAMPERS, EXCLUDING ABANDON PLATFORM DRILLERS.
5 # ADJ. TIME DELAY 0-10 SEC (OVERCOME SPURIOUS SIGNALS-SPRINKLER)

	WELLS & DHV SHUTDOWN BUTTON FROM QP	DISASTER SHUTDOWN
	WELLS & DHV S.D. BUTTON FROM PROD. CONTROL ROOM	DISASTER SHUTDOWN
	WELLS & DHV S.D. BUTTON - PRODUCTION OR DRILLING	DISASTER SHUTDOWN
	EMERGENCY SHUTDOWN FROM QP	PROD. PLATFORM S.D.
	EMERGENCY S.D. FROM PRODUCTION CONTROL ROOM	PROD. PLATFORM S.D.
	EMERGENCY S.D. - PRODUCTION OR DRILLING	PROD. PLATFORM S.D.
	SHUTDOWN BUTTON RIG FLOOR	RIG S.D. ONLY STOP DIESEL
	GENERAL ALARM BUTTON CIRCUIT RIG FLOOR	ALARM RIG
	GENERAL ALARM BUTTON CIRCUIT DRILLERS OFFICE	ALARM RIG
	ALARM BUTTON CIRCUIT IN PRODUCTION AREAS (28)	PS21 ALARM PLATFORM
	CORE ALARM BUTTONS (5)	
	FIRE IN STANDBY GENERATOR ROOM (DRILLING MODULE 4)	1st THRESHOLD
	" " " "	HALON
	FIRE ALARM BUTTONS / SPRINKLER - NEW RIG MODULE	2nd THRESHOLD
	FIRE ALARM BUTTONS / SPRINKLER - NEW LIVING QUARTERS	2nd THRESHOLD
	FIRE IN NEW LQ	1st THRESHOLD
	FIRE IN NEW LQ	2nd THRESHOLD
	FIRE IN NEW RIG MODULE	1st THRESHOLD
	FIRE IN NEW RIG MODULE	2nd THRESHOLD
	FIRE IN WHIA & WHIB, METHANOL DAY TANK	
	FIRE IN PM2	
	FIRE IN PM3	
	FIRE IN PM4 UTILITIES AND CEILINGS	ONE OF TWO DETECTORS
	FIRE IN PM4 UTILITIES AND CEILINGS	TWO DETECTORS
	FIRE IN PM4 CABINS AND LIVING QUARTER	SMOKE / SPRINKLER
	FIRE IN PM1 T1 AND T2	
	FIRE IN BR1 FIRE PUMP ROOM	FUSIBLE PLUGS
	FIRE IN BR1 FIRE PUMP ROOM	FUSIBLE SPRAYS
	FIRE IN BR1 COMPRESSOR ROOM	FUSIBLE PLUGS
	FIRE IN BR1 ELECTRICAL ROOM	ONE DETECTOR
	FIRE IN BR1 BATTERY AND SWITCHROOMS	TWO DETECTORS
	FIRE IN BR1 BATTERY AND SWITCHROOMS	FUSIBLE PLUGS
	FIRE IN BR2 FIRE PUMP ROOM	FUSIBLE SPRAYS
	FIRE IN BR2 FIRE PUMP ROOM	FUSIBLE PLUGS
	FIRE IN BR2 ELECTRICAL ROOM	ONE DETECTOR
	FIRE IN SDI TO 3 EXTRACT DUCT	TWO DETECTORS
	FIRE IN SDI TO 3 EXTRACT DUCT	ONE THERMAL DETECTORS
	FIRE IN GALLEY EXTRACT DUCT	TWO HEAT DETECTORS
	HALON MANUAL RELEASES PM4	
	HALON MANUAL RELEASES BR1	
	HALON MANUAL RELEASES BR2	
	PRODUCTION FIRE PUMPS MANUAL START STATIONS	PROD. HELIDECK + SAIPEM
	FIRE DETECTION CORE	FUSIBLE PLUGS
	FOAM TO CORE MANUAL FROM SERVICE DECK	
	FIRE IN SAIPEM 3rd FLOOR CO2/FOAM ROOMS & STORES AREA	1st THRESHOLD
	FIRE IN SAIPEM LQ (TECHN. ROOMS)	1 DETECTOR
	FIRE IN SAIPEM LQ (" ")	2 DETECTORS
	FIRE IN SAIPEM LQ OR 3rd FLOOR CO2/FOAM ROOMS & STORES	SPRINKLER
	FIRE IN SAIPEM ENGINE ROOM (MODULE 6) SAIPEM	
	FOAM MANUAL RELEASE SAIPEM	
	" " " " "	1st THRESHOLD
	" " " " "	2nd THRESHOLD
	FIRE IN SAIPEM ENGINE ROOM (MODULE 5A)	
	" " " " "	1st THRESHOLD
	" " " " "	2nd THRESHOLD
	FIRE IN SAIPEM MUD ROOM (MODULE 2A, 2B & 5B)	SPRINKLER
	FIRE IN DETECTION DRILLING MANUAL FAB'S	MANUAL
	FIRE IN SAIPEM ENGINE ROOM WORKSHOPS (MODULE 6)	1st THRESHOLD
	GAS L IN CORE	20% LEL
	GAS H IN CORE	60% LEL
	GAS L IN PM2	15% LEL
	GAS H IN PM2	30% LEL
	GAS L IN PM3	15% LEL
	GAS H IN PM3	30% LEL
	GAS L IN PM4	20% LEL
	GAS H IN PM4	40% LEL
	GAS L IN BR1	20% LEL
	GAS H IN BR1	60% LEL
	GAS L IN BR2	20% LEL
	GAS H IN BR2	60% LEL
	GAS L IN PM1, T1 & T2	20% LEL
	GAS H IN PM1, T1 & T2	60% LEL
	GAS L IN SDI TO 3	20% LEL
	GAS H IN SDI TO 3	60% LEL
	GAS L IN CORE	20% LEL
	GAS H IN CORE	60% LEL
	GAS L IN VENT INLET SAIPEM LQ	20 % LEL
	GAS H IN VENT INLET SAIPEM LQ	40 % LEL
	GAS L IN WH1 A	20% LEL
	GAS H IN WH1 A	60% LEL
	GAS L IN WH1 B	20% LEL
	GAS H IN WH1 B	60% LEL
	GAS L AT DAY METHANOL TANK	20% LEL
	GAS H " " " "	60% LEL
	GAS L SAIPEM ENGINE ROOMS VENT DUCT INLET (MODULE 4)	20% LEL
	GAS H SAIPEM ENGINE ROOMS VENT DUCT INLET " "	60% LEL
	GAS L STAINTSY GENERATOR ROOM AIR INTAKE	20% LEL
	GAS H " " " " "	60% LEL
	GAS L DRILLING "OUTSIDE" AREA	20% LEL
	GAS H " " " "	60% LEL
	GAS L IN NEW LQ	20% LEL
	GAS H IN NEW LQ	40% LEL
	GAS L IN NEW RIG MODULE	20% LEL
	GAS H IN NEW RIG MODULE	40% LEL
	LOW PRESSURE UPSTREAM CHOKE VALVES	PSL 51 - 24
	" " " " "	FSM - 05
	" " " " "	LSPM - 07
	" " " " "	LSLL - 07
	LOW PRESSURE SEA LINES (24")	LSL 05
	HIGH PRESSURE SEA LINES 20" (2)	PSH - 19A & B
	HIGH DIFFERENTIAL PRESS ACROSS SCRUBBERS (24-101 24)	DPSH-02
	1500 PSI HYDRAULIC LOW PRESSURE EMERGENCY SUPPLY	PSL 20 & 21 B
	HIGH GAS FLOW SCRUBBERS FA-101 (24)	FSL 20 & 21 A
	PRESSURE FAULT SEA LINE A FROM TP1	PSL-M1
	PRESSURE FAULT SEA LINE B FROM TP1	PSL-M2
	LOW PRESSURE ISEA LINE FROM TP1 (TELEMT)	PSL-M9-1
	PRESSURISATION BR2 & PM1 VENTILATION FAILURE	
	PRESSURISATION FAILURE BR1 OR PM4	PSL 40 A & B
	LOW PRESSURE FIRE JUMPS STARTING AIR	
	6000 PSI HYDRAULICS LOW PRESSURE TO DHV	PSL-16 A & B
	3000 PSI HYDRAULICS LOW PRESSURE TO WELLHEAD	PSL-17 A & B
	3000 PSI AUX HYDRAULICS ACUM PRESS LOW	PSL-18
	LAR PRESSURE 3 BAR	PSL-37
	LAR PRESSURE 10 BAR	PSL-38
	FAILURE TR1	FOR MORE DETAILS SEE DWG CDP-1 EE-118
	FAILURE TR2	
	POWER FAILURE MCC A & B GE-100 NO 5 SKV	
	POWER FAILURE MCC "C"	
	EARTH FAULT MCC A & B	1st STAGE
	EARTH FAULT MCC A & B	2nd STAGE
	EARTH FAULT MCC "C"	1st STAGE
	EARTH FAULT MCC "C"	2nd STAGE
	POWER FAILURE ON 5.5 KV	
	BATTERY CHARGER FAILURE 48 V	
	BATTERY CHARGER NAV AID FAILURE	
	ABANDON PLATFORM PUSH BUTTON NE LIFEBOAT	
	WORKOVER BYPASS SELECTOR SWITCH	

70	
69	
68	SAIPEM BOILER SHUTDOWN
67	SHUTDOWN DIESEL ENGINES - DRILLING
66	SHUTDOWN STANDBY GENERATOR
65	
64	
63	METHANOLATED WATER FROM TP1 - HOV 23 (SHUT)
62	METHANOL INJECTION ROV-17 1 1/2" (1) SHUT
61	METHANOL INJECTION ROV-16 1 1/2" (1) SHUT
60	METHANOL INJECTION ROV-15 1 1/2" (1) SHUT
59	METHANOL INJECTION ROV-14 1 1/2" (1) SHUT
58	
57	
56	
55	
54	DIVIDER GAS VALVE ROV-05 24" (1) SHUT
53	VENT ROV-08 10" (2) SHUT
52	SEA LINE GAS VALVE ROV-06 24" (2) SHUT
51	DHV ROV-01 (24) SHUT 60 SEC DELAY
50	MASTER VALVE ROV-02 (24) SHUT
49	WING VALVE ROV-03 6" (24) SHUT
48	VENT VALVE ROV-07 2" (24) SHUT
47	FLOWLINE VALVE ROV-04 8" (24) SHUT
46	
45	METHANOL PUMP GA114 A & S STOP
44	METHANOL PUMP GA111 A, B & S STOP
43	METHANOL PUMP GA150 STOP
42	
41	
40	
39	SEA WATER PUMP GA112 A, B & S STOP
38	SEA WATER PUMP GA 108 A & S STOP
37	SOFT WATER PUMP GA105 A & S STOP
36	GAS OIL PUMP GA 101 A & S STOP
35	
34	SYMINEX SHUTDOWN
33	LOAD SHEDDING 48 VDC (WHEN 380 V AC SHUT DOWN)
32	LOAD SHEDDING 48 VDC PM 4 - BR1 & BR2
31	CALLING SEQUENCE 2
30	
29	START GENERATOR GE-100
28	GENERATOR STOP GENERATOR START INHIBIT - GE 100
27	CIRCUIT BREAKERS OPEN ACB 401, 402 SHUTDOWN G9
26	CIRCUIT BREAKERS 380 V TRANSFERS OPEN ACB 402, 406
25	BREAK SWITCHES ON 55KV IN BR1 OPEN - ACB 402, 404-405
24	CIRCUIT BREAKER ON 5.5KV ON QP OPENS ACB 206
23	SHUTDOWN SUPPLY WELDING SOCKETS
22	STOP COMPRESSOR TOP BR 2
21	FIRE CONTROL (24V) SHUTDOWN
20	VENTILATION SHUTDOWN RELEVANT MODULE
19	INDICATE FIRE WATER AVAILABLE
18	
17	
16	HALON RELEASE RELEVANT AREA OR CEILING
15	
14	FIRE PUMPS A & B START PRODUCTION
13	
12	DELUGE WATER FLOWS
11	DELUGE ZONES (10) RELEVANT AREA
10	FIRE INDICATOR-LIGHT OUTSIDE RELEVANT ROOMS
9	SHUT MAGNETIC DOORS IN SAIPEM LQ
8	
7	ALARM ANNUNCIATOR IN PRODUCTION CONTROL ROOM
6	
5	PLATFORM FIRE WARNING LOUDSPEAKERS INTERMITTANT SIGNAL
4	DISASTER ALARM MUSTER STATIONS - PA
3	WARNING HORNS IN CORE
2	ALARM ANNUNCIATOR IN RIG FLOOR CONSOLE
1	ALARM ANNUNCIATOR IN DRILLERS OFFICE
0	ALARM TO QP CONTROL ROOM

SEE NOTE 3 — SEE NOTE 1 — SEE NOTE 2 — SEE NOTE 2 — SEE NOTE 1

DSD - ESD - ALARM | FIRE | GAS | PROCESS | UTILITIES | ELECTRICAL | DRILLING | ALARM | FIRE FIGHTING | ESSENTIAL | MTL PUMPS | PROCESS

EFFECT / CAUSE

rev.	date	DESCRIPTION	by	app.
9	28.7.87	AS BUILT	MM	SS
8	16-4-86	REVISED AS BUILT MN 91166X	C.S	
7	17.12.85	updated as MAINT. INFO	MSC	
6	5.3-85	STATUS 'A' ADDED.	CS.	
5	23.10.84	UPDATED AS BUILT 91176, 91144, 91144N1, N2. 91055A2 & 91093	C.S.	
4	12.83	UPDATED ACCORDING TO MAINTENANCE INFO	T.D	S.R
3	22.12.82	UPDATED ACCORDING TO MAINTENANCE INFO.	AS	S.R
2	22.4.82	UPDATED 91139A (91130A) + SAIPEM	DMS	
10	22.4.88	UPDATED MN 91195 & 91196X SYMINEX FIRE S/D	MM	
11	28.9.88	UPDATED MN 90127		

BROWN & ROOT CDP-1 - 11 - 100

elf aquitaine norge a/s p.o.box 168 — 4001 Stavanger

(A) Installation: CDP 1 | System: EMERGENCY SHUTDOWN

Job no. | Scale

SHUT-DOWN & ALARM MATRIX

FRIGG FIELD | Drwg no. FF 91-16 - 21-1101 | Rev 11 | Sheet 1 / 1

FIRE AND SMOKE DETECTION

1 GENERAL

1.1 A fire and smoke detection system is provided on CDP1 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) CDP1 firewater pumps will start.

(c) Indication of the fire area at the fire control panels in the Safety Equipment Room on the second level of PM4. Associated alarm annunciators operate in the Production Control Room and QP Control Room.

(d) Initiation of Emergency Shutdown (ESD) if the seat of the fire is in certain areas; see Section 10.5.

(e) In certain circumstances Halon, water deluge, or sprinkler systems will be brought into operation. Refer to Sections 10.10 and 10.9 for details of areas protected by these systems.

2 DESCRIPTION

There are three types of fire detection system used on CDP1. These are:

(a) Smoke detectors (ionisation type).

(b) Thermovelocimetric (heat rise) detectors.

(c) Fusible plugs.

2.1 Smoke Detectors

2.1.1 The smoke detectors used on the platform are Cerberus Type F6. Coincidence-interlocked detector heads are used in areas containing electrical equipment which are fitted with the facilities for the automatic release of Halon 1301. Single detector heads are used in all other areas. The Saipem living quarters are equipped with individual smoke detectors type HA553.

2.1.2 Each detector head transmits an electrical signal to the Cerberus Fire Detection Control Panel in the Safety Equipment Room on the second level of PM4. Associated alarm annunciators operate in the Production Control Room and, via telemetry, in the QP Control Room.

2.2 Thermovelocimetric Detectors

2.2.1 The thermovelocimetric detectors fitted on the platform are Cerberus Type D6A. This type of detector is used because it is not affected by fumes from appliances which could cause a false alarm.

2.2.2 Each detector head transmits an electrical signal to the Cerberus Fire Detection Control Panel in the Safety Equipment Room. Associated alarm anunciators operate in the Production Control Room and, via telemetry, in the QP Control Room.

2.3 Fusible Plugs

2.3.1 Firematic Type TP–57 fusible plugs are used in the Production Area and all modules except PM4. The plugs are arranged in pressure loops which are each related to a particular area or module, and each loop is connected to a local Deluge Control Panel which controls the operation of the associated deluge valves.

2.3.2 When a plug fuses due to heat, the following will occur:

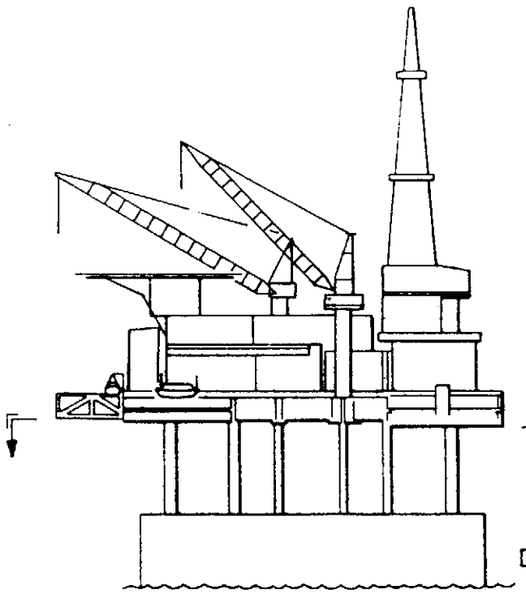
(a) A pneumatic signal is transmitted to a pressure switch in the Fire Detection Control Panel in the Safety Equipment Room. The pressure switch converts the pneumatic signal to an electrical signal which operates alarm annunciators in the Production Control Room and, via telemetry, in the QP Control Room. The pressure switches used in the fusible plug loops are Barksdale Type EISJ.

(b) The fire pumps start automatically.

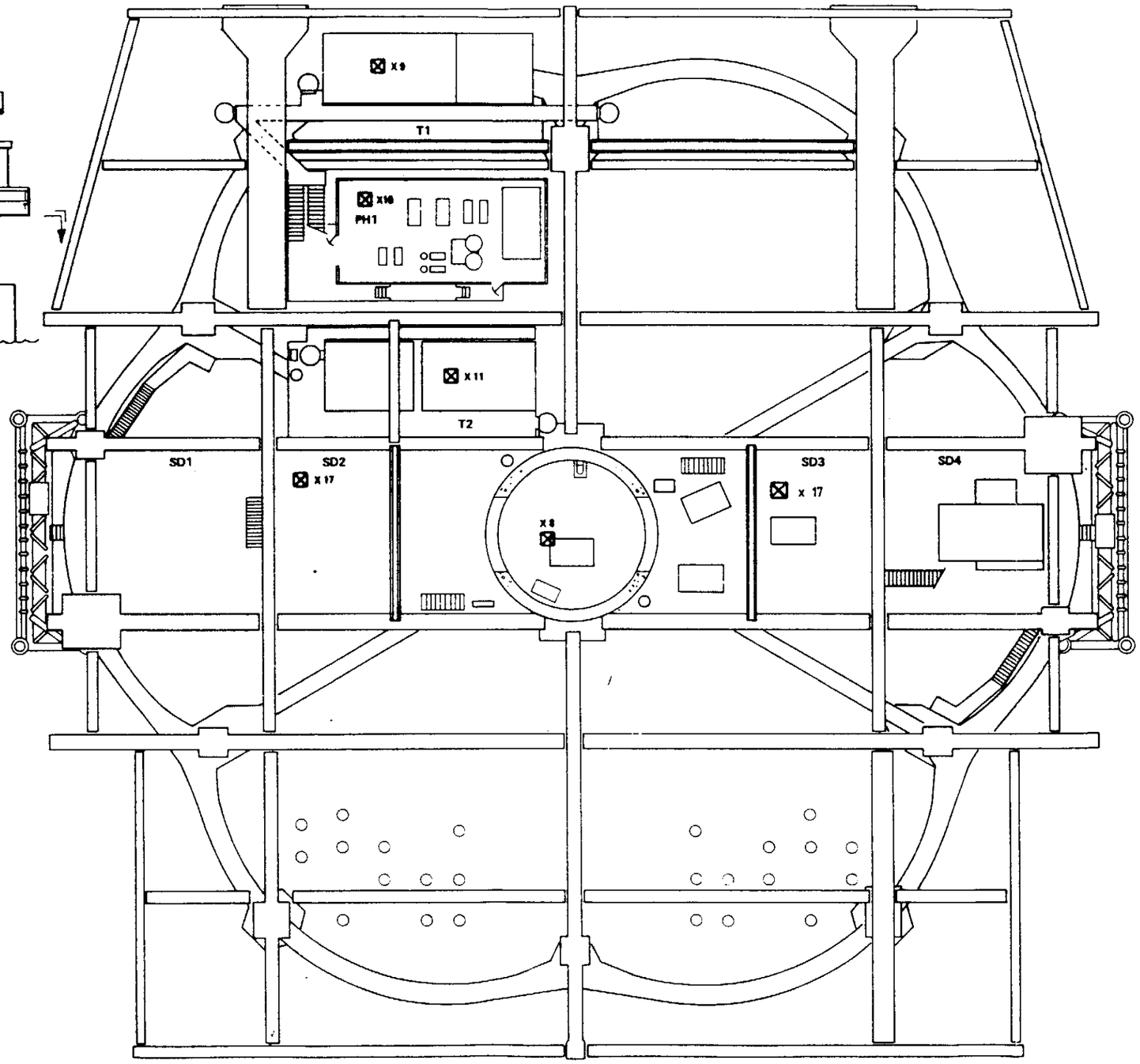
(c) The pressure drop in the control loop acts as a trigger for the appropriate deluge/foam deluge/sprinkler control valves to open.

2.3.3 The fusible plugs in Modules BR1 and BR2 operate Halon and sprinkler systems. The fusible plugs which operate the sprinkler systems trigger the opening of the deluge valve. This action fills the sprinkler lines with water. A frangible bulb which will operate at a higher temperature than the control loop fusible plug is provided in each sprinkler so as to release a spray in an appropriate area.

2.3.4 The fusible plugs in the Core Area operate a foam deluge system.



WEST ELEVATION



N

PLATFORM NORTH

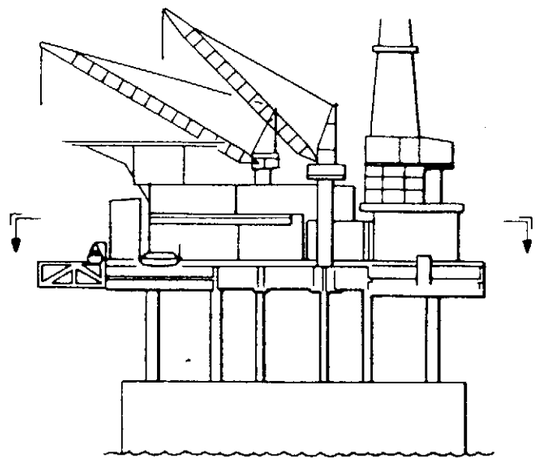
KEY

⊠ FUSIBLE PLUG

ISSUE 3 OCT. 1988

FIRE AND SMOKE DETECTION
Service Deck

10.6.1



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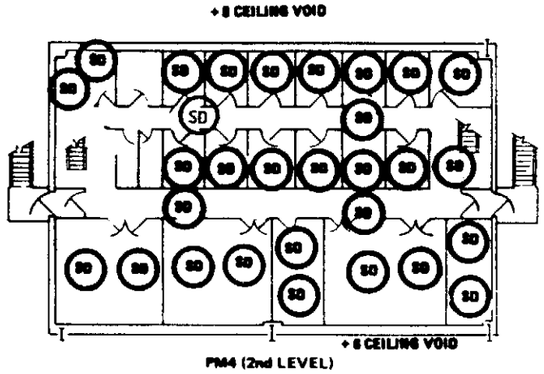
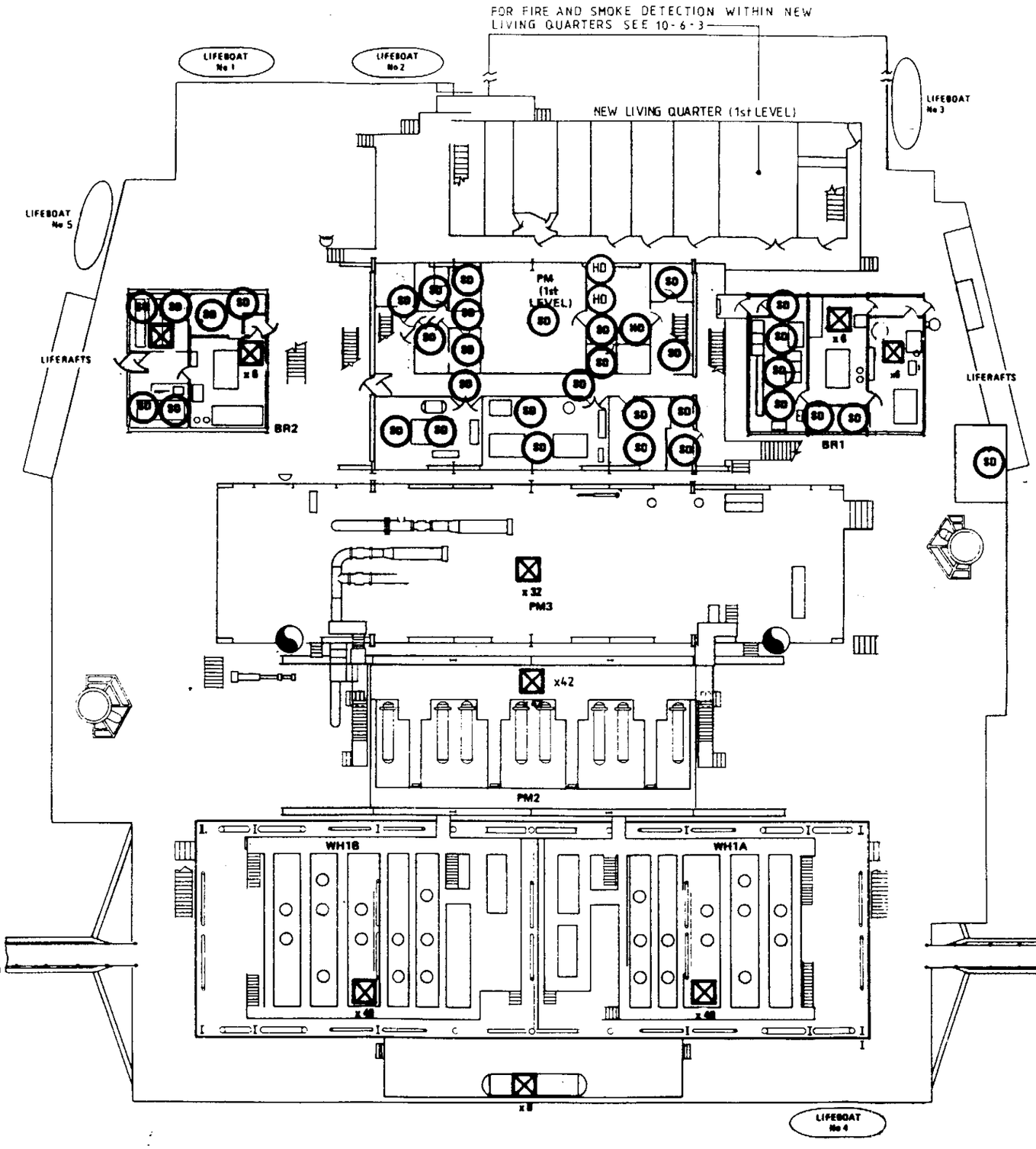
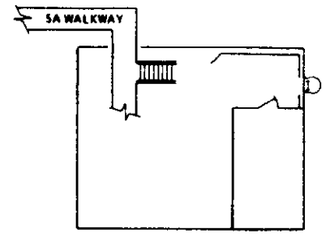


PM4 (2nd LEVEL)





PLAN ON ROOF OF BR1

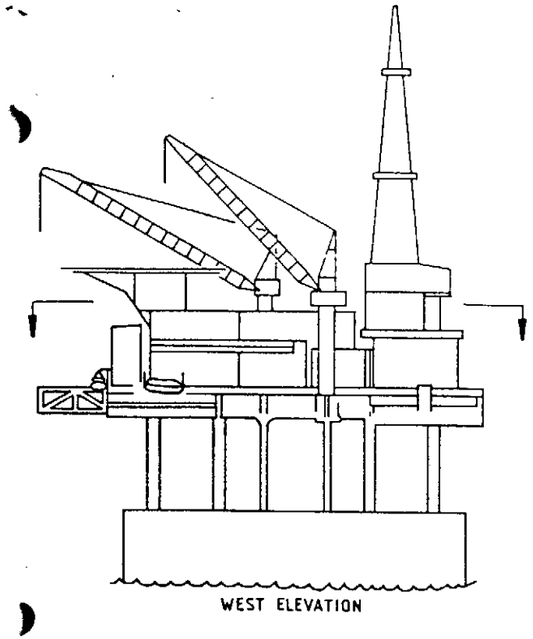
N
PLATFORM NORTH

KEY	
SD	SMOKE DETECTOR
HD	THERMOVELOCIMETRIC DETECTOR
⊠	FUSIBLE PLUG

ISSUE 5 OCT. 1988

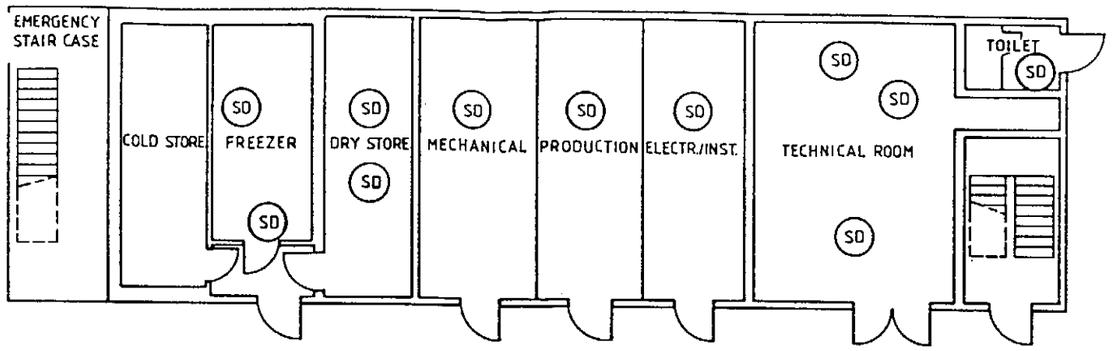
FIRE AND SMOKE DETECTION
Production Deck

10.6.2

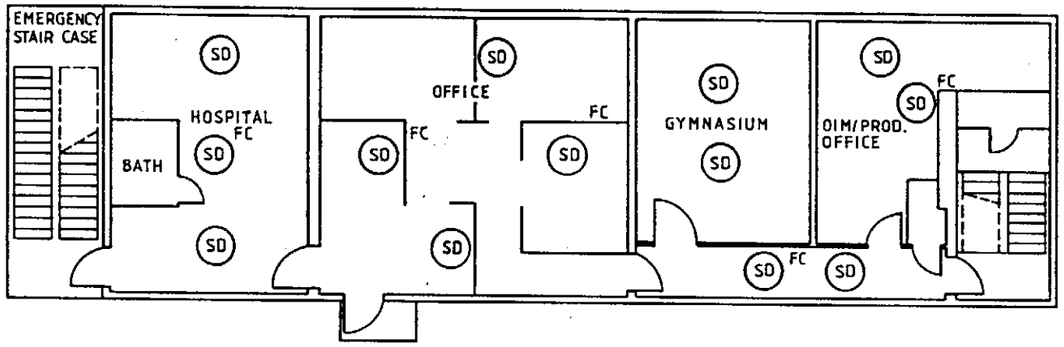


WEST ELEVATION

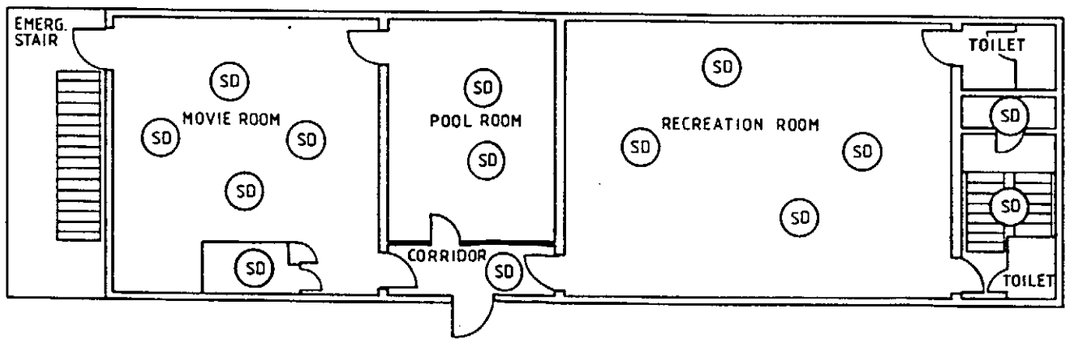
NEW LIVING QUARTER CDP 1 FIRST LEVEL



NEW LIVING QUARTER CDP1 SECOND LEVEL



NEW LIVING QUARTER CDP1 THIRD LEVEL



N
PLATFORM NORTH

KEY

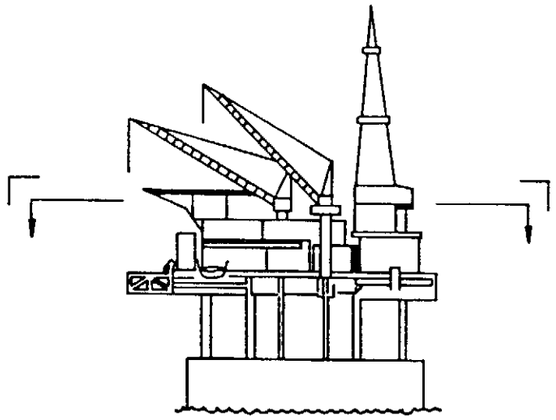
- (SD) SMOKE DETECTOR
- (HD) THERMOVELOCIMETRIC DETECTOR
- ⊠ FUSIBLE PLUG

NOTE:
FC =DETECTOR MOUNTED IN CEILING VOID

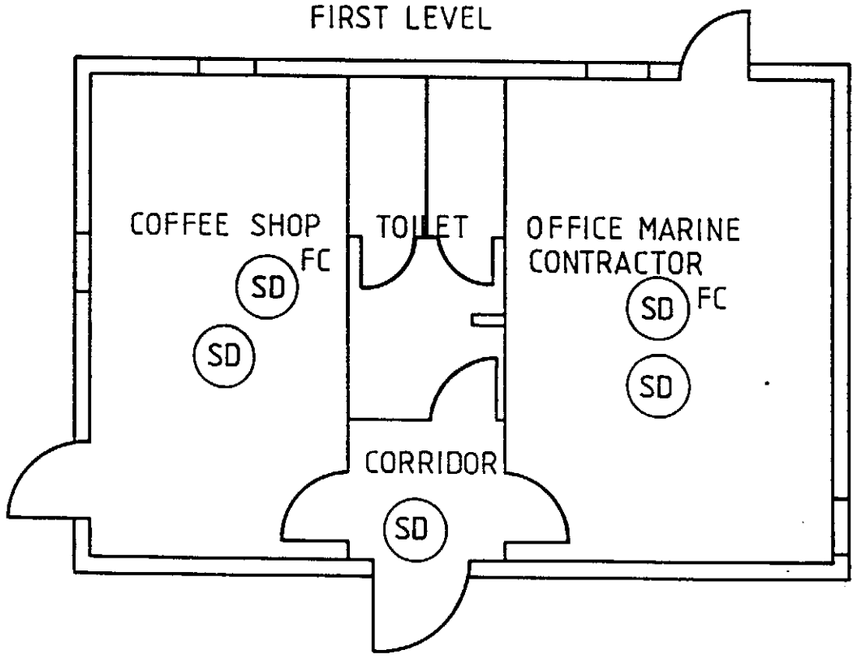
Issue 2, Oct.-88

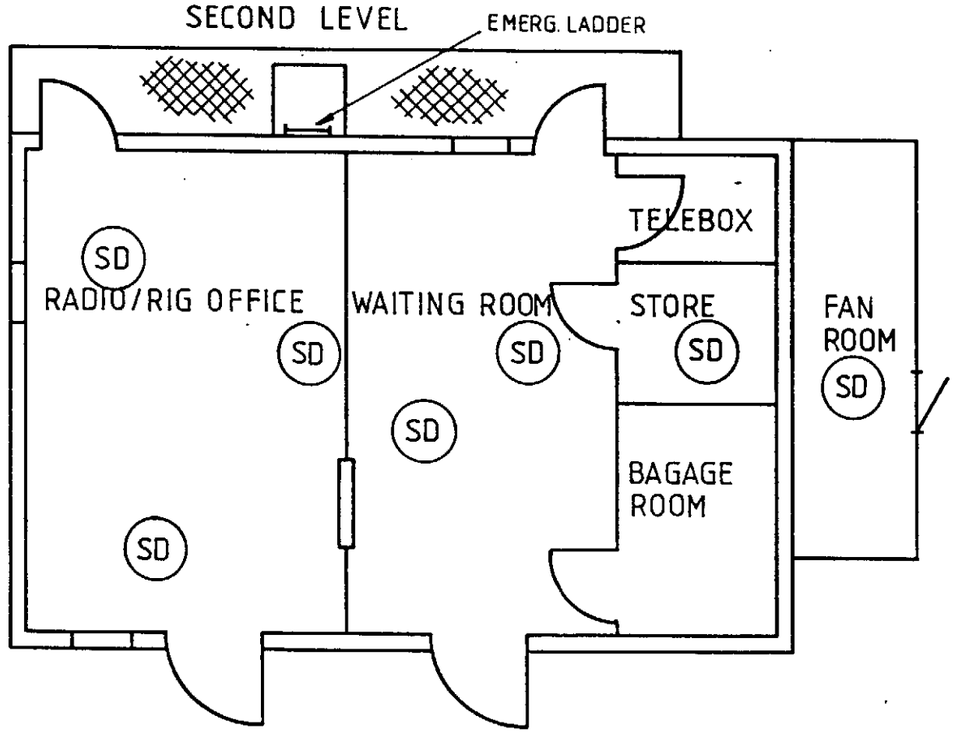
FIRE AND SMOKE DETECTION
NEW LIVING QUARTERS

10.6.3



WEST ELEVATION





KEY	
SD	SMOKE DETECTOR
HD	THERMOELECIMETRIC DETECTOR

NOTE:
FC - DETECTOR MOUNTED IN CEILING VOID

Issue 2, Oct.-88

FIRE AND SMOKE DETECTION
New rig module

10.6.4

GAS DETECTION

1 GENERAL

1.1 A gas detection system is provided on CDP1 which will detect the presence of inflammable gas within a set range before the concentration of the gas becomes a serious hazard.

1.2 Detection of gas at the higher value of the set range will result in the following:

(a) An audible alarm will sound in the Production Control Room.

(b) CDP1 firewater pumps start.

(c) Indication of the hazard area at the gas detection panels in the Production Control Room and QP Control Room.

Detection of gas at the higher value of the set range will initiate a further alarm and cause certain shutdown fuctions to take place. Refer to Section 10.5 for details.

2 DESCRIPTION

2.1 The gas detectors used on the CDP1 platform are Sieger Model 1402/1412 with type 770/780 explosionproof sensor head.Some detection points have two independent sensors connected for coincidental operation where shutdown functions are required.The paired sensor heads each transmits an electrical signal proportional to detected level of gas to their associated control unit.

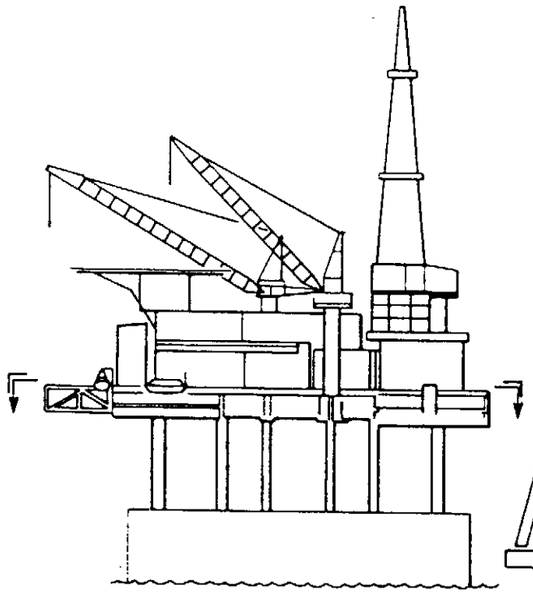
2.2 The control units are installed in the Sieger Gas Detection Cabinet which is located in the Safety Equipment Room on the second level of PM4. Associated alarm annunciators operate in the Safety Equipment Room, the Production Control Room and, via telemetry, in the QP Control Room.

2.3 Each control unit contains two manually operated alarm set-points, one for each sensor head. The alarm set-point are adjustable in the 0 to 100 per cent range of the lower explosive limit (LEL) of gas to air mixture. At most of the detection points the two sensor heads are set to operate at different levels. An alarm is initiated when the lower LEL value (first threshold) is detected by one sensor head, but automatic shutdown action is not initiated until the higher LEL value (second threshold) is detected by the second head.

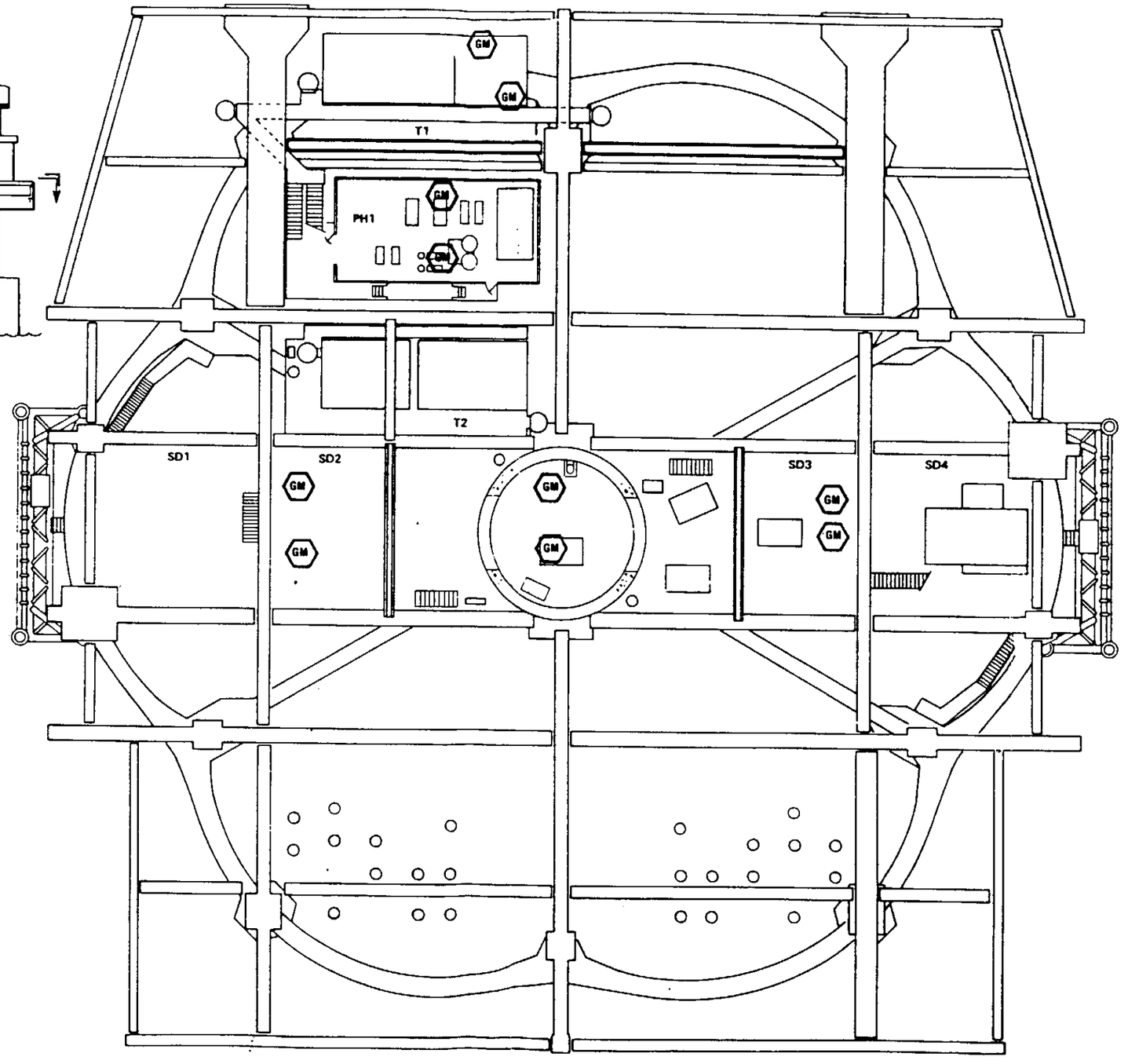
2.4 The LEL settings of the sensors are:

Module/Area	Light Methane	Heavy Vapour		Total	LEL Setting	
		Hydrocarbon	Methanol		Low	High
WH1A	12	-	-	12	20%	60%
WH1B	12	-	-	12	20%	60%
Methanol tank FA104	4	2	-	6	20%	60%
PM2	16	-	-	16	15%	30%
PM3	10	-	-	10	15%	30%
New L.Q (air intakes)	2	-	-	2	20%	40%
BR1	2	-	2	4	20%	60%
BR2	2	-	-	2	20%	60%
PM4 (air intakes)	6	-	-	6	20%	40%
SD2	2	-	-	2	20%	60%
SD3(core vent intake)	2	-	-	2	20%	60%
New rig module (air intakes)	2	-	-	2	20%	40%
PH1	2	4	2	2	20%	60%
Core	2	-	-	2	20%	60%
T1	-	-	2	2	20%	60%
TOTAL	76	6	6	82		

END



WEST ELEVATION



N
PLATFORM NORTH

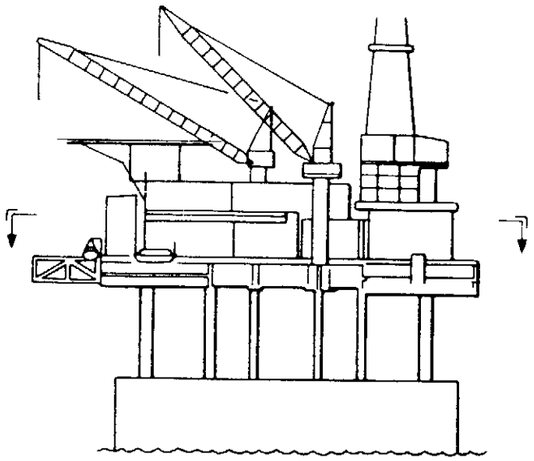
KEY

GM GAS DETECTOR

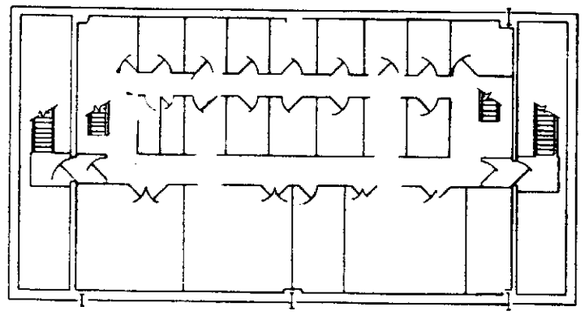
Issue 4,Oct.-88

GAS DETECTION
Service Deck

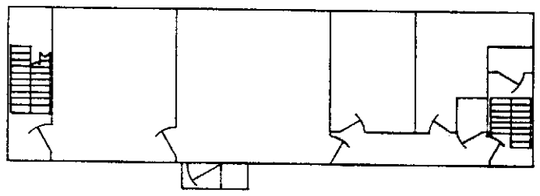
10.7.1



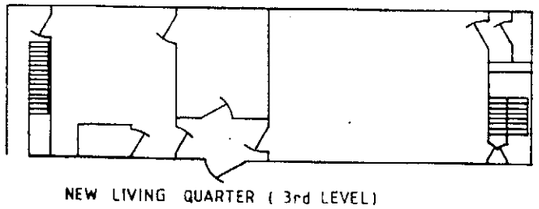
WEST ELEVATION



PM4 (2nd LEVEL)

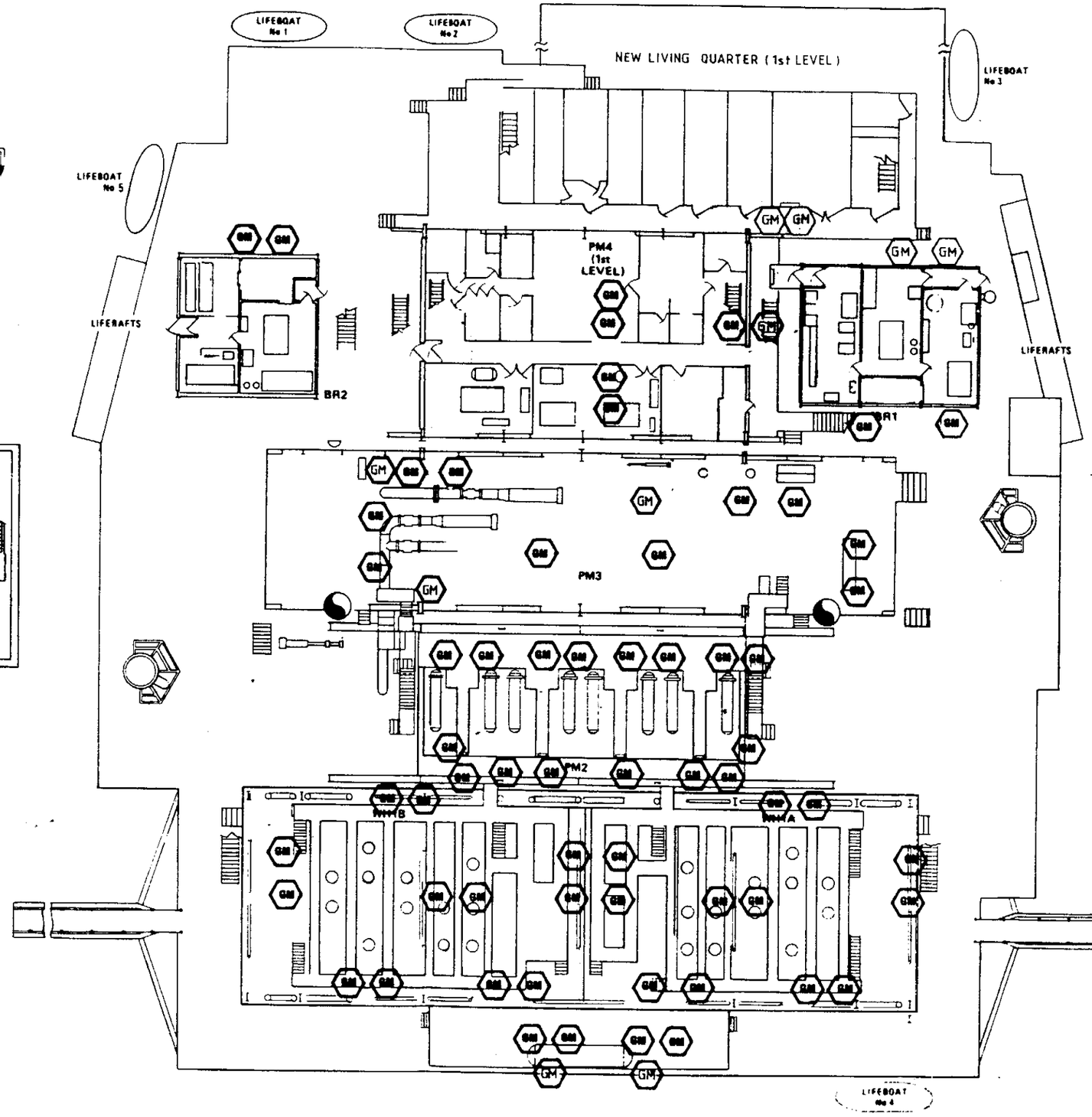


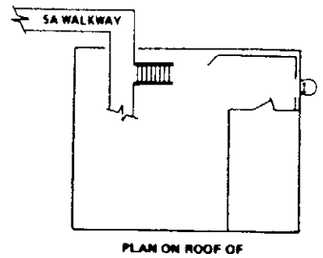
NEW LIVING QUARTER (2nd LEVEL)



NEW LIVING QUARTER (3rd LEVEL)

KEY	
GM	GAS DETECTOR





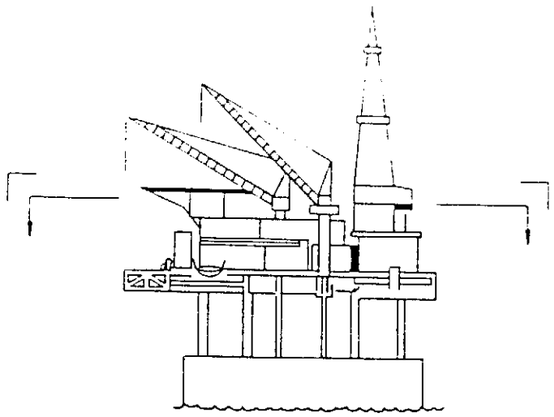
PLAN ON ROOF OF BR1

PLATFORM NORTH

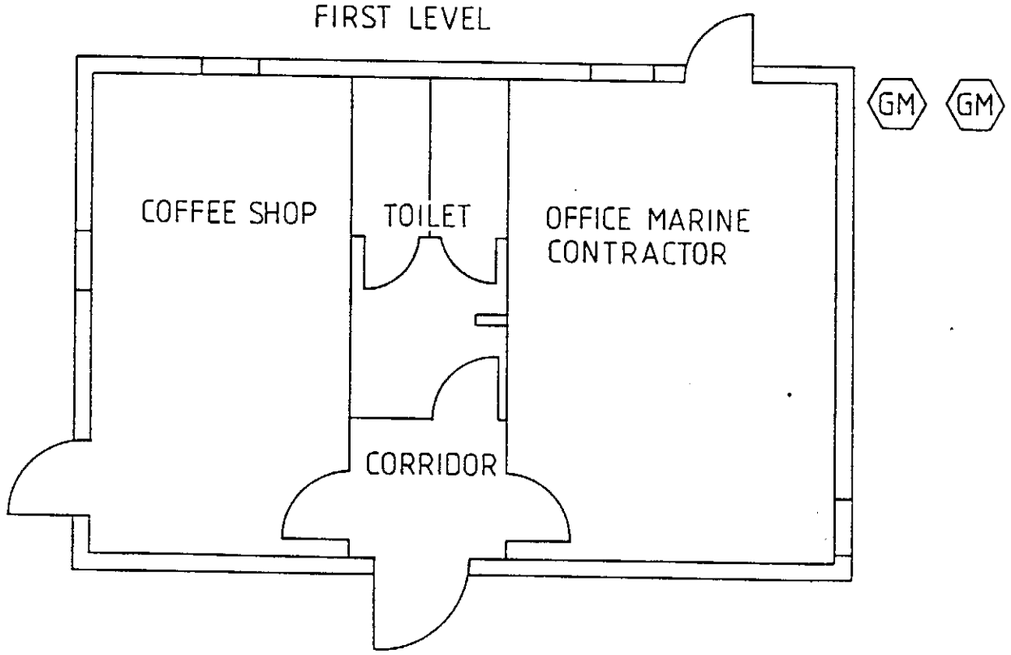
ISSUE 5. OCT. 88

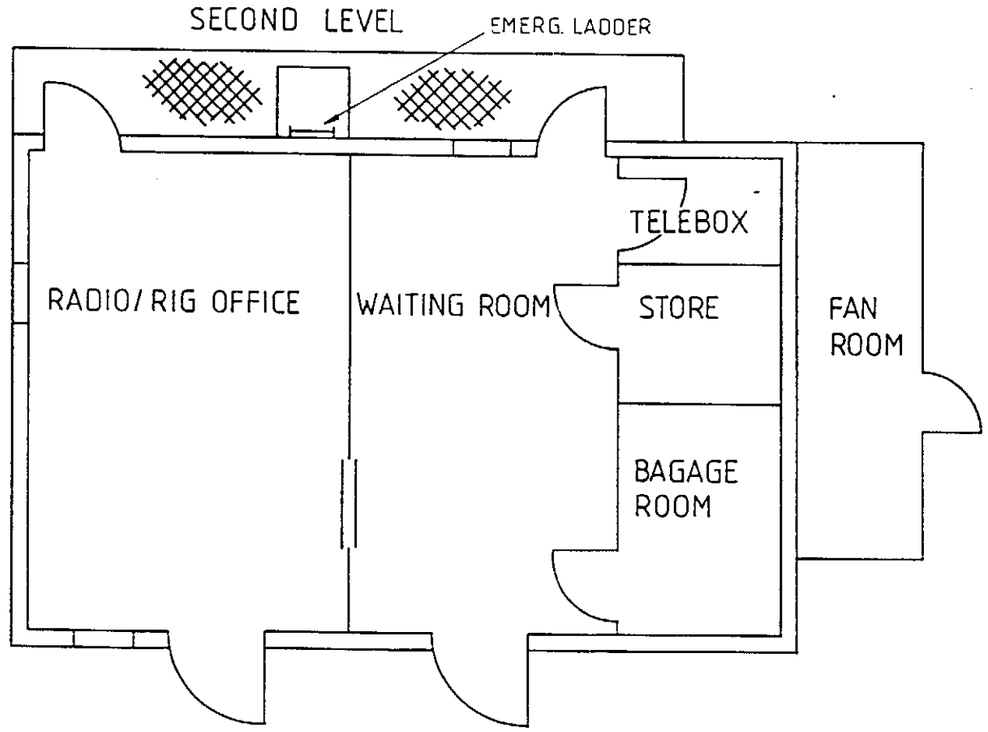
GAS DETECTION
Production Deck

10.7.2



WEST ELEVATION





KEY
GM GAS DETECTOR

Issue 2,Oct.-88

GAS DETECTION New rig module	10.7.3

FIREFIGHTING FACILITIES

1 GENERAL

1.1 CDP1 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 outfits and rescue equipment.

1.3 Five different types of extinguishant are used on CDP1 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 reignition. 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 reignition.

(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 1301 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.

2.2 The facilities which are supplied with sea water by the firewater system comprise:

(a) Water hosereels.

(b) Fire cannon monitors.

(c) Deluge systems.

(d) Sprinklers.

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) BCF/Halon extinguishers — 6kg capacity.

(f) Gas/water extinguishers — 10-litre capacity.

2.4 Fireman Outfits and Rescue Equipment

2.4.1 Fireman outfits and rescue equipment are provided for the protection of rescue teams and to enable them to make forcible entry. A fire blanket is available to smother a localised fire.

2.4.2 The equipment is located in protective boxes as follows:

(a) Fireman's station, on the west side of the first level of Module PM4.

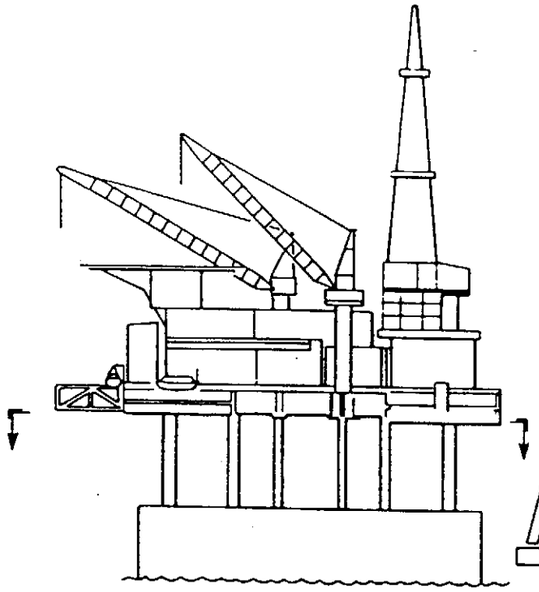
(b) Technical team's station, on the west side of the second level of Module PM4.

(c) Breathing apparatus, one set at the top and bottom of each stairway in Module PM4.

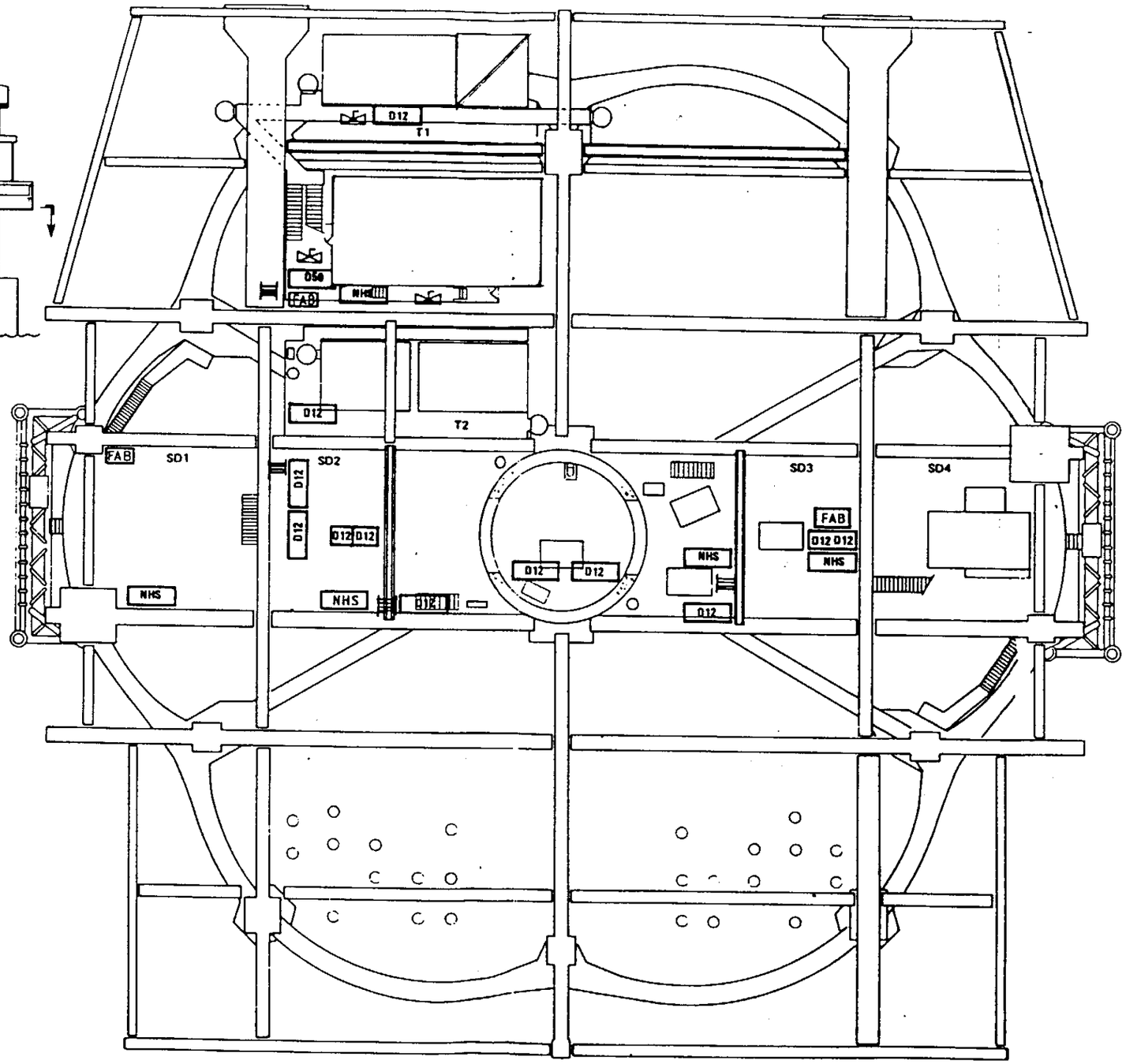
(d) Fire blanket, in the kitchen in Module PM4.

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 10.8.



WEST ELEVATION

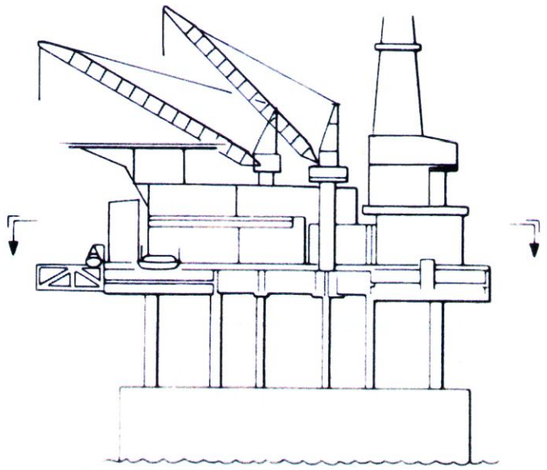


KEY	
D12	12 kg DRY POWDER EXTINGUISHER
D50	50 kg DRY POWDER EXTINGUISHER
NHS	FIRE PUMP START SWITCH
	DELUGE SYSTEM MANUAL START
	HALON MANUAL RELEASE LEVER
	FIRE CANNON MONITOR
FAB	FIRE ALARM BUTTON AREA PROTECTED BY HALON
	FIRE HOSEREEL

Issue 4, Oct.-88

FIREFIGHTING FACILITIES
Service Deck

10.8.1



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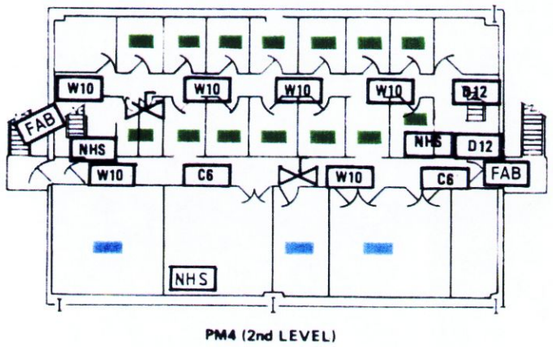
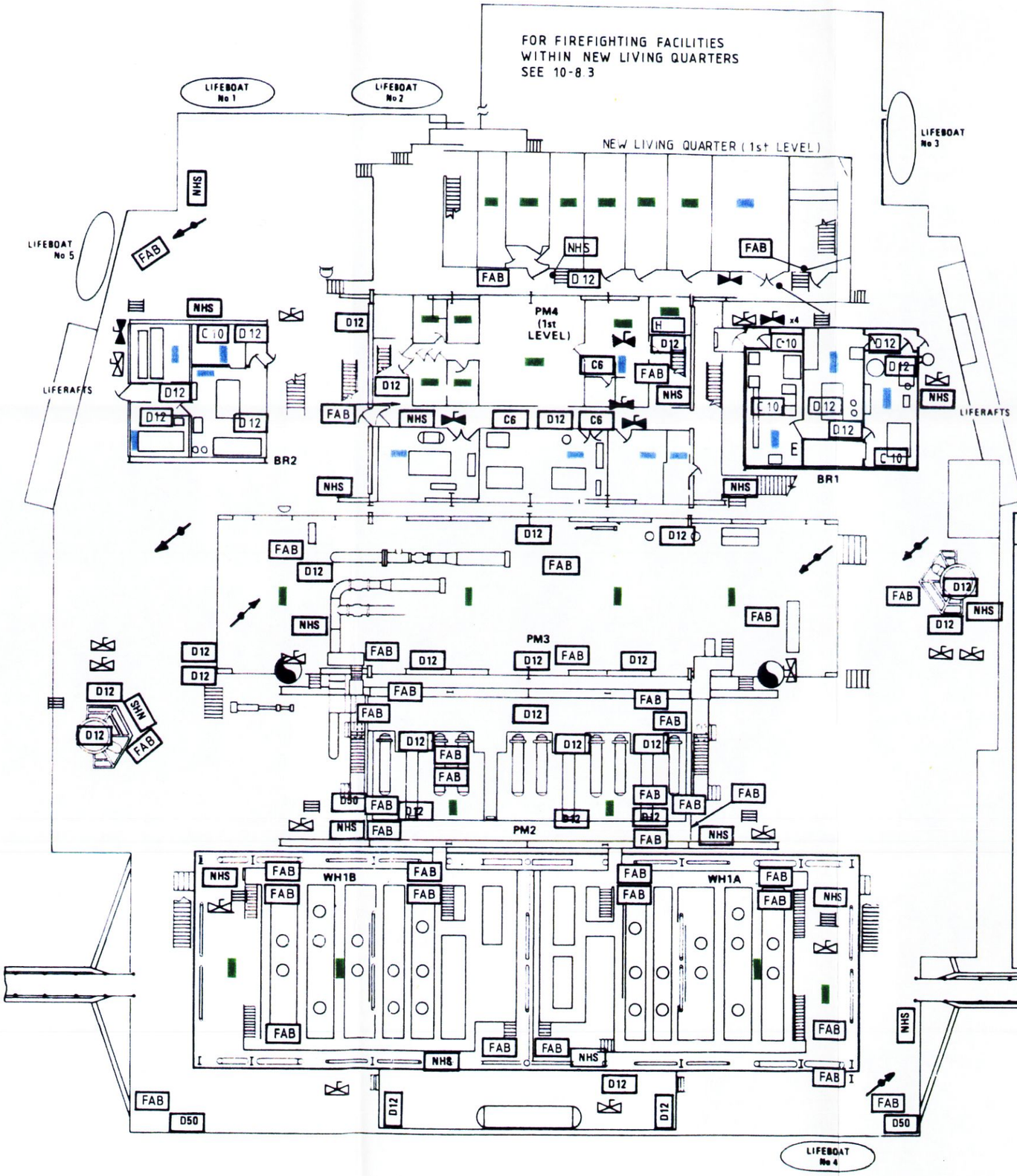
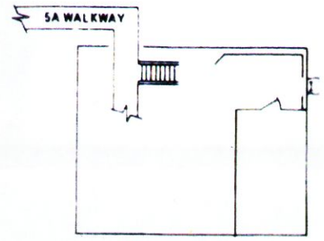


PM4 (2nd LEVEL)

FOR FIREFIGHTING FACILITIES
WITHIN NEW LIVING QUARTERS
SEE 10-8.3





PLAN ON ROOF OF BR1

PLATFORM NORTH

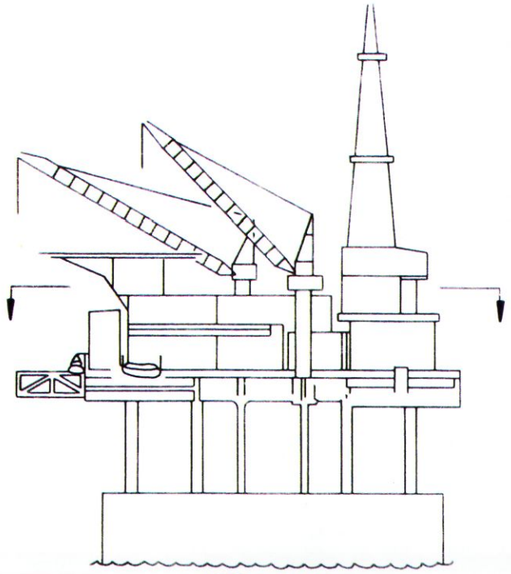
KEY

C6	6kg CO_2 EXTINGUISHER
C10	9kg CO_2 EXTINGUISHER
D12	12kg DRY POWDER EXTINGUISHER
D50	50kg DRY POWDER EXTINGUISHER
H6	6kg BCF/HALON EXTINGUISHER
W10	GAS/WATER EXTINGUISHER
NHS	FIRE PUMP START SWITCH
	DELUGE SYSTEM MANUAL START
	HALON MANUAL RELEASE LEVER
	FIRE CANNON MONITOR
FAB	FIRE ALARM BUTTON
	AREA PROTECTED BY HALON
	AREA PROTECTED BY DELUGE
	FIRE HOSEREEL
	AREA PROTECTED BY HALON

ISSUE 5 OCTOBER 1988

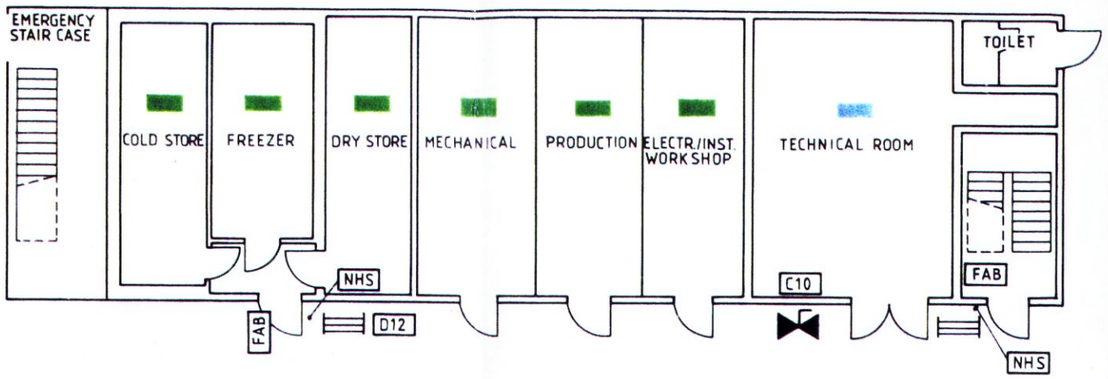
FIREFIGHTING FACILITIES
Production Deck

10.8.2

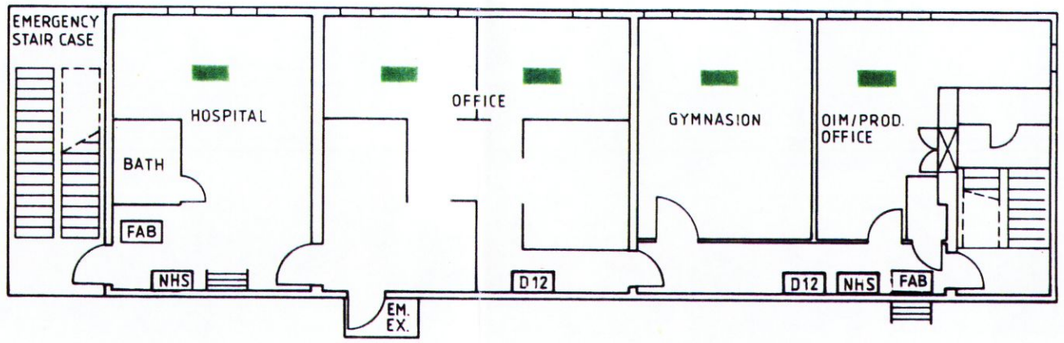


WEST ELEVATION

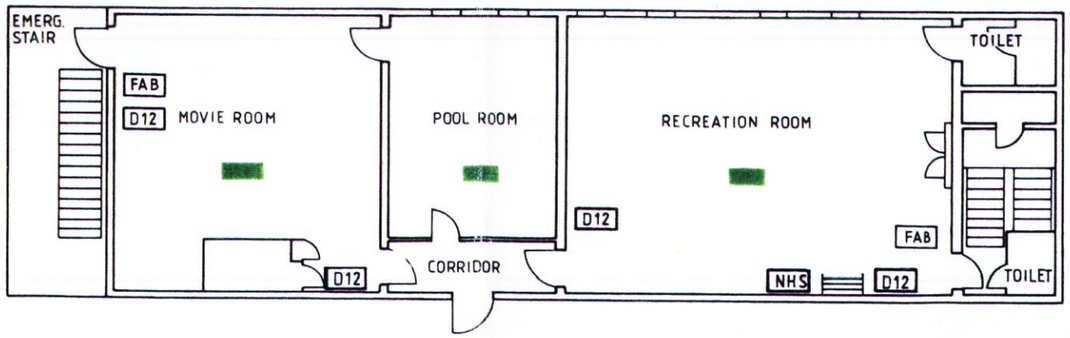
NEW LIVING QUARTER FIRST LEVEL



NEW LIVING QUARTER SECOND LEVEL



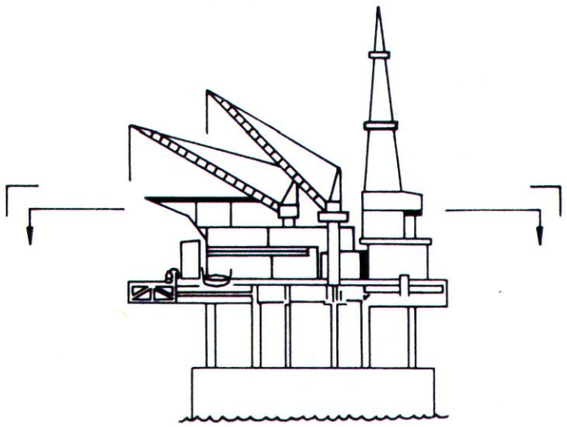
NEW LIVING QUARTER CDP1 THIRD LEVEL



N
PLATFORM NORTH

2, Oct. 88
ISSUE ~~1 JUNE 1984~~

FIRE FIGHTING FACILITIES NEW LIVING QUARTERS	10.8.3



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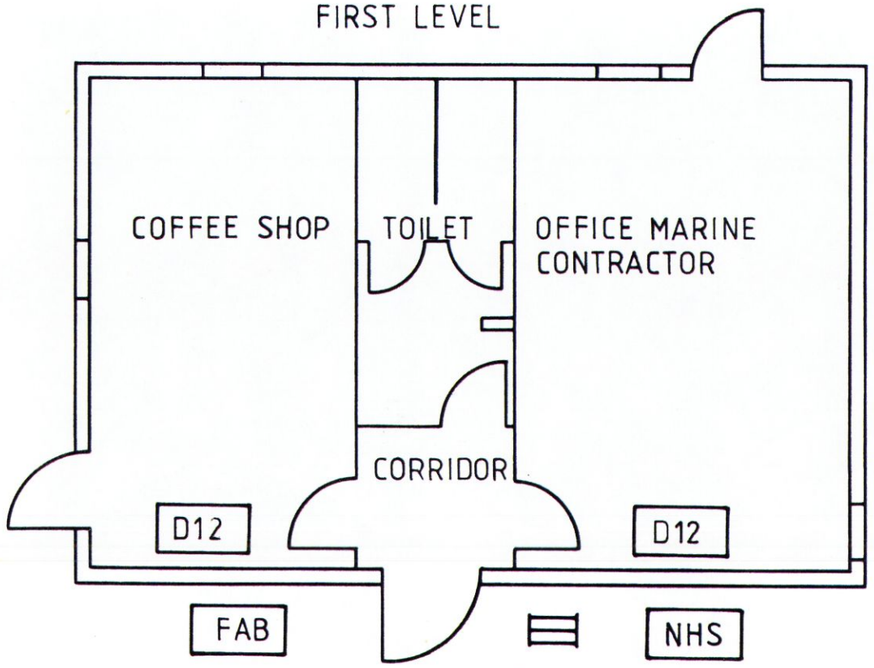
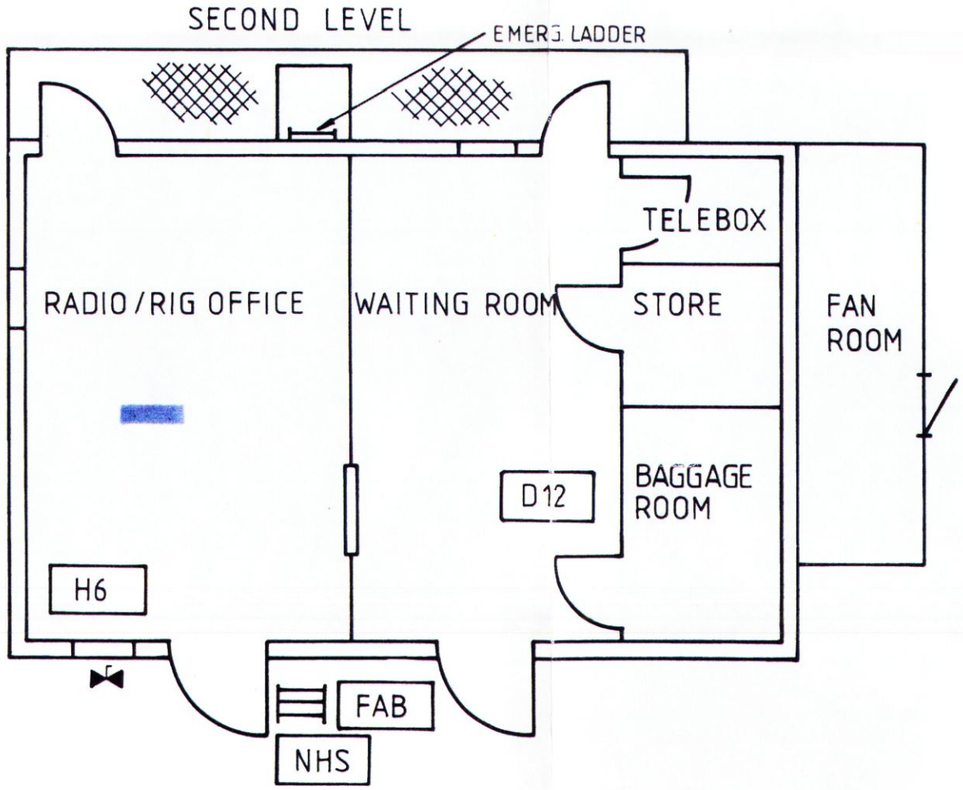




KEY	
D12 12 kg DRY POWDER EXTINGUISHER	DELUGE SYSTEM
H6 6kg BCF/HALON EXTINGUISHER	HALON MANUAL RELEASE LEVER
FAB FIRE ALARM BUTTON	AREA PROTECTED BY HALON
NHS FIRE PUMP START SWITCH	FIRE HOSEREEL

ISSUE ~~1 JUNE 1984~~ 2, Oct. 88

FIREFIGHTING FACILITIES
NEW RIG MODULE

10.8.4

FIREWATER SYSTEMS

1 GENERAL

1.1 The firewater system for the Production Deck is a 14in diameter ring main with 4in, 6in and 8in valved offtakes. It supplies firewater to hosereels, water cannon, and deluge, sprinkler and foam systems. The ring main is supplied with sea water by two diesel-driven firewater pumps. These pumps start automatically in response to a signal from either the fire detection control panel or a fire pump local control panel. The pipe systems are arranged so that each foam, deluge or sprinkler system is provided with two line feeds. In the event of failure in one line, water will be supplied to the system through the other.

1.2 The drilling package is provided with a separate firewater system connected to the Production Deck ring main system by two 6in lines. This interconnection provides back-up facilities for either firewater system.

1.3 The firewater system is maintained in a pressurised condition by a flow of chlorinated sea water supplied from the platform sea water system.

2 DESCRIPTION

2.1 Two vertical Sigmund Pulsometer Pumps Type FN17G/4, driven by Type V71 Detroit diesel engines, each take suction from a stilling tube. The pump suction level is at elevation +80m and the bottoms of the stilling tubes are at elevation +68.5m. The pumps each have an output of 650m^3/h against a discharge pressure of 9.8 barg at a speed of 1800 rev/min. The firewater system is protected against overpressurisation by relief valves at the pump discharges, excess water being discharged overboard. The relief valves are set at 14 barg.

2.2 Each fire pump discharge valve is provided with limit switches which operate to initiate an alarm in the Production Control Room if the valve is not fully open.

2.3 Reverse flow bypass lines are provided around the fire pump discharge valves. The bypass lines contain ¼in diameter orifice plates which allow a continuous flow of sea water through the ring main to prevent freezing. The water is chlorinated to 2 ppm to suppress marine growth in the ring main. A further orifice plate and an associated overboard discharge is provided at a point on the ring main most remote from the pumps. Additional orifice plates are provided at the same locations to allow a greater flow of water should the ambient temperature fall to −8°C. Flow through the additional orifice plates is controlled by a temperature control valve. Flowrates through the orifice plates are as follows:

Ambient Temperature	Flow round each fire pump	Flow at remote end of ring main
0°C	1.64m^3/h	1.4m^3/h
−8°C	3.4m^3/h	9.1m^3/h

2.4 The firewater pumps are normally started electrically. A back-up pneumatic start system is provided. If the electric start system fails to start a firewater pump in six attempts, the pneumatic start system will automatically make six further start attempts. Automatic starting is initiated by a signal from:

(a) The automatic fire detection systems.

(b) Operation of a Disaster Shutdown pushbutton, or an emergency shutdown pushbutton.

(c) Operation of a Fire Alarm pushbutton (FAB).

(d) Operation of a Deluge Start pushbutton.

(e) Operation of a Start pushbutton at a firepump local start panel.

2.5 Deluge systems are provided in Modules PM2, PM3, SD2, SD3, T1, T2, WH1A and WH1B. The jet fuel tanks and start-up separator areas have deluge heads supplied from adjacent modules. Sprinkler systems are provided in Modules BR1 and BR2. The deluge or sprinkler systems contain a fire by saturating a complete room or area. Operation of deluge systems is initiated by fusible plugs in the area, by locally mounted pushbutton or by operation of a Disaster Shutdown pushbutton.

2.6 Firematic Type TP–57 fusible plugs are used in the Production Area and all modules except PM4. The plugs are arranged in pressure loops which are each related to a particular area or module, and each loop is connected to a local Deluge Control Panel which controls the operation of the associated deluge valves. When a plug fuses due to heat, the following will occur:

(a) A pneumatic signal is transmitted to a pressure switch in the Fire Detection Control Panel in the Safety Equipment Room. The pressure switch converts the pneumatic signal to an electrical signal which operates alarm annunciators in the Production Control Room and, via telemetry, in the QP Control Room. The pressure switches used in the fusible plug loops are Barksdale Type EISJ.

(b) The fire pumps start automatically.

(c) The pressure drop in the loop acts as a trigger for the appropriate deluge valves to open.

2.7 Instead of operating deluge systems, the fusible plugs in Modules BR1 and BR2 operate Halon and sprinkler systems, and the plugs in the Core Area operate a foam system. The sprinkler systems each have their own individual fusible plugs which are set to operate at a higher temperature than those in the loop. In all other respects the systems used in Modules BR1, BR2 and the Core Area operate in a similar manner to those which operate the deluge valves.

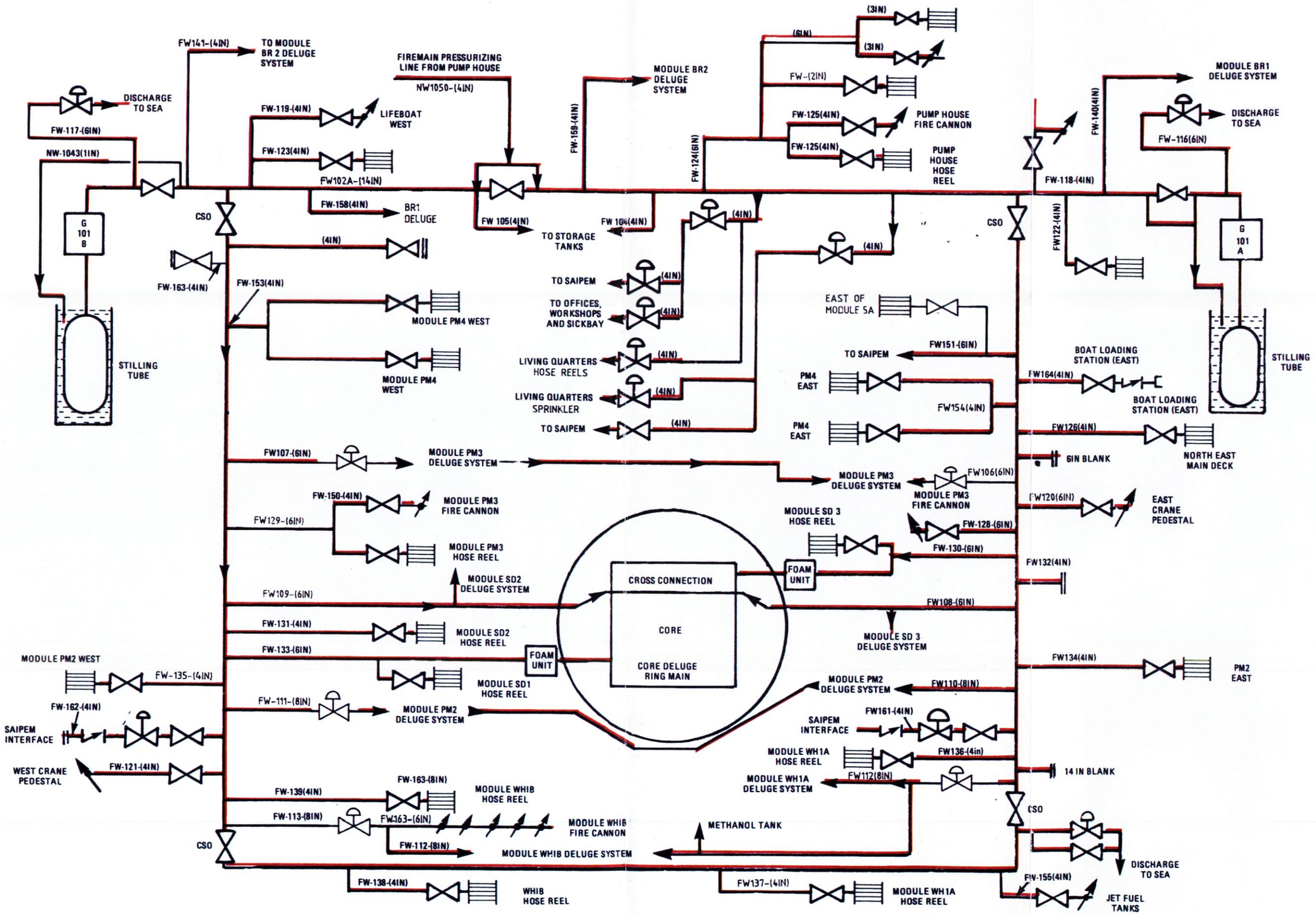
2.8 Flowrates for the various deluge systems are:

Module	Factor ($m^3/m^2/h$)	Area (m^2)	Deluge Rate (m^3/h)
WH1A	0.732	306	224
WH1B	0.732	306	224
Methanol tank FA104	0.732	45	33
PM2	0.732	227	166
PM2 (desanders)	0.732	272	199
PM3	0.732	217	159
SD2/SD3	0.732	242	177
Core	0.732	64	47
T1	0.732	58	42.5
T2	0.732	58	42.5
Test separator	0.732	45	33
Jet fuel tanks	0.732	28	20
BR1	0.732	28	20
BR2	0.732	27	20

2.9 Monitors (cannon) and hosereels are installed throughout the platform for local manual fire-fighting. Each hosereel contains 45 feet of 1½in hose.

2.10 Located near each monitor and hosereel is a manually operated switch to start the fire pumps.

END



ISSUE 3, OCT. 88

HALON SYSTEMS

1 GENERAL

Halon 1301 (BTM) is a colourless, odourless, electrically non-conductive gas that extinguishes or prevent ignition by inhibiting the cmemical 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 concentration. 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 1301 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 circiuts or manually from 'break-glass' units licated at the main entrance to each protected area.

2.2 Halon is distributed within each protected area by a pipework system, fitted with discharge nozzels specially designed to suit the particular application and strategically located to the 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 time delay is incorporated into the release circuitry.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 Alarm lamps to indicate that Halon has been released, are provided at the entrance. Halon released is red,halon on auto is amber & halon in manual mode is green.

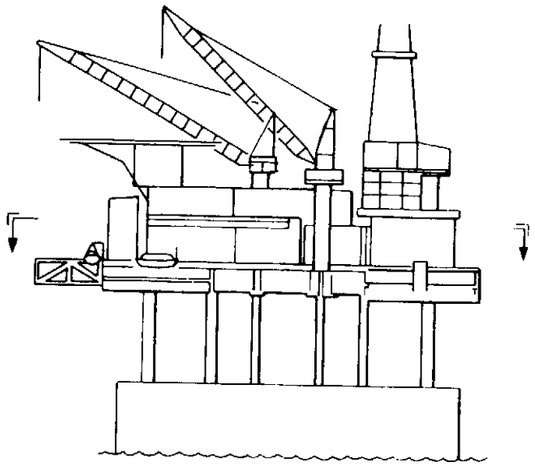
2.5 It is desirable to isolate the automatic operation of a Halon extinguishing system before personnel work within the protected area. To achieve this, a key-operated switch is provided at the main entrance to the area. Safety locking pins are provided to enable each Halon cylinder to be rendered inoperative.

3 LOCATION OF HALON SYSTEMS

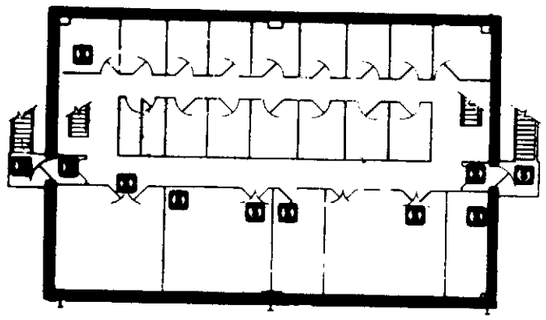
Completely independent Halon systems are provided for each area listed below, ie each area has its own Halon bottles and smoke detectors, which only activate the system within that particular area:

Module/Area	Weight of Halon(kg)	Number of Containers	Time Delay (seconds)
PM4 (1st Level)			
Generator Room	28	1	15
Transformer Room	7	1	15
Workshop/Store	15	1	15
Air Compressor Room	39	2	15
Ceiling Void 1B	-	1	30
Ceiling Void 4	-	1	30
Galley / kitchens	13.4	1	15
PM4(2nd Level)			
Electrical Room	25	2	15
Air Condtioning Plant	22	1	15
Battery Room	11	2	15
Safety Equipment Room	12	1	15
Radio Room	11	1	15
Ceiling Void 2A	-	1	30
Ceiling Void 2B	-	1	30
BR1			
Switchgear Room	63	2	15
Battery Room	14	1	15
Fire Pump Room	46	1	15
Compressor Room	58	2	15
BR2			
Electrical Room	21	2	15
Fire Pump Room	45	1	15
Compressor Room	64	2	15
Pumphouse	84	2	15
Methanol Tank 'Halon Blanket'	-	1	-
New Living Quarter (1st Level) HVAC-room	40	1	15
New Rig Module (2nd Level) Radio room	18	1	15

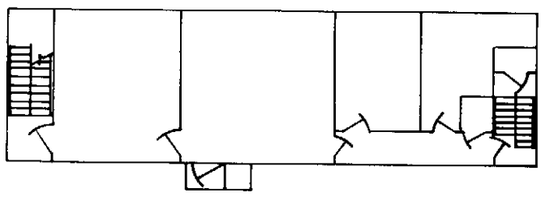
E N D



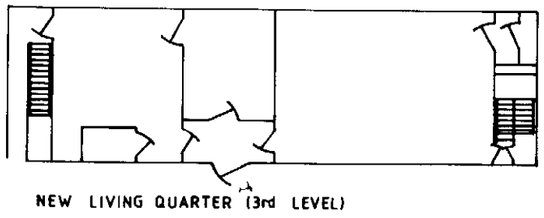
WEST ELEVATION



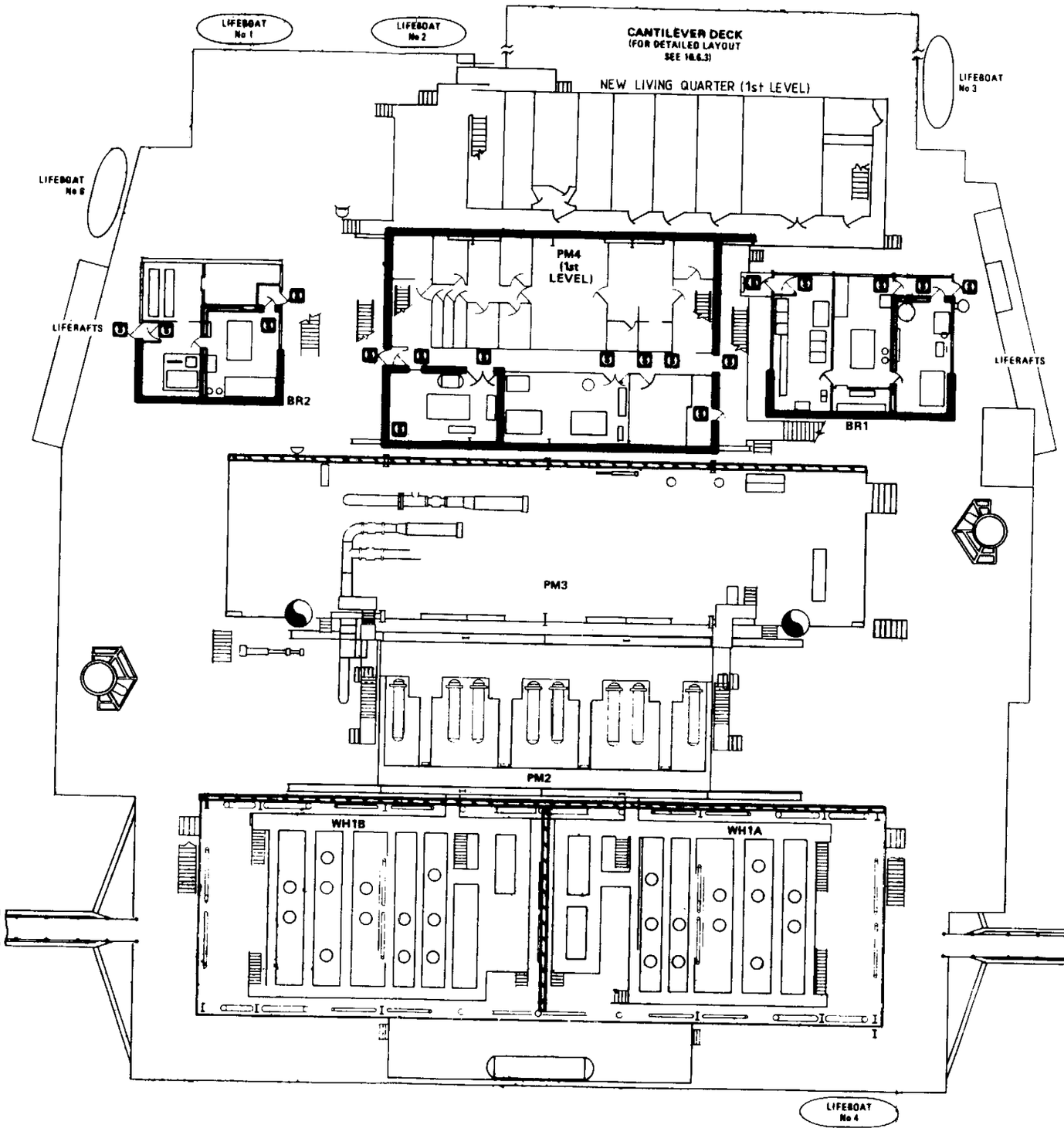
PM4 (2nd LEVEL)

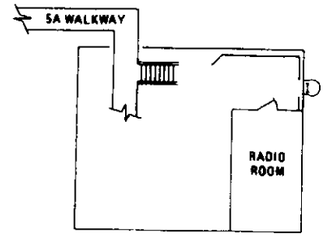


NEW LIVING QUARTER (2nd LEVEL)



NEW LIVING QUARTER (3rd LEVEL)





PLAN ON ROOF OF BR1

N
PLATFORM NORTH

KEY

- SOLAR RATING A60 WALLS
- SOLAR RATING B15 WALLS
- GAS TIGHT WALLS
- SELF-CLOSING DOORS

ISSUE 3 JUNE 1984

FIREWALLS AND FIREPROOFING
Production Deck

10.11

FIRST AID

1 GENERAL

1.1 Platform QP is equipped with medical facilities to cater for the total complement of 120 men working on platforms QP, TP1 and TCP2.

1.2 Infirmary is located on the middle deck of platform QP tform QP.

1.3 First aid kits and stretchers are distributed around the platform and a trained nurse will be available to administer first aid.

1.4 Platform CDP1 has its own medical facilities and trained nurse.

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)

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 12 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).

RESPIRATORY RESUSCITATION

Figure 1

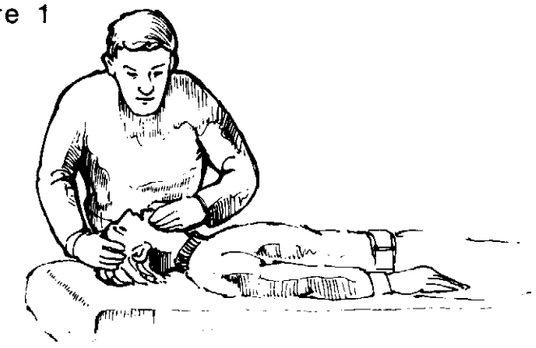


Figure 2

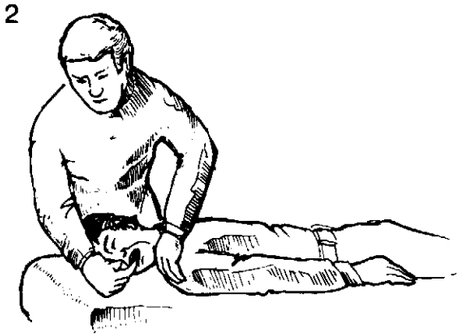
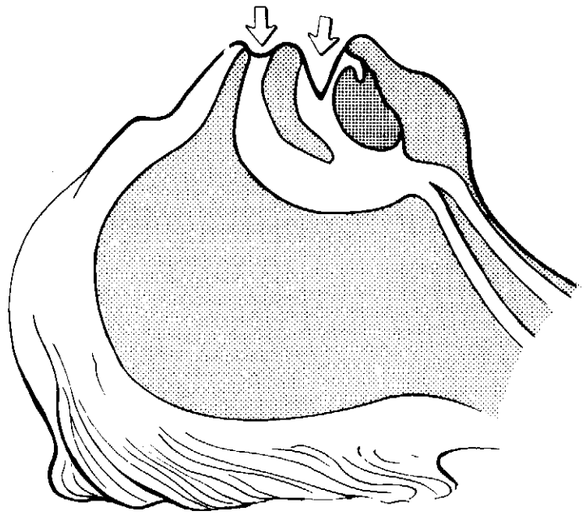


Figure 3



Mouth-to-Mouth
(Mouth-to-Nose)

Figure 4

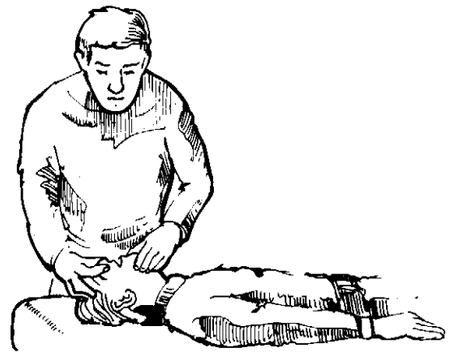


Figure 5

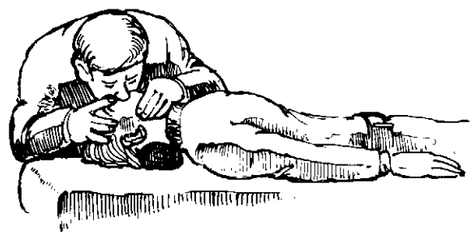


Figure 6

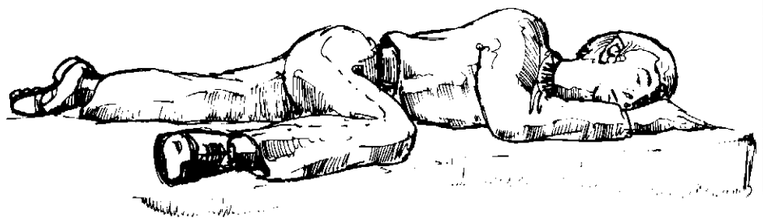


Figure 7

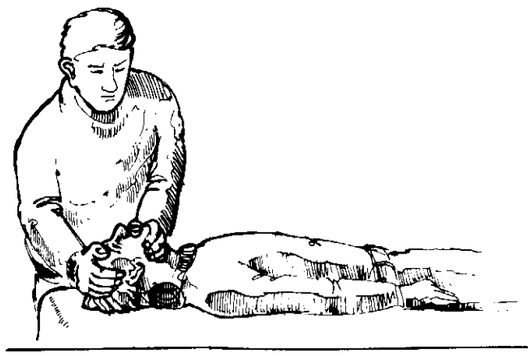


Figure 8

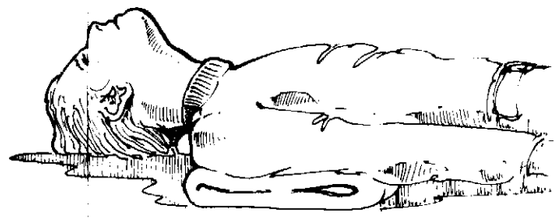


Figure 9

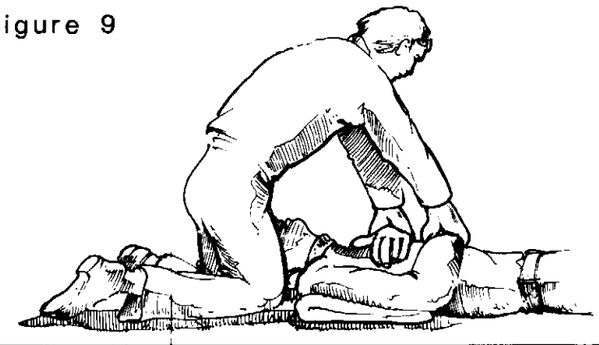


Figure 10

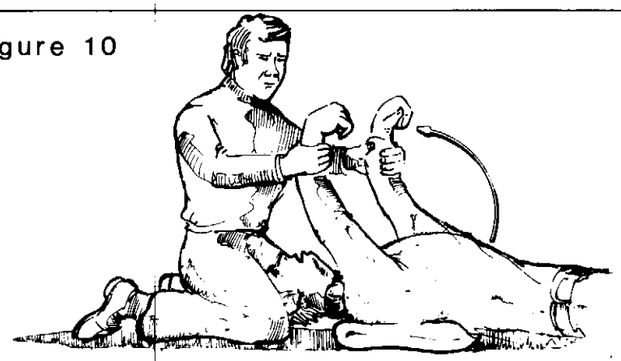
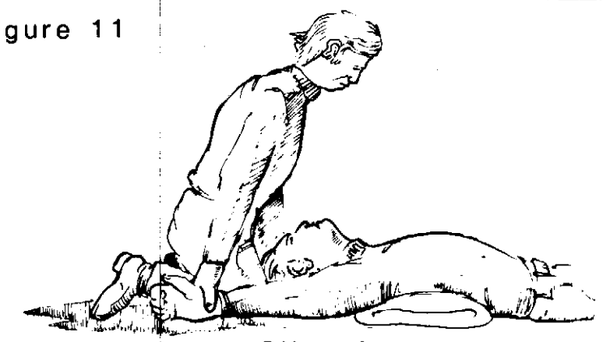


Figure 11



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 station.

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.

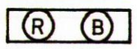
1.4 Personnel are allotted a lifeboat station on arrival on the platform, and should familiarise themselves with its position and the escape routes leading to it.

1.5 In the event of main power failure, adequate lighting of the escape routes is provided by the emergency lighting system.

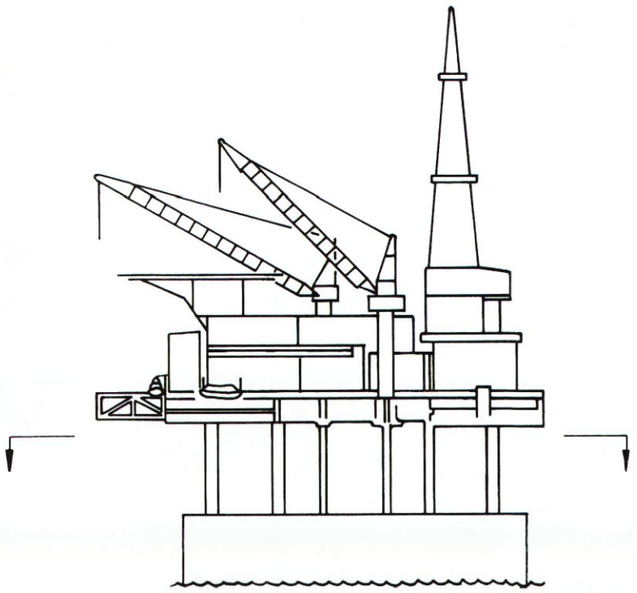
1.6 Escape from the core (when dry) can be achieved via the access lift or the ladders and landings.

1.7 The escape routes are indicated on Diagrams 10.13.1 to 10.13.14.

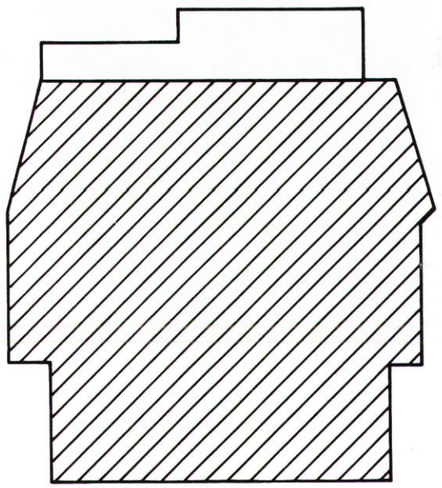
END

SYMBOL	SYMBOL DESCRIPTION	SYMBOL FORKLARING
	PORTABLE FIRE-EXTINGUISHER DRY CHEMICAL, WATER, CO_2.	FLYTTBART BRANNSLUKKINGSAPPARAT PULVER, VANN, CO_2
	STATIONARY FI-FI EQUIPMENT FOAM UNIT, HOSE REELS, WASHDOWN REELS	FAST MONTERT BRANNSLUKKINGSUTSTYR SKUM ENHET, BRANNSLANGE, SPYLESLANGE
	ALARM PUSHBUTTON FIRE PUMP START, GENERAL ALARM, MUSTER ALARM, DISASTER SHUTDOWN, EMERGENCY SHUTDOWN	ALARMKNAPP BRANNPUMPESTART, GENERELL, MØNSTRINGS ALARM MANUELL UTLØSNING D.S.D. E.S.D.
	FIRE, TECHNICAL TEAM LOCHER BREATHING APPARATUS, FIREMEN OUTFIT	BRANN, TEKNISK LAG SKAP PUSTEAPPARAT, BRANNMANNS UTSTYR
	CRASH KIT	HAVARI UTSTYR
	LIFERAFT	REDNINGSFLÅTE
	LIFEJACKETS	REDNINGSVESTER
	SURVIVAL SUIT	OVELEVNINGS DRAKT
	LIFE BUOYS	LIVBØYER
	AREA PROTECTED BY HALON OR CO_2	OMRÅDE BESKYTTET AV HALON ELLER CO_2
	AREA PROTECTED BY DELUGE	OMRÅDE BESKYTTET AV OVERRISLING
	ESCAPE ROUTES	RØMNINGSVEIER
	RED & BLUE FLASHING LIGHT	RØDT OG BLÅTT BLINKENDE LYS
	MANUEL ACTUATION OF AUTOMATIC HALON OR CO_2	MANUELL UTLØSNING AV DET AUTOMATISKE HALON/CO_2 ANLEGGET
	MANUEL DELUGE START COCK	MANUELL START AV OVERRISLINGSANLEGGET
	LIFEBOATSTATION	LIVBÅTSTASJON
	FIRE WATER MONITOR	VANNKANON

SAFETY PLOTPLAN & ESCAPE ROUTES

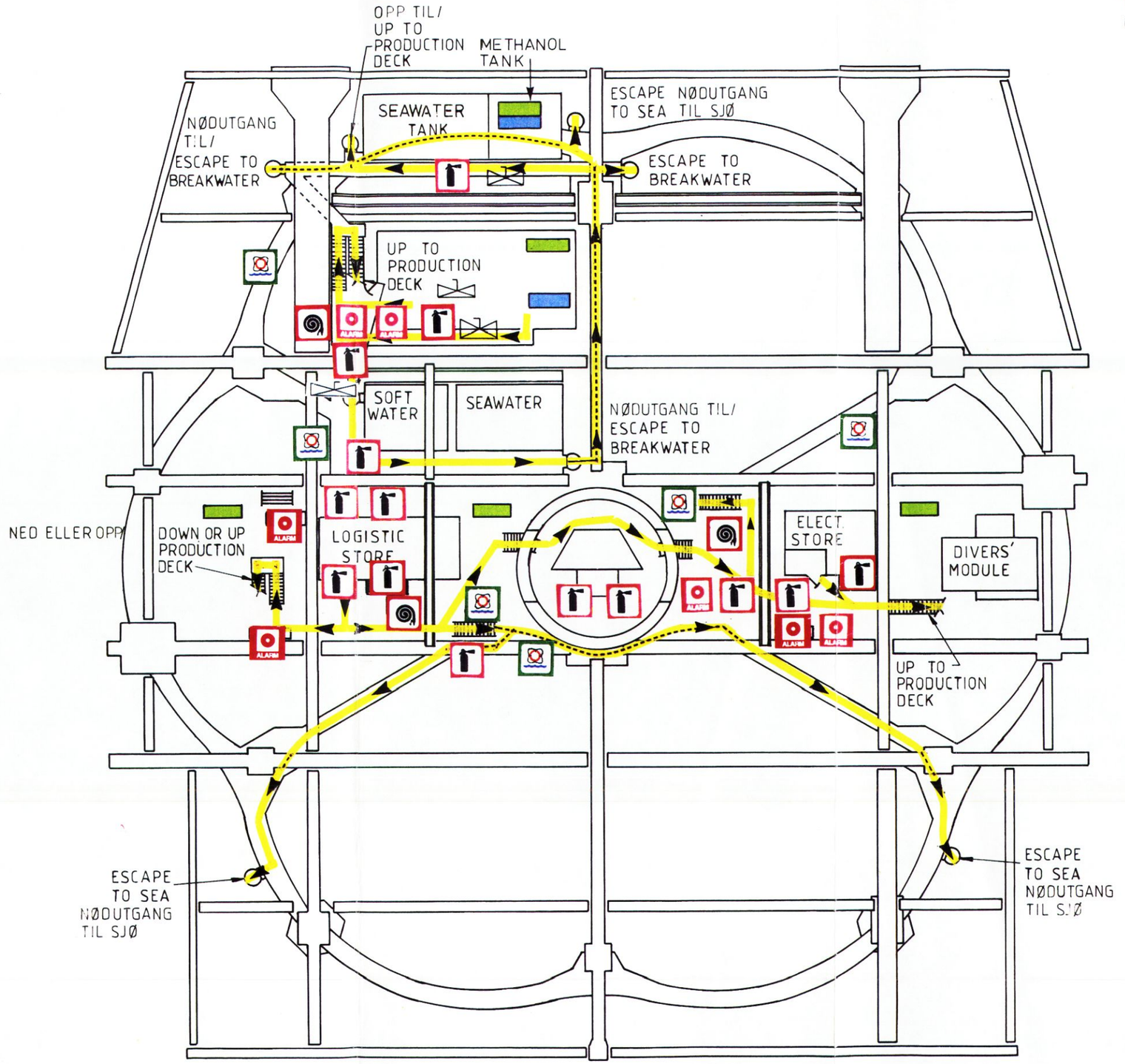


WEST ELEVATION



KEY PLAN CDP-1
PRODUCTION MODULES

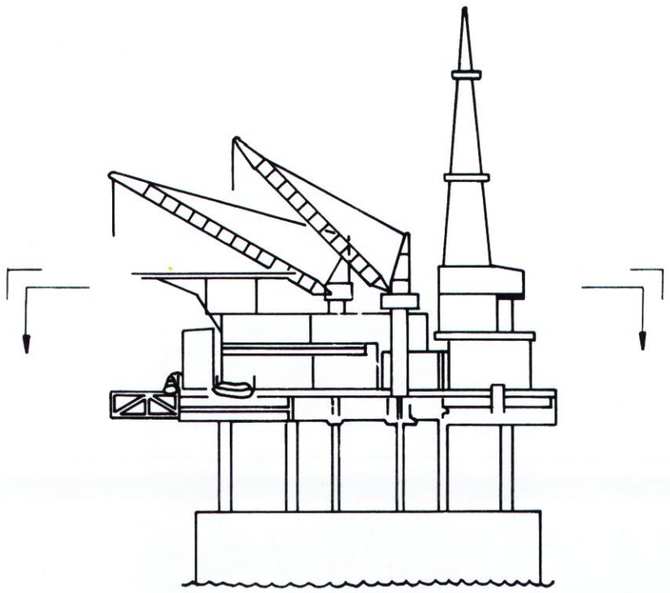
NOTE AREA MARKED THUS ON KEY PLAN, REPRESENTS AREA SHOWN IN DETAIL



SAFETY PLOT PLAN SERVICE DECK AND BREAKWATER AREAS CDP1

ISSUE 1, DEC. 1988

SAFETY PLOTPLAN & ESCAPE ROUTES SERVICE DECK	10.13.1



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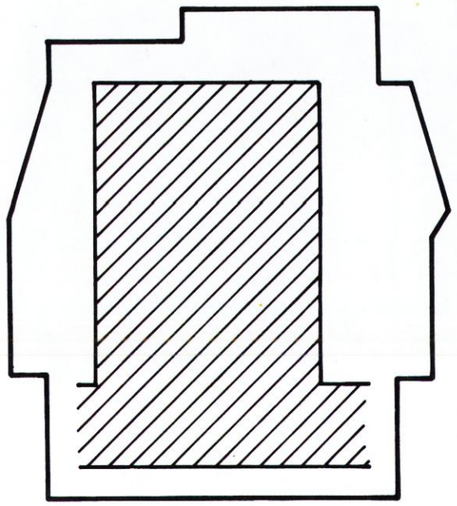
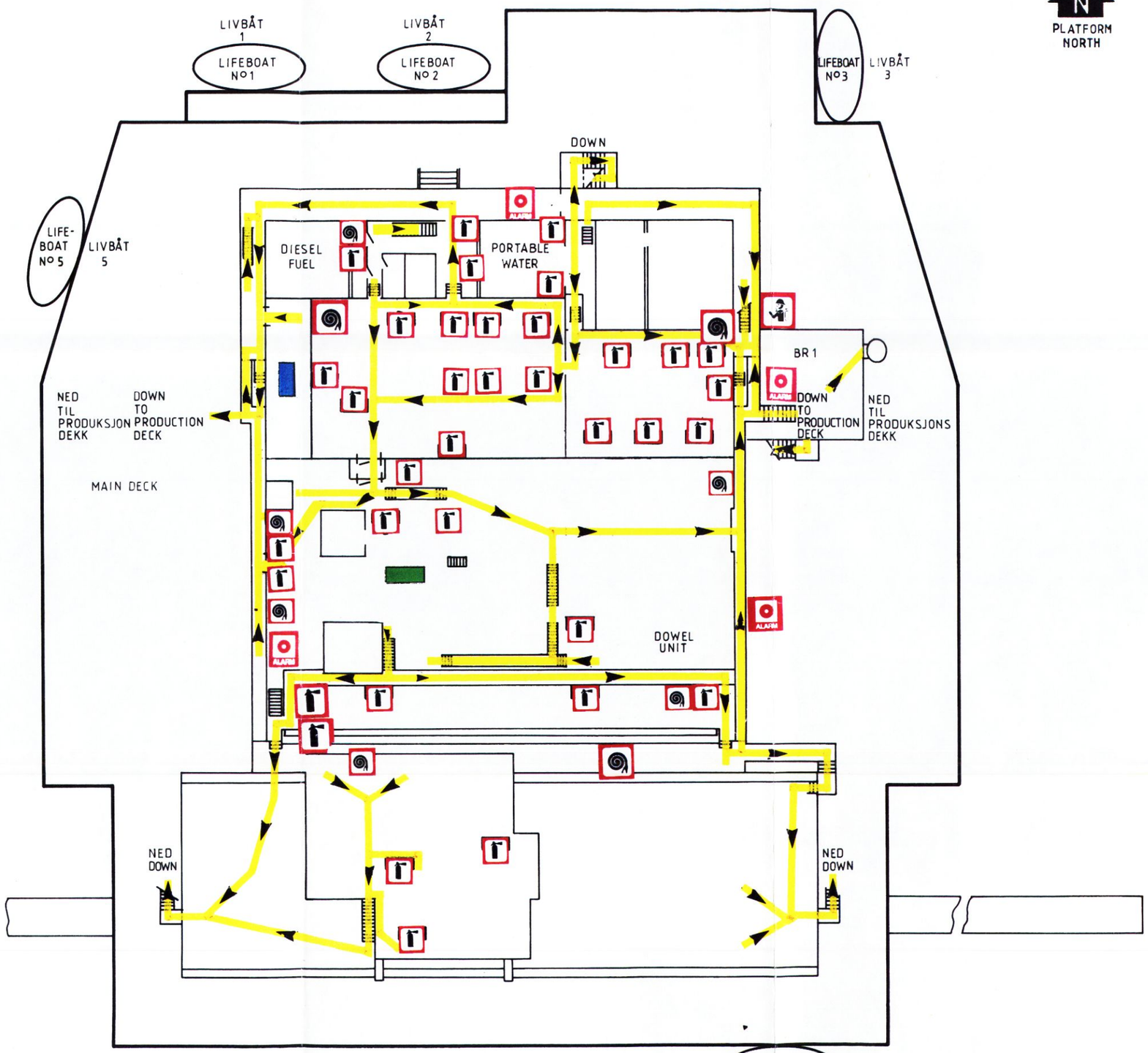


KEY PLAN CDP-1
PRODUCTION MODULES

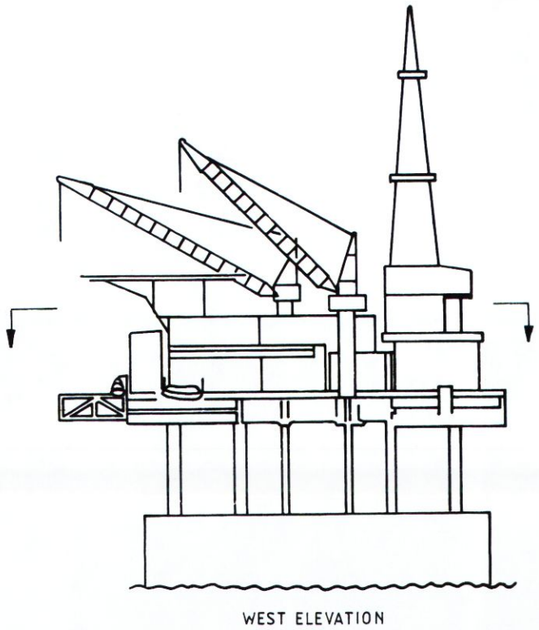
NOTE AREA MARKED THUS ▨ ON KEY PLAN REPRESENTS AREA SHOWN IN DETAIL



SAFETY PLOT PLAN SAIPEM GENERATOR ROOM AND MUD ROOM CDP1

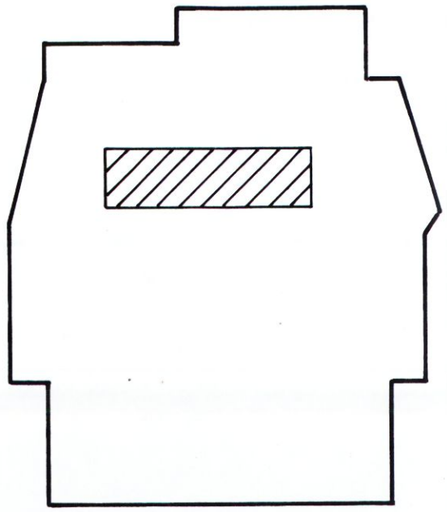
ISSUE 1, DEC. 1988

SAFETY PLOTPLAN & ESCAPE ROUTES UPPER DECK	10.13.3



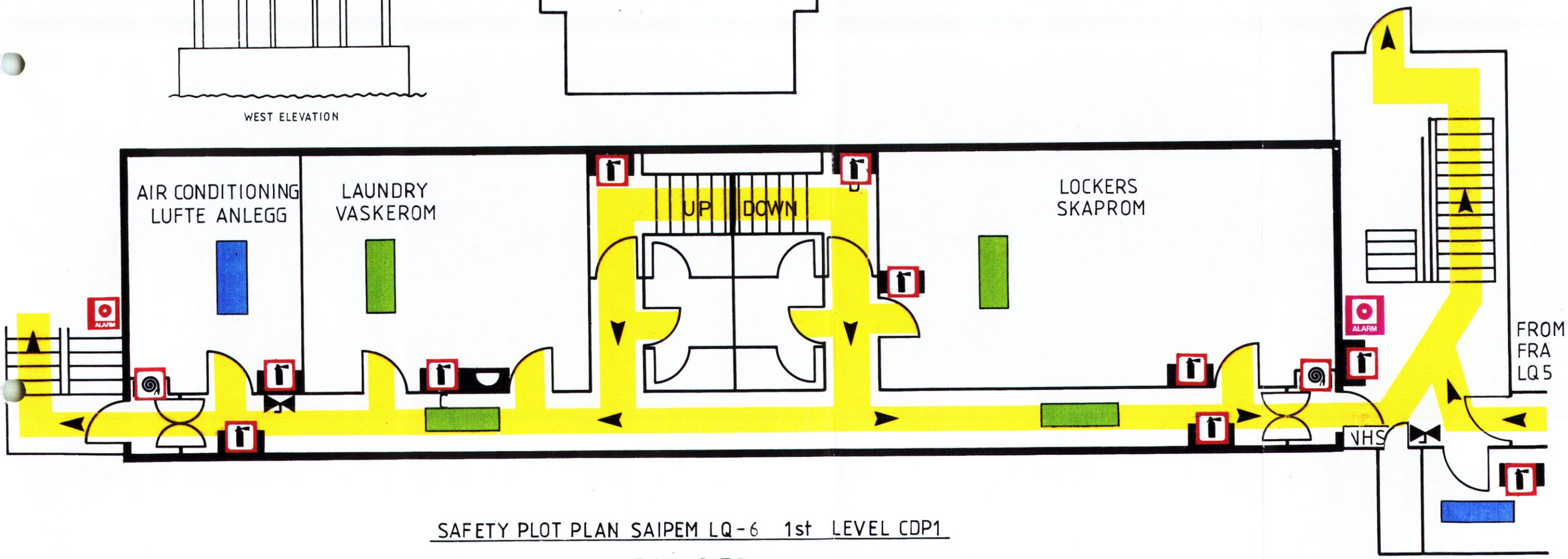
WEST ELEVATION

KEY PLAN CDP1
PRODUCTION MODULES



N
PLATFORM
NORTH

NOTE AREA MARKED THUS
ON KEY PLAN REPRESENTS
AREA SHOWN IN DETAIL

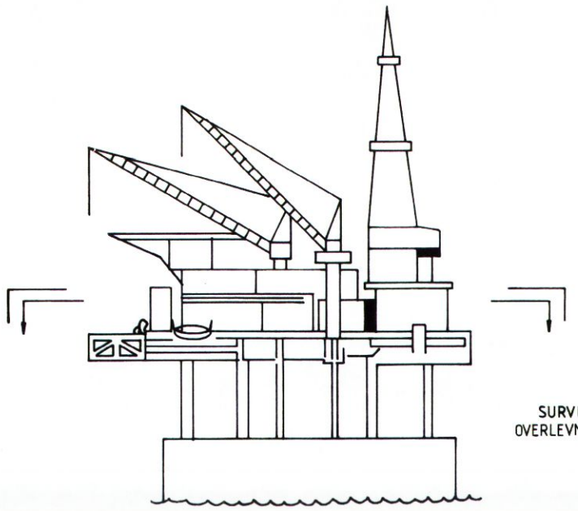


SAFETY PLOT PLAN SAIPEM LQ-6 1st LEVEL CDP1

RIG SIDE

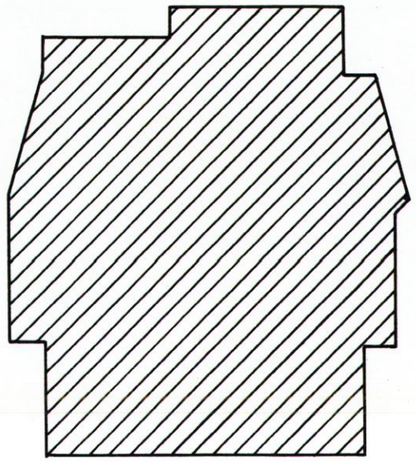
ISSUE 1, DEC. 1988

SAFETY PLOTPLAN & ESCAPE ROUTES LQ 1st LEVEL	10.13.4



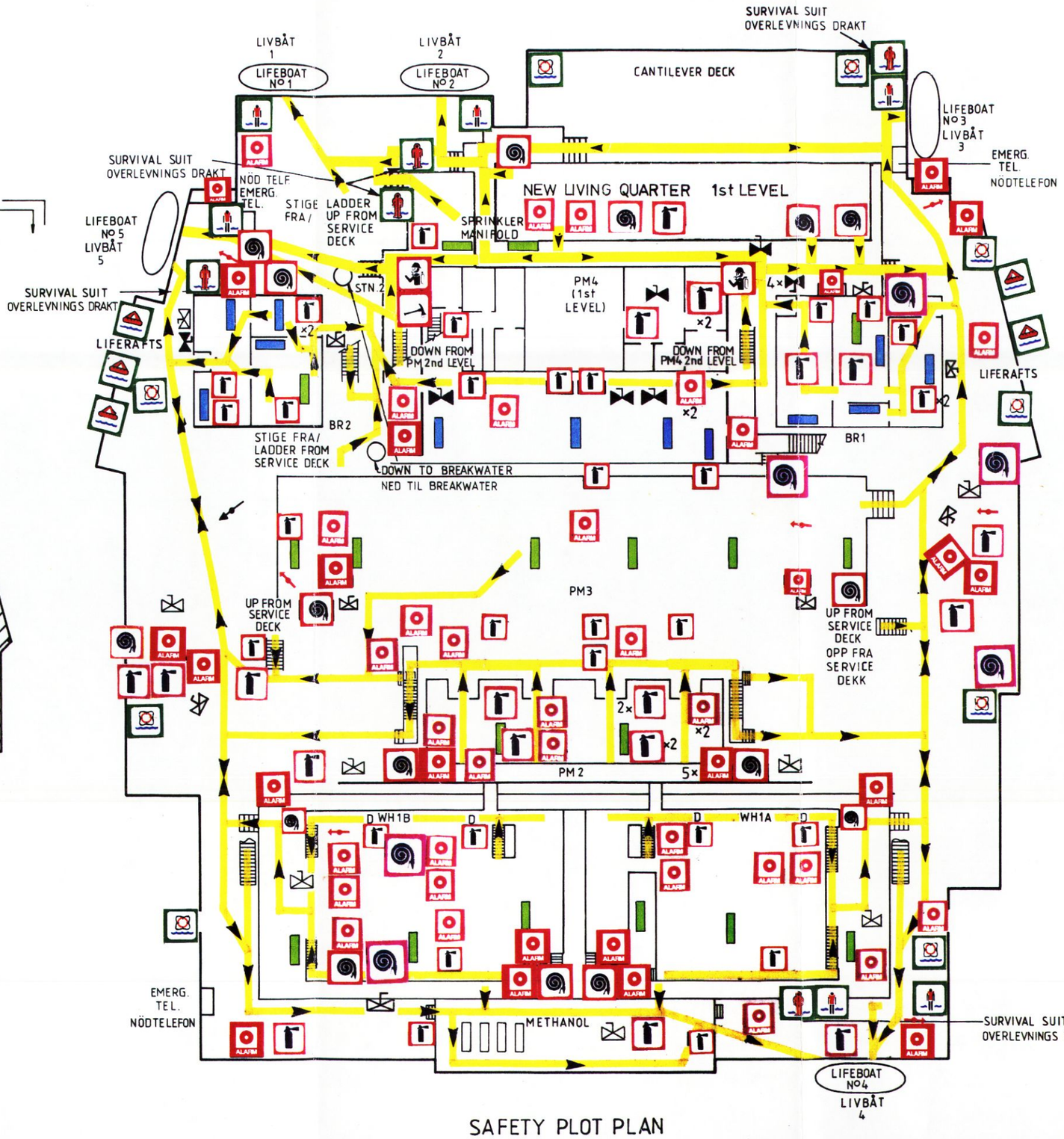
WEST ELEVATION

KEY PLAN CDP-1
PRODUCTION MODULES



KEY PLAN

NOTE AREA MARKED THUS ▨ ON KEY PLAN, REPRESENTS AREA SHOWN IN DETAIL

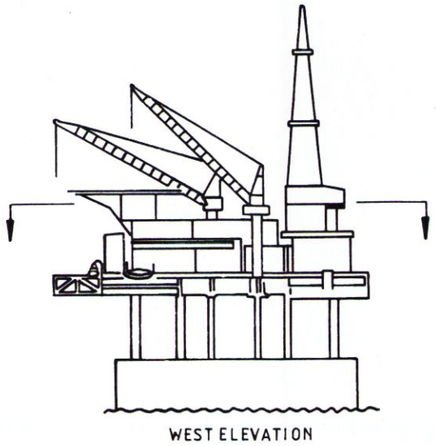


SAFETY PLOT PLAN
PRODUCTION DECK

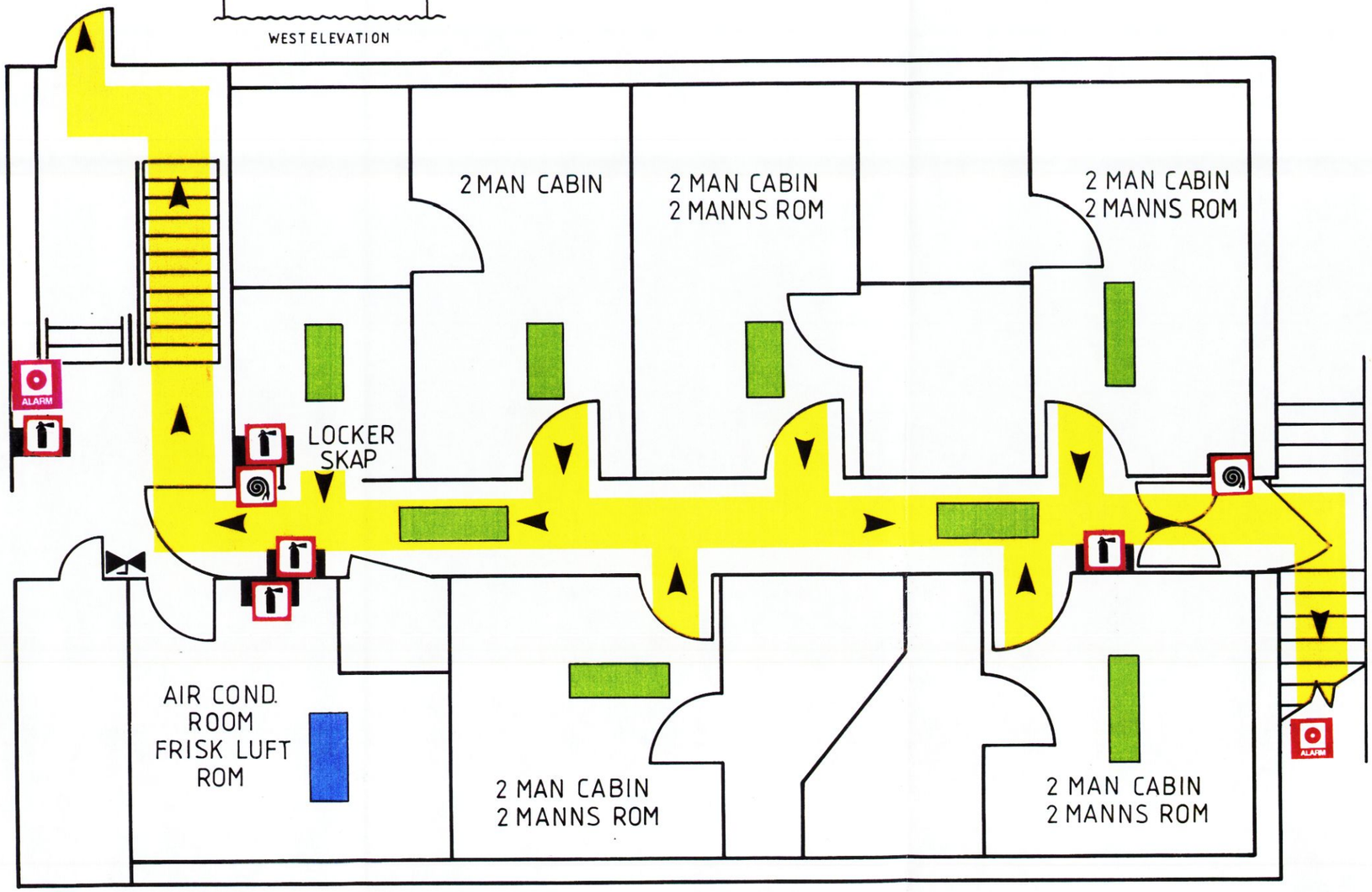
ISSUE 1, DEC. 1988

SAFETY PLOTPLAN & ESCAPE ROUTES
PRODUCTION DECK

10.13.2



WEST ELEVATION



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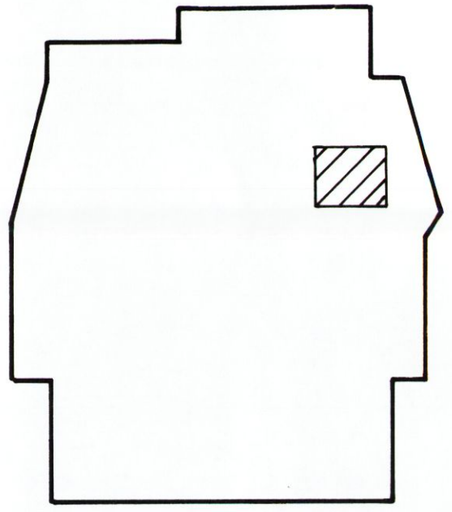
NOTE AREA MARKED THUS
ON KEY PLAN REPRESENTS
AREA SHOWN IN DETAIL



KEY PLAN CDP 1
PRODUCTION LEVEL

TO PRODUCTION
MAIN DECK/
TIL PRODUKSJONS
HOVED DEKK

SAFETY PLOT PLAN CDP1 LQ 5

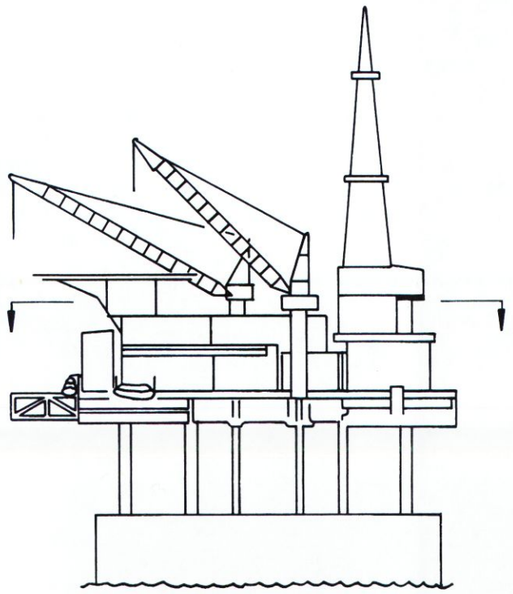
RIG SIDE

ISSUE 1, DEC. 1988

SAFETY PLOTPLAN & ESCAPE ROUTES LQ 5	10.13.5

N
PLATFORM
NORTH

KEY PLAN CDP1
PRODUCTION MODULES



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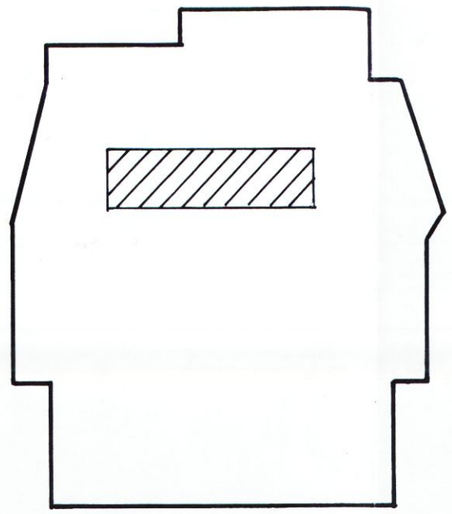

NOTE AREA MARKED THUS
ON KEY PLAN REPRESENTS
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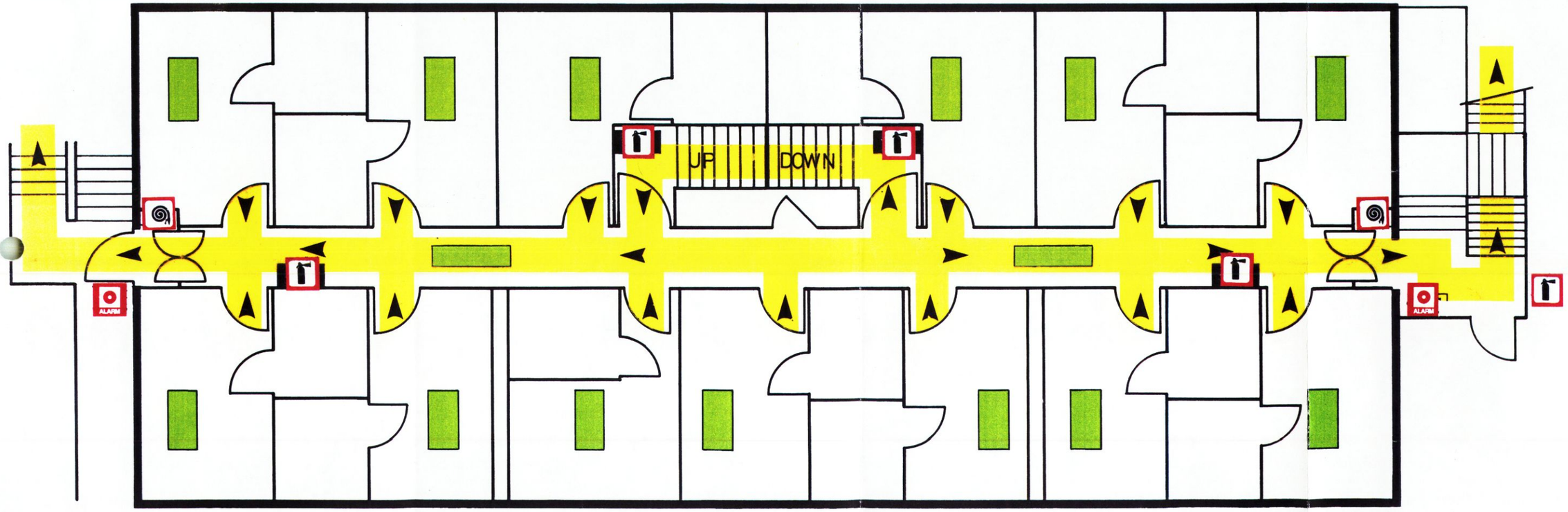


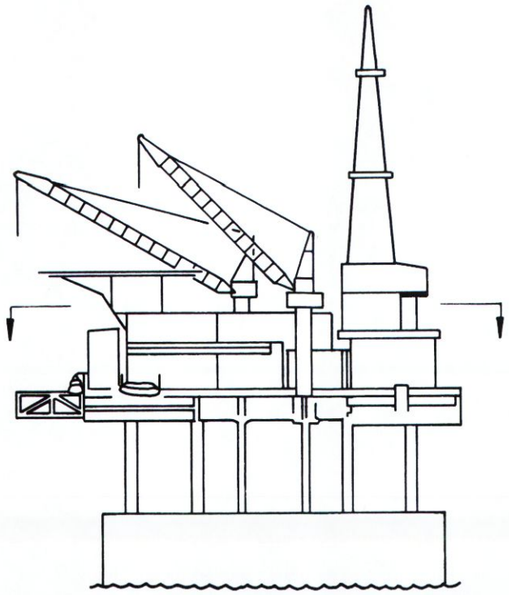
SAFETY PLOT PLAN SAIPEM LQ -6-2nd LEVEL CDP1

RIG SIDE

ISSUE 0, OCT. 88

SAFETY PLOTPLAN & ESCAPE ROUTES LQ 6 2nd LEVEL	10.13.6

KEY PLAN CDP1
DRILLING DECK



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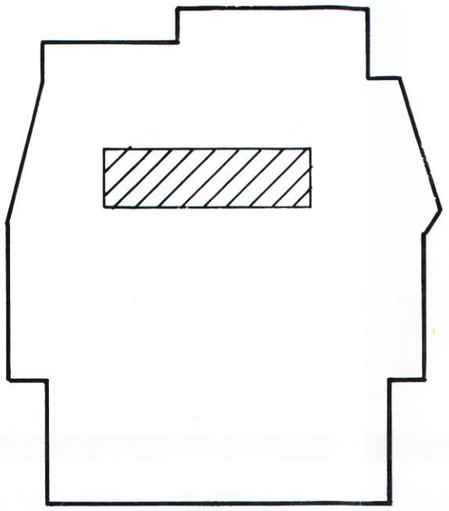

N
PLATFORM
NORTH

NOTE AREA MARKED THUS
ON KEY PLAN REPRESENTS
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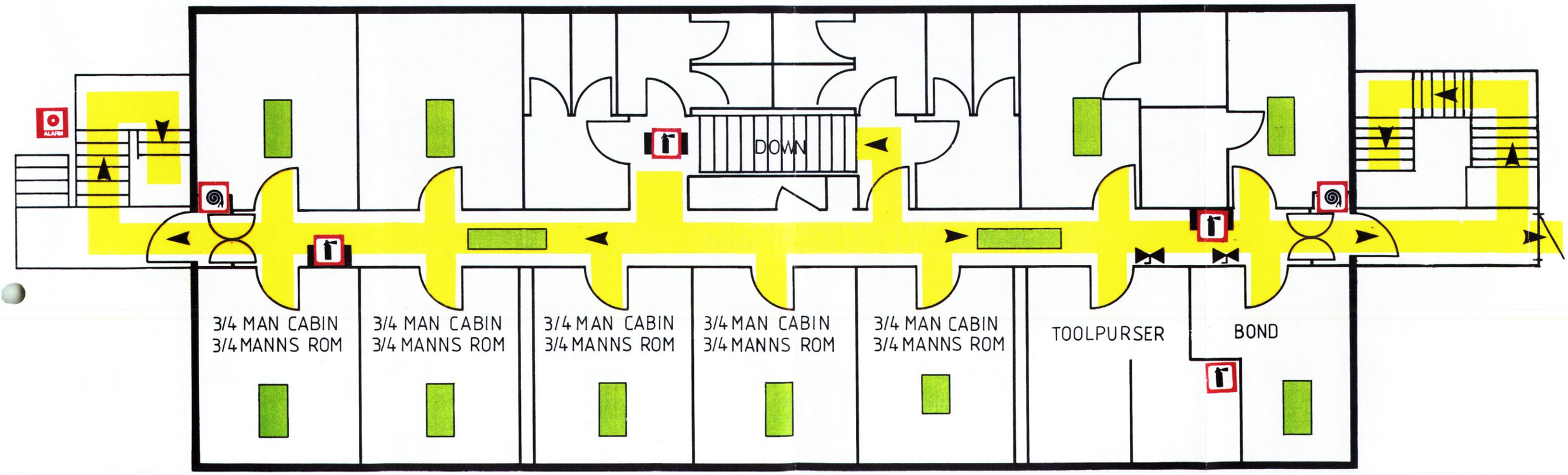
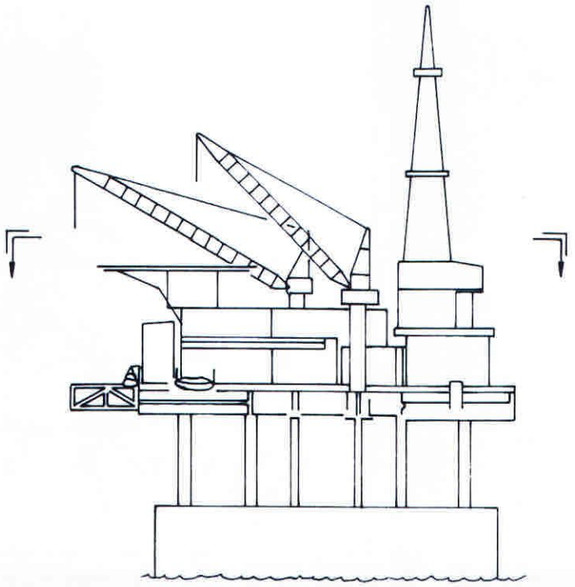


SAFETY PLOT PLAN CDP1
RIG SIDE
SAIPEM LQ-6-3rd LEVEL

ISSUE 1, DEC. 1988

SAFETY PLOTPLAN & ESCAPE ROUTES LQ 6 3rd LEVEL	10.13.7



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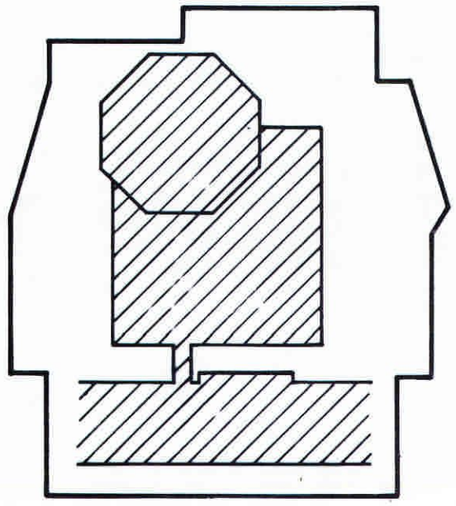

KEY PLAN CDP-1
PRODUCTION MODULES

NOTE AREA MARKED THUS ▨
ON KEY PLAN REPRESENTS
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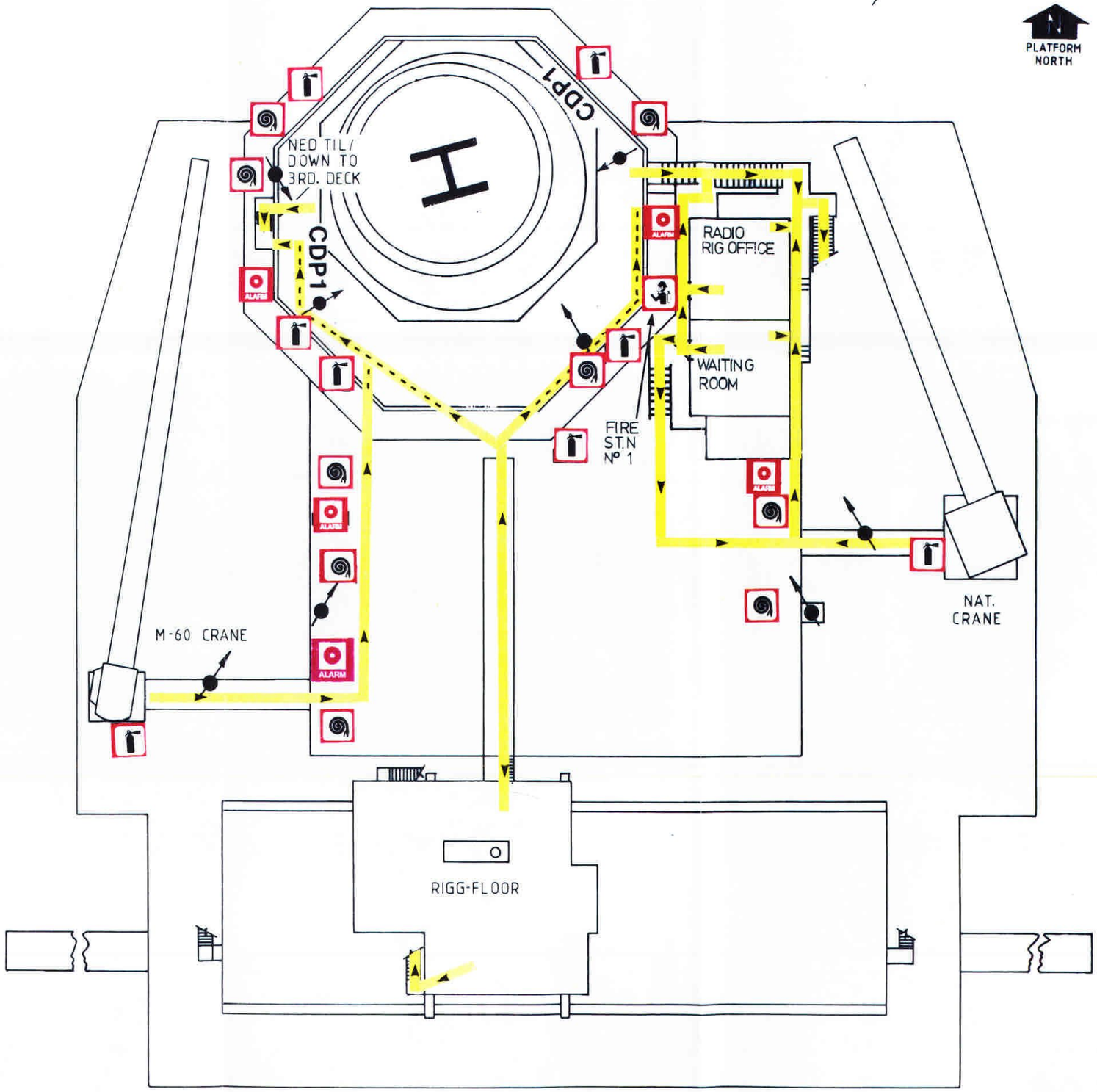


SAFETY PLOT PLAN HELIDECK AND SAIPEM PIPERACK DECK CDP1

ISSUE 1, DEC. 1988

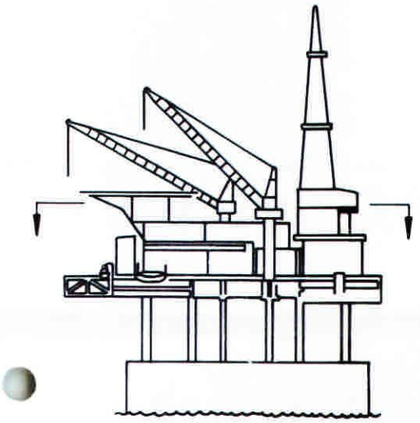
SAFETY PLOTPLAN & ESCAPE ROUTES
HELIDECK

10.13.8

SAFETY PLOT PLAN CDP1

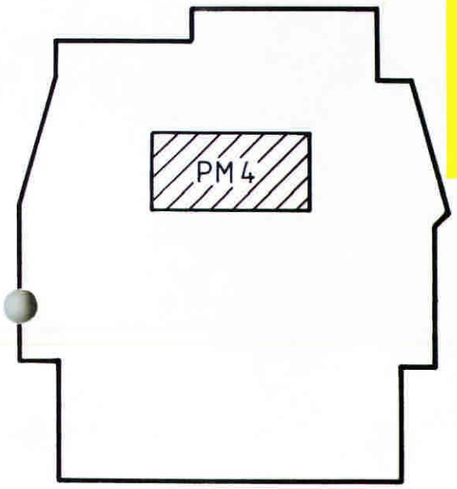
PM4- FIRST LEVEL

N
PLATFORM NORTH

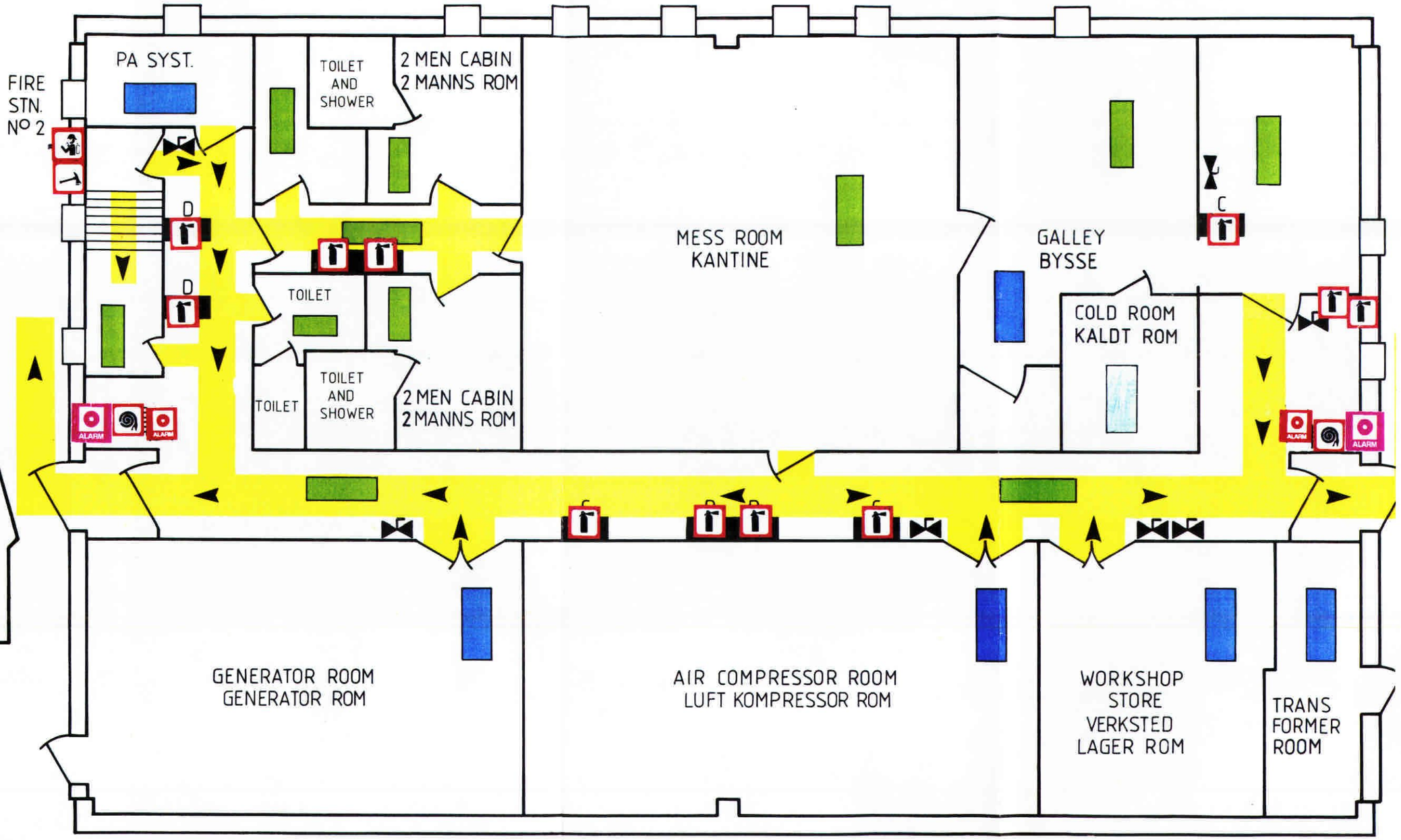


WEST ELEVATION

KEY PLAN CDP-1
PRODUCTION



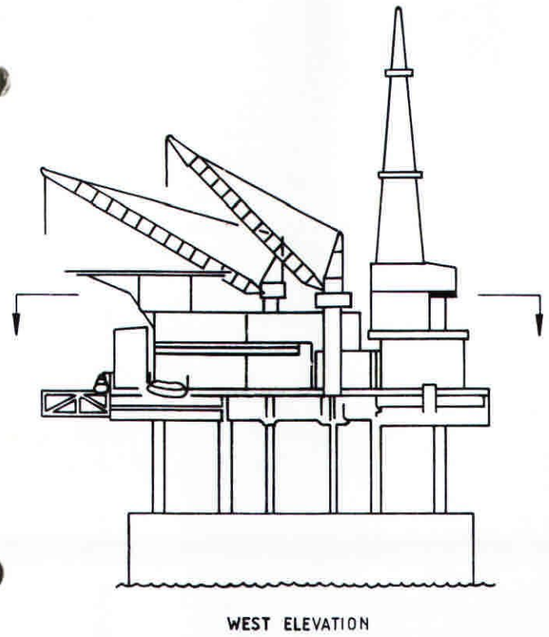
NOTE AREA MARKED THUS ▨ ON KEY PLAN REPRESENTS AREA SHOWN IN DETAIL



RIG SIDE

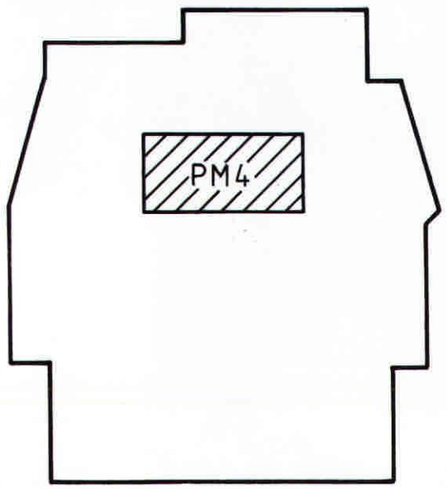
ISSUE 1, DEC. 1988

SAFETY PLOTPLAN & ESCAPE ROUTES PM 4 1st LEVEL	10.13.9



WEST ELEVATION

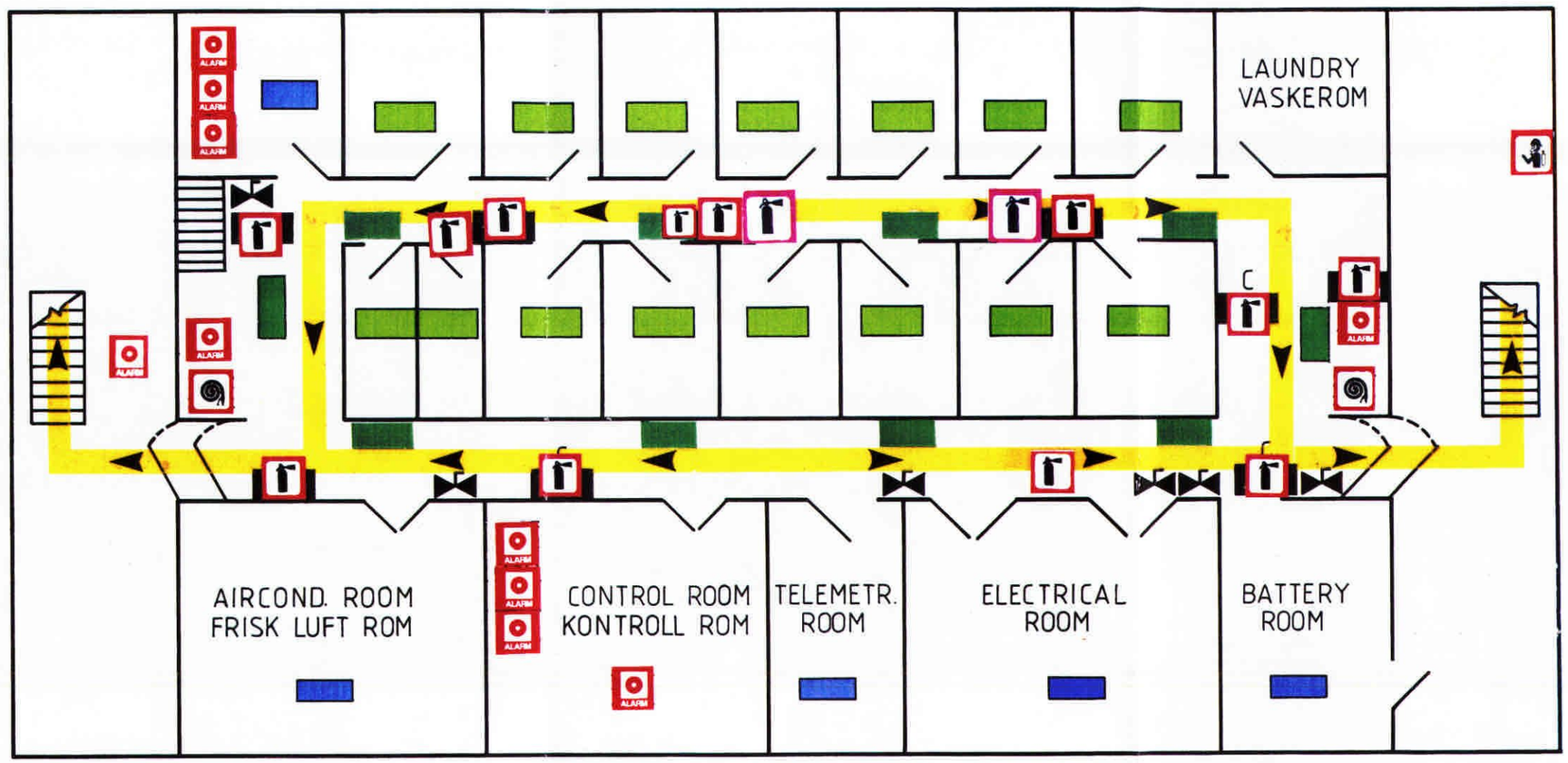
KEY PLAN CDP-1
PRODUCTION MODULES



NOTE AREA MARKED THUS ▨ ON KEY PLAN, REPRESENTS AREA SHOWN IN DETAIL

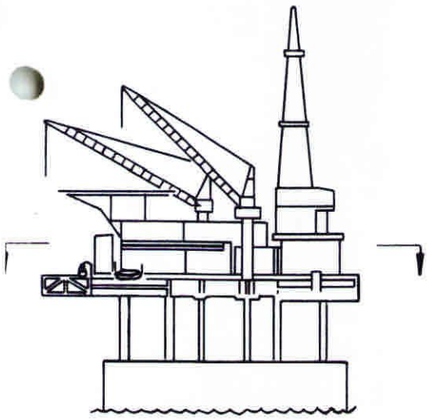
SAFETY PLOT PLAN CDP 1

MODULE PM 4 SECOND LEVEL



ISSUE 1, DEC. 1988

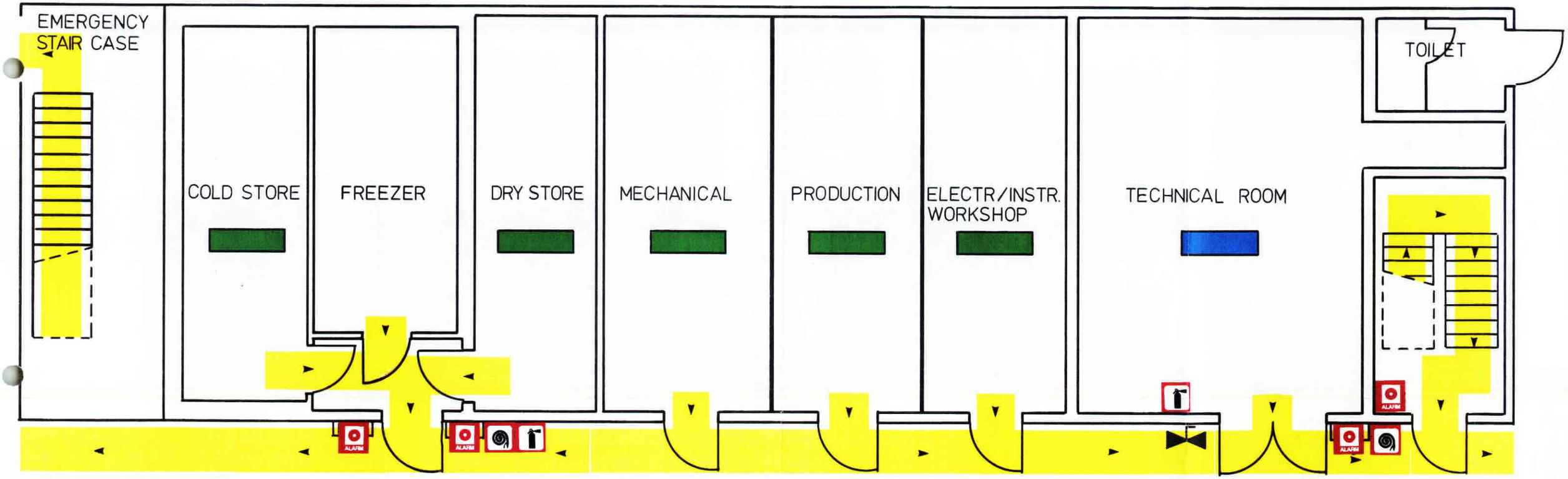
SAFETY PLOTPLAN & ESCAPE ROUTES PM 4 2nd LEVEL	10.13.10



WEST ELEVATION

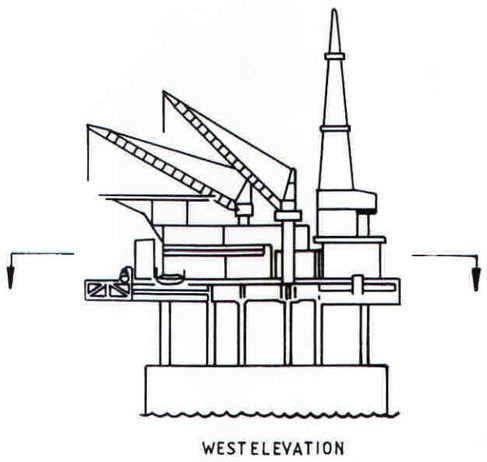
N
PLATFORM
NORTH

NEW LIVING QUARTER CDP1 FIRST LEVEL



ISSUE 0, OCT. 88

SAFETY PLOTPLAN & ESCAPE ROUTES NEW LIVING QUARTERS 1st LEVEL	10.13.11



WEST ELEVATION

N
PLATFORM
NORTH

NEW LIVING QUARTER CDP1 SECOND LEVEL

EMERGENCY
STAIR CASE

HOSPITAL

BATH

OFFICE

GYMNASIUM

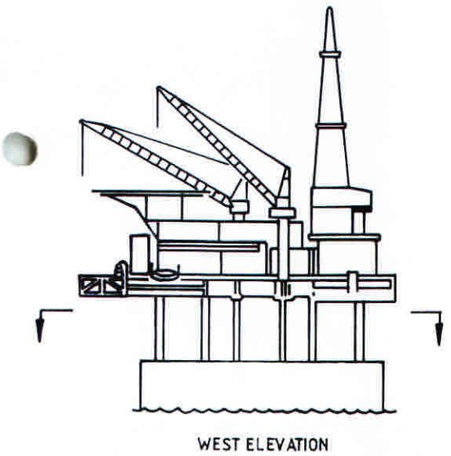
OIM/PROD
OFFICE

ALARM

EM.
EX.

ISSUE 0, OCT. 86

SAFETY PLOTPLAN & ESCAPE ROUTES NEW LIVING QUARTERS 2nd LEVEL	10.13.12



WEST ELEVATION

N
PLATFORM
NORTH

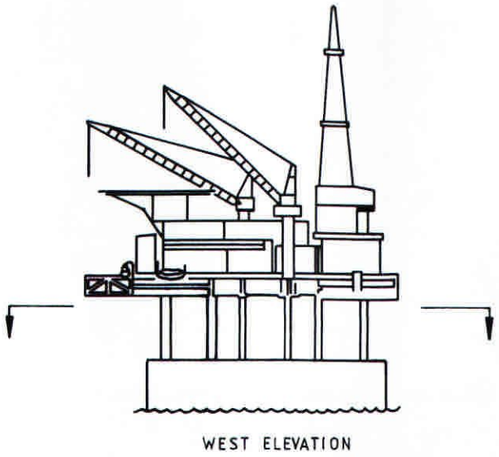
NEW LIVING QUARTER CDP 1 THIRD LEVEL

EMERG. STAIR
ALARM
ALARM
MOVIE ROOM
POOL ROOM
RECREATION ROOM
TOILET
CORRIDOR
ALARM
ALARM
CATERING
UTILITY
ROOM

ISSUE 1, DEC. 1988

SAFETY PLOTPLAN & ESCAPE ROUTES
NEW LIVING QUARTERS 3rd LEVEL

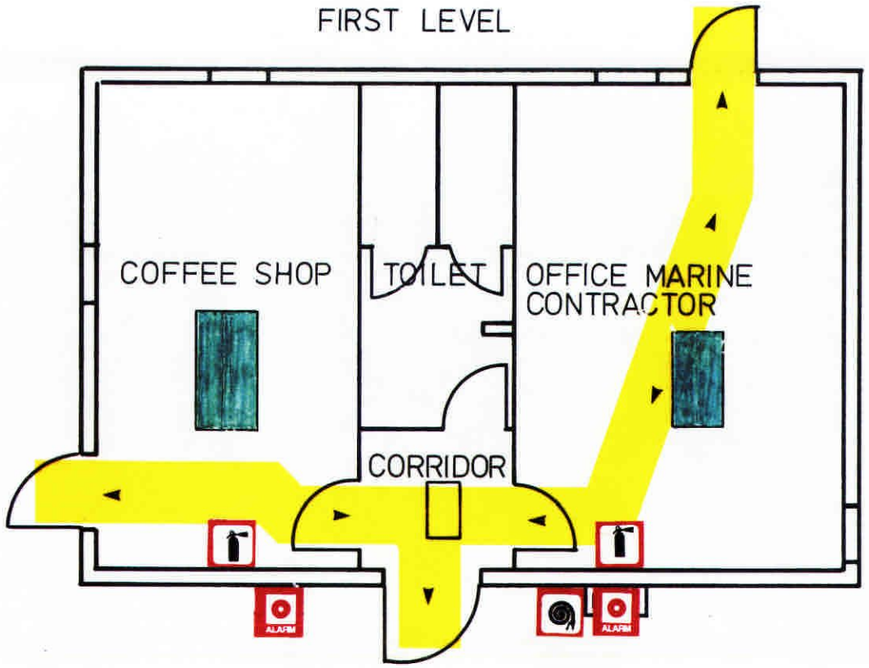
10.13.13



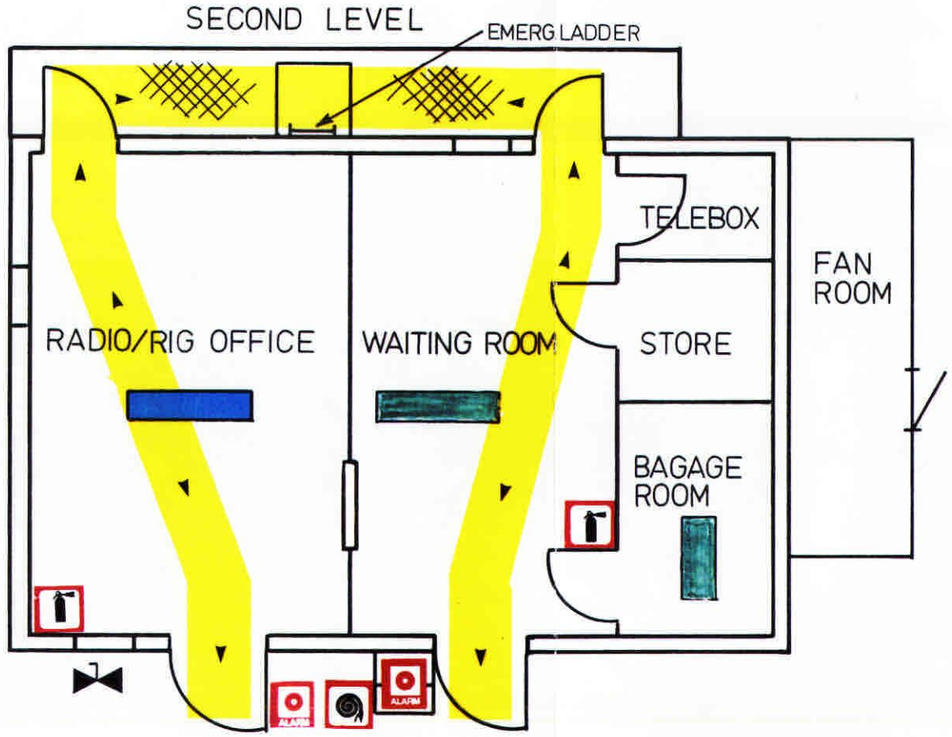
NEW RIG MODULE CDP 1

N PLATFORM NORTH

FIRST LEVEL



SECOND LEVEL



ISSUE 1, DEC. 1988

SAFETY PLOTPLAN & ESCAPE ROUTES	10.13.14

EMERGENCY LIGHTING

1 GENERAL

1.1 Emergency lighting is that lighting which is battery-maintained after main and standby supply failure. It remains in operation for a limited period.

1.2 This lighting is categorised as follows:

(a) Lighting fittings supplied at 48V dc from the platform central dc supply.

(b) Normal 220V ac twin-tube (2 x 40W) cold-cathode fluorescent luminaires with rechargeable batteries and changeover facilities.

1.3 The above fittings are in use during normal operation as well as during generated supply failures.

2 DESCRIPTION

2.1 Distribution

2.1.1 The 48V lighting fittings are supplied from three dc distribution boards in Modules BR1, PM4 and BR2. Each output circuit has 'cut-off' contactor timing contacts in series with its isolating fuse-switch.

2.1.2 The 220V battery-supported lighting fittings are supplied from lighting panels LL101, LL01 and LL02.

2.2 Lighting Fittings

2.2.1 The following types of dc lamps are fitted:

(a) Inside Modules:

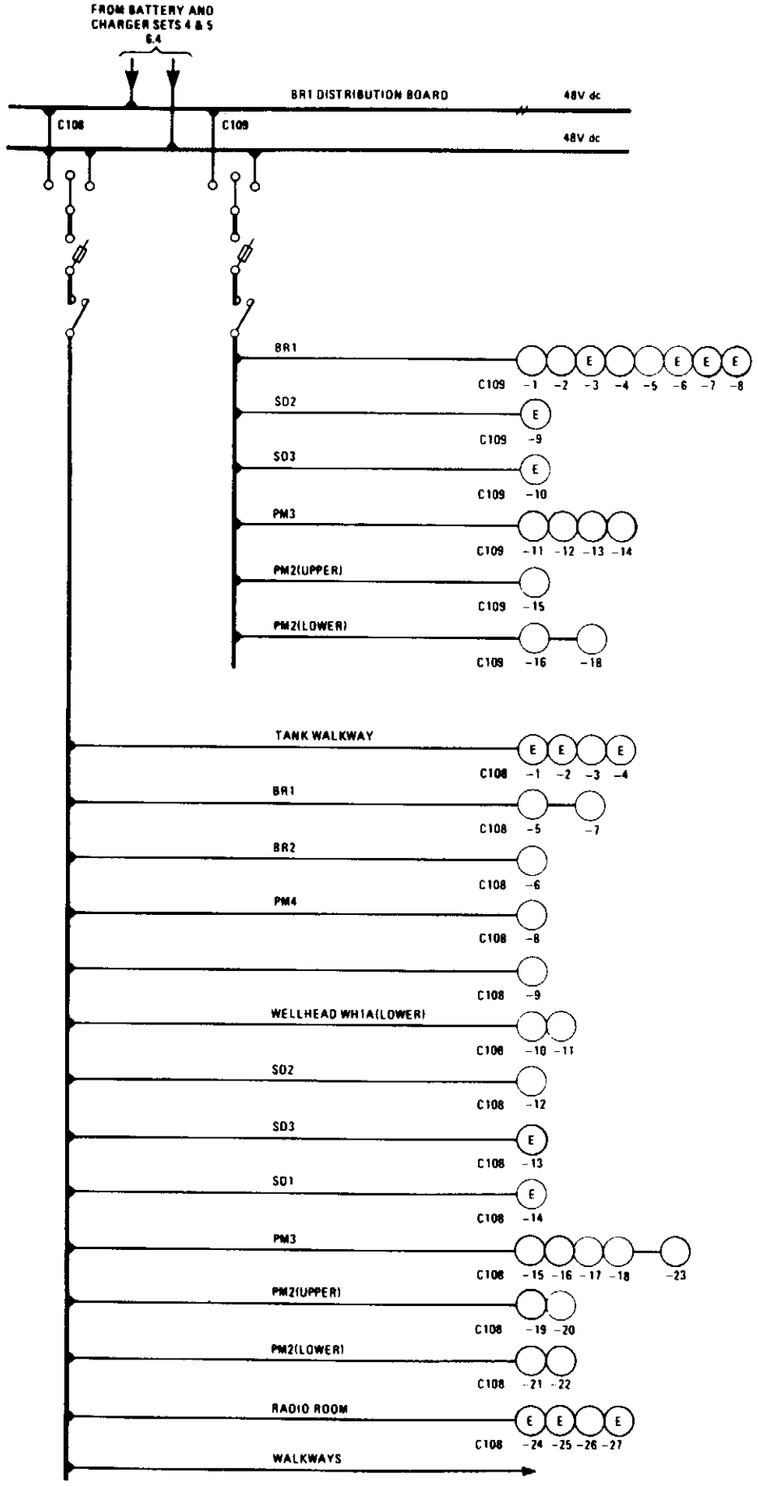
Incandescent 40W (0.9A) fittings to provide general area lighting. They are automatically cut off one hour after loss of the 380V ac supply.

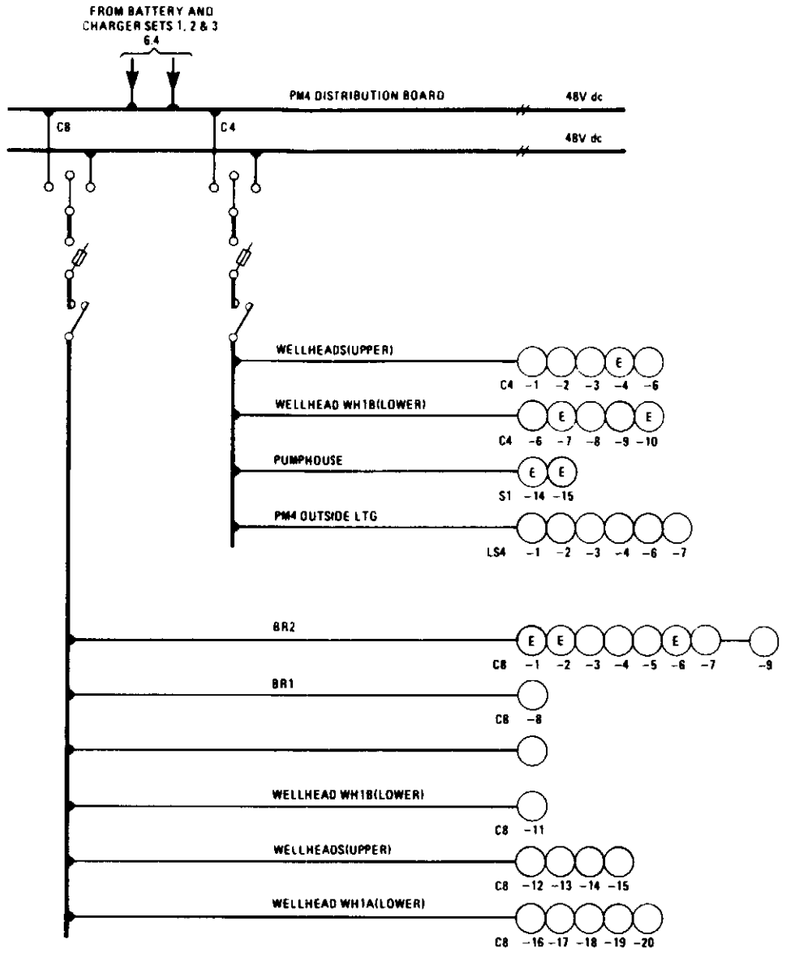
(b) Exit doorways, stairways and passageways:

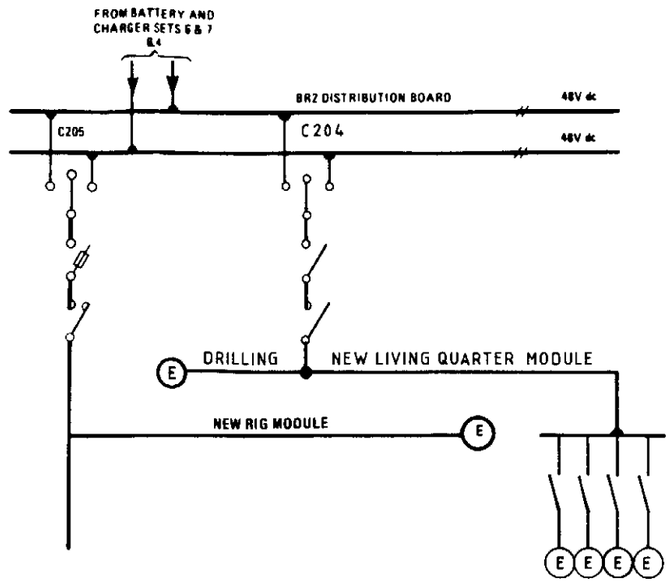
Incandescent 2 x 25W (1.0A) fittings to provide escape route lighting. They are automatically cut off 24 hours after loss of the 380V ac supply.

2.2.2 In addition, certain of the 220V ac fluorescent normal lighting fittings are provided with their own independent battery support. Each of these selected units has a long tubular 6V battery above it on the fittings, together with a rectifier, inverter, transformer and relay. On failure of the 220V ac system the relay switches on the inverter which converts the battery 6V dc supply to ac, and the transformer steps it up to 220V. One of the two tubes is also disconnected by the relay, and the battery can maintain the other tube illuminated for about 90 minutes. This will provide limited light in case of total platform shutdown including the 48V dc systems. Recharging of the 6V batteries is automatic on restoration of main ac power and takes about 24 hours from full discharge.

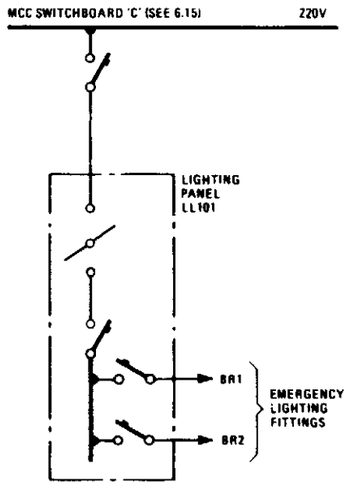
2.2.3 There are also 48V dc-operated 400W floodlights for the boat landing and lifeboat areas. They are switched on locally by any one of four pushbuttons at each lifeboat station and will automatically cut out one hour later. They may be used only for short periods during the 24 hours after loss of main ac power.

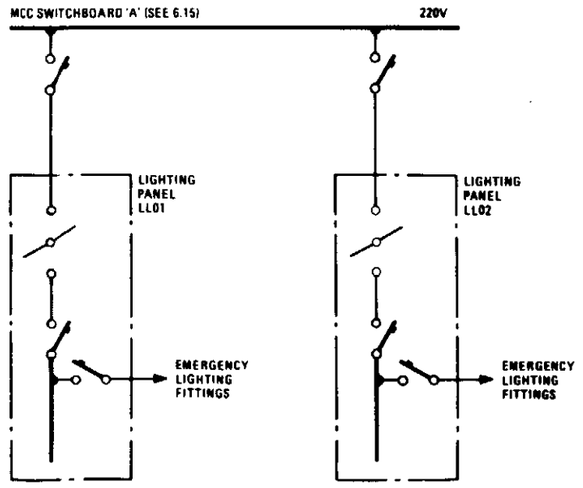






KEY	
○	48V dc LIGHTING FITTINGS, WEATHER AND EXPLOSION PROOF
(E)	SAME AS ABOVE, MARKED EXIT





EMERGENCY LIGHTING | 10.14

LIFESAVING EQUIPMENT

1 GENERAL

1.1 Lifesaving equipment providing the primary means of personnel evacuation from the platform comprises the following:

(a) Five 50-man lifeboats.

(b) Five 20-man self-inflating liferafts.

1.2 The lifeboat system enables personnel to evacuate the platform quickly. The five lifeboats are located as follows:

(a) Three on the north side of the external walkway at production deck level.

(b) One on the south side of the external walkway at production deck level.

(c) One on the north-west corner of the external walkway at production 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 production deck as follows:

(a) One at the north-east corner.

(b) One at the north side.

(c) One at the west side.

1.5 Lifejackets and lifebuoys are provided as additional individual lifesaving appliances.

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 Each lifeboat is powered by a 22kW Lister HRW2 water-cooled diesel engine, fitted with a Bryce Berger hydraulic start system and Borg Warner hydraulic gears.

2.1.3 The water spray system consists of a nominal $16m^3$ capacity tank charged to 248.3 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 18 to 36m/min. Lowering, controlled by the helmsman, is 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 davits 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 an 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 Access into the lifeboat is by two watertight doors at each side.

2.1.9 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 radiotelephone, 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 Mk 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 float 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 15 lifebuoys are provided, located throughout the platform specifically on external walkways, at production and service deck levels.

2.3.2 All 15 lifebuoy installations are provided with water activated Aqualites. Eight are also equipped with TRON 3F flashers. The remaining seven are equipped with Buoysmoke smoke markers.

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 Overhead 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.

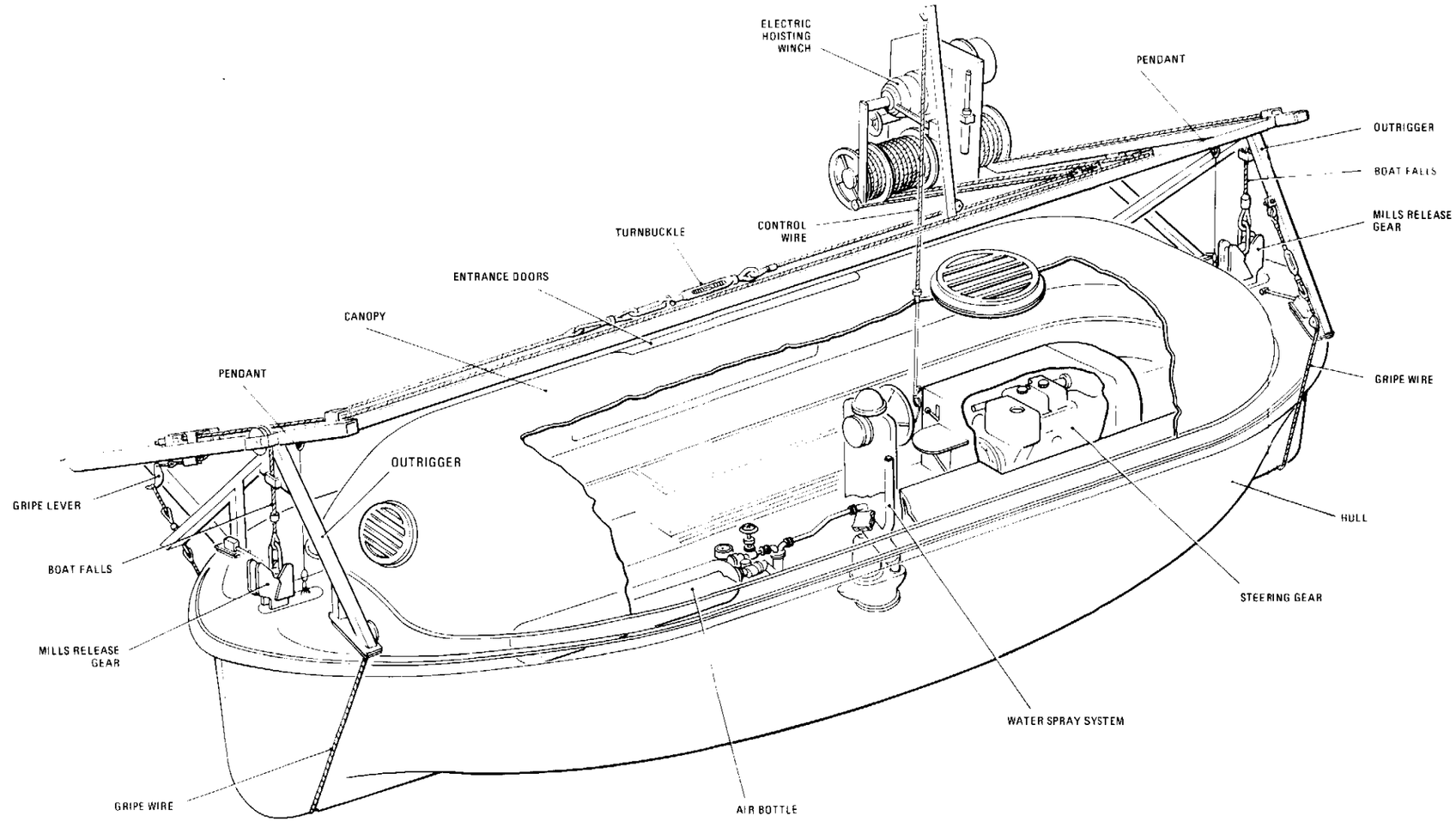
(7) When the lifeboat is 6in from the stowed position, stop the winch motor.

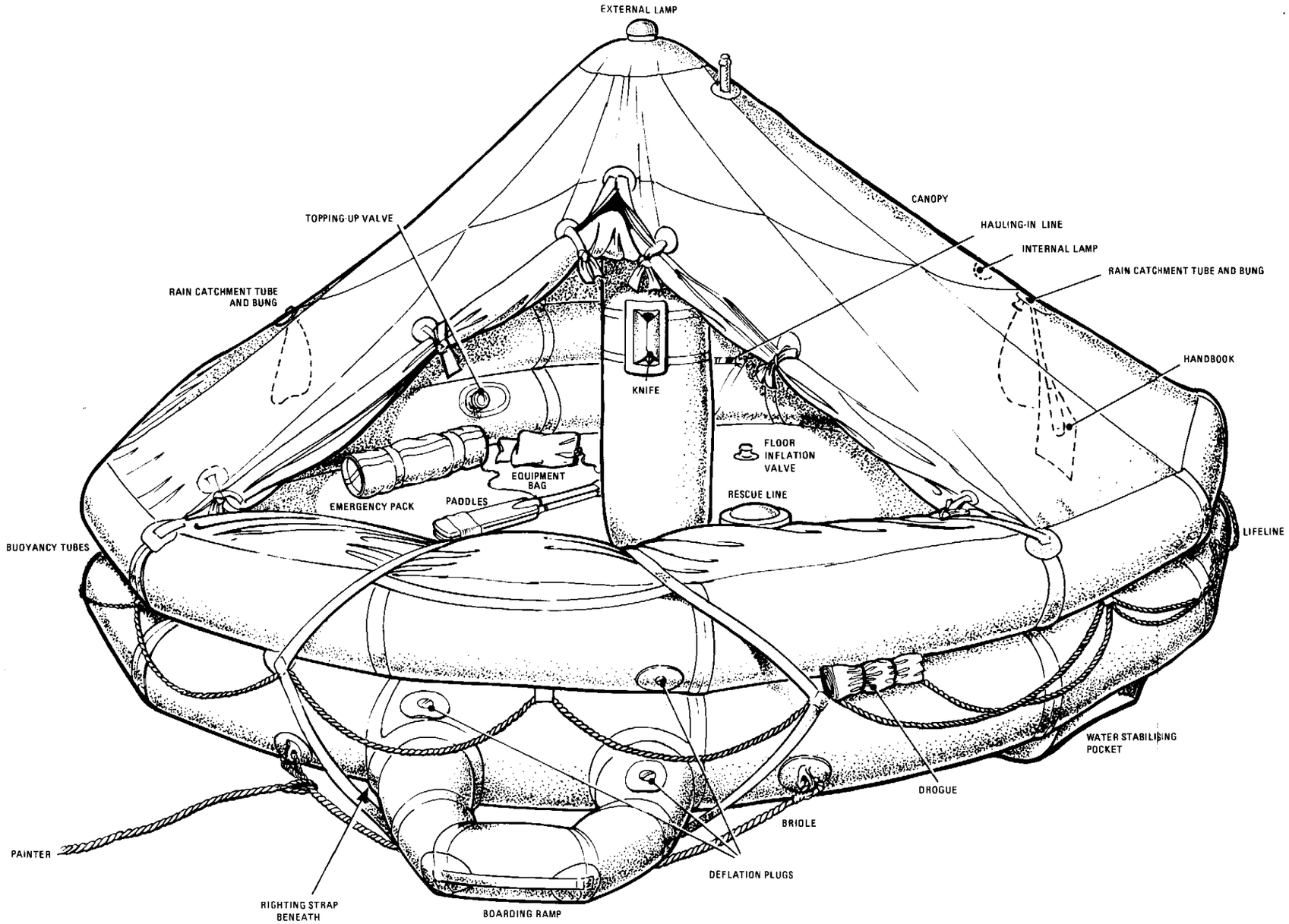
(8) Open the main circuit breaker and complete stowage of the boat by hand crank.

(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
MILLS RELEASE GEAR
HULL
STEERING 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.