TOTAL E&P UK PLC

COMPANY MANAGEMENT SYSTEM

LEVEL 3

INTERNAL ASSET DOCUMENT

MCP-01 OPERATING MANUAL

CONTROLLED
COPY No:
VALID ONLY IN RED

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REVISION HISTORY		
REV	**DATE**	**DESCRIPTION**
0	May 1993	
1	Nov 2003	Combined with former Statutory Operations Manual and reformatted in line with the new Total document specification. Updated to reflect the current status of equipment and systems.

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COPY NUMBER	COPYHOLDER'S POSITION OR RESPONSIBLE PERSON
1	MCP-01 OIM (NNS/FSO/OIM)
2	Head of Production (NNS/FSO/PRO)
3	Head of Maintenance (NNS/FSO/MNT)
4	St Fergus Control Room
5	MCP-01 Control Room
6	Altens Emergency Control Room
7	St Fergus Emergency Control Room

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The purpose of this document is to present a brief description of the main design features and the operational and emergency techniques applicable to the operation of the Total Offshore Installation MCP-01 as a 'not normally manned' facility. By doing so, the attention of the Offshore Installation Manager (OIM) is drawn to the essential information which is required to enable him to discharge his duties in ensuring that operations and maintenance are carried out in a manner which ensures the integrity of the structure.

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1.0 OVERVIEW

The official designation of the structure is 'MCP-01 Not Normally Manned Installation 14/9' which is described in the official records as a concrete gravity manifold compression platform with Registration Number 0119. Registration was first effected on 13th February 1976. The Installation was emplaced on the seabed in May 1976, and additional compression facilities were commissioned on 1st October 1983.

The compression facilities were decommissioned in 1990, since which time a comprehensive modification programme has provided for continuing use of the Installation as a 'not normally manned' manifold station in the Frigg System Operations.

The Owner of the Installation is:

Total E&P UK PLC
Crawpeel Road
Aberdeen
AB9 2AG

The Installation is located in 93m of water (at lowest astronomical tide) in Block 14/9 of the UK Sector of the North Sea. Its geographical co-ordinates are latitude 58° 49' 39" north and longitude 00° 17' 12" west which is approximately 175km (109 miles) north-east of St Fergus on the Scottish mainland. The nearest offshore structure to MCP-01 is the Claymore Platform which lies approximately 45km due south. Orientation of the Installation (ie platform north) is 30° east of true north (refer to Figure 1.1).

The Installation receives gas from the Galley, Rob Roy, Ivanhoe, Piper and Tartan fields through the 18in Texaco pipeline. It is then routed via the Texaco Riser Module into the Frigg Transportation System (of which MCP-01 is a part) which carries the gas from Frigg, north-east Frigg, Alwyn and Odin fields through twin 32in pipelines to the gas reception terminal operated by Total E&P UK at St Fergus.

For inspection and cleaning of the 18in pipeline, the Installation is equipped with pig reception facilities.

The Installation is designed to handle approximately 3 million standard cubic metres of gas a day. Pressure in the system will vary with flow demand, the maximum permitted pressure being 149barg.

2.0 RESPONSIBILITIES

2.1 Owner

The Owner is responsible for defining, applying and verifying a Written Scheme of Examination for the Installation and for ensuring the continued validity of the scheme. The Owner is also responsible for providing all technical information necessary to enable the Verifying Authority to make an independent and comprehensive assessment of the design and construction of the Installation. This includes the provision of any specialist assistance required and access to logs and records. The Owner has a statutory responsibility for the sound design, proper construction and effective maintenance of the Installation. The Verifying Authority must be notified of any damage, suspected damage or deterioration which may affect the safety, strength, stability or integrity of the Installation or if equipment is subject to extensive repair or replacement. All repairs and alterations or replacement of equipment must be carried out to the original standards by competent personnel.

3.0 MANNING PHILOSOPHY AND PERSONNEL LOCATION

3.1 General

As a 'not normally manned' Installation, manual intervention is only foreseen under the following circumstances:

- Attendance to carry out routine inspection and minor maintenance works
- Pre-planned and scheduled visits to carry out major maintenance and inspection programmes (flotel or shuttle supported)
- Unscheduled essential breakdown maintenance for critical equipment

The design and maintenance philosophy adopted for the Installation is primarily based on high reliability and low maintenance equipment with 100% installed standby capacity as a minimum. Maintenance will therefore, in general, be undertaken on the basis of breakdown and direct replacement from offshore held spares inventories. With few exceptions, major maintenance activities which would require significant disassembly work, will be deferred to the pre-planned major maintenance programmes to be carried out on 2-yearly cycles.

The inspection and survey philosophy adopted to maintain the Licence to Operate for the Installation is based on a rolling inspection and maintenance programme submitted to, and accepted by, the Verifying Authority.

The necessary inspections and surveys required for compliance with the Offshore Installations (Construction and Survey) Regulation 1974 (SI 289) will therefore take place during any of the different periods of attendance at the Installation (as outlined below), and be subject to the same attendance, access and restricted practices as may therefore apply.

In this context, only two different manning conditions are envisaged:

- *'Not Normally Manned Installation' but 'Routinely Attended' for Minor Maintenance and Inspection Visits*

  (Limited unscheduled breakdown maintenance or abnormal operational requirements are also considered to fall into this category.)

  Such attended activities will be carried out without external support facilities.

  Limitations are applied to the number of persons allowed onboard, the duration and frequency of attendance and work practices.

  Under these circumstances, the Installation is generally considered to fall within the classification as a 'not normally manned' Installation as defined by The Offshore Installations and Pipeline Works (Management and Administration) Regulations, SI 1995/No 738. Areas of non-compliance with this guidance have been identified, and justification for variance is provided by this document.

- *'Not Normally Manned Installation' but 'Temporarily' Manned for the Performance of Scheduled and Pre-planned Major Maintenance and Inspection Programmes*

  Such activities will include, not only the major topsides maintenance and inspection requirements, but also subsea structural and pipeline riser inspections **within** the breakwater wall.

  All such operations will only be carried out with the external support facility of a bridge-linked flotel or shuttle programme.

Subsea structural, pipeline and riser inspection works **external** to the breakwater wall will be carried out from a Remotely Operated Vehicle (ROV), survey or diving support vessel with normally no requirement for access to or support from the Installation.

During periods of flotel-supported operations, restrictions will be applied to:

- Allow access to the platform for essential personnel only
- Limit the maximum number of persons onboard
- Limit onboard work periods and practices
- Discontinue attendance in the event of circumstances likely to jeopardise personnel safety either on the Installation or which may affect the flotel bridge link
- Limit the use of the Installation helideck facilities to emergency situations only

3.2 Manning Philosophy – 'Attended' Operations

The estimated workload based on a 2-yearly cycle between major maintenance activities is anticipated to be 3000 to 3500 man-hours per year.

This includes mandatory inspection and testing requirements and essential regular routine works required to maintain effective process monitoring and control, reliability of safety systems and availability of communications.

The estimate also includes an element of 'breakdown' maintenance required for utility systems.

For any visit to the Installation, a core team of essential personnel is necessary ie:

- Offshore Installation Manager (OIM)
- Operations
- Maintenance
- Safety

For strict compliance with the 12 persons maximum allowed on the Installation, this would necessitate some 82 visits per year.

The manning levels for routine attendance have been set at 17 persons maximum per visit (including pilots). This is consistent with the total passenger carrying capacity, single-engine performance criteria, payload restrictions and single-flight evacuation capacity of a second helicopter in the event of breakdown (ie based on current type of helicopters used). During routine visits, the helicopter will remain available on the Installation at all times.

The manning levels will enable completion of the predicted workload to be achieved by 48 visits to the Installation in each year.

To optimise the frequency of visits to the Installation, a 2-monthly cycle will be adopted. Routine visits will be scheduled once every 2 weeks with the option to replace the last visit in each cycle with consecutive visits of up to a maximum of 5 days.

This approach will afford the flexibility to carry out any breakdown maintenance activities with the benefit of pre-planning. The 2-monthly cycle option is also compatible with the normal scheduled availability of supply boat visits to the Installation. The option to utilise consecutive visits will be on an 'only as necessary' basis.

For normal operations, compliance with the requirement of restricting visits to a maximum of three, and for a cumulative attendance period not exceeding 24 hours in any 7-day period, will therefore be achieved.

For abnormal operations, the worst case envisaged would be for breakdown maintenance of any one of the three (100%) power generation units. It is estimated that such works can be completed within the constraints of the five consecutive day visits and a maximum attendance of 12 hours on each day. This option is also considered to offer the potential for improved productivity through pre-planning and for personnel continuity for completing the defined tasks.

Note: No overnight occupancy of the Installation will be allowed except in the extraordinary event that transportation is unavailable.

During any visit, additional safety and operational constraints will also limit the workscope. In particular, restricted or controlled access will apply to hazardous areas, sealed/redundant areas of the Installation and the centre core, and all works will be controlled by Permit to Work procedures.

Over-the-side works will not be permitted unless a fully certified standby vessel is on station. As it is intended that a standby vessel will not be permanently on station for routine visits, over-the-side working will not be permitted. Any requirement for such works will therefore be restricted to either the consecutive day visit periods or the 2-yearly major maintenance programme when a standby vessel will be permanently on station for the duration of the work.

3.3 Personnel Locations – Routinely Attended Operations

During attended operations, the Installation control point will be manned at all times by at least one person.

The distribution of other personnel will be dependent on the inspection/maintenance programme of activities, and will vary accordingly with each visit. Such activities will, in general, be determined by the Computerised Maintenance Systems (CMS) in place and the requirements of the in-service inspection manuals.

The occupancy factors used (ie 1.0 is permanent occupancy throughout the period of the visit) are intended to reflect the cumulative occupancy in the specified area throughout the duration of the visit.

As overnight platform attendance is not allowed except in extraordinary circumstances, variations in personnel distribution outwith normal work periods do not normally apply. Should such circumstances occur, the control point will remain continuously attended by two persons, whilst the remaining personnel will be located in the two emergency sleeping areas within the Temporary Refuge (TR) and mess areas.

3.4 Manning Philosophy – Major Maintenance/Inspection

Major maintenance and inspection programmes will be pre-planned, with scheduled activities to be carried out on a 2-yearly cycle basis. During such work programmes, the Installation may require the support of a bridge-linked flotel facility.

In accordance with the Offshore Installations (Safety Case) Regulations 1992, a separate Safety Case submission for the combined operations will be made at least 6 weeks prior to the commencement of such operations. Combined operations will not commence until acceptance has been granted.

In order to optimise the design of the Installation for its primary role as a 'not normally manned' facility, some constraints to operation during major maintenance and inspection have been accepted as necessary. Similarly, it is anticipated that some additional facilities may be required and will be provided by the flotel as support to those permanently installed on the MCP-01 platform.

These constraints and additional support facilities are outlined below only as the basis for interfacing requirements of future operations.

3.4.1 Schedule

Major maintenance and inspection programmes will be pre-planned and scheduled to be performed every second year. Work will be scheduled for the period between April and October (for optimal environmental conditions) and have an anticipated continuous duration of up to approximately 8 weeks.

3.4.2 Combined Operations Configuration and Access

The existing east-side flotel landing platform will **not** be used. The new west-side landing platform only will be utilised for future operations to:

- Minimise potential anchoring implications
- Reduce vessel collision profile and vessel/platform impact consequences
- Afford maximum protection from platform hazards for the bridge link

During combined operations, helicopter access and operations will only be carried out to or from the flotel. Only in exceptional emergency conditions will the MCP-01 helideck be utilised.

A fully certified standby vessel will be permanently on station throughout the duration of combined operations.

3.4.3 Manning Levels

During combined operations, the MCP-01 platform will be considered to be a temporarily manned work area, and again fully controlled by a Permit to Work system.

A maximum complement of Persons Onboard (POB) MCP-01 at any one time will be restricted to 63 persons. This will ensure that the permanently installed survival craft (TEMPSC) provide adequate capacity (ie 150%) for POB.

Personnel allowed onboard MCP-01 platform will be restricted to those essential for the control of platform operations and safety, and for the supervision and performance of the scheduled works.

As necessary, additional manning restrictions will apply to works in specific areas of the platform and are as defined by platform operational and organisational procedures, eg restricted numbers and multi-level working constraints within the centre core.

Overall and local area manning levels will be subject to strict monitoring and control procedures.

3.4.4 Platform Occupancy

During combined operations, the normal day-to-day platform occupancy shall, where practical, be an extended day work period of up to 14 hours. Where operational circumstances allow, ie process topside facilities isolated and depressurised, then 24-hour maintenance activities as necessary will be allowed.

During certain scheduled inspection activities, ie within the centre core or diving operations within the breakwater wall, safe working practices and procedures will dictate that simultaneous maintenance work activities are restricted. In such circumstances, 24-hour inspection activities will be allowed but within the constraint of essential personnel only being onboard.

3.4.5 Abnormal/Emergency Conditions

During combined operations, the MCP-01 TR will be considered as secondary to that provided on the flotel. Under any circumstances which may jeopardise the bridge link and/or initiate MCP-01 platform general alarm condition, then immediate mustering and evacuation of all non-essential personnel from MCP-01 shall take place.

The bridge link between the platforms will therefore be considered as the primary escape route and must be afforded full protection against possible MCP-01 hazardous occurrences, by the Flotel Safety facilities.

3.4.6 Additional Monitoring/Communications

As the flotel will be considered as the primary safe refuge during combined operations, remote indication/status monitoring of essential elements of the MCP-01 safety systems will be provided on the flotel. Spare communication channels have therefore been allocated within the platform telecommunication system to facilitate the necessary extension during combined operations.

3.5 Personnel Locations – Temporarily Manned Operations

The programme of works envisaged to occur during such periods will include equipment maintenance (including major overhaul works), carried forward or major repair works, protective painting and inspection works (including structural and survey works as necessary to maintain the Written Scheme commitment for the Installation).

When necessary, and as determined by previous operational experience and/or events, any construction/modification activities would also be pre-planned and scheduled to take place during such periods.

4.0 PRIMARY FUNCTIONS

The primary function of the MCP-01 platform has been modified to that of a ‘not normally manned’, remotely operated manifold platform for the import and export of commingled third-party gases.

All imported gases are preconditioned, quality monitored and fiscally metered at their originating platforms, while the exported gas is treated onshore to meet final sales gas specification. The facilities provided on MCP-01 for functional operation can therefore be described by the following systems:

- Import pipeline/riser
- Process – pressure/flowcontrol skid
- Export risers/pipelines

- Blowdown and flare system
- Support utilities
- Control and communication

Although no permanently installed facilities for the support of diving operations are provided, such operations both from the platform and from Diving Support Vessels (DSV) will be necessary to meet inspection requirements.

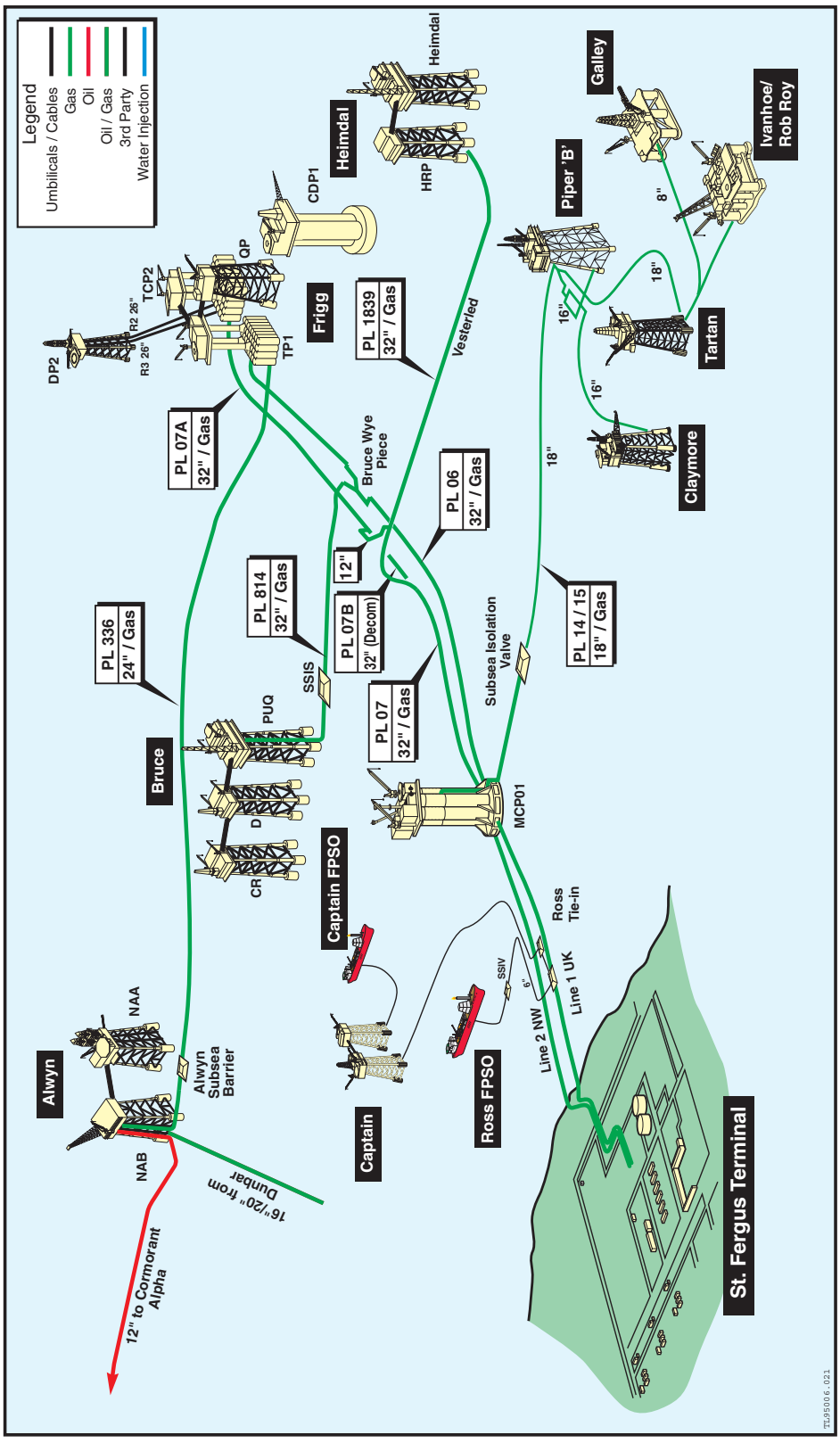

Figure 1.1 MCP-01 Location

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1.0 PLATFORM LAYOUT

The original platform orientation and layout was established on the principles for a permanently manned Installation ie:

- Separation and segregation of potentially hazardous process areas from accommodation areas
- Orientation to utilise prevailing winds for dispersion of hazardous releases
- Use of the concrete centre core for the protection of import/export risers and Emergency Shutdown (ESD) valves

The principles used in design of the modified Installation have therefore been to retain the inherently beneficial aspects of the original layout without compromise, and to further enhance the safety of operations by:

- Considerably reducing the inventory of hazardous materials
- Concentrating the hazardous materials to the minimum possible number of locations and thereby restricting the sphere of influence of such hazards
- Re-utilising and enhancing the most inherently safe areas of the platform, eg for location of the Temporary Refuge (TR)
- Locating new equipment and operational areas consistent with established escape routes and evacuation facilities
- Utilising redundant existing facilities/modules to provide shielding or buffer zones to fire and explosion hazards

Although fundamentally a not normally manned Installation with limited attendance, the requirements for accessibility, escape, safety and welfare of the more dispersed and greater numbers of personnel onboard during planned major maintenance activities have been considered as the dictating case for layout of the platform facilities.

The following provides an outline description of the platform layout. (Refer to Figures 2.1 to 2.10.)

1.1 Main Deck North (Process Facilities)

The hazardous process facilities have been significantly reduced by the platform modifications and are now essentially restricted to the Texaco skid (MP-R-07). The skid is located adjacent to, and east of the centre core structure. The skid is in a naturally ventilated area but segregated from other areas of the topsides facilities by:

- The concrete centre core structure to the west
- An existing 3m high firewall, A-60 rated (with emergency escape doors), to the east and north boundaries of the skid
- An existing A-60 rated firewall to the south of the skid (and redundant utilities skids). The firewall extends the entire width of the north facing sides of the utilities (MP-R-02) and generator (MP-R-03) modules

The Texaco skid provides facilities for gas import pipeline pigging, pressure letdown and pressure, temperature and flow monitoring.

The gas import riser ESD valve is located at the north-west corner of the skid below main deck level. The valve and access basket platform is protected from below and at the sides by H-120 rated partial firewalls and the concrete beam structure of the main deck; and from above by deck plate.

The majority of the gas export riser pipework and ESD valves are located within the concrete centre core and are therefore well protected from external hazards by the core.

Escape routes from the skid area are provided through the north and east firewall; via the Load Repartition Structure (LRS) and redundant valve manifold skid to the west and north-west areas of the platform; and to the south along the east/west firewall of the utilities/generator modules.

An inclined cold vent stack is located at the north-east corner of the main deck and rises to an elevation of 185.765m. A cold vent header connecting the Texaco skid and vent stack is routed essentially below main deck level, and provided with passive fire protection in the vicinity of the Texaco skid.

The stack elevation and location make maximum use of prevailing winds for dispersion of controlled releases or for emergency depressurisation of topsides gas inventory.

Similarly, in the event of adverse weather conditions and inadvertent ignition of the cold vent, the stack elevation/location ensures that resulting thermal radiation levels at all potentially manned areas of the Installation are well within the API 521 limits, at the blowdown rates considered.

All other areas at main deck level and to the north of the existing utilities/generator modules are now essentially non-operational with the exceptions of the:

- Navaid station
- East crane and north-east and west laydown areas
- Instrument air compression and air drier package (MP-V-11000) which are enclosed in an ISO container located to the west of the centre core

The LRS and the fully isolated and decommissioned compression/separation modules are retained in situ. These modules provide considerable protection for the access and escape routes along the north and west faces of the platform (and through the LRS itself); which lead to the flotel landing platform and TEMPSC (No 3) located at the north-west corner of the platform.

Similarly, the redundant and decommissioned A-60 fire rated, firewater pump modules (MP-V-7110/7120) are retained in situ to provide shielding of further sections of the west face escape routes.

1.2 Main Deck South (Utilities/Control Areas)

The main deck area south of the centre core was the original location for utilities, power generation and distribution, and accommodation modules.

All the multi-level modules are retained in situ but only certain areas of the ELQ, utilities and power generation modules are reused operationally. The retained east-west firewall and the existing and redundant A-60 fire rated modules thereby afford fire and explosion protection/buffer zones for the critical operational areas.

The four-level ELQ module has been isolated, decommissioned and sealed with the exception of:

- Level 3 (East) – in which the control area, main telecommunications equipment and Switchroom 3 are housed. Switchroom 3 contains one of the two Uninterruptible Power Supply (UPS) power and distribution systems

- Level 1 (West) – which is designated as the TR. The TR area comprises:

  – Muster area for up to 50 persons (also acts as an instrument/electrical workshop)

  – The emergency command centre (including emergency communications/safety system monitoring console)

  – First aid area/emergency temporary sleeping area for six persons

  – Accommodation and messing facilities for nine persons

  – Toilets/shower area

  – Level 1/3 internal interconnecting A-60 rated stairwell for emergency escape/evacuation of the control area to the TR

For Level 3 areas, access and escape routes are provided from/to external walkways on the east and south faces of the module which lead either up to the helideck (supported from the ELQ roof), or down to main deck levels, or internally to the TR as indicated above.

For Level 1, access routes are provided via the covered walkway between the utilities/ELQ modules and at the west and south faces, all at main deck level. Two evacuation routes from the TR are via the south and west access points, close to each of which are located TEMPSC (No 1 and 2 respectively).

The existing two-level generator module (MP-R-03) is retained although the lower level (air compressor/MCC switchgear rooms) is essentially redundant except for a small area used for mechanical stores. The second level has been internally reconstructed following removal of two (of the four) dual-fuelled turbogenerator sets; the other two sets are fully redundant, decommissioned and isolated.

The reconstructed area is used to house two new 100%, 218kW diesel engine driven generator sets (MP-P-10202A/S or G1/2), and Switchroom 1.

The switchroom houses one of the two main power distribution switchboards and the second of the UPS power systems.

Each generator set is installed within an enclosure, which, along with the switchroom are all individually protected by total flood CO_2 extinguishant systems.

The existing diesel fuel supply header tank (MP-D-102) and filter coalescer unit (MP-C-134A) located in the north-east corner of Level 2 of the generator module, are reutilised. The redundant lube oil header tank (MP-D-104) alongside the diesel tank has been converted for diesel use, giving a total header tank(s) capacity of some 3.5m (ie approximately 72 hours of operation).

A second diesel filter/coalescer unit (MP-C-134B) is retained in its original location within the decommissioned utilities module providing service for maintenance generator (MP-V-8102 or G3).

Access and escape routes to and from the module are provided at the north west and south east corners of the module at Level 2, and lead to main deck level and both main deck and the helideck respectively.

The existing two-level utilities module (MP-R-02) is essentially redundant and decommissioned. However, access to the washdown pumps (MP-G-106A/B), sea sump (MP-D-118) and sea sump pump (MP-G-108), and emergency standby diesel filter coalescer unit (MP-C-134B) is required at Level 1 of the module; and to the washdown water storage tank (MP-D-100) at Level 2.

The operational use of these facilities will only be necessary, and only as required, for short durations during periods of attendance on the platform. Such access and operations will be controlled by work permit procedures. At all other times the equipment will be physically and electrically isolated.

Access and escape routes from both levels of the module are provided to main deck levels to the east and west sides of the module, and to the covered walkway between the utilities and ELQ modules.

Two existing A-60 fire rated skid-mounted modules, the Permanent Living Quarters (PLQ) (MP-R-10) and the emergency generator module (MP-V-8102) are both located on the roof of the utilities module, and are retained in place. The PLQ module is, however, decommissioned, isolated and sealed.

The emergency generator module houses the emergency/maintenance generator (MP-P-8102 or G3) with integral diesel day tank, and a separate switchroom (No 2). The 665kW diesel engine driven generator, although available as standby/backup to the two other generators, is provided mainly for the increased demand necessary during major maintenance periods and during crane operations. The switchroom houses the second of the main power distribution switchboards.

Both the generator area and switchroom are protected by a total flood CO_2 extinguishant system. Access and escape routes are provided to each area of the module, and internally between the areas.

1.3 Underdeck Areas

A number of underdeck basket areas within the main deck structure were previously utilised for equipment location and storage areas. Following platform modification, many of these areas are now redundant and have been decommissioned.

In the underdeck areas to the north of the centre core, only the following are retained for operational use:

- *Stores Basket*

  Situated at the north-west corner of the platform, at elevation +116.50m, the stores basket has been reconstructed as the new flotel bridge landing platform. Access to the platform is available from the main east/north side and west side escape routes and via the LRS area. The basket provides a well protected area for mustering and evacuation due to its remote location, and the shielding provided by the main deck and redundant compression modules.

- *HP/LP KO Drum Baskets*

  Situated along the platform north face. Due to the design changes and much-reduced inventories, the High Pressure (HP) and Low Pressure (LP) depressurisation facilities are now superseded and the original facilities have been decommissioned and isolated. The condensate receiver (MP-C-120) originally providing HP liquid knockout capacity has, however, been recertified and reconfigured to provide instrument air buffer storage capacity, and is capable of meeting peak demands under emergency scenarios.

Access and escape routes to/from the area are provided at main deck level to the north, north-east, north-west locations and to the LRS area.

Significant underdeck areas to the south of the centre core, ie below the utilities and ELQ modules, remain operational. However, some equipment functions and area utilisation have been changed.

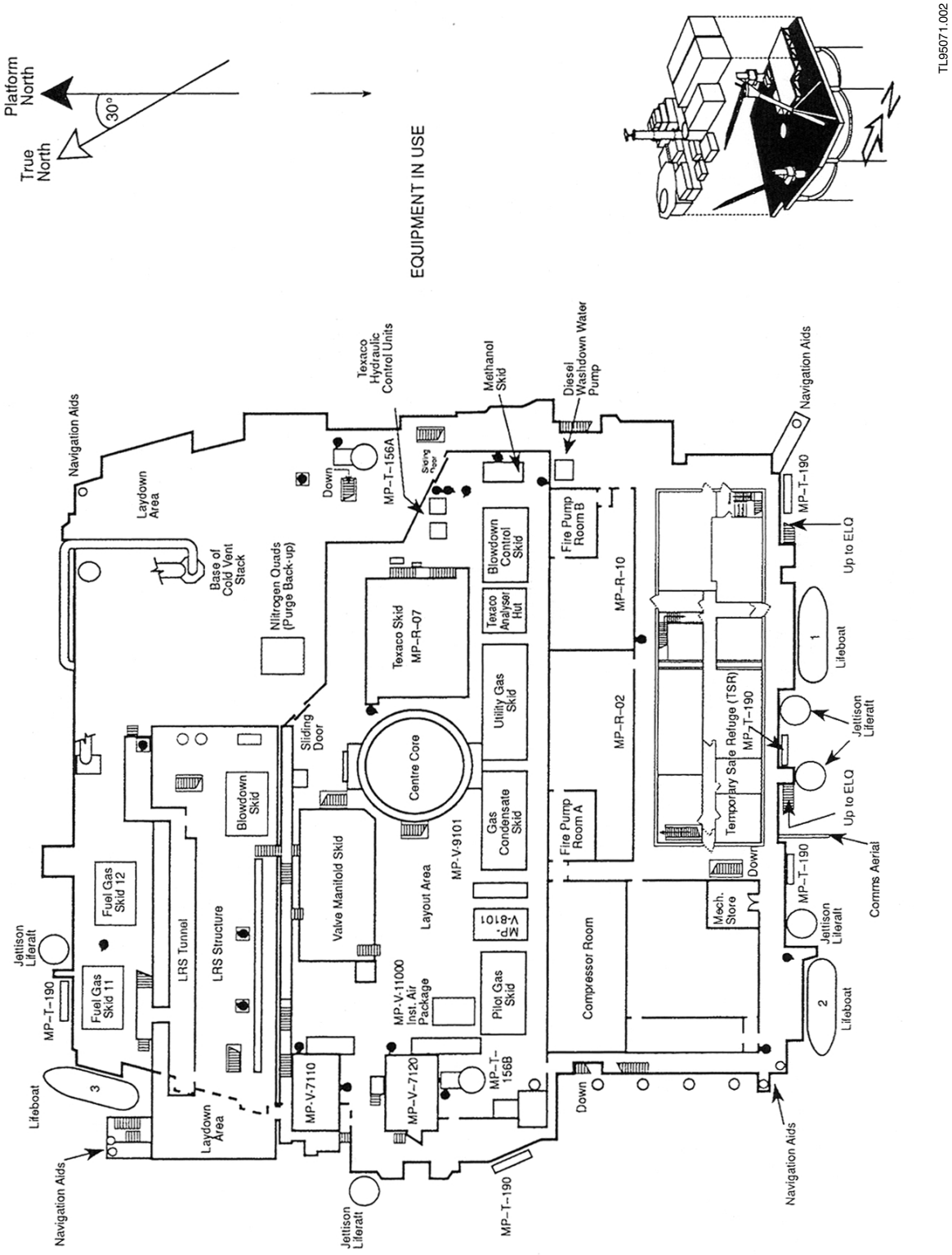

Figure 2.1 Equipment Layout – Main Deck

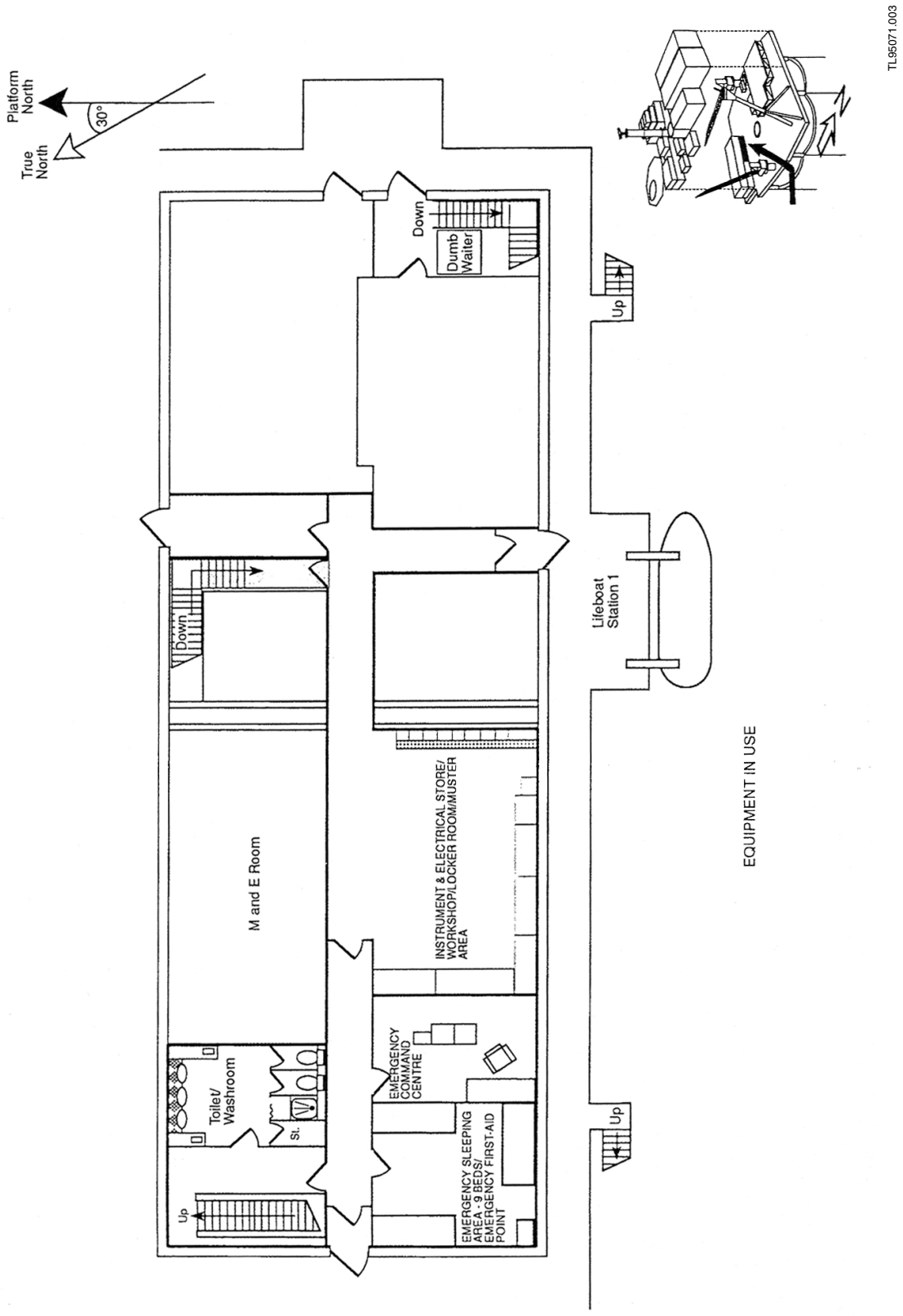

Figure 2.2 Equipment Layout – Temporary Refuge (ELQ – Level 1)

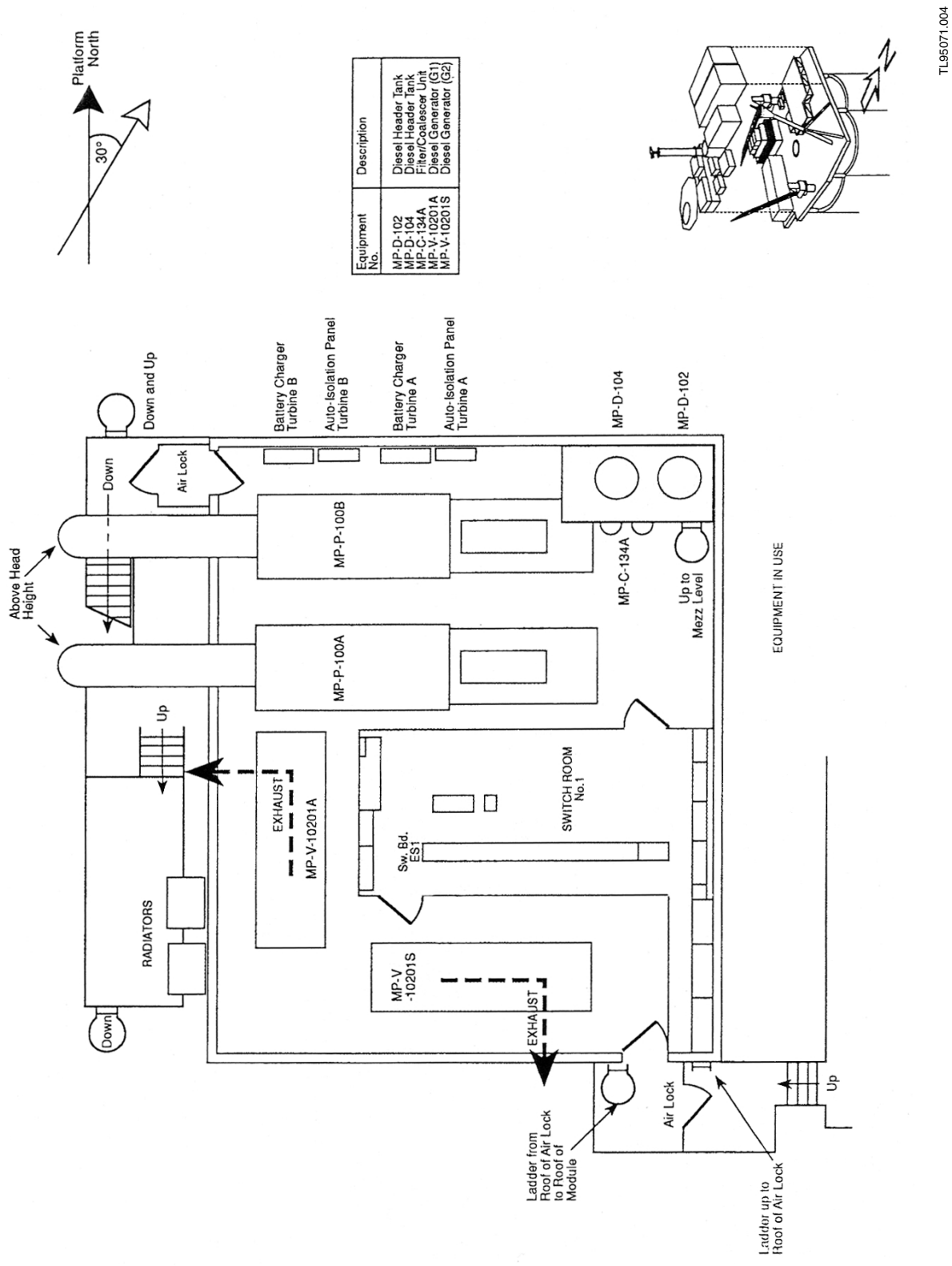

Figure 2.3 Equipment Layout – Generator Area/Switchroom 1

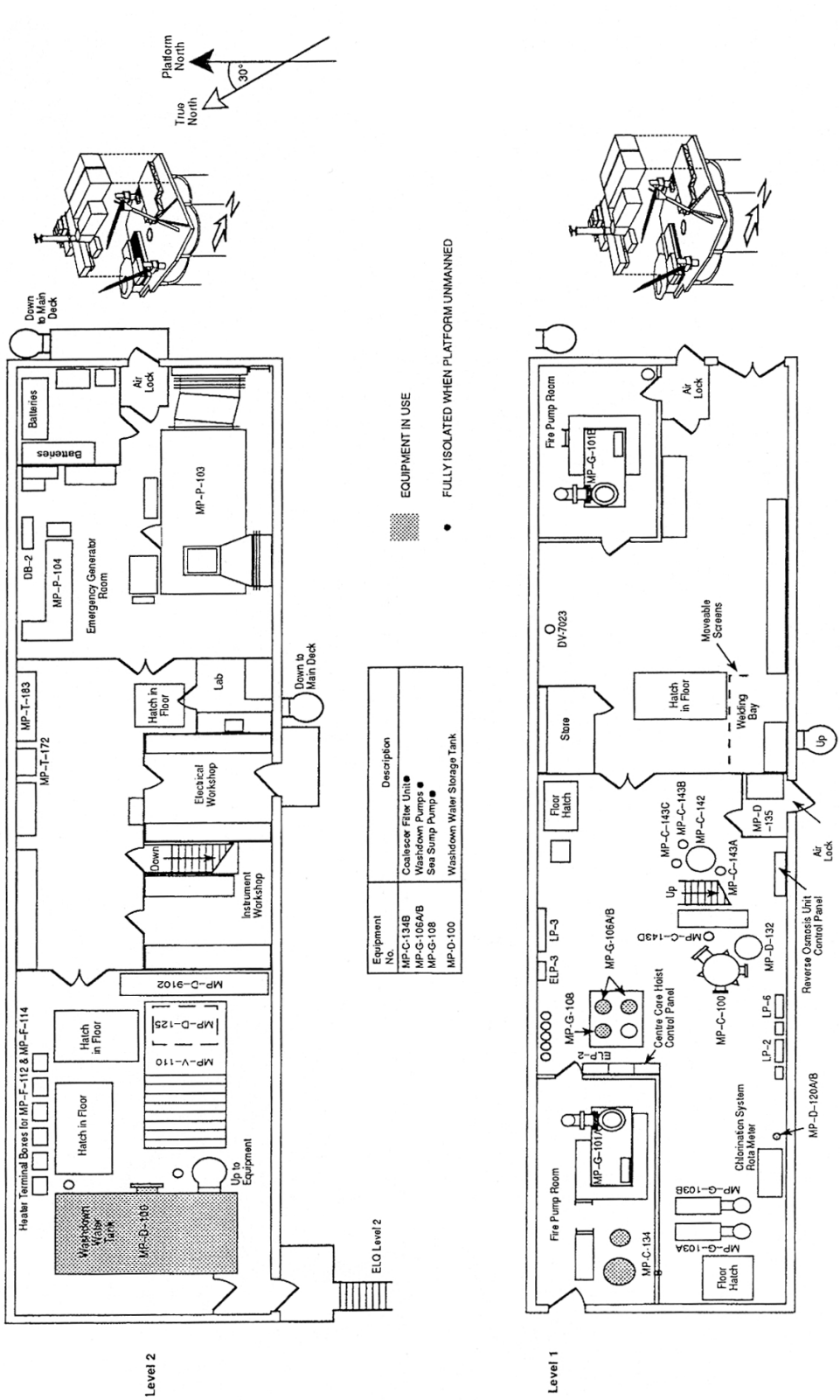

Figure 2.4 Equipment Layout – Utilities Module Level 1/2

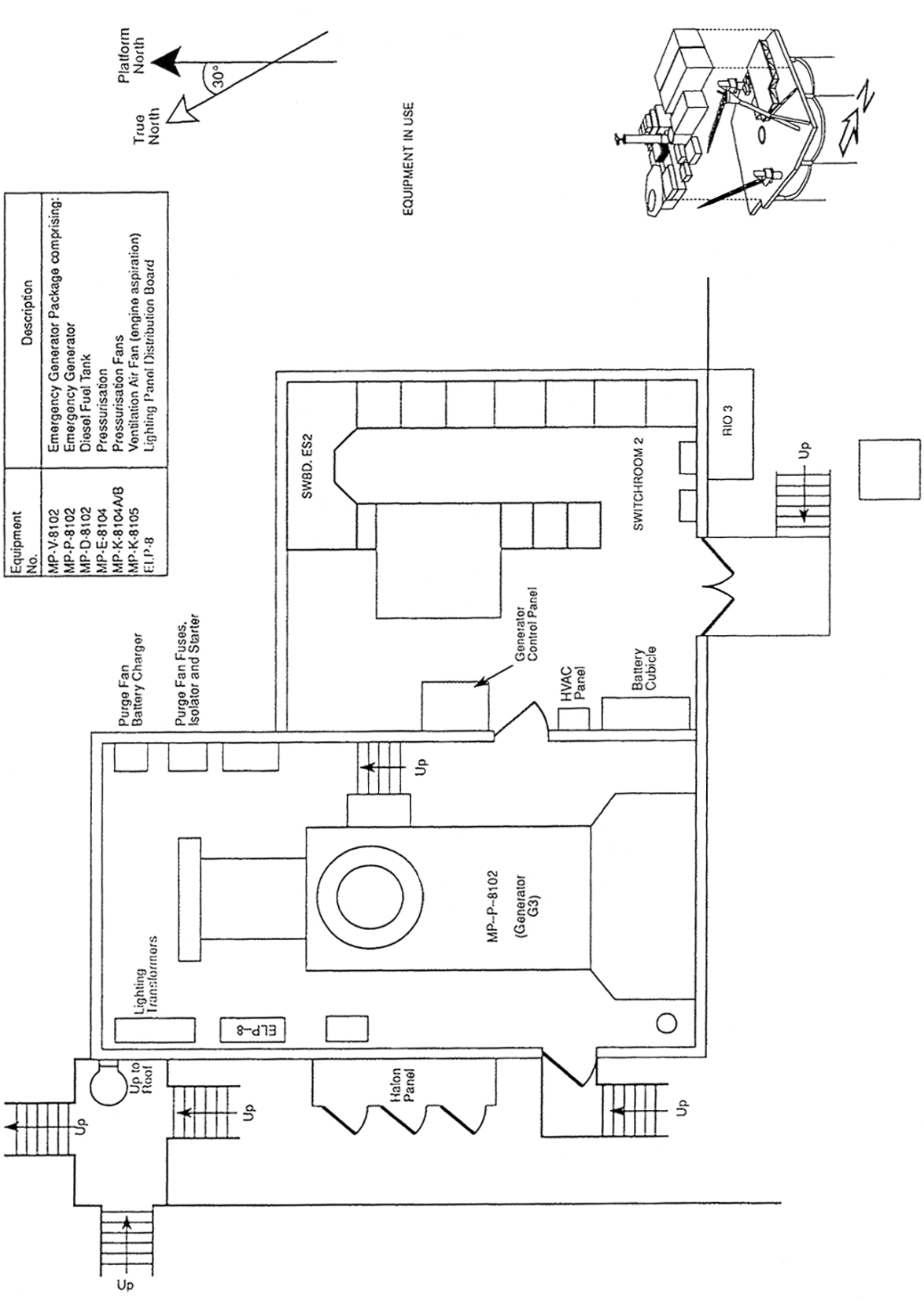

Figure 2.5 Equipment Layout – Emergency Generator Module

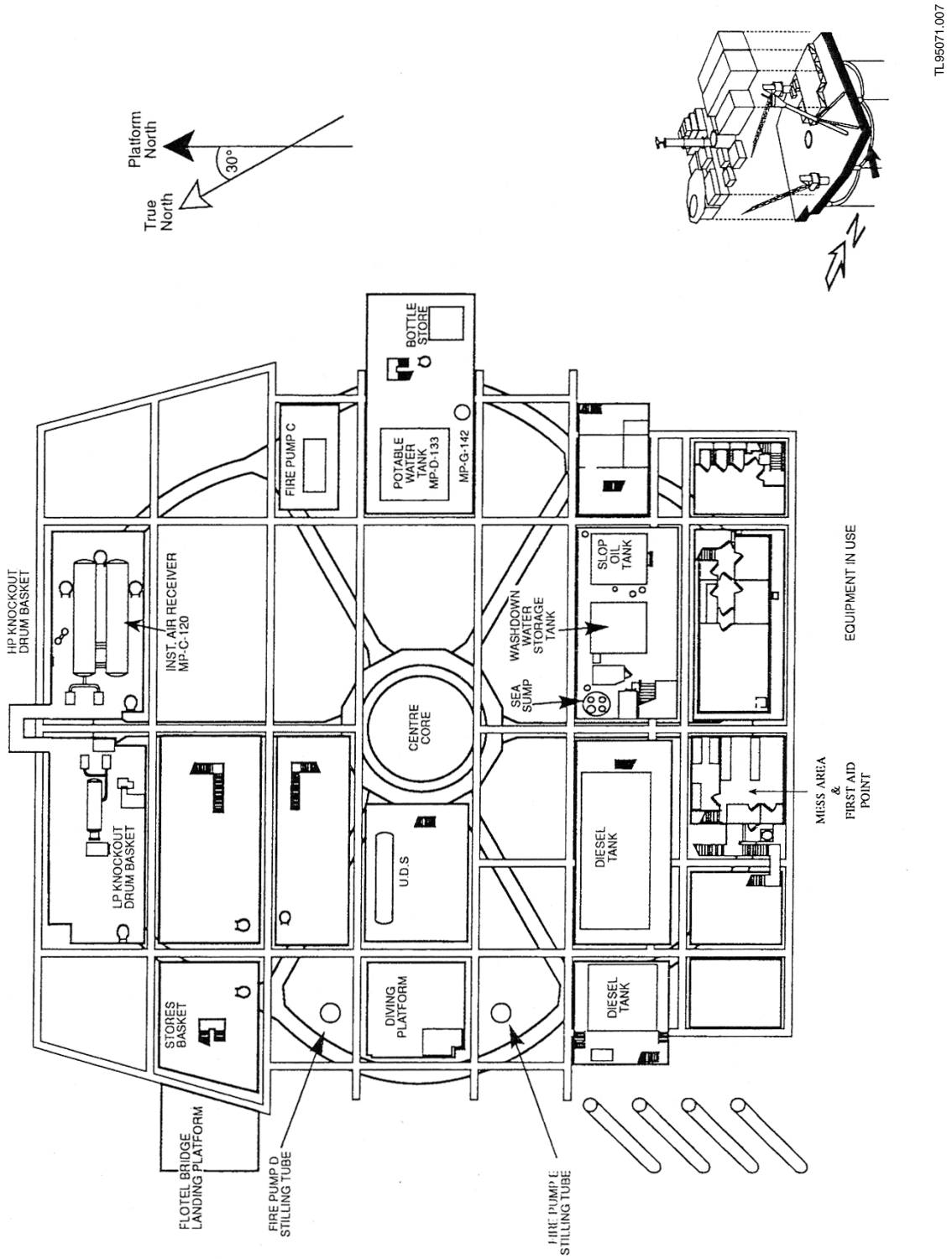

Figure 2.6 Equipment Layout – Underdeck General Arrangement

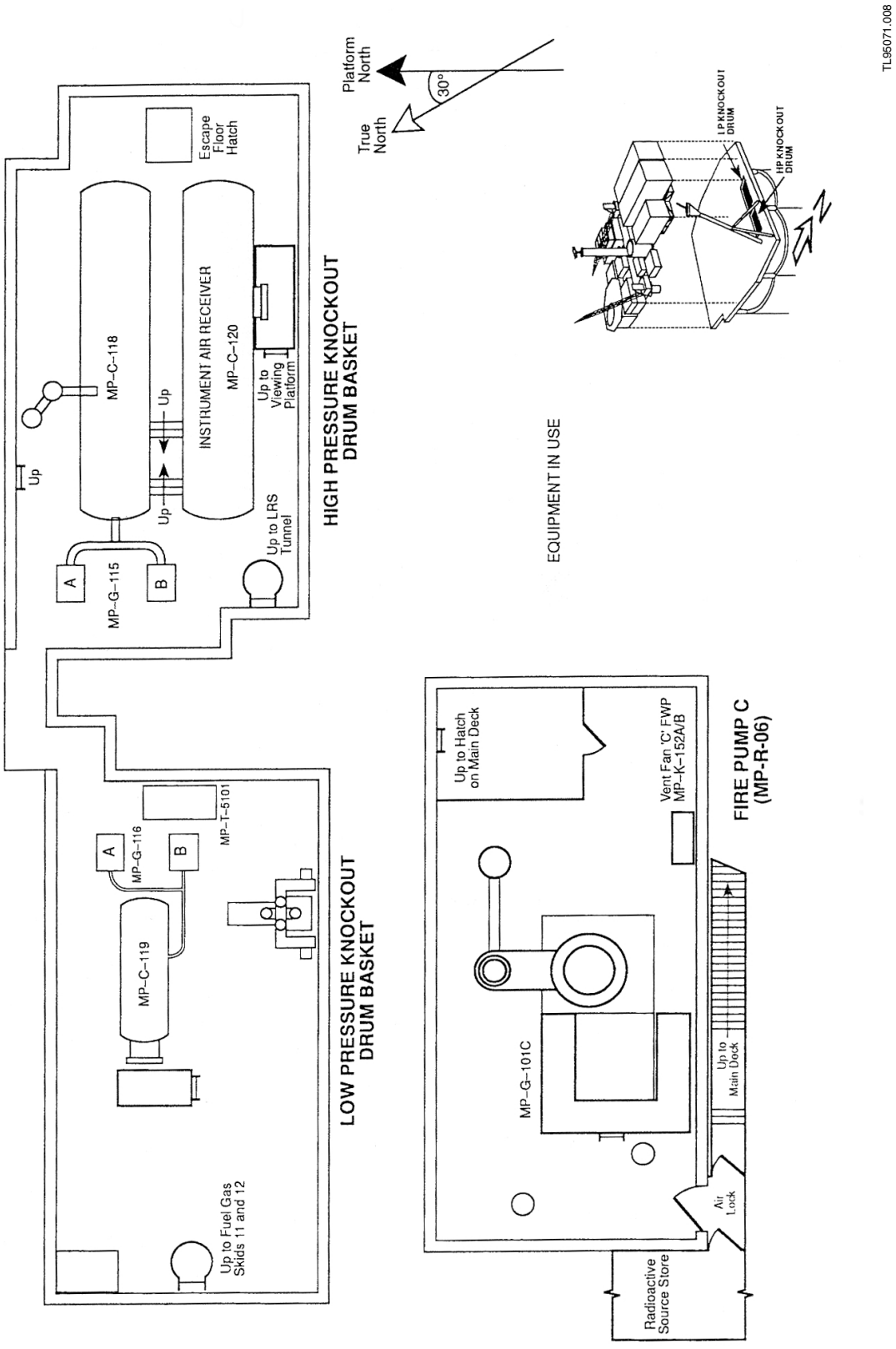

Figure 2.7 Equipment Layout – North East Underdeck

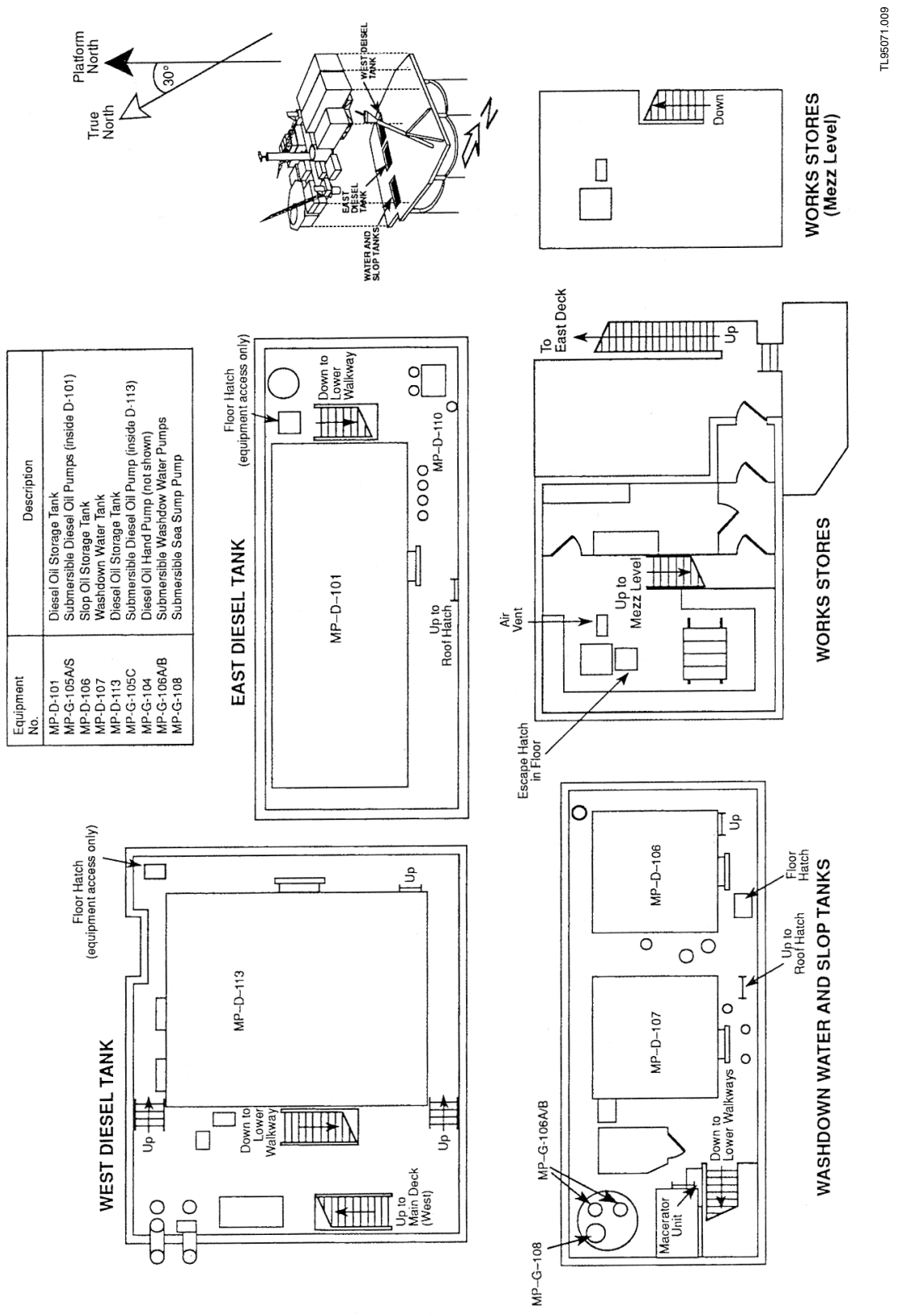

Figure 2.8 Equipment Layout – Underdeck Detail

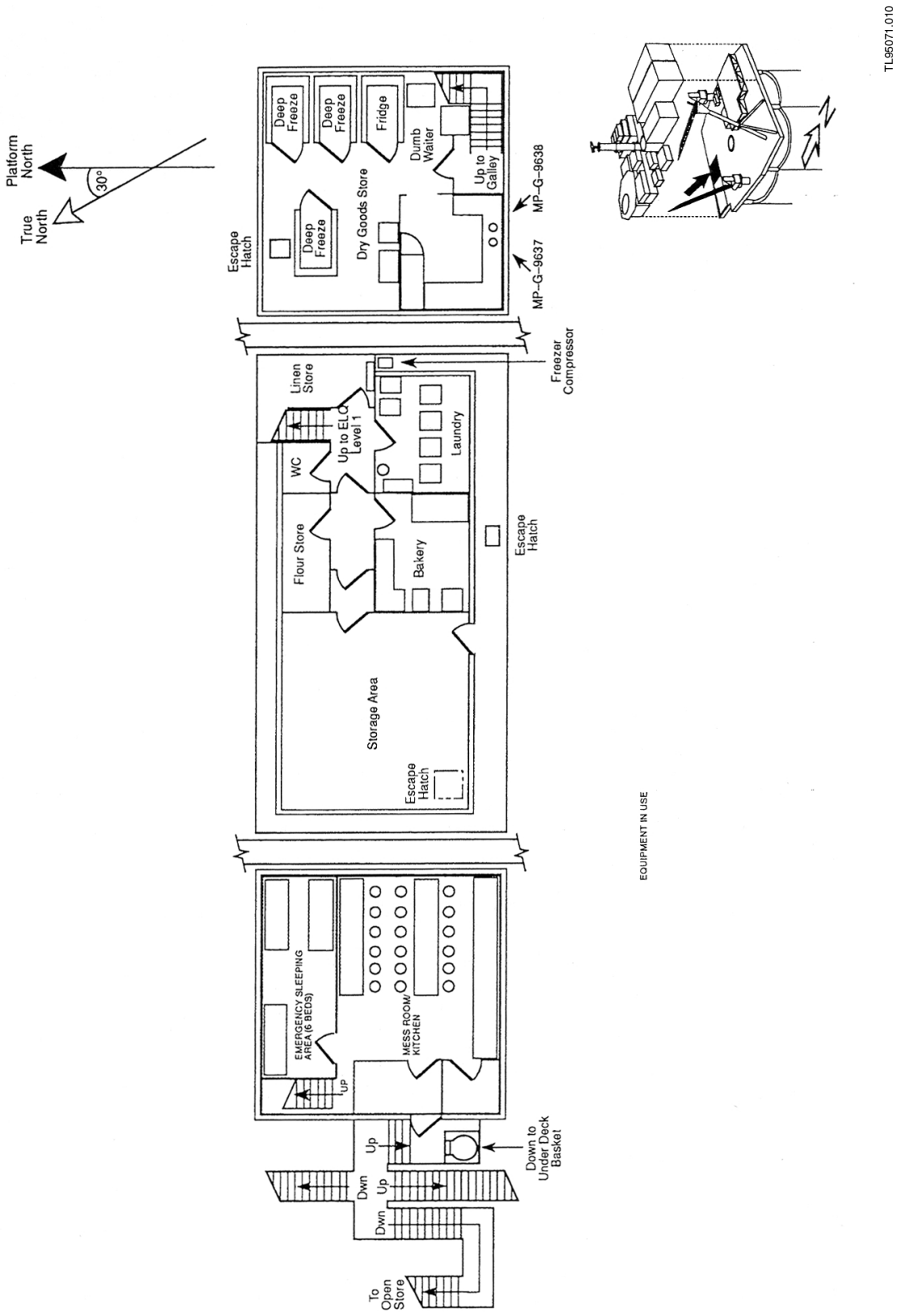

Figure 2.9 Equipment Layout – Accommodation – ELQ – Cellar Deck Level

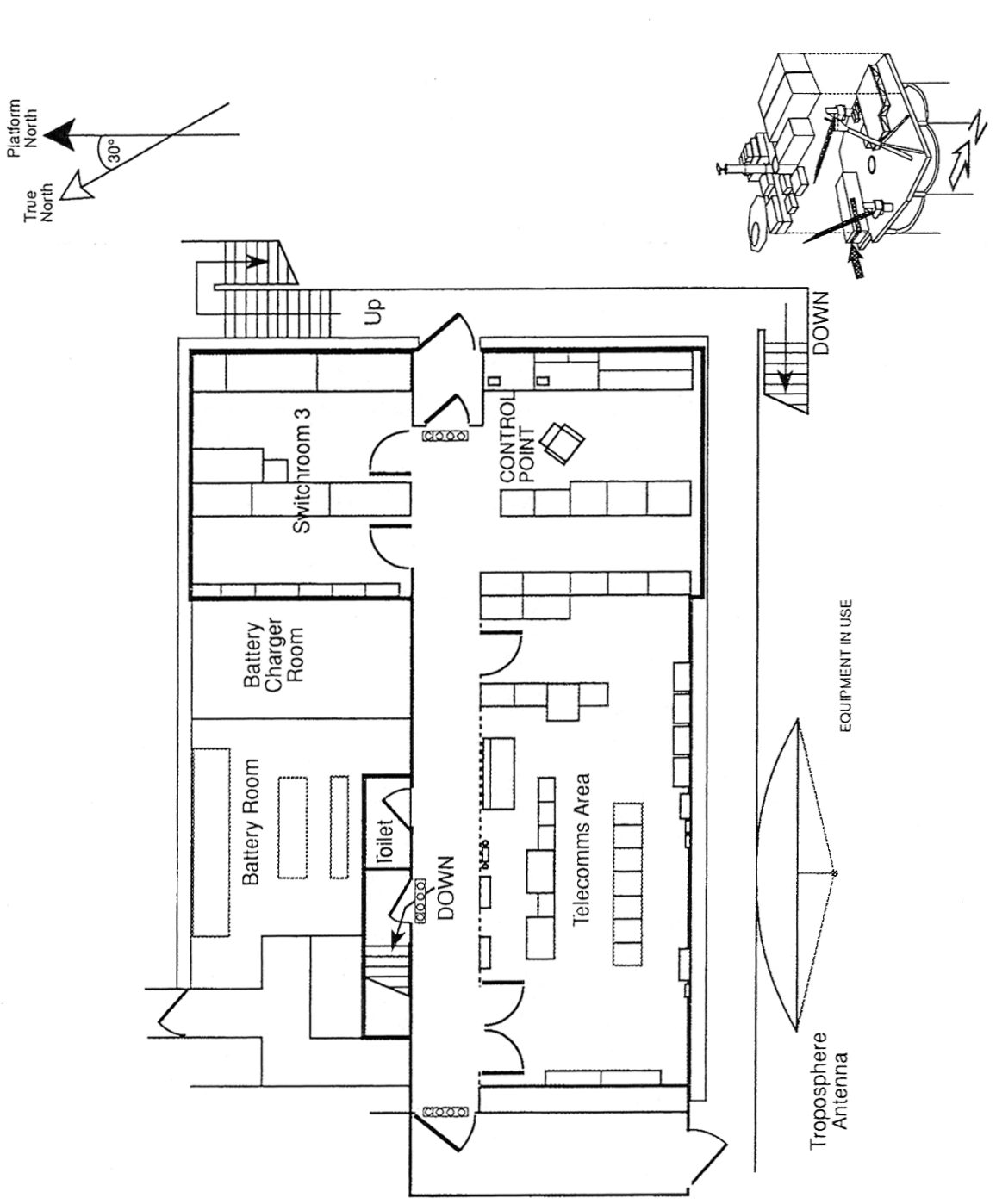

Figure 2.10 Equipment Layout – Control Area ELQ – Level 3

CONTENTS

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1.0 DESCRIPTION OF PLATFORM

1.1 General Description

1.1.1 Historical Development

The official designation of the existing Installation is Frigg field 14/9 MCP-01. The Installation was first placed in May 1976 and was described as a concrete gravity manifold platform.

The Installation was originally designed for operation as a manned intermediate manifold platform for the twin 32in submarine pipelines of the Frigg transportation system.

The Installation was subsequently modified in 1979/80 to accommodate the import/export of third-party gases from the Tartan and Piper 'A' platforms, via an 18in submarine pipeline with manifold connection on the MCP-01 topsides.

The MCP-01 facilities were further expanded in 1983 with the addition of gas compression and separation equipment. Although not originally designed for the purpose of pipeline depressurisation, the platform flare facilities afforded the capability for pipeline depressurisation, in emergency conditions, at rates up to 2.5 x 10^6scm/d.

Due to the progressive decline of gas production from the associated fields, long-term future operational requirements have determined a revised role for the Installation.

To these ends, a phased programme of decommissioning and modification was put in place with the final objectives for late 1992 being:

- A simplified manifold platform for the import, monitoring and export of third-party gases only
- A not normally manned Installation, remotely controlled from the shore terminal at St Fergus

During 1990, the compression/separation facilities were decommissioned and in 1991, the four 32in pipeline risers and the majority of topsides gas handling equipment were decommissioned. This was achieved by the installation of 32in bypass spools, between the north and south legs of the Frigg pipelines, inside and at the base of the concrete centre core. Two new 12in export risers were also installed within the core and connected to the bypass spools to maintain the third-party gas exporting capacity.

During 1992, the existing accommodation, power generation and utility systems were either decommissioned, modified or replaced with facilities more appropriate to the future operating scenarios.

1.1.2 Modified Facilities

The MCP-01 processing facilities are designed primarily to enable import, monitoring and export of partially conditioned third-party gases, for onward transportation in the Frigg transportation system to the shore terminal at St Fergus.

The capability exists for export into either of the two 32in pipelines or for simultaneous export to both.

No facilities are provided, or are required, for gas separation/compression or for hydrocarbon condensate handling, as final treatment to sales gas quality is carried out onshore at St Fergus.

Fiscal metering and gas quality monitoring is performed at each of the producer platforms into the 18in pipeline and therefore only gas flow, pressure and temperature monitoring facilities are provided on MCP-01.

Under abnormal operating conditions, reverse flow operations can be accommodated.

Pig reception facilities for the 18in pipeline are retained on the MCP-01 topsides for pipeline pigging.

The much-reduced topsides facilities are designed for gas import flowrates up to 9 x 10^6scm/d (maximum), while each of the two export risers are designed for 4.5 x 10^6scm/d (subject to gas composition and pipeline operating differential pressures).

Maximum and minimum allowable pipeline operating pressures for the 18in pipeline are imposed by the design at 149/110bar(a), respectively. These will ensure:

- A limitation on maximum pipeline operating differential pressures and therefore minimum temperatures
- An operating pressure above the import gas cricondenbar and therefore no gas condensate formation

A range of conventional utility systems are provided and are consistent with the requirements for low maintenance, high reliability/availability and autonomy of operations for the not normally manned mode.

On the basis of the reduced topsides gas inventory, the original flare stack has been converted for use as a cold vent, and the vent collection system simplified. Due to the potential hazards associated with the formation, accumulation and disposal of natural gas liquids from pipeline depressurisation, the facilities are designed only for handling topsides depressurisation operations.

Alternative provisions for pipeline depressurisation during Emergency Pipeline Operating Scenarios have been made at the producer platforms in the pipeline network.

Accommodation (temporary emergency only), control and communications centres and the Temporary Refuge (TR) are all located within the essentially redundant Existing Living Quarters (ELQ).

Note: All fully redundant areas of the ELQ are decommissioned and sealed.

Access to the Installation during routine or unscheduled visits in the not normally manned mode of operation will be by helicopter. The existing 'D' size classification helideck is retained but no helicopter refuelling facilities are provided.

During any planned major maintenance/inspection activities, a bridge-linked flotel support facility will be utilised, and the use of the MCP-01 helideck will be limited to emergency situations only.

The modifications to the design of MCP-01 have been based fundamentally on the requirements for the not normally manned operating mode, ie low exposure of personnel to risk situations. To maintain this approach, during periods of attended operation eg routine visits or major maintenance periods, the emphasis is placed on the adoption of organisational and operating procedures which minimise exposure of personnel. Procedural constraints and selectable design response actions (automatically adopted when attended or manned) are intended to ensure personnel protection and facilitate safe personnel escape, evacuation and rescue.

2.0 LOCATION

The MCP-01 Installation is located in Block 14/9 of the UK sector of the North Sea in a mean water depth of 94m (and 92m at lowest astronomical tide).

The geographical co-ordinates of the Installation are:

- Latitude 58° 49' 39" north
- Longitude 00° 17' 12" west

The orientation of the Installation (ie platform north) is 30° east of true north.

The Installation is therefore located some 175km approximately north-east of St Fergus (on the Scottish mainland), and 186km approximately south-west of the Frigg field.

The nearest fixed offshore Installations to MCP-01 are:

- The Claymore Platform some 45km to the south
- The Piper Bravo Platform some 53km to the south east

The MCP-01 Installation is located approximately 20km to the north of the nearest designated shipping clearway, ie Pentland Firth/Rogaland (Stavanger).

The Installation is a focal point for the 4 x 32in submarine pipeline legs of the Frigg transportation system and the 18in submarine pipeline from the Tartan, Claymore, Ivanhoe/Rob Roy and Piper fields.

The Frigg pipeline area is a corridor 5km on either side of the pipelines and is identified as a 'controlled zone' (SI 1513/1982). Movement of any vessel within the MCP-01 500m safety zone around the Installation is not permitted without notification to, and permission from, the Offshore Installation Manager (OIM), who will be onshore-based at St Fergus or in attendance at the Installation. (Refer to Figure 3.1.)

During major inspection/maintenance programmes, if a flotel is used, a bridge link will be positioned on the west of the Installation.

Other vessel movements foreseen within the MCP-01 500m zone are supply boat operations, coincident with routine platform attended operations; and the use of ROV, survey and diving support vessels for inspection of external pipelines, risers and structures. Standby vessels will also be on station during flotel-supported operations and during consecutive day visits to the Installation.

3.0 ENVIRONMENTAL CRITERIA

The following data represents the latest information on environmental criteria, and is based mainly on the original design conditions. It is intended during 1992-93 that all environmental data will be updated as part of a reanalysis exercise, and this section will be revised accordingly at that time.

3.1 Seabed Soil Properties

The area of the seabed on which the Installation is located was originally surveyed in detail by fourteen Kullenberg samples, each having a mean penetration of 2m and ten borings from the MV Mariner, some of which achieved a penetration of 30m below the sea floor. A brown medium sand with many shell fragments comprises the top layer to a thickness of 2 to 3m. Underneath, and down to the bottom of the series, are fine grey sands interspersed with thin centimetric levels of more or less clayey silt and levels of organic matter. A few interbedded levels of gravel are also present.

3.2 Sea Current Speeds

The sea current speeds in the immediate area of the manifold compression platform are 0.62m/s at the surface and 0.41m/s at the bottom with variations being approximately linear, not taking into account current field distortion due to the presence of the structure.

3.3 Water Depth

The datum point for water depth calculations (and elevation points on the Installation itself) is taken as the seabed, which is 0m. The minimum sea level (the Lowest Astronomical Tide (LAT)) is 92m and the Mean Sea Level (MSL) is taken as being 94m.

The maximum sea level – the 100-year maximum is calculated as 97.1m, being computed from MSL (94.0) plus maximum high water (spring tides) of 2.1m, plus maximum surge (100-year) of 1m.

Crest elevation for a 100-year maximum wave is 17.1m and the maximum crest elevation (100-year maximum) is 114.2m (maximum sea level of 97.1m plus maximum crest elevation of 17.1m). The air gap, taking into account the now redundant underdeck diving system in storage position, is 2.6m.

3.4 Waves

The manifold compression platform was originally designed and constructed to withstand wave conditions as follows:

- Operating 18m with 12.5-second period
- 100-year maximum 29m with 16-second period

The splash zone, ie the area of the support structure subjected to repeated wetting and drying cycles by wave and tidal action, is considered to be the area between 93m and 114.7m above the datum point.

3.5 Temperature and Humidity

Air temperatures likely to be experienced will range between a maximum of +22°C and a minimum of -9°C, whilst sea temperatures will range between +17°C and -2°C. Relative humidity in the area around the manifold compression platform can vary between 40% and 100%.

3.6 Wind

The prevailing direction of the wind is southerly although, for design purposes, the wind speeds are considered as coming from any direction. The annual wind distribution is shown in Figure 3.2. The operating wind speed (one month recurrence) is taken as 36m/s while the 100-year maximum (3-second gust) is taken as 53m/s.

3.7 Ice Formation

Sea-spray ice forms into a band of 15m to 60m Above Sea Level (ASL). The design of the Installation has taken into account ice formations as follows:

- 15m ASL 100mm of ice of specific gravity 0.9
- 60m ASL 50mm of ice of specific gravity 0.5

3.8 Marine Growth

Three types of marine growth are experienced on the Installation. The effect of marine fouling, particularly in the Jarlan holes located in the splash zone, is to increase wave-load forces on the structure. No allowance for this increase in loading was included in the original design. As a result, marine growth thicknesses are monitored annually and design checks are performed accordingly. Cleaning of the Jarlan holes has been undertaken to keep the wave-load forces within acceptable limits. The three types of marine growth are essentially microscopic, consisting of bacterial and diatomic slime films to a typical thickness of 3mm in winter and 10mm in summer; soft fouling, consisting of seaweed, soft corals, sponges, sea squirts and anemones to typical thicknesses, depending on type, of 50mm to 100mm; and hard fouling, consisting of barnacles, mussels, tube worms and other shelled organisms to a typical thickness of 110mm.

3.9 Seismic Activity

Design for seismic activity was not considered applicable to the original or present design, as the seismicity of the North Sea region is small in worldwide terms. Traditionally, offshore oil and gas Installations in the UK sector of the North Sea have not been specifically designed for earthquake loads. This practice has been widely accepted and justified on the basis that structures correctly designed and detailed for other environmental loads should have sufficient strength and ductility to withstand the relatively low magnitude earthquake occurrences likely in this region.

From a study of North Sea seismicity, peak ground acceleration contour maps (corresponding to an annual probability of exceedance of 10^{-4}, 10^{-2} and 2×10^{-2}) have been developed to demonstrate the regional variability of seismic hazard.

Based on these general representations of seismic hazard, the MC-P01 Installation is located within a large central area of the region predicted to have the lowest seismic hazard potential (eg less than 0.03g ground acceleration value with a probability of exceedance of 0.02). At these levels, it is also considered unwarranted to investigate the implications of local active faulting or development of site-specific seismic response spectra.

From a more recent seismic monitoring study of the North Sea, forecasts for largest magnitude earthquake occurrences and average return periods for the whole of the North Sea region have been made. These suggest that the seismic hazard during the relatively short lifetime of some ‘high consequence’ Installations such as oil and gas platforms will be dominated by the low annual probability of peak accelerations due to large earthquakes.

3.10 Scour and Scour Protection

The Installation maintains its position on the seabed by virtue of its weight, which must be evenly distributed over the base area. The action of seabed currents can lift and remove seabed materials. Where these currents are obstructed in their natural path, the velocity will increase thereby increasing the likelihood of material being scoured out around the obstruction.

To minimise the possibility of scour:

- The walls of the structure adjacent to the seabed are perforated to minimise the local increase in seabed current
- Scour mats were initially placed around the circumference of the base and overlay the soil adjacent to the base. These have now been replaced by a band of rock dumping around the entire circumference, prior to rock dumping, and localised areas of erosion under the base were grouted

The base of the structure is inspected, as part of the statutory 10-year recertification, to ensure that no significant scour has taken place. The inspection frequency may be increased depending on the occurrence of heavy storms and/or any significant scouring. Readings of relative tilt are taken periodically.

Foundation conditions are monitored by visual survey and instrumentation, and any deterioration is checked by calculation and/or further inspection.

3.11 Lightning Protection

Although the incidence of lightning storms in the area is low, the Installation is fully protected against a lightning strike. The highest structures on the Installation are the cold vent stack and radio tower and, with the jib in the fully derricked-back position, the east crane jib.

Due to its almost central position on the Installation, the radio tower carries the lightning preventer head.

In addition to the specific lightning protection system, all equipment on the Installation is adequately bonded to achieve good earthing connections.

4.0 STRUCTURE AND LAYOUT

4.1 Main Structure

The main structure is a reinforced and post-tensioned concrete structure with a Jarlan perforated breakwater. The Installation was designed by the CG Doris-Howard partnership and constructed at Stronstadt, Sweden by Skanska Doris in 1975/6.

The concrete structure comprises three main components, namely:

- Foundation raft
- Lobate vessel (breakwater)
- Decks

An outline schematic giving elevation and datum points is shown in Figure 3.3.

The foundation raft, which transmits the Installation weight and environmental forces to the seabed, is some 101m in diameter. Six radial tunnels, integral with the foundation raft, connect to a hollow centre core (9m ID), which rises to an elevation of 139m. An anti-scour perforated wall is provided around the base of the raft structure.

The lobate vessel is 62m in diameter, rising to an elevation of 105m. The vessel, which absorbs wave forces (and was also used as the buoyant unit during construction and towing), is sand ballasted to ensure that the Installation will withstand the environmental loads. The upper section of the vessel is also perforated to reduce wave effects on the Installation.

Steel columns (concrete filled) erected on the lobate wall are used to support the main beams of the concrete deck structure at elevation 123.80m.

4.2 Steelwork

Steelwork used on the original structure is to BS 4360 (1972) standard and/or the equivalent Swedish or American standards. For structural steel used during the compression project, BS 4360 (1979) is applicable.

4.3 Risers

Three gas import/export risers are provided for the Installation, ie the 18in Texaco gas import riser and two 12in gas export risers (refer Figure 3.4).

The 18in gas import riser is routed external to the concrete structure to access the platform topsides at main deck level. The riser is routed over the anti-scour wall and horizontally to the breakwater wall. The riser is then run vertically to an elevation of 72.2m where it is then routed horizontally, through the perforated wall, to the centre core. Outside the breakwater, the riser is supported by vertical and horizontal trussed beam structures. Within the breakwater, a similar horizontal trussed beam structure, spider wall and strut beam from the centre core shaft, support the riser.

The two 12in gas export risers are located within the centre core, each riser being connected to only one of the two 32in gas pipelines within, and at the base of the centre core. The 32in pipelines access and exit the centre core via the radial tunnels, each of which is provided with a caisson seal system to maintain the dry environment within the core.

The 12in risers are provided with guides/supports at each of the eleven intermediate access platform structures within the core, and are anchored at Level 6 (elevation 98m).

4.4 Caissons

A 2.13m (OD) deep well casing is installed within the breakwater wall extending from the utilities module, located on the main deck, down to an elevation of 63.450m. This casing houses two seawater lift (washdown) pumps and the sea sump/sea sump pump.

The sea sump is a 0.63m (OD) stilling tube used for the collection and separation of oily water/effluent from the platform effluent drains system.

A 0.2m (OD) J-tube, for the protection and routing of the hydraulic umbilicals to the 18in subsea isolation valve (SSIV-4300) is located below main deck level on the north-east corner of the Installation. The J-tube is run external to, and supported from, the breakwater wall.

4.5 Platform Topsides Configuration

The main concrete deck structure is used to directly support a number of retained, either 'live' or redundant modules.

Similarly, a number of underdeck baskets are supported from the structure, again only some of which are retained in use following the platform conversion.

The retention in situ of many of the redundant modules and equipment skids is based on the positive contribution which they can make, in hazardous situations, towards the fire and explosion protection of live areas, and the thermal shielding afforded to escape routes and safety systems.

A continued commitment to their retention, or their future removal, will, however, be based on the medium or long term maintenance required to ensure their integrity or continued effectiveness.

The main modules, their description and status (ie whether live or partly/fully redundant) are listed in Table 1.

The redundant compression/separation modules (MP-R-11/12/13), located in the north-west quadrant of the platform topsides, are supported from a dedicated Load Repartition Structure (LRS).

The emergency generator (MP-P-8102) and redundant permanent living quarters (MP-R-10) are both skid mounted and located on top of the utilities module, while the helideck (MP-M-01) is supported by structural steelwork from the roof of the Existing Living Quarters (ELQ) module.

Two cranes, east and west (the latter now being redundant), are supported from the main deck and positioned for load bearing directly over the main deck structure support columns. The inclined cold vent stack, on the north-east corner of the main deck is supported by tubular steel bracing tied to the main deck.

The other main modules are all directly supported by the main deck structure.

EQUIPMENT/ MODULE NO	DESCRIPTION	STATUS/COMMENTS
MP-R-01	Existing Living Quarters (ELQ)	Four levels above deck and cellar deck level. Only part Level 3 (new control area), part Level 1 (new TSR/emergency command centre/ emergency accommodation) and part cellar deck (mess area/emergency accommodation) and internal interconnecting staircases retained in service.
MP-R-02	Utilities Module (include redundant FWP 'A/B')	Two level module essentially redundant. Intermittent access required to Level 1, for manual operation of sea sump/washdown pumps and service of diesel filters (MP-C-134B), and to Level 2, for inspection of water storage tank (MP-D-100).
MP-R-03	Turbo Generator Module (renamed Generator Area)	Two level module – Level 1, switchgear and air compressor packages – Level 2, reconfigured to house new diesel generators, separate switchroom and diesel day tanks/filters. Part of redundant Level 1 will be used for mechanical store.
MP-R-04	Manifold/centre stairs	Open three level structure for redundant 32" manifold facilities. All equipment redundant, structure retained for access/escape routes.
MP-R-05	Not used	
MP-R-06	Fire Pump 'C' Module	A60 module underdeck east side redundant (firepump removed).
MP-R-07	Texaco Gas Skid	Includes 18" pipeline pigging facilities and import/export gas monitoring.
MP-R-08	SW corner offices	Skid mounted on top of MP-R-03 redundant.
MP-R-09	Not used	
MP-R-10	PLQ	Permanent Living Quarters skid mounted A60 rated module located on top of MP-R-02 – redundant.
MP-R-11/12	Compression modules	Four level modules. Totally isolated and decommissioned. Supported by LRS and now redundant.
MP-R-13	Separation module	Four level module. Totally isolated and decommissioned. Supported by LRS and now redundant.
MP-M-01	Helideck	Jet fuel storage/dispensing systems and auto firewater/foam systems decommissioned. Use restricted to routine/emergency visits.
MP-R-8102	Emergency Generator Module	Skid mounted A60 module located on roof of utilities module. Separate generator and switchgear rooms.
MP-V-7110 and MP-V-7120	Firepump 'D' module Firepump 'E' module	Skid mounted A60 modules located on platform main deck west side – both redundant.
MP-D-101 and MP-D-113	Diesel Fuel Storage	West side diesel fuel storage tanks located in underdeck (cellar deck) below MP-R-03. Maximum storage capacity restricted to 110 cu. m (total).
MP-D-106	Slop Oil Storage	East side storage tank located underdeck (cellar deck) below MP-R-02. For recovered slops/oily water from sea sump prior to shipping to shore by totetank.
MP-D-107	Washdown/Firewater storage (ex-sump tank)	East side storage tank located underdeck (cellar deck) below MP-R-02. For onboard storage of washdown/fire hose water.
MP-D-120	Instrument air buffer vessel (previously HP condensate receiver)	Located in underdeck basket at north-east corner of platform.

Table 3.1 Module/Equipment Status

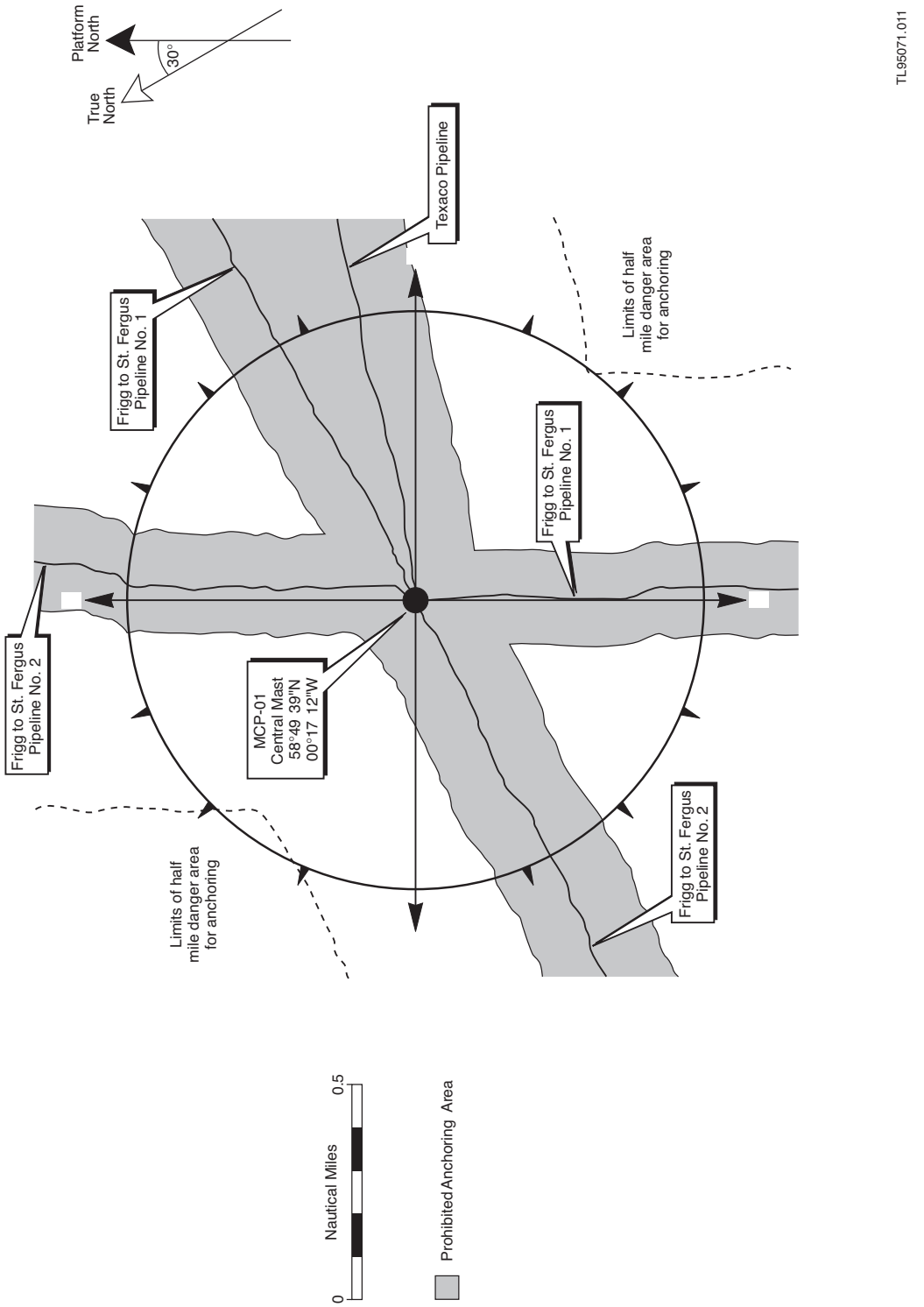


Figure 3.1 Vessel Anchoring

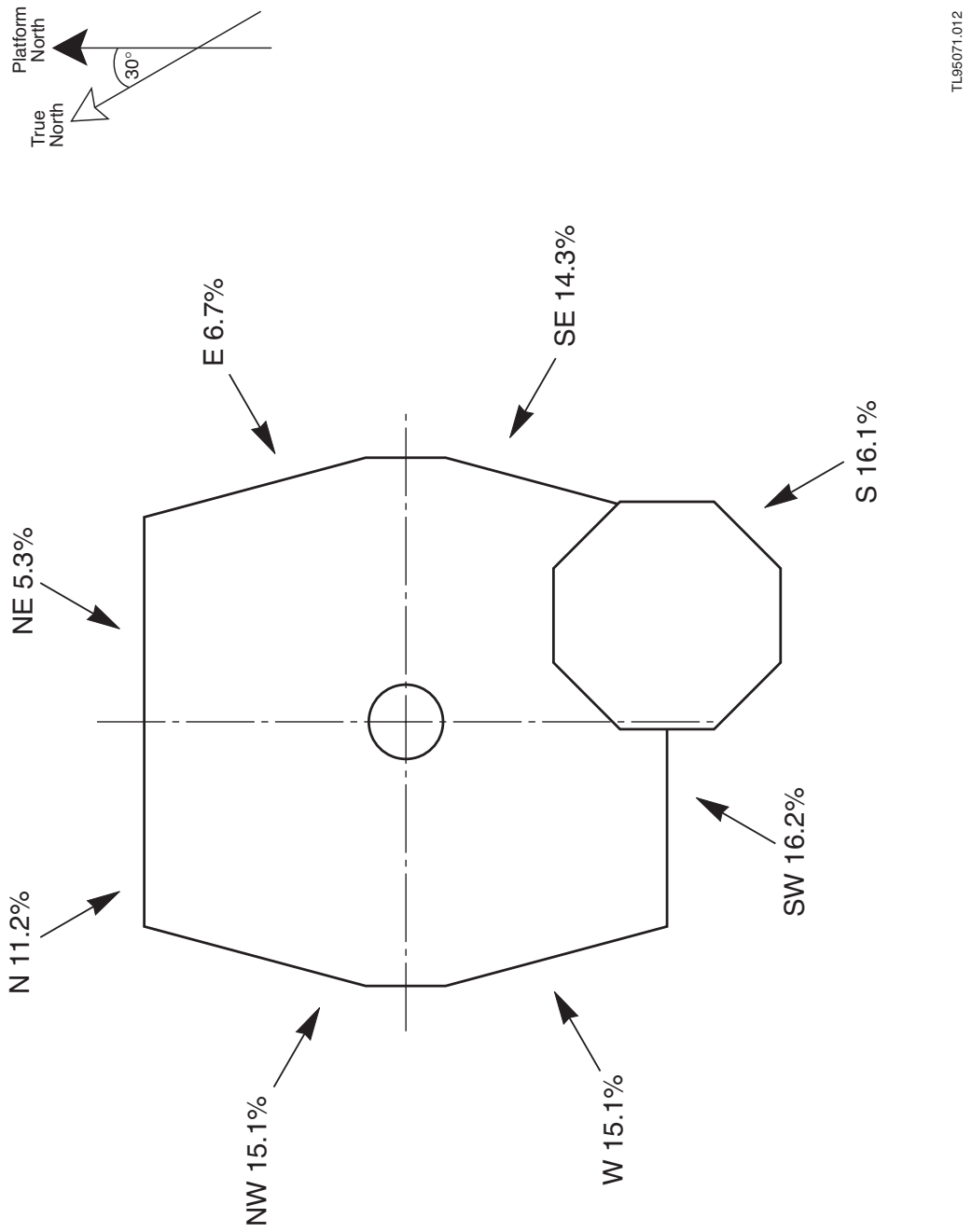


Figure 3.2 Annual Wind Distribution

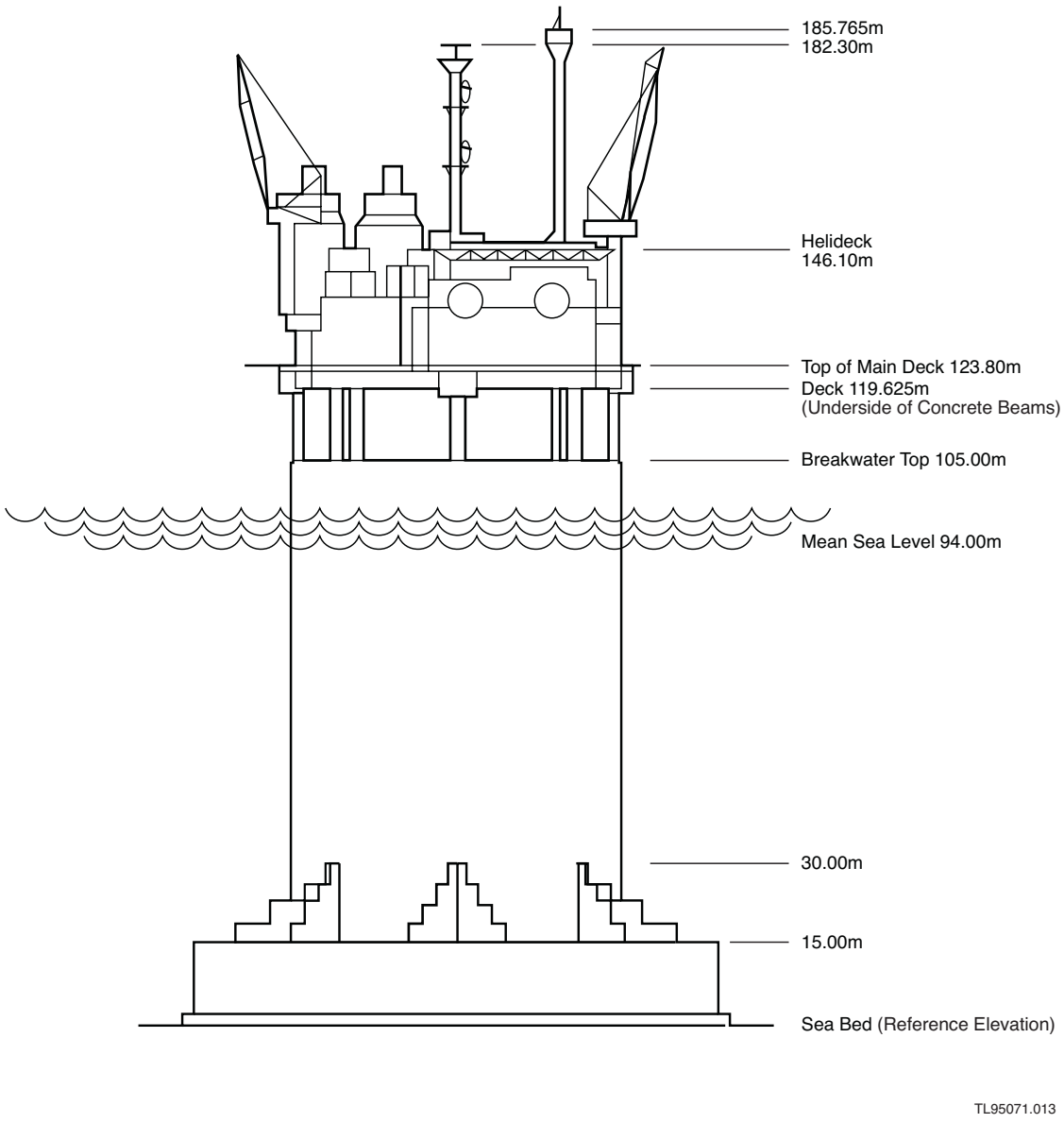


Figure 3.3 Elevation and Datum Points

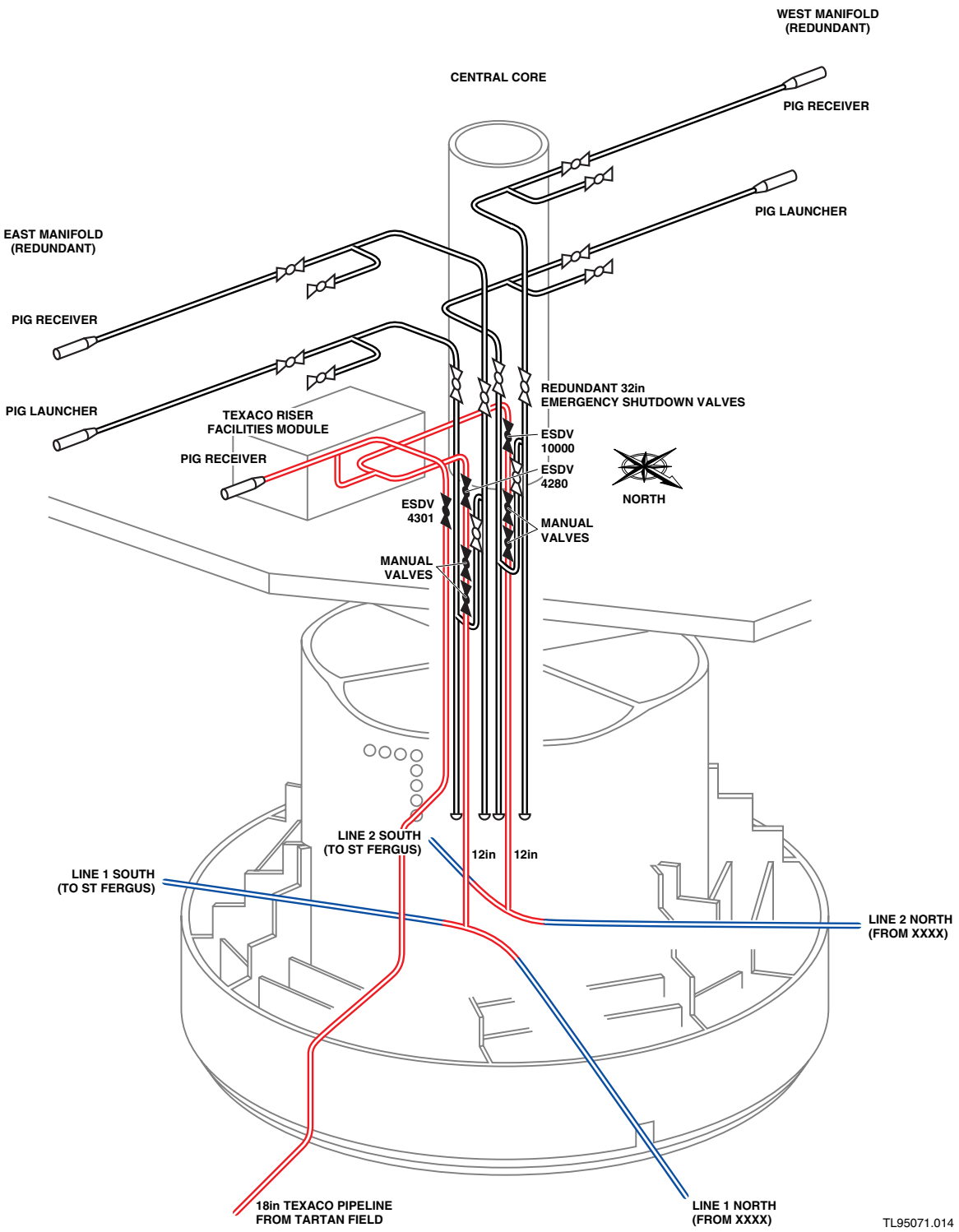


Figure 3.4 Gas Risers and Pipelines

BS CP3	Chapter V, Part 2 - Wind Loads
BS 4	Structural steel sections
BS 12	Portland cement
BS 302	Specification for wire ropes for cranes
BS 336	Specifications for fire hose couplings and ancillary equipment
BS 381C	Colours for specific purposes
BS 462 Part 2	Bulldog grips
BS 464	Thimbles for wire ropes
BS 476	Fire tests on building materials
BS 499	Welding, brazing and thermal cutting
BS 590	Mild steel chain
BS 639	Covered electrodes for the manual metal arc welding of carbon and carbon-manganese steels
BS 709	Methods of testing fusion welded joints and weld metal in steel
BS 729	Hot dip galvanising
BS 853	Calorifiers for hot water supply
BS 889	Specification for flameproof electric light fittings
BS 970	Wrought steel specifications
BS 1139	Metal scaffolding
BS 1259	Intrinsically safe electrical apparatus
BS 1290	Wire rope slings and sling legs
BS 1500	Part 1 Class III - pressure vessel code (helifuel tanks)
BS 1501	Steels for fired and unfired pressure vessels
BS 1515	Fusion welded pressure vessels
BS 1710	Paint colours
BS 1881	Concrete testing
BS 2482	Timber scaffolding boards
BS 2569	Sprayed metal coatings
BS 2573	Specifications for permissible stresses in cranes and design rules
BS 2869	Class A2 (diesel engines for fire pump service)
BS 2853	The design and testing of steel overhead runway beams
BS 2902	Higher tensile steel chain slings
BS 2903	Specification for high-tensile hooks
BS 3032	Higher-tensile shackles
BS 3113	Alloy steel chain
BS 3243	Hand-operated chain pulley blocks
BS 3367	Fire brigade and industrial ropes and rescue lines
BS 3458	Alloy steel chain slings
BS 3551	Alloy steel shackles
BS 3617	Pre-stressing cable specification
BS 3701	Winches
BS 3895	Guide to the design, testing and use of packaging for sale and transport of radioactive materials
BS 4165	Electrodes, wires and fluxes for the submerged arc welding of carbon steel and medium tensile steel
BS 4232	Blast cleaning of steelwork
BS 4360	Steel specification
BS 4800	Paint colours
BS 4848	Hot rolled structural steel sections
BS 4891	A guide to Quality Assurance
BS 4898	Chain lever hoists
BS 5135	Metal arc welding of C and C-Mn steels
BS 5252	Paint colours
BS 5306	Fire extinguishing installations and equipment
BS 5345	Electrical apparatus in potentially explosive atmospheres
BS 5422	Thermal insulating materials
BS 5493	Protection of iron and steel structures from corrosion
BS 5500	Specification for unfired fusion welded pressure vessels
BS 5744	Code of Practice for the use of cranes
BS 5896	High tensile steel wire and strand for pre-testing of concrete
BS 5973	Access and working scaffolding and special scaffold structures in steel
BS 6020	Instruments for detection of combustible gases
BS 6166	Recommendations for ratings of lifting equipment for general purposes
BS 6235	Code of Practice for fixed offshore structures

Figure 3.5 Relevant British Standards

CONTENTS

1.0 GENERAL

Although the Installation will primarily function as a 'not normally manned' and remotely operated facility, the overall safety philosophy is dictated by the need to ensure the safety and welfare of personnel when attending the Installation.

In this context, however, a balance between the provision of specific key safety features and the application of strict organisational and operational procedures has been adopted. As an existing Installation with many already inherent safety features, the general safety philosophy has been to engineer modifications, where necessary, to reduce the risk of occurrence and consequences of hazardous events, while enhancing or replacing the specific personnel safety features in line with the reduced exposure of personnel to the consequences of any credible events.

The following paragraphs serve to identify these inherent and/or new safety systems which, taken as a whole, are aimed at providing a comprehensive regime of both 'active' and 'passive' protection measures for control and mitigation of the identified credible events.

The basis of this regime has been to achieve the following fundamental objectives:

- Separation and segregation of all areas handling hazardous hydrocarbon materials from non-hazardous areas, by firewalls
- Ensure the integrity of separation and segregation features against the worst credible explosion events that can occur
- Control, and/or mitigation of the consequences, of escalating credible fire events by both active and passive protection measures, as appropriate
- Provide high reliability/availability systems for the detection of hazardous conditions
- Provide a fully integrated, fail-safe emergency shutdown, isolation and depressurisation system to minimise the occurrence and the potential for escalation of hazardous events
- Locate non-process related equipment and facilities, as far as physically possible, from classified hazardous areas and, where enclosed or not naturally well ventilated, use forced ventilation to prevent the ingress of gas and/or smoke
- Provide a 'safe' refuge or refuges with an integrity and endurance (as a minimum) appropriate to the conditions prevailing during the worst identified credible event
- Provide secure routes for normal access requirements and for emergency escape and evacuation of personnel, from all areas, during the occurrence of credible hazardous events
- Provide survival craft, liferafts, personnel escape facilities throughout the Installation to ensure their availability to meet the demands, as a minimum, from the **maximum** full complement of personnel when onboard

As indicated previously, and due to variable occupancy criteria, procedural measures will be enforced to complement the safety features. These measures are primarily intended to restrict personnel exposure to hazardous situations during periods of platform attendance. In general, the following constraints and guidance will apply:

- Following the occurrence of any hazardous event, with the **potential** for significant escalation, the primary objective during any period of platform attendance shall be the mustering, escape and evacuation of personnel
- Restricted access will apply to many areas of the Installation and necessary access will be controlled by the Permit to Work procedures
- The location, and extent of work to be performed, will determine the requirement for full process topsides isolation and/or depressurisation
- No overside works will be allowed without the support of a fully certified standby vessel on location
- During major crane lifting operations or where the potential for significant hydrocarbon releases may occur due to dropped objects, normal personnel deployment will be restricted
- During periods of flotel-supported operations, the flotel and its bridge link will be the primary safe refuge and escape route, respectively. When bridge disconnection is foreseeable or during any general alarm condition, work onboard the Installation shall cease and immediate mustering and evacuation of non-essential personnel to the flotel will be carried out

2.0 SEPARATION AND SEGREGATION

Due to the decommissioning and rationalisation of the topsides equipment containing hazardous process hydrocarbons, the hazardous areas of the platform have been considerably reduced and restricted. (Refer to Figures 4.16 to 4.23.)

Hazardous area classification has been carried out in accordance with the Area Classification Code for Petroleum Installations (Part 15 of IP Code for Safe Practises in the Petroleum Industry – 1990).

The hazardous areas have thus been restricted to:

- Export risers/pipelines within the physical confines of the concrete centre core structure
- Import riser external to the centre core and below east main deck level
- Texaco skid area at main deck level
- The cold vent stack and collection header

All these areas are therefore essentially in the open, ‘adequately’ ventilated areas of the north-east quadrant of the Installation, and are all well located with respect to the prevailing wind direction for dispersion of gas releases.

In the context of the primary objectives described previously, it has been the deliberate policy therefore to reuse or relocate other equipment and control areas as far to the south and south-west sections of the Installation as possible.

By the adoption of this approach and by maintaining and reusing the east-west firewall and redundant utilities and PLQ/ELQ accommodation modules (all A-60 fire rated), an effective general separation and segregation of the hazardous areas is achieved.

In addition, localised separation features, existing, new, and inherent to the original design, are made use of in enhancing the overall segregation of the hazardous areas and to provide protection of critical safety features, ie:

- Location of the export risers and their ESD valves within the concrete centre core at the optimum elevation, affords protection from external fire and explosions. Equally, confinement by the core structure restricts the escalation potential and consequences of events occurring internally. These are further limited by local passive fire protection measures to both risers and valves

- The existing import riser and its ESD valve are located on the outside of the centre core and within the breakwater wall. Inherent protection is therefore afforded against ship collision and dropped objects by their location. Separation and protection from the consequences of topsides fires and explosions are provided by the main deck concrete beam structure and deck plating. In addition, local passive fire protection of the riser, riser ESD valve and access basket are provided to minimise escalation of localised events

- The section of the 18in riser below sea level and outside the breakwater wall, although susceptible to impact/dropped object damage, is essentially protected by the trussed beam structure. The 'vulnerable' section is also at least 16m below LAT and therefore only susceptible to impact damage from deep draft vessels

- Retention of the A-60 rated firewall to the east and north of the Texaco skid, in conjunction with both the centre core structure to the west and the main east/west firewall to the south, provides further separation of the local area

- The existing inclined flare stack has been reused as the cold vent due to its optimum remote location and elevation for the dispersion of uncontrolled gas releases (and minimising thermal radiation effects in the event of accidental ignition)

Within 'safe' areas of the Installation, separation and segregation principles have also been adopted to further enhance not only the security of personnel, when in attendance, but also the availability of control and monitoring functions and support services. High availability aspects are consistent with not normally manned operations and are discussed further in the following paragraphs.

With regard to personnel security, the platform TR has been located at main deck level within the redundant ELQ accommodation module (Level 1). This is based on qualitative assessment of several locations subjected to worst credible events.

The TR is principally for use during routine attendance periods but will provide a limited secondary facility during flotel-supported periods.

In this location, separation and segregation of the TR is provided by the redundant utilities and PLQ modules to the north, and by encapsulation from above, below and to the east/north by redundant sealed areas of the ELQ.

The whole ELQ module is fire rated to A-60 standards and will therefore provide protection and endurance from the effects of worst credible fire events. Similarly, the redundant areas encapsulating the TR will provide buffer zones and explosion resistance to these events.

The TR, being a focal point, has therefore determined the necessary layout of escape and evacuation routes and the location of evacuation facilities and lifesaving appliances.

The survival craft locations and capacities were determined to ensure maximum availability and effectiveness for both routinely attended and flotel-supported operations. Two TEMPSC have been located at main deck level along the south face of the Installation and provide quick and easy access from the TR. At these locations, inherent protection and shielding is provided by both physical distance and the modules, and also by the helideck located on the ELQ roof. A third TEMPSC is located at the north-west corner of the Installation, and is again afforded protection and shielding by the redundant compression/separation modules.

Access and escape routes to/from the TR and to the survival craft are provided via two well-separated main escape routes at main deck level, ie along the perimeter of the platform to the east and west sides. Both main routes can be readily accessed from all areas of the platform and are each provided with protection/shielding, for the majority of their route, by A-60 rated firewalls and/or redundant modules/structures.

These same escape routes also provide an easy access to the flotel bridge landing platform during flotel-supported operations. The bridge landing platform, being below main deck level, is further separated from above deck events by the deck structure.

Access to the helideck is available from the TR and main deck levels via external stairways on the south-east and south-west corners of the ELQ module, and are interconnected at various levels along the south face. Two separate access routes to the helideck are therefore available.

3.0 FIRE PROTECTION SYSTEMS (PASSIVE)

The passive fire protection measures installed for the original facilities have been retained, maintained to their A-60 or A-30 rating or been supplemented by additional specific protection features.

The future maintenance requirements, removal or upgrading of the retained materials will be continually reassessed based on future development plans for the reuse or removal of now redundant and decommissioned facilities, eg MP-R-04 manifold structure and MP-R-11/12/13 compression/separation modules.

The fundamental protection measures are to achieve:

- Separation of hazardous platform areas
- Prevention of spread of fires between areas
- Protection of critical structural and support elements

These have been accomplished by various means, which are briefly outlined below.

3.1 Firewalls

The main firewall extends the entire width of the north-facing sides of the utilities, ELQ and generator modules, and is continued round the utilities module to cover the east end. The firewall is formed from deck level to the roofline of the utilities and generator modules and from Level 2 to Level 4 of the ELQ (at the time this firewall was fabricated the PLQ was not installed).

This external firewall comprises a 10mm layer of Durasteel 3DF2 sheet which covers the steel cladding of the modules to prevent structural collapse under high temperature. It is directly attached to the corrugated sheet cladding which serves to preserve gas tightness.

Behind the steel skin is a 38mm layer of heavy mineral wool (Rocksil L/R 144) which is continuous over all the main structure, backed by a 100mm thick layer of lighter mineral wool retained by thin plate. The thick layer of insulation contributes to the firewall protection between columns but continues around on to non-firewall surfaces where it provides thermal insulation.

Extensions from the firewall are installed in a northerly direction at both east and west sides of the platform.

At the east side, the 3m high A-60 rated firewall is extended to enclose the Texaco skid area on its east and north boundaries, thereby affording segregation of the skid from the main east side access and escape routes.

A similar 3m high extension to the west encloses the now redundant main deck utilities area. The firewall extends north and is connected to the now redundant north/south firepump modules (MP-V-7110/7120) to provide segregation and shielding of the main west side access and escape routes.

3.2 Spray Fireproofing on Module Undersides

Spray fireproofing is used under the utilities modules where the original requirement for an A-30 fire barrier is retained. This is combined with thermal insulation and forms a gas-tight seal over the diesel tankage area.

The underdeck areas/extension of the ELQ module have A-60 rated fire protection.

3.3 Spray Fireproofing on Manifold Structure

A 15mm thick coating is applied to the manifold support structure (columns and beams) and is designed to provide protection from a hydrocarbon fire for a period of 30 minutes (ie H-30 fire rated).

3.4 Concrete Roof Covering

For module roofs, a combination of fireproofing, environmental protection and rainwater dispersion is provided by shuttered and poured concrete, lightly reinforced and caulked around penetrations.

3.5 Firewall Penetration

Where entrances are made into the modules structures, the doors or penetration areas are constructed to conform to the rating of the adjacent firewall.

3.6 PLQ Module (Redundant MP-R-10)

The PLQ accommodation unit is located on a skid frame on the utilities module roof. The utilities roof skid frame and the underside of the PLQ module have been fireproofed using the Marine Mandolite 40 system, 35mm thick, with Decadex firecheck coating. The main structure of the PLQ wall cladding and roof etc is class rated A-60.

3.7 Emergency Generator Module (MP-V-8102)

The emergency generator module is located on its own support structure on the roof of the utilities module. The support structure has been fireproofed using the Marine Mandolite 40 system and the module itself is completely class rated A-60.

3.8 Load Repartition Structure (LRS)

The primary structure is fireproofed to class rating A-60 using the Marine Mandolite 40 system. The major support points of the LRS at deck level have been fireproofed.

3.9 Compression Modules (Redundant MP-R-11/12)

Modules 11 and 12 have a class rated A-60 Durasteel 3DF2 firewall running in a north-south direction extending from the base to the top of the module structure.

On the south faces of Modules 11 and 12, the firewalls extend the full height of each module and 3m horizontally in a westerly direction to prevent firespread around the modules. An extension of this firewall continues in an east-west direction some 2.8m high providing fire protection of 8m in height from the redundant outlet manifold skid. The main decks and primary structure of both modules each carry a class A-60 rating.

3.10 Separator Module (Redundant MP-R-13)

The separator module is situated on the LRS on the centreline of the Installation and has all primary steel members sprayed with the Marine Mandolite 40 system to provide class A-60 fireproofing.

In addition to this, the east face of the module has, running in a north-south direction, a Durasteel 3DF2 firewall (class A-60) extending from the base to the top of the module.

3.11 North and South Firepump Modules (Redundant MP-V-7110/7120)

Both firepump modules are of similar construction and are class A-60 rated, clad structures. The firewater lift caissons from their point of entry through the deck to each pumphouse are fully enclosed in their own Durasteel 3DF2, A-60 rated enclosures.

3.12 Risers and ESD Valves

Within the centre core the 12in export risers, riser supports, ESD valves and manual isolation valves are all provided with passive protection.

The risers and supports are protected to some 15m above and below the higher and lower valve locations, by H-120 rated Thermolag preformed shell materials.

Both ESD and manual valve sets are separately and totally enclosed within fireboxes. The boxes provide protection of the valves against jet flame impingement to H-120 rating and for the ESD valve actuators for a 15-minute operational period against high temperature.

The 18in import riser and ESD valve location are also locally protected. The riser, valve and actuator are provided with cemeticious coating rated to H-120, from main deck level to below the valve location. The access basket surrounding the valve location is also partially enclosed with H-120 rated materials to prevent downward flame impingement of the lower riser area above sea level.

3.13 Texaco Skid Pipework

Due to the possibility of small fires continuing for the duration of any blowdown period, passive protection coatings have been applied to the inlet and outlet pipework of the blowdown valves.

The protection is rated for jet flame impingement for a nominal period of up to 30 minutes. This protection is extended to the blowdown collection pipework within the skid area and until the pipework is routed below main deck level.

Similarly, main inlet and export pipework, above main deck level in the skid area, is partially protected to the same degree.

This partial protection extends up to the skid inlet valve (MOV-4303) and from the outlet valves (MOV-4307/8) to the centre core. This additional protection is provided against external fires acting on the pipework which could, under emergency conditions when main isolation failure has occurred, be deliberately isolated.

4.0 FIRE PROTECTION SYSTEMS (ACTIVE)

The Installation topsides are essentially divided into fire areas which are physically separated by fire rated divisions. Based on both qualitative and quantitative assessment of potential fire events in these areas, the need for and the extent/type of fixed fire protection measures have been determined. However, such needs have been further rationalised on the basis of not normally manned operations and the consequential effects of reduced personnel exposure.

4.1 Water System

It has been concluded that fixed firewater based deluge or sprinkler systems are not required. The provision of such systems is seen to offer the potential for increased risk to personnel due to significant increases in maintenance required and therefore personnel attendance and exposure.

An integral washdown water/firehose water system is, however, provided to assist in any necessary access for rescue of personnel in the event of fires occurring in the Texaco skid area, ie the main process area. This system will be operational and continuously pressurised throughout **any** period when personnel are required to carry out work in the Texaco skid area, and is designed to meet, as a minimum, simultaneous demand from two firehoses ($52m^3$/hr) at 5bar(g) for approximately 2 hours.

The system is based on onboard water storage capacity, located in secure areas and which can be routinely recharged by onboard seawater lift pumps during routine visits. A portable diesel engine driven water supply pump (and onboard local uninstalled spare unit) is provided for water distribution, under backpressure control, to washdown water stations and to fire hydrants located around the skid area. The pump unit is also located in a safe area.

As no permanent accommodation areas are provided on the Installation, in any operational mode, the provision of wet pipe sprinkler systems is also considered unnecessary.

During periods of attendance, the continuous fire/smoke/heat detection systems in areas where personnel may be present affords the opportunity for manual intervention to deal with the very limited potential for fire occurrence. While during all other periods, no risk to personnel exists, and both normal non-essential electrical isolation and/or total flood extinguishant system are provided.

4.2 Total Flood Extinguishant Systems

Local or area-specific, automatically initiated, total flood extinguishant systems have been provided for areas with a fire risk from electrical equipment, and which contain emergency equipment or controls. These areas specifically are:

- Control area including control point, telecoms area and Switchroom 3
- Emergency Command Centre (ECC) of the TR containing emergency communications and control/monitoring equipment
- Main generator enclosures ie MP-P-10200A/S

- Switchroom 1 in the generator area
- Emergency/maintenance generator room MP-V-8102
- Switchroom 2 for the generator MP-V-8102

With the exception of the Generator 3 and Switchroom 2 areas, which are covered by CO_2 total flood systems. The CO_2 systems are designed to provide a nominal 35% by volume concentration on release, while the existing halon systems provides a 6% by volume concentration.

With the exception of the new generator enclosures systems, automatic release will only be permitted when the platform is unmanned, and systems are physically and automatically isolated when the platform is in the attended mode. During such attended periods, deisolation and manual release can be effected external to the specific areas, following personnel evacuation.

Extinguishant is stored in manifold bottle racks, locally but external to each specific area.

4.3 Helideck Systems

No automatic systems are provided for the helideck, but portable facilities are provided for use during periods of helicopter startup and shutdown. These facilities include trolley CO_2 extinguishers complete with lances, a portable foam facility, and DP trolley extinguishers.

4.4 Manual and Portable Equipment

Water, dry chemical, and CO_2 portable fire extinguishers are, as appropriate to the local areas risk, provided in all areas of the Installation.

5.0 BLAST RELIEF AND BLAST PROTECTION

Qualitative assessments and calculations have been carried out to determine the likely explosion generated overpressures which could occur within the hazardous areas of the Installation topsides.

Initial assessments were carried out on the basis of the original platform design to establish those areas in which explosion overpressure potential represented a problem. This data was thus utilised to decide whether design modifications or improved safety features presented the optimum solution. As a result, many of the original sources of explosion overpressure potential have been eliminated by the decommissioning of redundant facilities.

The remaining areas, ie centre core and Texaco skid, have been subsequently reassessed and the following conclusions determined.

5.1 Centre Core

The evaluation of possible explosion overpressure in the centre core shows that an overpressure of up to 2bar is theoretically possible with a uniform stoichiometric gas mixture in the core and an ignition source close to the base of the core. However, circumstances within the core, and the location of likely release and ignition points reduce this to an estimated maximum of 1bar for a downward pointing jet release from the new riser valve location.

In any explosion which occurred in practice in the centre core, it is likely that the overpressure would be somewhat less than this figure (ie assessed as less than 0.6bar), as a uniform stoichiometric gas mixture is unlikely to occur throughout the path of combustion. Also, it is more likely that ignition will take place at the start of any leak before significant quantities of gas have been released.

The predicted overpressures have been based on published research information and are considered to be conservative. While these predicted levels of overpressure are likely to cause significant damage to ducting, cable trays and the valve fire protection enclosures, the risers and ESD valves are likely to remain undamaged.

Equally, the inherent design strength of the concrete structure itself is unlikely to be affected.

5.2 Texaco Skid/Redundant Manifold and LRS Areas

A large release of gas could generate a gas cloud underneath the redundant manifold, within the LRS area (which supports the decommissioned compressions/separation modules), or the Texaco skid area.

The manifold area is partially enclosed by the main firewall to the south and a large concrete support beam to the north. Ignition could be expected to generate a maximum explosion overpressure of approximately 0.2bar. As this is only likely to occur with an ignition source central to the area, the probability is remote.

Following such overpressures, the integrity of the main firewall is unlikely to be maintained and, although total collapse is unlikely, the fire protection capability will be impaired. Such damage is not, however, considered critical to the integrity of safety functions due to the further buffer areas provided by redundant units and the physical distances separating the facilities from the event.

The LRS and Texaco skid areas are similar, being open and well ventilated. Explosion overpressures are expected to be low (around 0.05bar) and would therefore pose no real escalation risks.

6.0 FIRE AND GAS DETECTION AND ALARM SYSTEMS

Fire and gas detection devices have been installed throughout the Installation in all areas where the release of hydrocarbons may occur, and where a risk of developing fires could jeopardise personnel safety, the integrity of key safety functions or continued functional operations. (Refer to Figures 4.3 to 4.15.)

In principle, it has been the objective to detect any release of hydrocarbons as soon as possible, and to initiate executive actions to restrict the potential for ignition and to limit the quantities of hydrocarbons released. The integration of fire and gas detection and ESD and depressurisation systems as an overall safety system has therefore been applied.

In support of this objective and as a result of the relative simplicity of the process system, gas detection devices have been located, wherever practicable, at potential release sources.

Similarly, the use of various different fire detection devices, ie UV, IR, smoke, heat detectors and frangible bulb systems, has been applied to gain the optimum benefits from their individual localised or area detection capabilities.

The location, use and the resultant protection measures generated by the various devices have been based on a principle of fire areas. In the context of a not normally manned and remotely operated facility, these areas have been defined by the escalation potential from the specific area and the likely exposure of personnel to the event ie:

- Process areas
- Power generation areas
- Control and TR areas
- Underdeck utilities area
- Helideck

Fire and gas detection is achieved by the field located devices, which are hard wired directly to a central control suite of cabinets located in the control area (Level 3 of the ELQ). Field devices and associated local electrical equipment are certified for use in a Zone 1 hazardous area.

The control suite provides the facilities, via a number of modular units, to:

- Monitor and control all field detection devices and display their status
- Provide interfacing communication to the Local Area Network (LAN) systems
- Control the power supplies
- Drive a conventional control and display matrix and annunciate fire and/or gas detection
- Interface and control output actions (safety controllers)
- Record event sequencing
- Provide safety controller programming access

Field output signals are also hardwired either directly to Exd instruments or to electrical marshalling cabinets forming part of the emergency switchboards (ES1 and ES2).

In order to achieve the high availability necessary in such systems, three basic principles have been applied in the design, namely:

- Detectors and instruments which generate shutdown actions are triplicated and processed by different simplex input modules
- Logic is carried out by triplicated processors running in parallel with two-out-of-three voting
- Output modules are duplicated and fault tolerant

6.1 Gas Detection Systems

Combustible gas detectors, either Sieger 910 or Chubb ESL 300, have been installed in all areas where the potential for hydrocarbon gas releases can occur, ie:

- Centre core – source release detection devices are installed to monitor each riser ESD valve and manual isolating valve set
- 18in import riser – source release detection devices are installed to monitor the riser ESD valve
- Texaco skid – two groups of area detection devices are installed to monitor the area. Area detection only has been provided due to the relatively high number of instrumentation connections and adequate natural ventilation in this area

Detection of 'small' releases was therefore considered to be impractical before natural dilution and dispersion would occur. All instruments connected to the process system are installed with a 6mm restriction orifice in the impulse lines to limit the maximum release rate in abnormal circumstances.

Gas detection devices have also been installed in non-hazardous areas of the Installation. In general, these are located to detect any accumulation effects and more specifically to identify gas ingress to areas containing potential ignition source, ie:

- Power generation and electrical switchgear rooms
- Control, telecommunication and power distribution areas of the control point
- TR and mess areas
- Air compression skid

This also includes the provision of specific gas detection devices for all air ventilation system intakes to these areas.

Gas detectors are set to provide a low level alarm at 10% LEL and high level alarm at 60% LEL concentration of methane. Alarms are initiated as a result of single detectors but executive control actions are not initiated until coincident high levels are confirmed.

In general, gas detection at any location of the Installation, will initiate platform isolation and 'enable' the depressurisation facility. Automatic depressurisation will, however, occur in certain circumstances (refer to Paragraph 7).

Gas detectors (H_2) have not been installed in battery rooms, as the type of batteries installed are sealed lead/acid type.

6.2 Fire Detection Systems

Fire detectors have been installed throughout the Installation in all areas where there is a risk of fires developing.

Detection devices used include the following types:

- UV/IR flame detectors ie Detronic type C7050, Chubb MK4 or general monitor type FL 2000 (UV/IR)
- Heat detectors (rate compensated)

- Smoke detectors
- Frangible bulb systems

The use of individual types or a combination of devices have been selected on the basis of the specific area hazards and the need to provide detection reliability and the earliest indication/response to the hazards.

UV/IR detectors and frangible bulb systems have therefore been used for the hazardous areas of the Installation, and principally generate alarm and execute control actions on the basis of single detector initiation.

In the centre core, each ESD valve set is provided with independent frangible loop detection systems, and the valve locations are monitored by four (in-series) UV detectors. The Texaco skid is again covered by a frangible bulb loop system, but by only three UV detectors.

The Texaco riser ESD valve location is similarly covered, however, two UV detectors only are provided and executive control action is dependent on confirmed coincident detection.

Fire detection in any one of these hazardous areas will automatically initiate platform isolation and depressurisation, and therefore only passive fire protection measures have been provided in these areas to prevent further escalation.

In the non-hazardous areas of the Installation, alternative devices and combinations have been adopted. These areas, in the not normally manned mode, are also conducive to active protection by means of automatic fixed systems; whilst when personnel are in attendance, manual intervention may be effected.

All power generation units and power distribution systems are within individual rooms or enclosures. Each area is therefore provided with UV flame detection devices to initiate total flood extinguishant release. This is a CO_2 total flood system.

The UV detectors initiate alarm and executive actions on the basis of one-out-of-three operation, and produce local area/facilities isolation.

For the new generator area and switchroom, additional general areas, and ventilation intakes, smoke detection devices are provided and alarm on single detection. Smoke detection in the switchroom will also initiate extinguishant release.

The same principles/facilities are applied for the existing MP-V-8102 module, although existing heat detectors are also retained. Any fire, smoke or heat detection will initiate closure of fire dampers and stop ventilation fans for the area concerned.

For the remaining non-hazardous areas ie control, TR and mess areas, fire detection is achieved by the use of a combination of both smoke and heat detectors, which, depending on the area, will operate on single or two-out-of-three coincident principles. Specifically, each sub-area, enclosed space, false floor or ceiling and all ventilation intakes are fitted with detection devices.

The control area (including switchroom, telecoms area and control point) and the Emergency Command Centre (ECC) of the TR (which includes emergency control and communication equipment) are all provided with smoke detection systems operating on coincident two-out-of-three detection for the release of CO_2 extinguishant systems.

The automatic release of any extinguishant system to areas where personnel can be present (ie except the generator enclosures for G1/G2) will only be possible when no one is onboard. When personnel are present, manual release can be initiated only following physical deisolation and evacuation of the area, and from outside the areas.

6.3 Manual Alarm Callpoints

Manual alarm callpoints have been located throughout the Installation local to all areas of potential hazard and at escape and evacuation points.

If operated, platform alarm is raised at the control point and via the telemetry link to shore.

6.4 Platform Status/Hazard Warning Lamps

All areas protected by CO_2 release systems are provided with system status lamps to indicate healthy, pre-discharge warning and extinguishant released conditions.

General platform status and alarm lamps are provided in areas of high noise to supplement the PA/GA systems. A duplicated platform status/helicopter wave off warning lamp system is provided at the helideck in compliance with the CAA recommendation. On fire detection or single high level gas release detection, blowdown enable or blowdown release, then indication for helicopter stand-off will be illuminated.

6.5 General Platform Alarms

A duplicated system of combined public address and general alarm systems has been provided to cover the not normally manned operational areas of the Installation, with field equipment being suitable for Zone 1 hazardous area operation.

During flotel-supported periods, temporary extensions of the system to the flotel will be provided.

Access into areas not covered by the PA/GA system is restricted to permit entry only. Communications to these areas will be provided by hand-portable radios.

General Platform Alarm (GPA) can be initiated manually, or automatically on confirmed hazard situation from the safety system. The Prepare to Abandon Platform (PAPA) alarm will only be initiated manually.

6.6 Video Surveillance

A remotely-operated slow scan video surveillance system is provided to visually monitor key areas of the Installation. This system provides additional facilities for the detection of abnormal events on the Installation such that remotely initiated actions can be taken.

7.0 ISOLATION, EMERGENCY SHUTDOWN AND VENTING

An isolation, emergency shutdown and venting system has been incorporated into the design of the facilities and is integrated with the fire and gas detection system to provide an overall safety system.

The shutdown system is in some measure automatically selective in the extent of shutdown, based on the emphasis for personnel protection during any routine or scheduled attendance periods, eg automatic closure of the subsea isolation valve will be initiated for certain events only when personnel are in attendance.

However, due to the simplicity of the process system, platform and process isolation are essentially synonymous and effected by closure of the platform ESD riser valves, which fail safe to close.

There are, however, some minor shutdown/isolation actions associated with the process system and therefore four levels of shutdown are provided in all.

These levels of shutdown and consequential effects are described below in order of ascending significance.

7.1 Platform Isolation (Unit Shutdown)

During abnormal operating conditions, isolation of the Texaco skid inlet and outlet flow tubes may be necessary to prevent high pressures, low temperatures or off-specification conditions occurring.

As the control of these conditions can be affected by operation of the main platform isolation valves, the detection devices and control actions are incorporated into the main safety system. Remote reset functions are provided for restoration of operation following satisfactory resolution of the problems.

7.2 ESD Level 2 Shutdown (Process/Platform Isolation)

Full process, and therefore platform, isolation can be initiated automatically or manually, by local or remote action. Level 2 shutdown will isolate the facilities by closing:

- Platform ESD valves 4260/10000 (export)
  4301 (import)

- Export control valves PCV-4345B/4351B

Automatic initiation occurs following abnormal conditions occurring within the process system, the essential supporting utilities, or on fire detection in non-critical utility areas, or gas detection in any area, eg:

- Level 1 shutdown initiation

- Low low pressure in the instrument air system

- Blowdown (depressurisation) valves not closed

- Low low pressures in the outlet manifolds

From the fire and gas detection system on confirmed two-out-of-three detection for:

- Fire in the diesel and slop tank areas

- Gas detection in the Texaco skid/riser area

- Gas detection in the centre core when platform unmanned (see Level 1 for manned condition)
- Gas detection in any air intake for ventilation or combustion (ie control area, TR, switchrooms, generator enclosures) and to the instrument air compressors

For this level of shutdown, the automatic depressurisation (blowdown) of the topsides will be 'enabled' to allow remote initiation to be carried out if necessary. The only exception being on low low pressure in the outlet manifold (ie potential major loss of containment) when blowdown is automatically carried out.

7.3 ESD Level 1 Shutdown (Non-essential Electrical Isolation)

Level 1 shutdown can be initiated, automatically or manually, by local or remote action.

Level 1 initiation will automatically initiate a Level 2 shutdown and, in addition, isolate all electrical generation and distribution systems with the exception of the UPS No 2 system. The UPS No 2 system is retained operational to provide monitoring and status data, control and communication for a maximum period of 3 hours before automatic shutdown. The UPS system will therefore retain sufficient capacity for restart of the safety system.

Level 1 shutdown occurs following:

- Level 0 initiation
- Total telecontrol systems failure
- Local or remote manual initiation
- Remote manual initiation from Tartan (only if telecontrol between MCP-01 and St Fergus is unavailable)
- Low low pressure in the inlet manifold/riser
- From the fire and gas system ie:
    - Gas detection in the centre core (if platform unmanned then only Level 2 initiated)
    - Fire detection in process related areas and/or smoke detection in control area/TR ventilation systems

In addition to electrical isolation, and platform isolation (via Level 2 shutdown) automatic depressurisation of the topsides gas inventory is actioned, and additional isolation by closure of the 18in import riser subsea isolation valve is carried out. This latter action is automatically deselected, unless personnel are onboard, for:

- Fire and gas actions
- Total telecontrol system failure
- Inlet manifold low low pressure conditions

Local or remote initiation to close the valve if necessary is, however, available.

7.4 ESD Level 0 (Platform Abandon)

Level 0 shutdown is initiated by gas detection within the control point area and manually from pushbuttons located at all evacuation points, ie helideck, lifeboat locations and flotel bridge landing platform.

Level 0 shutdown will automatically initiate Level 1 shutdown, ie non-essential electrical and total platform isolation and depressurisation, and also isolate the UPS No2 system.

Although platform general alarm scenarios are normally only initiated by manual action, the incorporation of an automatic fire and gas input is available (keyswitch selection).

The platform depressurisation (blowdown) system is a central feature in the control of hazardous situations. By enabling the disposal of gas inventory quickly and to a safe location, a reduction in the potential for escalation is effected. Equally, should escalation still occur, the action of depressurisation is crucial to restricting the sphere of consequences of the event.

The limited gas inventory, the absence of process liquids and the design of the cold vent system, have all enabled depressurisation to be achievable to 1bar(g), in 10 minutes or less.

To enhance the availability and security of the depressurisation system, under conditions of possible simultaneous fire and blowdown, passive fire protection against jet flame impingement is provided for vulnerable impulse and discharge pipework around the blowdown valves.

8.0 HEATING AND VENTILATION

As a principle, all hazardous areas have made use of natural ventilation and are predominantly open areas. Other work areas, not enclosed within buildings, have also been located to make use of natural ventilation and in areas classified as safe.

As the Installation is not normally manned and is remotely controlled, the requirements for ventilation systems have been based on simple design with minimum maintenance. Their prime function is to provide suitable operating conditions for equipment and comfort for personnel who periodically visit the Installation. The necessary facilities are therefore for specific enclosed buildings, remote from hazardous areas with no requirement for positive pressurisation against gas ingress, and are mechanical ventilation systems.

Electrical heating units are also provided but will normally only function on demand to maintain minimum temperatures.

All ventilation air intakes are positioned to minimise the possibility of smoke or gas ingress from credible events and are provided with smoke and gas detection devices. All air intake and exhaust ducts, are fitted with pneumatic fire dampers at their penetration to/from the area.

CO_2 overpressure release dampers have also been provided in those areas where CO_2 is released in the event of a fire.

Fire dampers are controlled on an individual area basis from an H&V control point located near to the entrance door of each area, and which provides the necessary interfacing to the F&G system.

8.1 Control Area – Level 3

The control area, located on Level 3 of the ELQ module, comprises control and telemetry areas with small areas used for electrical distribution and UPS equipment, corridors and stairs.

This level is served by supply ventilation to all areas, recirculation from control and telemetry areas and extract from UPS, toilet and telemetry areas. Telemetry areas are fitted with ventilation pressure exhaust dampers, set at 60Pa with additional CO_2 overpressure dampers, set at 60Pa, for use only during CO_2 discharge.

The H&V panel is located in Level 3 and controls all H&V equipment serving this level.

The operating philosophy of the system is to operate a constantly running ventilation system which maintains a temperature of 18 to 21°C in the areas served. Fresh air makeup duct is fitted with a frost heater to protect against icing problems.

The system will generally operate on a recirculated air basis in order to minimise heating loads. The H&V controls will adjust the recirculation dampers to maintain the desired room temperature.

Being installed on an unmanned platform, the system will be fitted with automatic controls which maintain its operation during failure of certain components.

8.2 TR and Mess Areas

The TR located on Level 1 of the ELQ and the mess area in the underquarters comprise emergency living areas, emergency command centre, kitchen, toilet/washroom.

All areas are served by supply ventilation with extract from toilet/washroom only and recirculation from all other areas. Each level is fitted with a pressure relief damper set at 60Pa.

The emergency command centre is fitted with a CO_2 overpressure relief damper set at 60Pa for use only during CO_2 discharge.

The H&V control panel is located in Level 1 muster area/workshop and will control all H&V equipment serving TR and mess areas.

The operating philosophy of the system is to operate the system to maintain a temperature of 18 to 21°C in the areas served. The system will be used intermittently, only when the platform is manned. The system will generally operate on a recirculated air basis in order to minimise heating loads. The electrical control of heating will operate in conjunction with a pneumatic system which will operate modulating fresh air/recirculation/ exhaust dampers.

Under normal conditions, the system will be manually started and stopped by visiting personnel, and be operational only for the duration of the visit.

Common alarms will only operate when the panel is energised and with the system operational.

The system will be shut down by interlocks with the F&G panel.

8.3 Switchroom 1

The Switchroom 1, located in the generator area, comprises a partitioned area containing electrical equipment. The area is served by supply ventilation and pressure relief dampers set at 60Pa. A CO_2 relief damper is fitted which will operate in conjunction with the F&G system upon CO_2 release, and is again set at 60Pa.

The H&V panel serving the area is located within the switchroom.

The operating philosophy of the system is to operate a constantly running ventilation system to maintain a temperature of between 15 and 25°C within the area.

The system will operate on a 100% fresh air basis with a three-stage preheater being fitted on the fresh air inlet and a two-stage filter unit fitted to the supply duct.

8.4 Emergency/Maintenance Generator Module (MP-V-8102)

The module housing the generator and Switchroom 2 is equipped with the following ventilation systems:

- A continuous ventilation system common to both the generator and Switchroom 2 areas
- An engine ventilation/cooling fan (generator area only), which activates when the engine is in operation

All inlet and outlet ducting is fitted with fire dampers which operate automatically in response to signals from the F&G system and are interfaced through the local H&V control panel. The outlet ducts are also fitted with pressure control dampers.

8.5 Centre Core

The centre core has a permanently installed ventilation system consisting of two supply fans, MP-K-111A&B (operating on a duty/standby basis), and a single extract fan MP-K-112.

The supply fan intakes are located at the south-west corner of Level 4. Air flow is controlled by volume control dampers and vitiated air is discharged to atmosphere at the top of the central core.

The extract fan is situated on Level 4 near the north-west corner of the G3 module. Air is drawn from near the central core base and is ducted to its discharge point at the fan location.

Portable ducting can be fitted to the system to allow extract of fumes from specific areas at the central core base during maintenance work.

9.0 EMERGENCY POWER, COMMUNICATION AND LIGHTING

9.1 Power Generation/Distribution

As a not normally manned Installation, the normal power demands are already minimised to essential users only.

The demand for power on loss of normal generation capability is therefore essentially unchanged and all power generation and main distribution systems are designed to act in normal duty/standby role, as well as ‘emergency’ backup to maintain minimum essential facilities.

During circumstances where ‘critical’ loads only are essential, ie operation of the safety and communications systems, demands are met from the duplicated (240V ac and 24V dc) UPS supply and distribution systems.

Each UPS system is capable of supplying the critical platform loads for 4 hours. When required to supply the load, the UPS system will automatically shut down after 3 hours of operation, thus retaining a minimum of 1-hour capacity in each system. This will allow a 'black start' of the platform systems subsequent to any incident involving the total loss of generation.

9.2 Communications

The main shore communications links are an essential element for the remote control of the Installation.

The shore communication links are fully redundant and provide the option for each of two alternative communication links to the Installation, although not simultaneously.

The power requirements for the main communications equipment installed at MCP-01 are met by the same flexible and high availability system as described above (power generation/distribution) and, hence, are inherently secure. The duplication of communication equipment, as independent systems 'A' and 'B', therefore also ensures a highly secure and available system.

Hotline telephone communication links are also provided to allow dedicated direct communication links to pipeline(s) control centres at St Fergus and the Tartan platform.

A range of VHF aeronautical, marine band and HF-SSB radios are provided for internal and external platform communication with other platforms, local vessels and helicopters.

Within the ECC, a VHF/FM marine band radio set (Exd rated with battery backup supply for 2-hour operation) is provided to operate at **all** levels of platform shutdown. The radio is available to enable an extreme emergency communication link to Tartan or Claymore platforms.

9.3 Lighting

The platform lighting philosophy has been based on the three operating scenarios ie not normally manned, routinely attended, and major maintenance periods.

During periods when no one is present, the lighting requirements will be minimal and only the following will be illuminated:

- Navigation aids (switched by photo electric cell)
- Obstruction lights
- Platform status lights (ie helicopter wave-off subject to actual status)
- Some escape route lighting

The escape routes' lighting is provided by twin-tube fluorescent type Exe, with integral battery backup. They are either permanently on or wired in the switched mode such that when the platform is unattended all lighting which is switched off will still receive a trickle charge for the batteries.

The helideck landing lights can be off but are provided with a remote switching facility from St Fergus. (In practice, the lights are left on to prevent internal condensation.)

During periods of routine attendance, personnel are anticipated to be onboard during daylight hours only, although escape during the hours of darkness may be necessary. The lighting requirements will therefore be as above, with the following additional provisions:

- Helideck landing lighting switched on
- Generator area/Switchroom 1, generator room/Switchroom 2 and centre core – switched individually so that they are only illuminated as required
- Other operational areas normally off with individual switching as above
- Escape routes will be illuminated

During major maintenance periods, the permanently installed lighting systems will be supplemented by temporary fittings fed from temporary distribution boards in the necessary work areas.

The platform status lights (ie helideck wave-off lights) are provided with a dedicated charger/battery backup supply. The light-fittings and battery charger are certified suitable for use in Zone 1 hazardous areas.

9.4 Navigation Aids

The Installation is provided with white and red flashing navigational lights, red steady obstruction lights, fog signal system and platform ident panels to conform to the Department of Transport and Northern Lighthouse Board standard marking schedule for offshore structures.

All stations are provided with main and secondary systems, with battery backup supplies for 96 hours of operation.

The fog signal stations are always switched on, but are provided with manual override to allow switching, as required, during attended operations.

10.0 PIPELINE COMMUNICATION/CONTROL

The communication systems' linking the Installation with the pipeline producers and the shore terminal have been described previously. Also, the means for interface, control and isolation of the MCP-01 Installation from the pipeline systems have been discussed.

In its not normally manned role, the MCP-01 Installation is designed only as a means for interfacing and export of the third-party gas and will no longer provide any designed functional roles in the control of pipeline-related major accidents, which are fully defined in the Frigg Transportation System Emergency Procedures Manual.

In its normal operating mode, any mitigation actions and measures for the emergency control of pipeline operations will be carried out remotely, and are the responsibility of Gas Production Transportation Organisation (GPTO), at St Fergus.

During any period of attendance at MCP-01, the OIM will be fully aware, and conversant with, all Emergency Pipeline Systems Operating Procedures and will have responsibility for local actions to ensure the safety, evacuation and welfare of personnel on the Installation. Overall responsibility beyond these local constraints will still be co-ordinated by GPTO at St Fergus.

11.0 ESCAPE ROUTES AND EVACUATION

11.1 General

Escape routes and evacuation provisions have been based on the following principles:

- Existing provisions have been retained wherever practicable and appropriate to the revised topsides facilities and layout
- Escape routes are provided to ensure at least one such route will be available from any area in the event of credible incidents occurring
- Escape routes are arranged to provide access to the muster area (ie platform temporary refuge or flotel during major maintenance periods) by the most direct route possible
- Evacuation (embarkation) locations are positioned as close to the TR and/or as far as possible away from the sources of potential hazardous releases
- On occurrence of hazardous events, either by the sounding of the platform general alarm, or by PA announcement, all personnel will immediately muster to the TR. Based on the two possible modes of operation, two different scenarios will however apply:
  - For routine visits, ie personnel onboard restricted to 17 persons, immediate mustering to the platform TR by all personnel will occur
  - For major maintenance periods, ie up to 100 personnel onboard, immediate evacuation to the flotel by all personnel (except those specifically designated as Emergency Event Team members) will occur. Emergency team members will muster to the platform TR

    Note: Where evacuation to the flotel is impeded, all persons will muster at the platform TR.

11.2 Mustering

The platform TR will be designated as the platform muster area and is described more fully in Paragraph 12.0. However, the TR is designed principally for operations on the platform in the not normally manned mode and provides a protected and durable location for the max 17 persons expected to be in attendance.

During other operational modes, the TR will provide the same facilities and protection, and is principally sized for 'worst expected' occupancy by 50 persons.

11.3 Escape Routes

Two types of escape routes are provided for the Installation:

- *Primary Routes*

  Primary routes run around the perimeter of the platform connecting the TR (muster area) and evacuation facilities provided at main deck level eg TEMPSC, liferafts. Essentially, two primary routes are provided along the west and east faces of the platform and are protected from the consequences of credible events by protection walls and/or existing redundant modules/enclosures, all to A-60 rating.

- *Secondary Routes*

  Secondary routes lead from within specific areas, buildings etc of the platform to connect to the primary routes. Within each such area, at least two separate alternative routes are provided. Where routes require a change of elevation, as far as is practicable, they have been accomplished by stairways, although fixed ladders have been necessary in some cases eg:

  – Alternative escape route from the crane

  – Within the centre core

  – Escape routes direct to the sea

Escape and access routes for the helideck are provided from main deck level via stairways, external to the ELQ module, leading to both east and west helideck access areas. The stairways are essentially sheltered by the ELQ module and interconnected along the south face of the module at various levels, and therefore shielded from credible events by the module and physical distance from the events.

It is unlikely, however, following escalation of a centre core-related credible event, that helicopter operations would be practical or possible. The alternate escape routes to the TR or to sea evacuation facilities would therefore be utilised.

Safety signs are located at strategic locations to indicate direction and route to mustering and embarkation locations.

Studies for assessing the vulnerability and efficiency of escape routes and evacuation facilities have been carried out, and the protection provided and locations utilised reflect the recommendations to achieve optimum safety.

11.4 Evacuation (to Sea)

A range of evacuation methods and facilities to enable evacuation to the sea have been provided, and include:

- Survival craft (TEMPSC)
- Liferafts
- Scramble nets and ropes

12.0 TEMPORARY REFUGE

12.1 General

A designated Temporary Refuge (TR) has been provided on the Installation to primarily meet the requirements for not normally manned operations, ie to include periods of limited attendance by restricted number of personnel. The facilities provided are therefore limited with respect to the other predicted operational mode of major maintenance, when far greater numbers of personnel can be onboard. In these circumstances, the designated TR will be located on the flotel supporting such operations and the platform facility will therefore function as an ‘enhanced’ muster area and backup facility.

The platform TR is located at the south central face of the platform, as far as is practical from all platform hazardous areas and pipeline risers. The TR is at main deck level and occupies the western section of Level 1 of the predominantly redundant, existing accommodation module (ELQ).

The redundant isolated areas of the ELQ, to the north, west, above and below and the external fire rating of the ELQ, therefore provide protection and buffer zones to the consequences of credible events.

The TR comprises a mustering area for approx 50 persons (which also acts as an instrument workshop area), an emergency sleeping area, toilets/showers area and an Emergency Command Centre (ECC). Within the ECC room is located an emergency communication system for PA/GA, local platform radio and external radio communications. These facilities are powered from either of the UPS systems located external to the TR but in separate, well segregated, normally safe areas of the Installation.

External VHF radio communication facilities with local battery backup supply are also provided in the event of **total** power loss.

The ECC also contains a control and monitoring VDU workstation to provide access/monitoring of the platform safety systems.

The TR is connected by means of an internal vertical A-60 protected stairwell to the control area located on Level 3 of the ELQ. This, therefore, provides a protected escape to the TR from the control point, or an escape route from the TR to the higher ELQ level for access to the helideck east side embarkation area.

Two further alternative evacuation routes, on the south face and west side of the TR, lead directly at main deck level to lifeboat evacuation stations or to the main east and west side platform perimeter escape routes. Both escape routes are provided with firewall (and/or redundant module) protection to enable access to the third lifeboat and flotel bridge landing area, and evacuation facilities at the north-west corner of the platform.

Access to the TR is provided from all areas of the platform, mainly via the east/west side platform perimeter escape routes to the south and west entrances of the TR. A further route is also provided at main deck level via an enclosed corridor between the redundant utilities/ELQ modules to access the TR from the north.

12.2 TR Integrity – Design Intent/Implementation

The primary design intent has been that the TR should be capable of withstanding the effects of all credible events until such time as either evacuation has been completed by helicopter or survival craft, or until the event has subsided.

As MCP-01 is an existing Installation, a deliberate approach has been adopted to reuse, where practicable, existing facilities and to minimise any necessary modifications consistent with achieving the design intent.

As part of the Formal Safety Assessment (FSA) process, a series of studies both previously carried out on the basis of the manned Installation, and new studies specific to the not normally manned operations, have been used either directly or indirectly towards achieving this intent.

Based on these studies, the key aspects relevant to the design and endurance requirements of the TR have been identified. The following features/capabilities have been ensured for the final TR design:

- The existing external A-60 fire rating of the entire ELQ module has been maintained, is gas tight and consistent with the duration and intensity of credible events, ie 1 hour minimum

- To ensure maximum accessibility during emergency events, a number of entrances have been provided. Their locations are such as to afford access from all main escape routes and are well shielded from the effects of the events

- The distances between evacuation exits and embarkation points are minimised and well shielded and protected

- All access/exit points are fitted with airlock doors to reduce the likelihood of ingress of smoke/gas
- Internal areas are provided with fire doors as barriers to smoke or fire migration
- Gas, smoke and heat detection devices are fitted to all ventilation system air intakes and exhausts. On activation, fire dampers are automatically closed to prevent gas or smoke ingress, and ventilation systems shutdown
- Internal construction material, cables etc have been specified to ensure that release of toxic substances is avoided
- Evaluations have confirmed that sufficient quantities of air from within the TR will be available for 50 persons, and breathable for up to 2 hours in the event of a need to isolate the ventilation system
- The means of support for the TR is adequate (concrete main deck structure) or passively fire protected (structure steelwork) for a minimum period of 1 hour

13.0 LIFESAVING APPLIANCES

13.1 General

In the not normally manned mode, when routine attendance is required, the helicopter will remain available at the Installation throughout the period for evacuation purposes; and will afford the primary means of escape.

Following an occurrence resulting in uncontrolled gas release or fire, and subject to weather conditions, the use of the helicopter could be severely restricted. Where it is not possible to 'wait out' the event in the TR, the primary evacuation routes in this case will be to the sea.

A range of facilities is provided for the safe evacuation to the sea, primarily survival craft. These are backed up by liferafts, survival suits, lifejackets, smokehoods and lifebuoys, which, coupled with alternate means of escape (ie ladders and scrambling nets), provide a comprehensive range of appliances.

13.2 Survival Craft (Lifeboats)

Two Totally Enclosed Motor Propelled Survival Craft (TEMPSC) of the davit launch type are provided. Each craft has a seating capacity of 47, providing in excess of 2 x 100% capacity during periods of attendance. The two craft also provide approx 150% capacity for the POB during major maintenance periods, should evacuation to the flotel not be possible.

All three craft are located with direct access from main deck level, two on the south face of the platform and the third at the north-west corner. The craft are positioned to launch away from the Installation, and located in non-hazardous areas as far as possible away from the effects of credible events.

13.3 Liferafts

Liferafts are provided as a backup means of escape for personnel not able to use the survival craft.

Five liferafts, each of 20-man capacity, are provided. They are jettison launch arrangements and located three on the south platform face and one each on the north and west faces.

13.4 Survival Suits

All personnel visiting the Installation will be provided with a helicopter transit suit, which will be used as a survival suit in an emergency.

Additionally, abandonment suits are provided at the following locations:

- 30 at each lifeboat station
- 30 located in the TR

13.5 Lifejackets/Smokehoods

Lifejackets

- 35 jackets located at each lifeboat station
- 35 jackets located in the TR

Smokehoods

- Smokehoods will be provided at the TR, control area and each lifeboat station in adequate numbers for the personnel onboard

13.6 Safety Signs

Pictorial type signs, with legends, are provided throughout the Installation for identifying the location of safety equipment and escape routes. The signs use photo-luminescent paint for easy identification.

14.0 STANDBY VESSELS

During periods of flotel-supported operations and attendance for routine or consecutive 5-day visits, a fully certified standby vessel will be maintained continuously on station within 5 nautical miles of the Installation.

In principle, any visit to the Installation, continuation or curtailment of planned activities once onboard, will be determined by the suitability of prevailing weather conditions for helicopter operations.

Equally, restrictive work practices on the platform will be enforced to ensure no over-the-side works are performed unless a standby vessel can launch its Fast Rescue Craft (FRC).

15.0 SECURITY

Security safeguards are installed to prevent/identify unauthorised access to the platform.

Both physical and electronic barriers are utilised to prevent or detect intruder access from the sea and from the air. Access from the sea is prevented by steel gates and fencing protected by fibre optic cabling which will initiate an alarm if broken or damaged. Access from the air is detected by security monitoring cameras to allow identification of the threat.

Additional detectors are located in the top of the centre core to provide added protection, and identification of the threat can be facilitated by use of associated cameras.

All alarms are fed to the telecontrol system and transmitted to the St Fergus Gas Terminal for evaluation and, if required, further action.

In the case of a positive illegal entry, Grampian Police will be contacted for assistance.

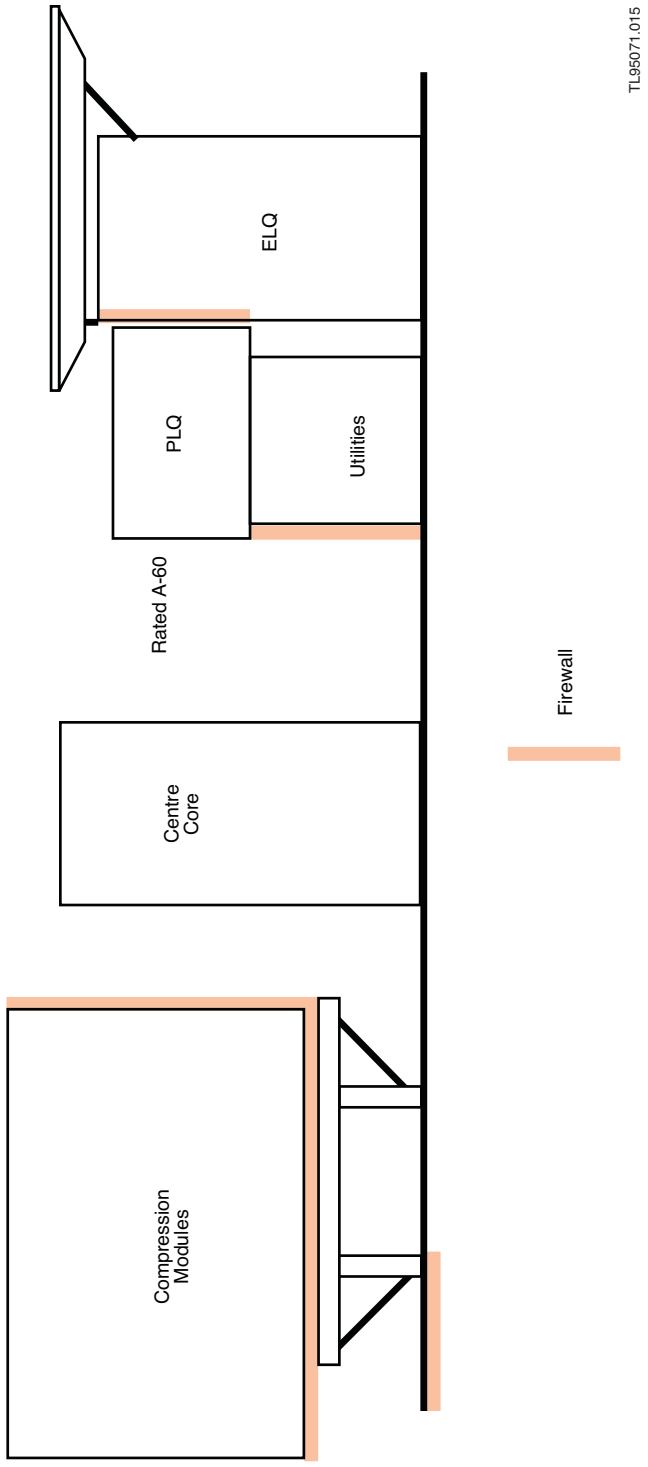


Figure 4.1 Main Firewalls and Fireproofing (1)

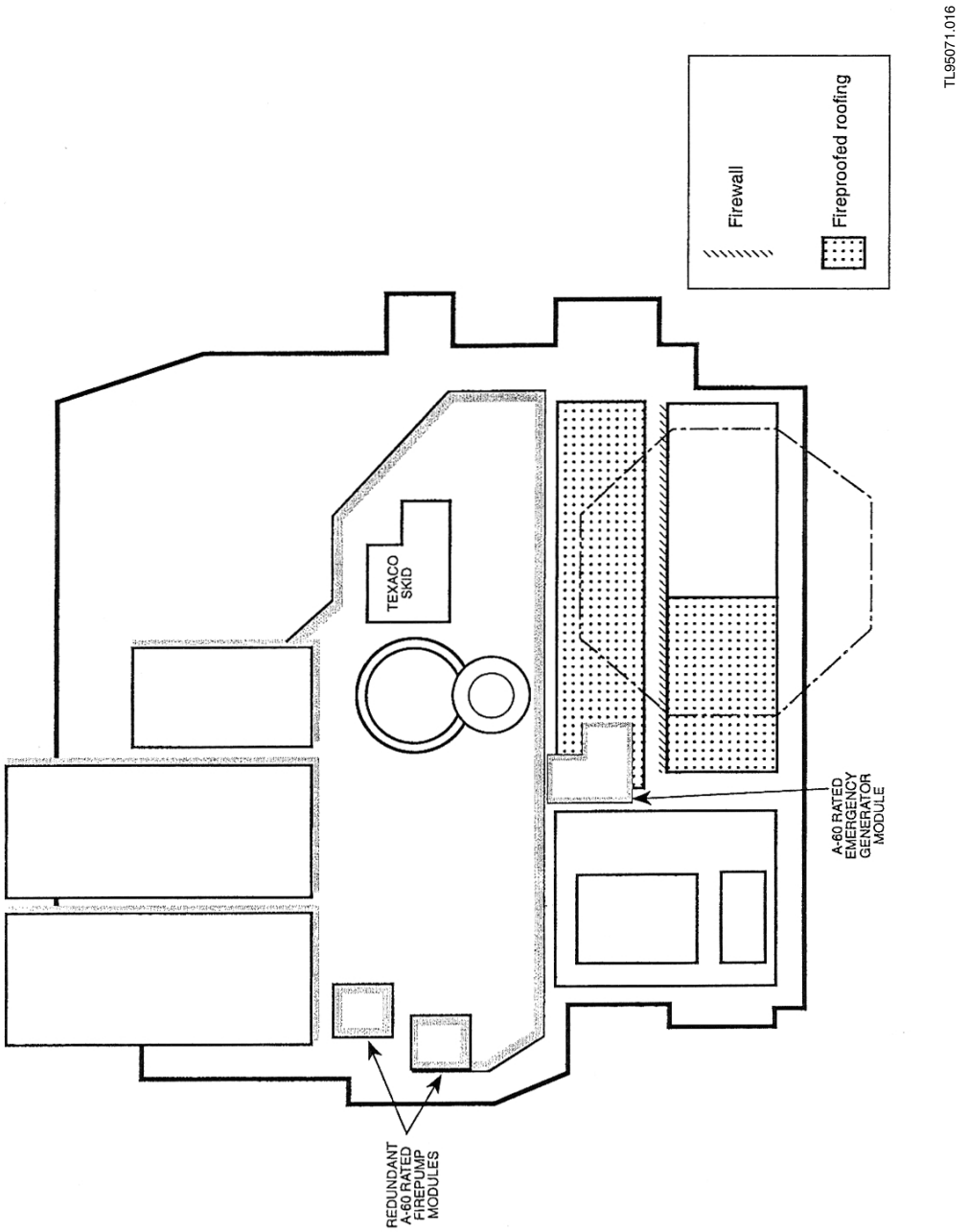


Figure 4.2 Main Firewalls and Fireproofing (2)

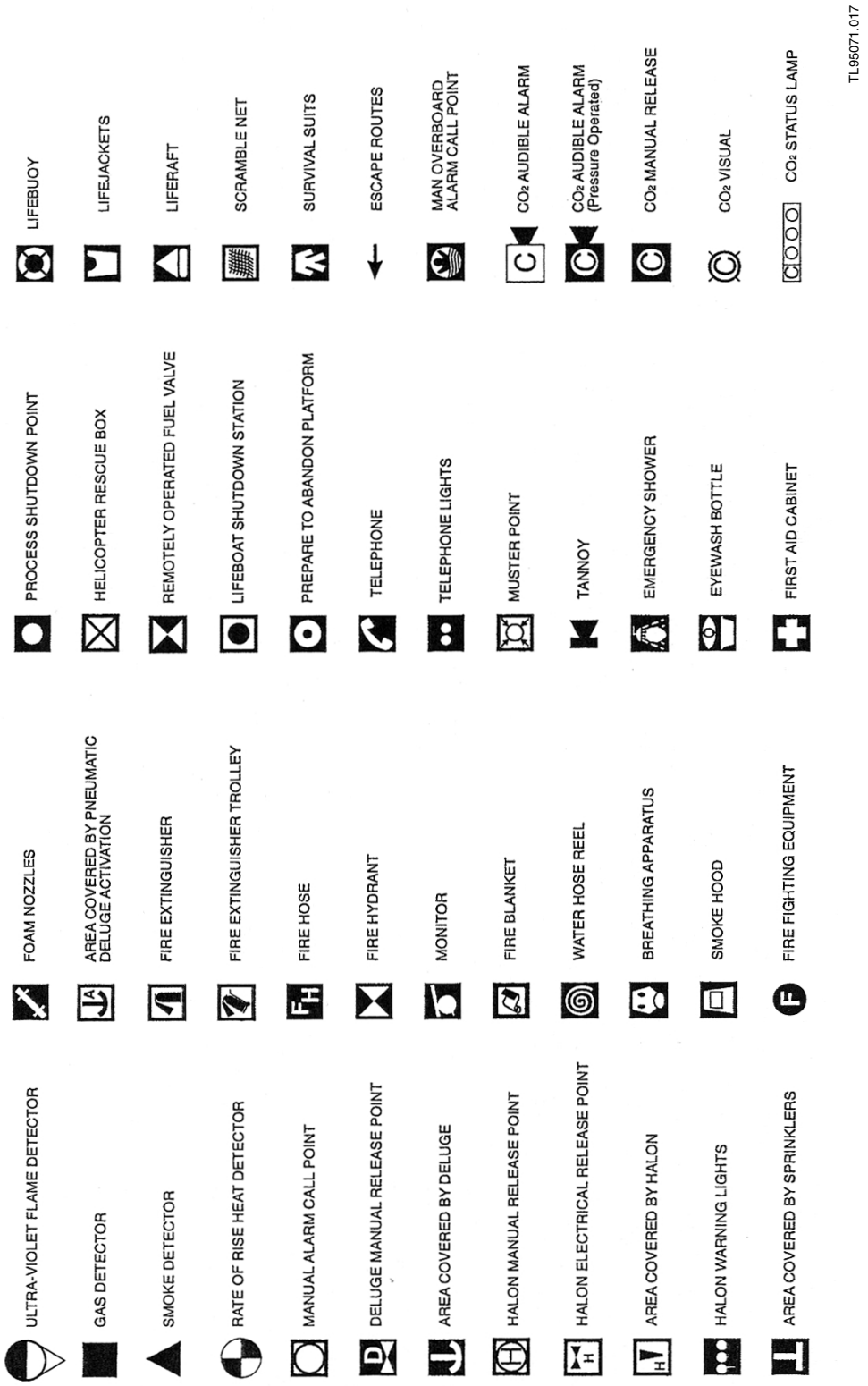


Figure 4.3 Safety Systems – Symbols

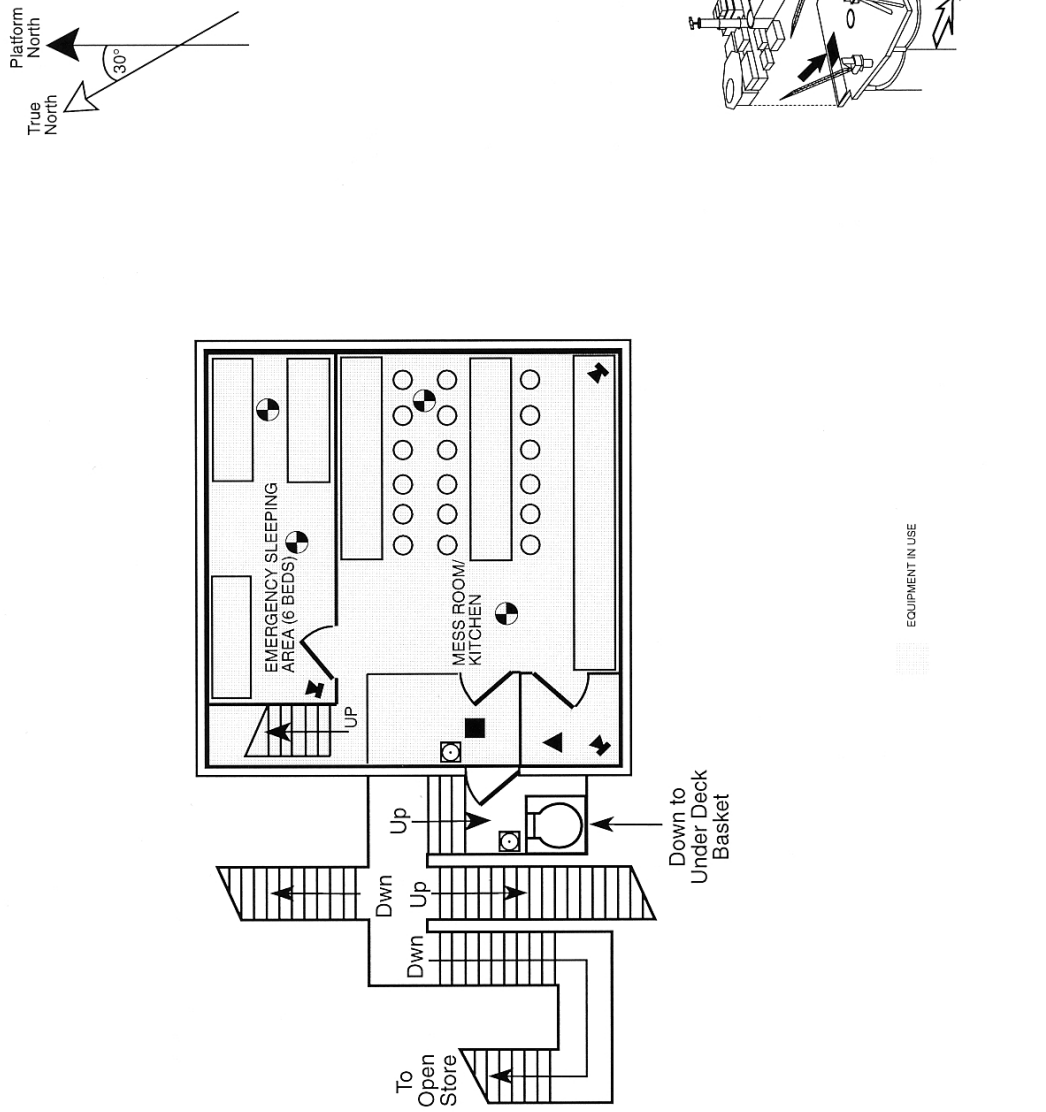


Figure 4.4 Safety Systems – Accommodation – ELQ – Cellar Deck Level

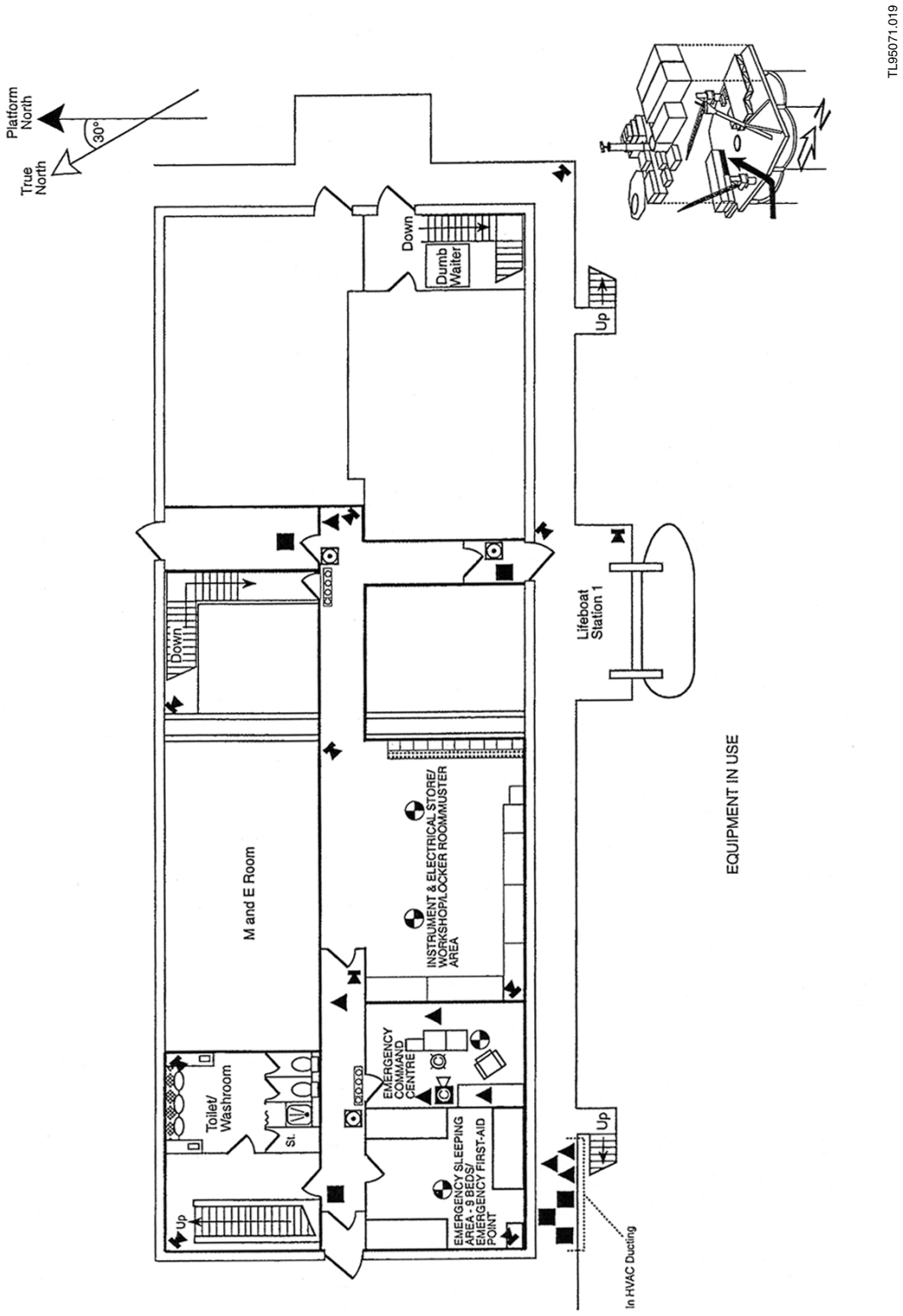


Figure 4.5 Safety Systems – Temporary Refuge (ELQ – Level 1)

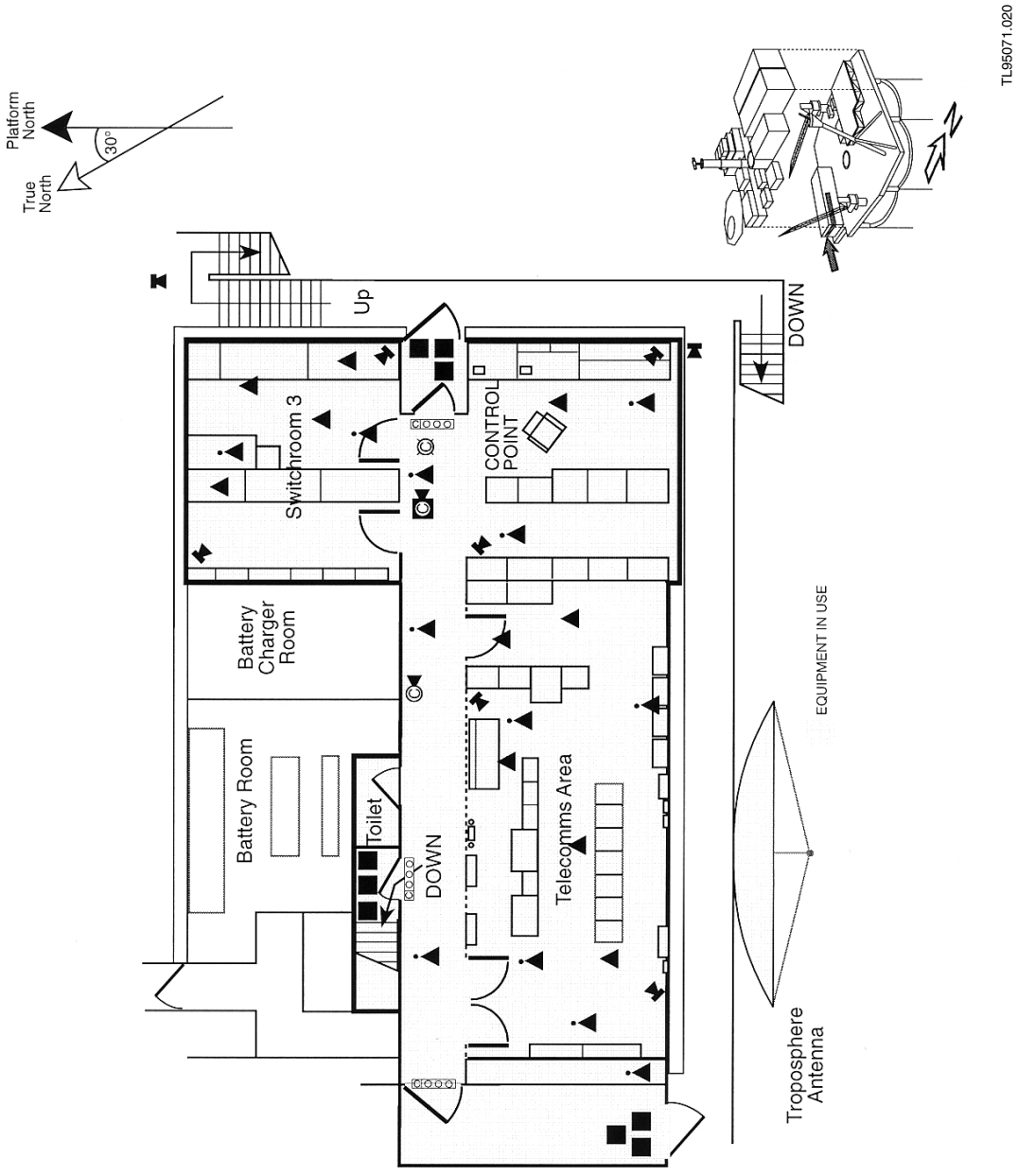


Figure 4.6 Safety Systems – Control Area ELQ – Level 3

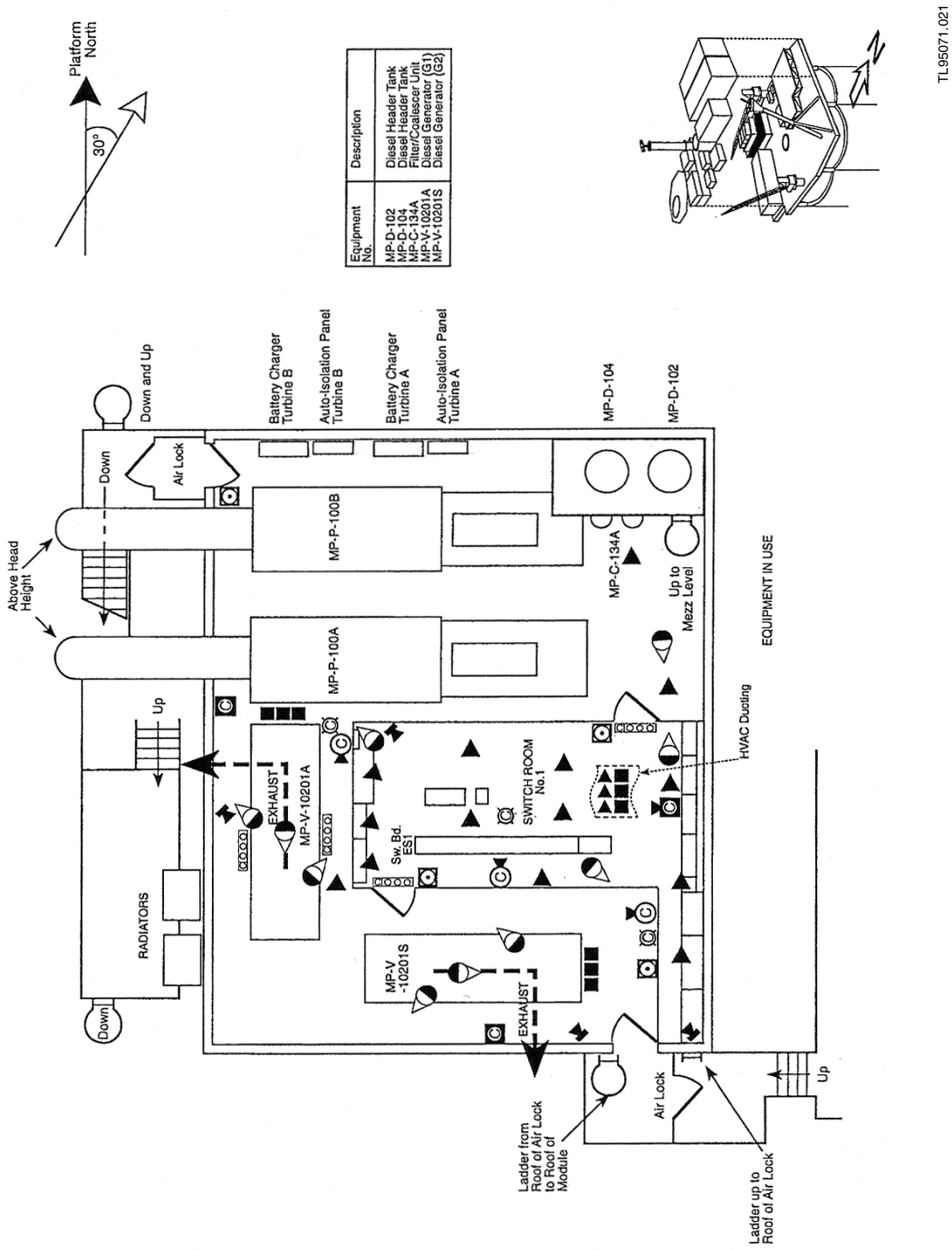


Figure 4.7 Safety Systems – Generator Area/Switchroom 1

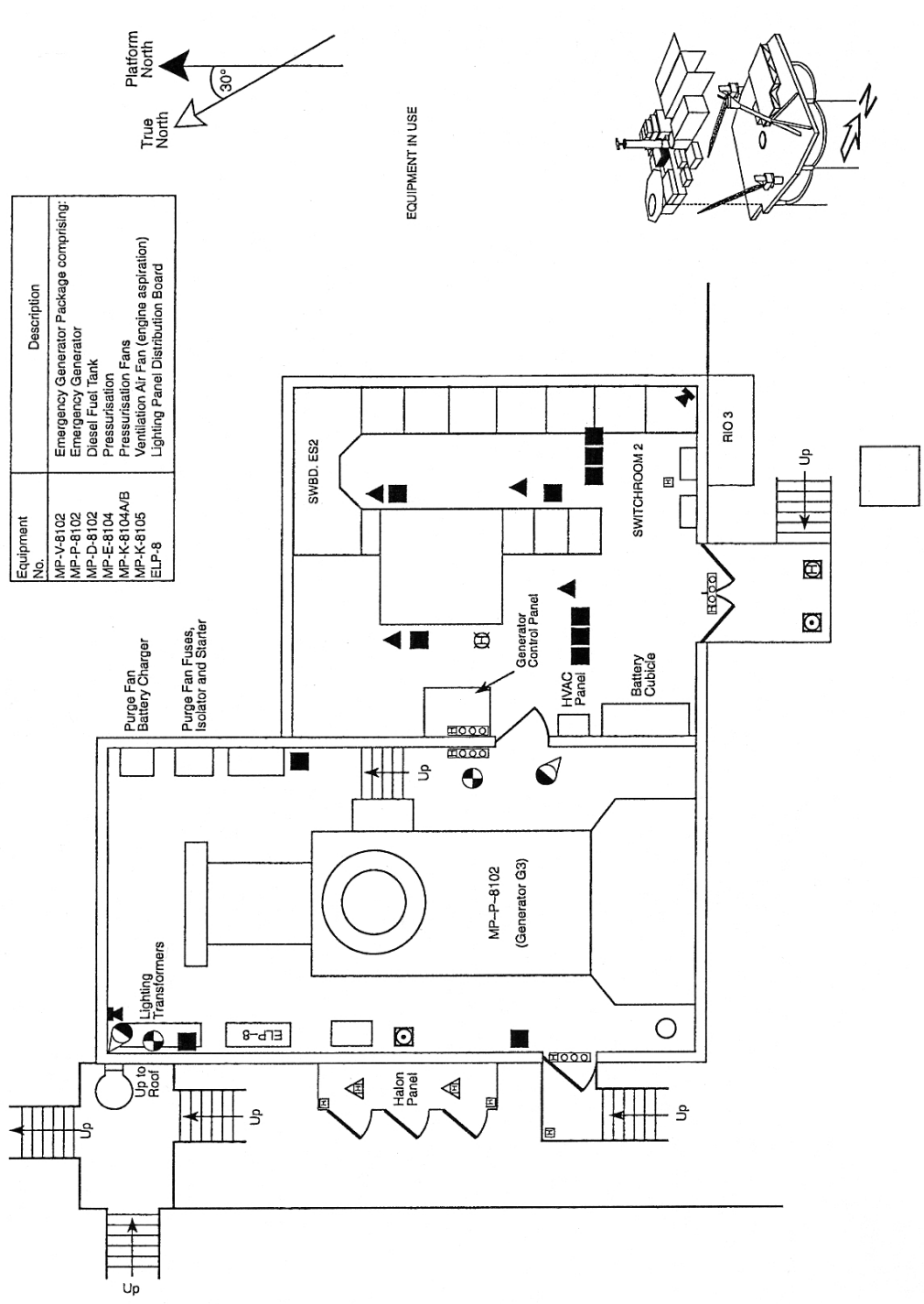


Figure 4.8 Safety Systems – Emergency Generator Module

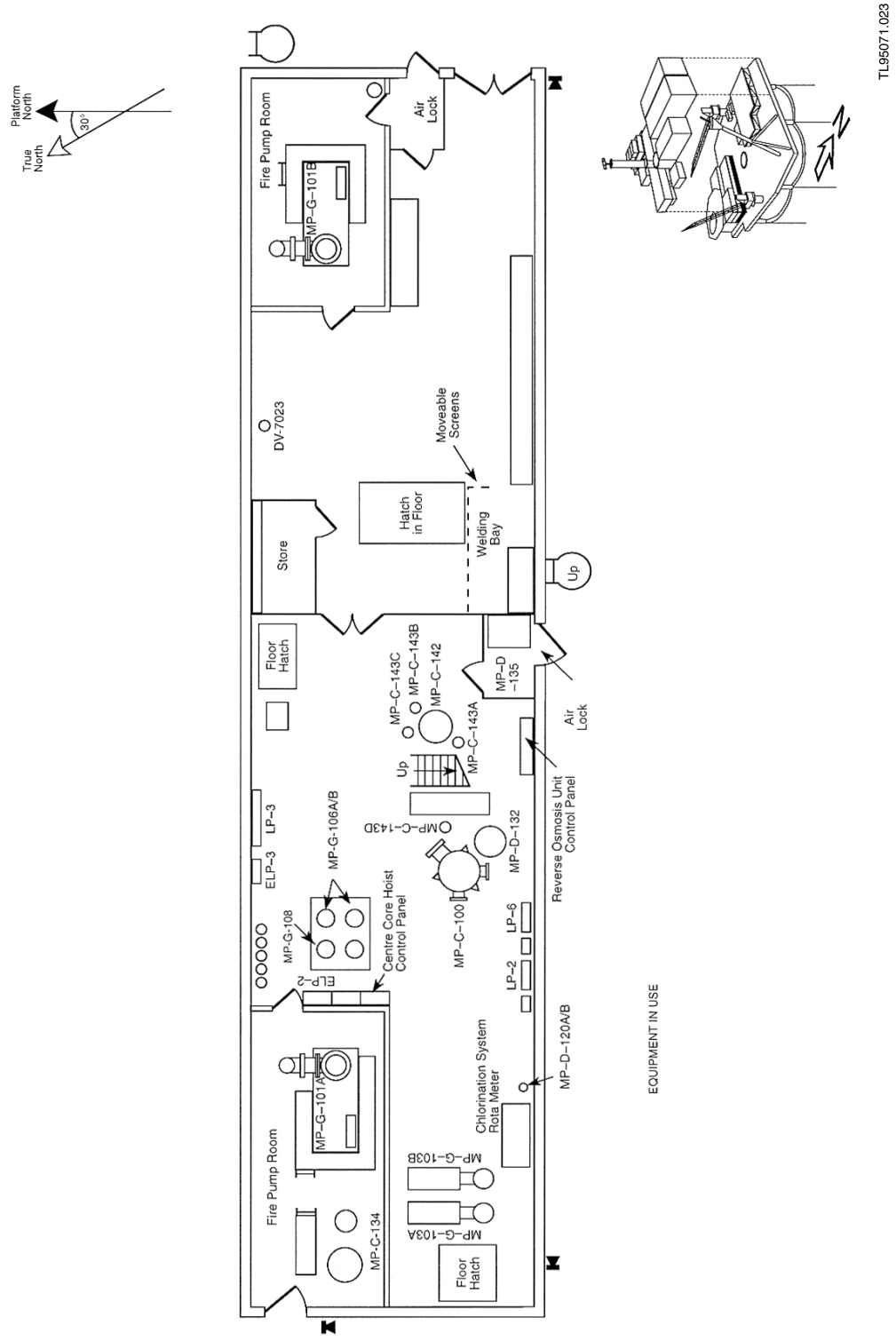
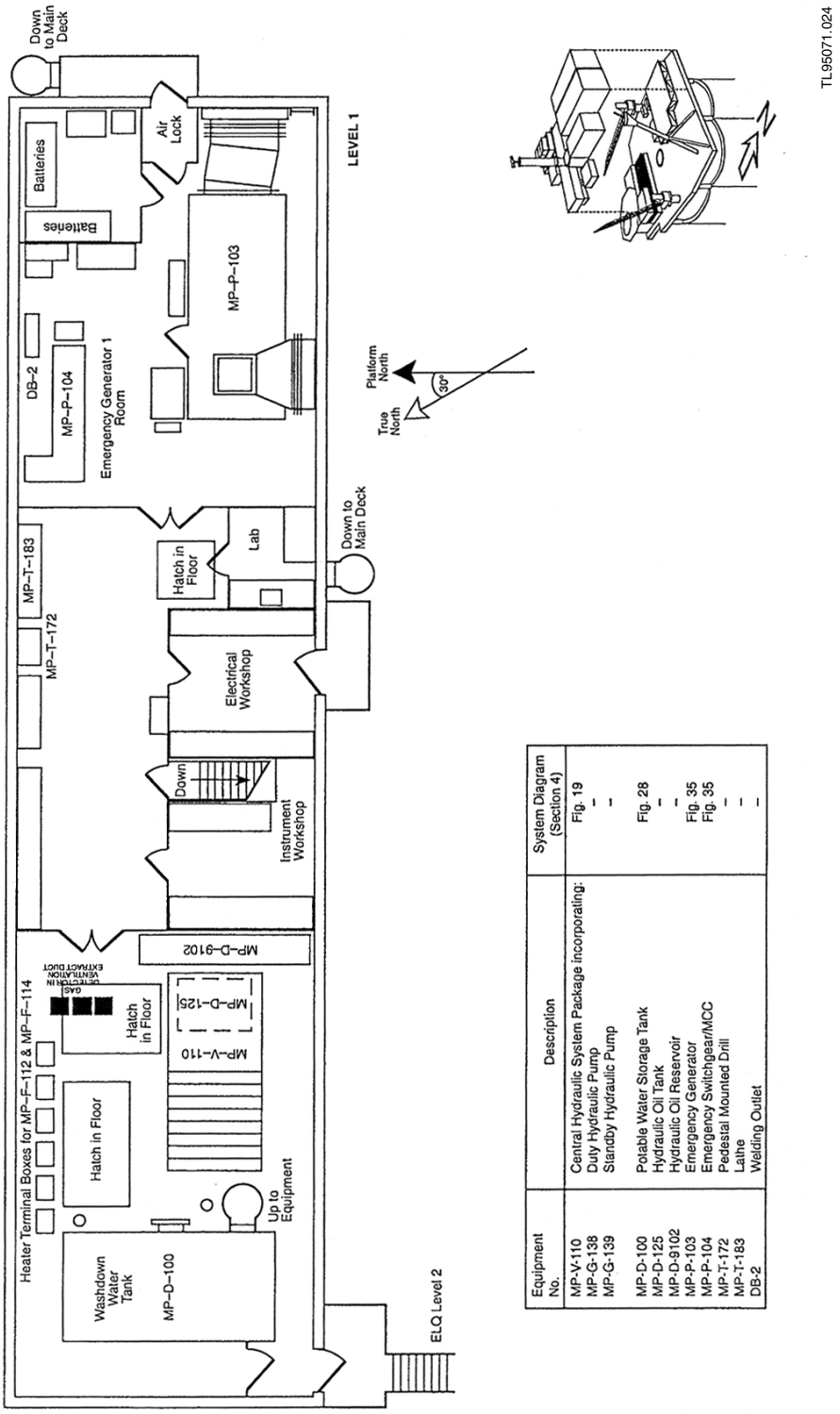


Figure 4.9 Safety Systems – Utilities Module – Level 1



Equipment No.	Description	System Diagram (Section 4)
MP-V-110	Central Hydraulic System Package incorporating:	Fig. 19
MP-G-138	Duty Hydraulic Pump	- -
MP-G-139	Standby Hydraulic Pump	
MP-D-100	Potable Water Storage Tank	Fig. 28
MP-D-125	Hydraulic Oil Tank	- -
MP-D-9102	Hydraulic Oil Reservoir	- -
MP-P-103	Emergency Generator	Fig. 35
MP-P-104	Emergency Switchgear/MCC	Fig. 35
MP-T-172	Pedestal Mounted Drill	- -
MP-T-183	Lathe	- -
DB-2	Welding Outlet	

Figure 4.10 Safety Systems – Utilities Module – Level 2

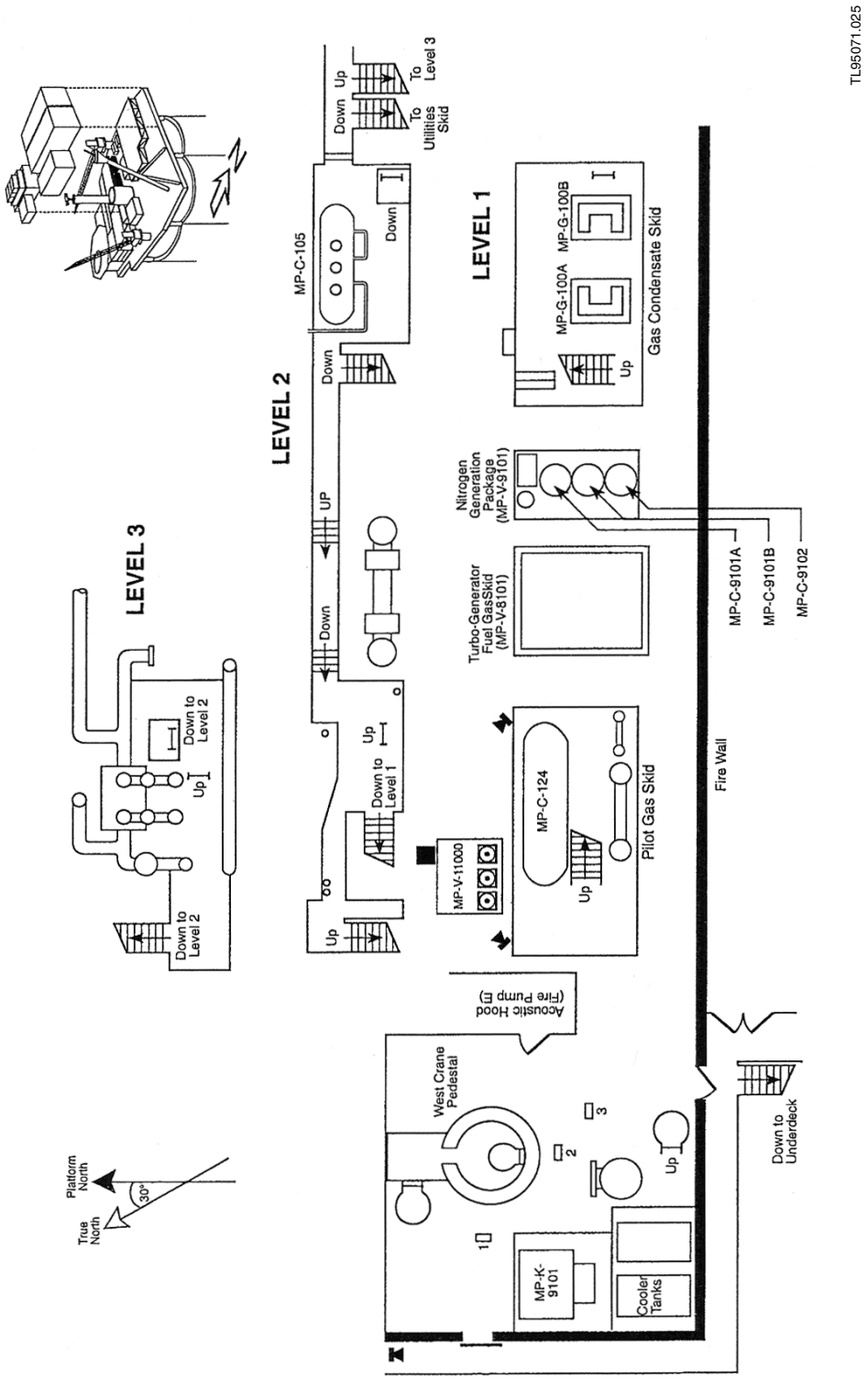


Figure 4.11 Safety Systems – Main Deck Skids – West

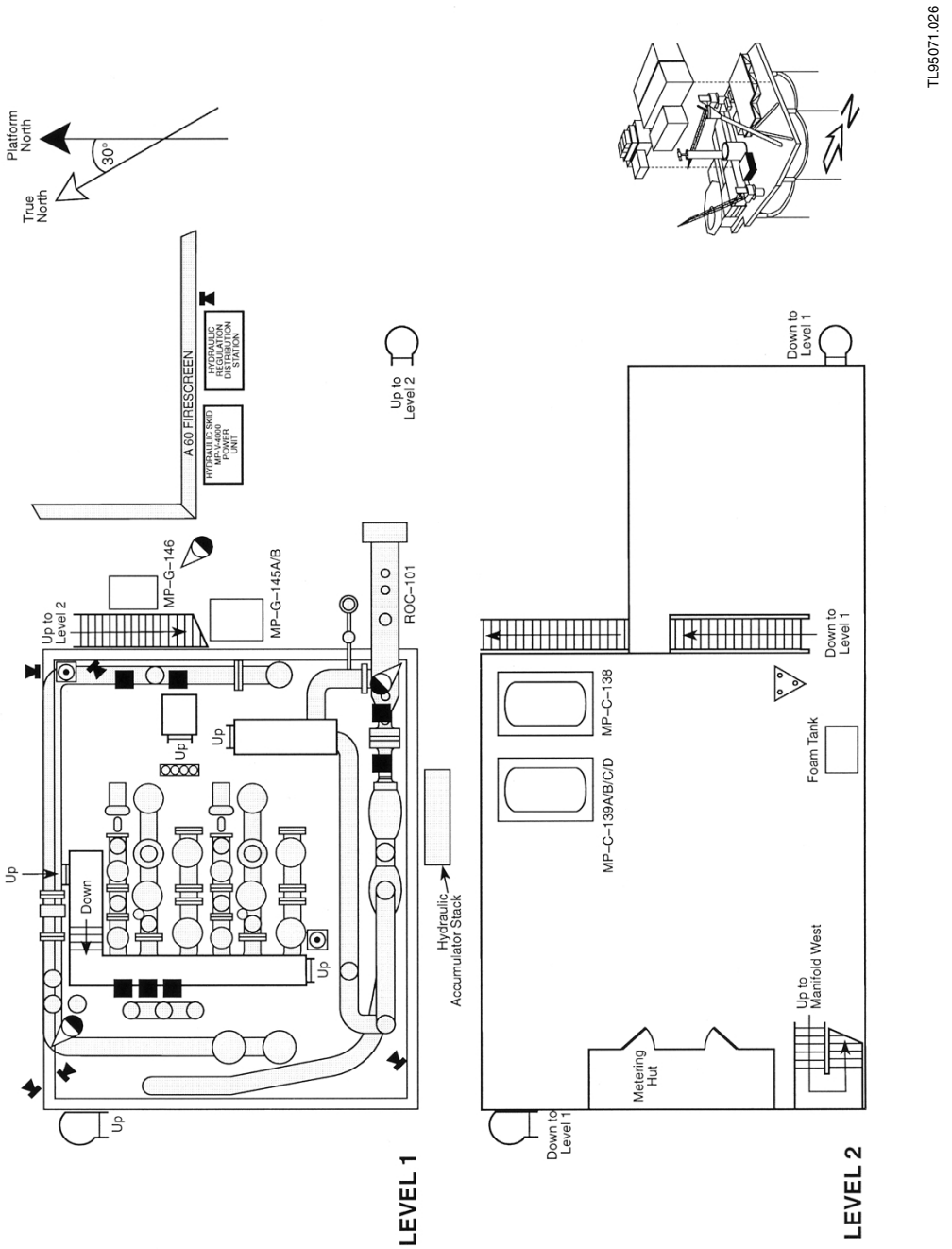


Figure 4.12 Safety Systems – Texaco Riser Module

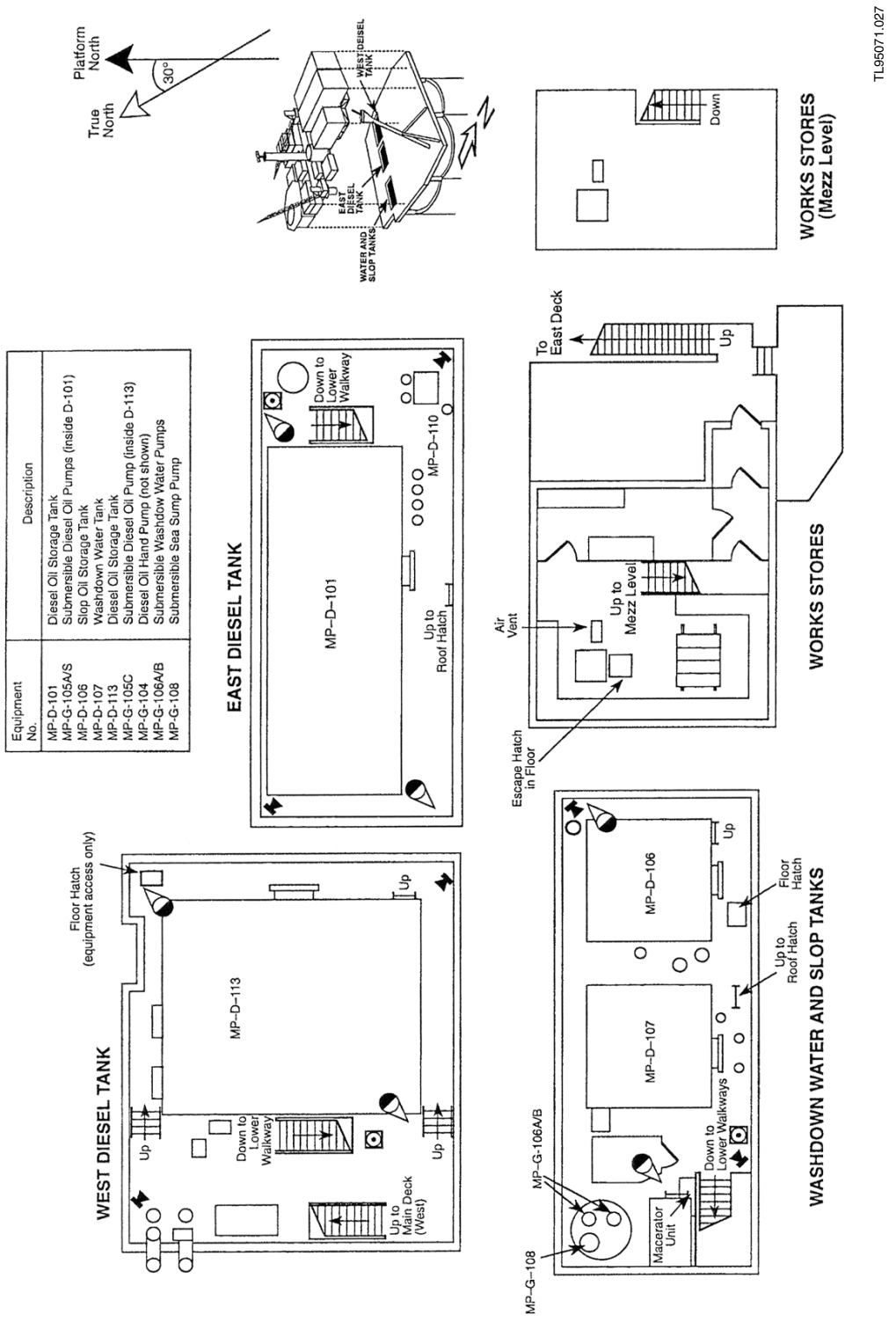


Figure 4.13 Safety Systems – Underdeck Detail

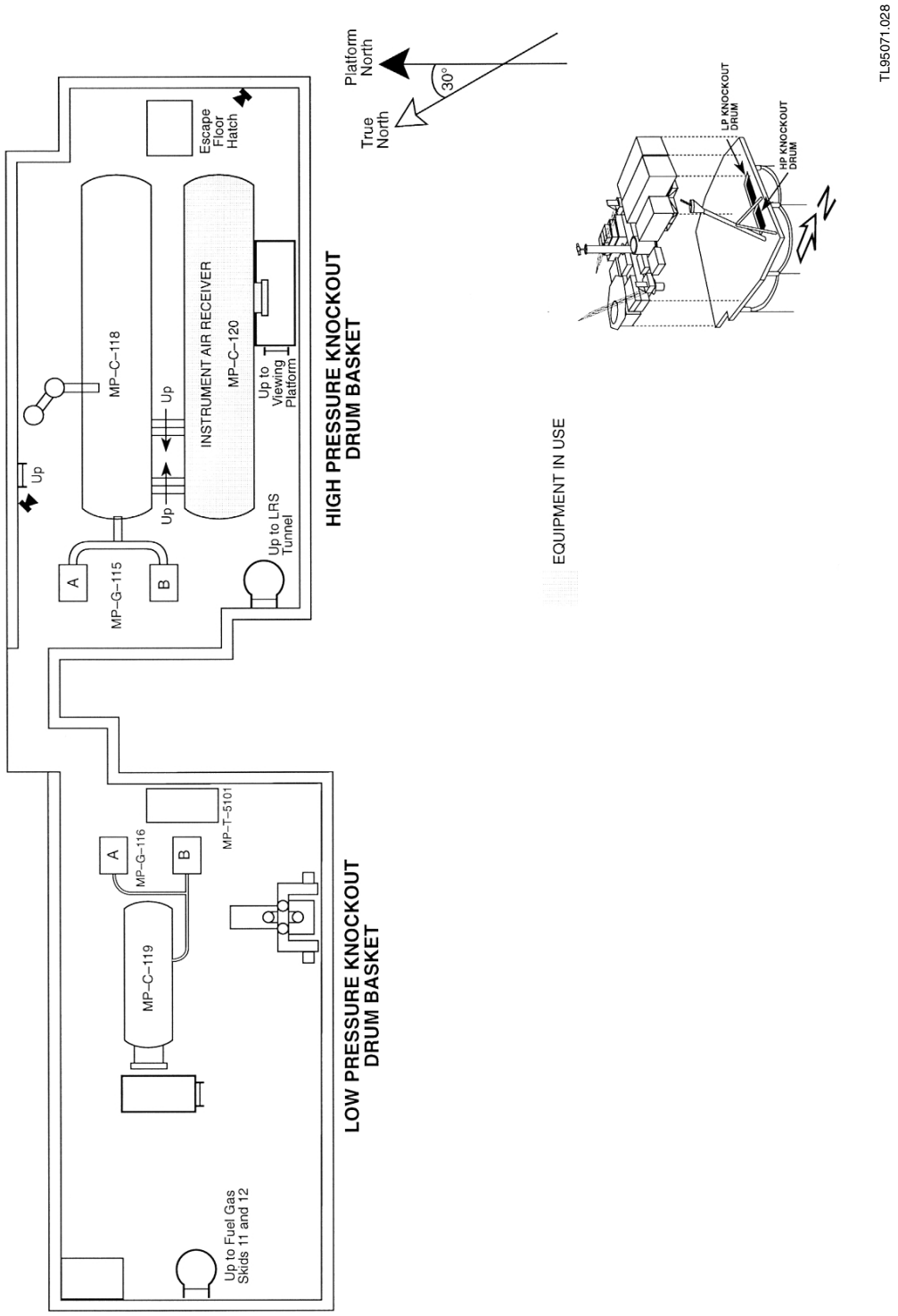


Figure 4.14 Safety Systems – North East Underdeck Detail

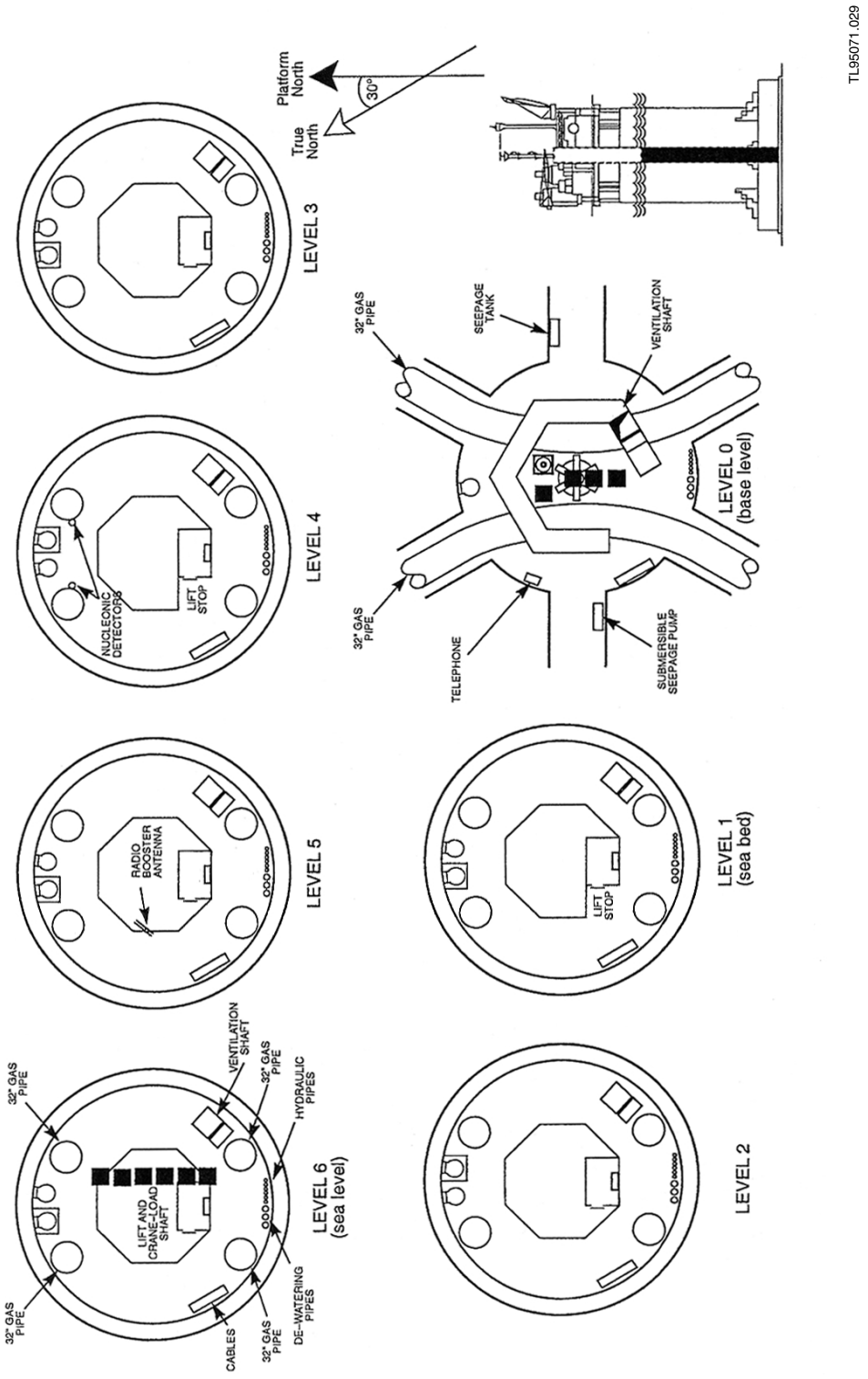


Figure 4.15 Safety Systems – Centre Core – Below Sea Level

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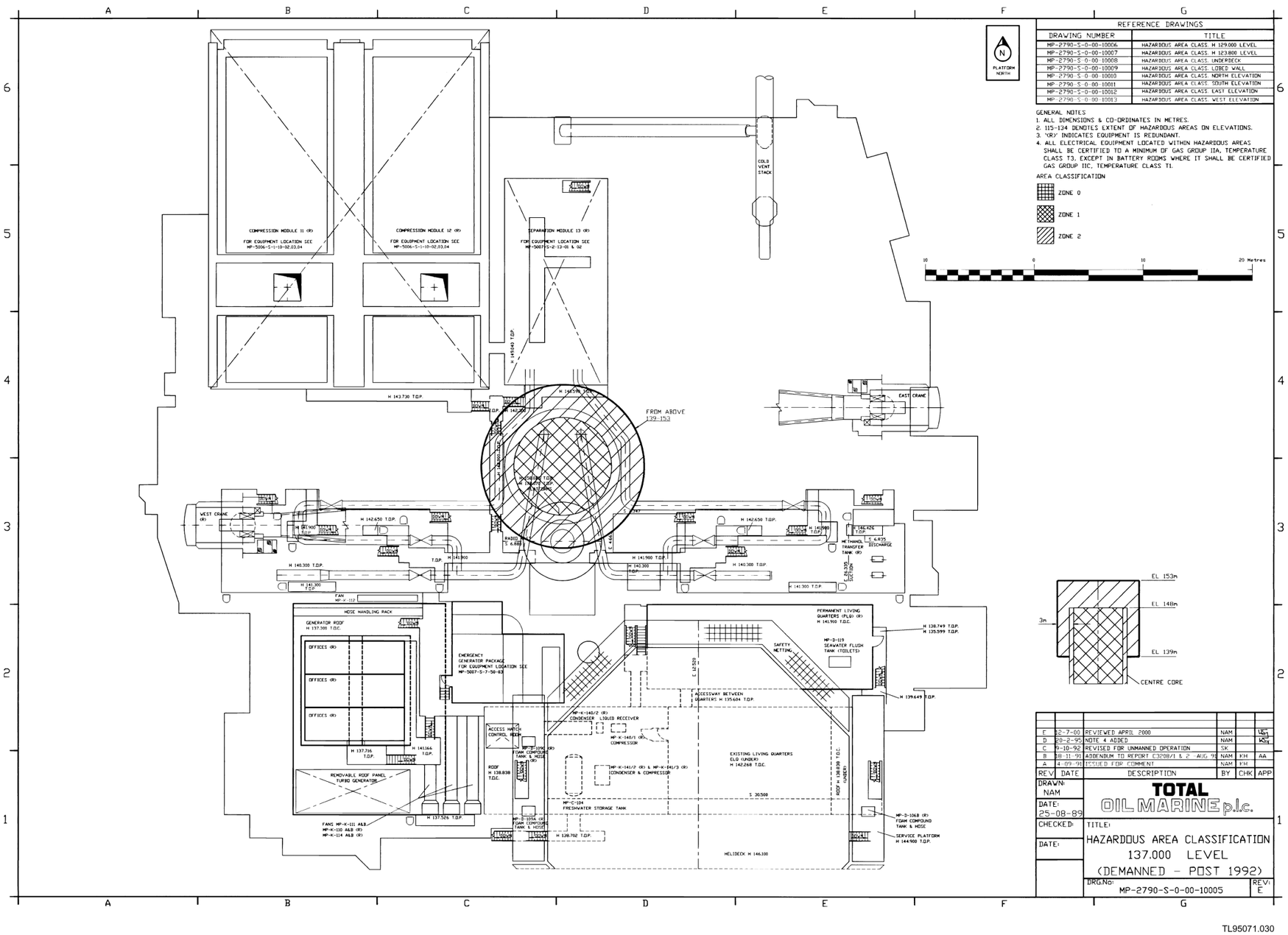

Figure 4.16 Hazardous Areas – 137,000 Level

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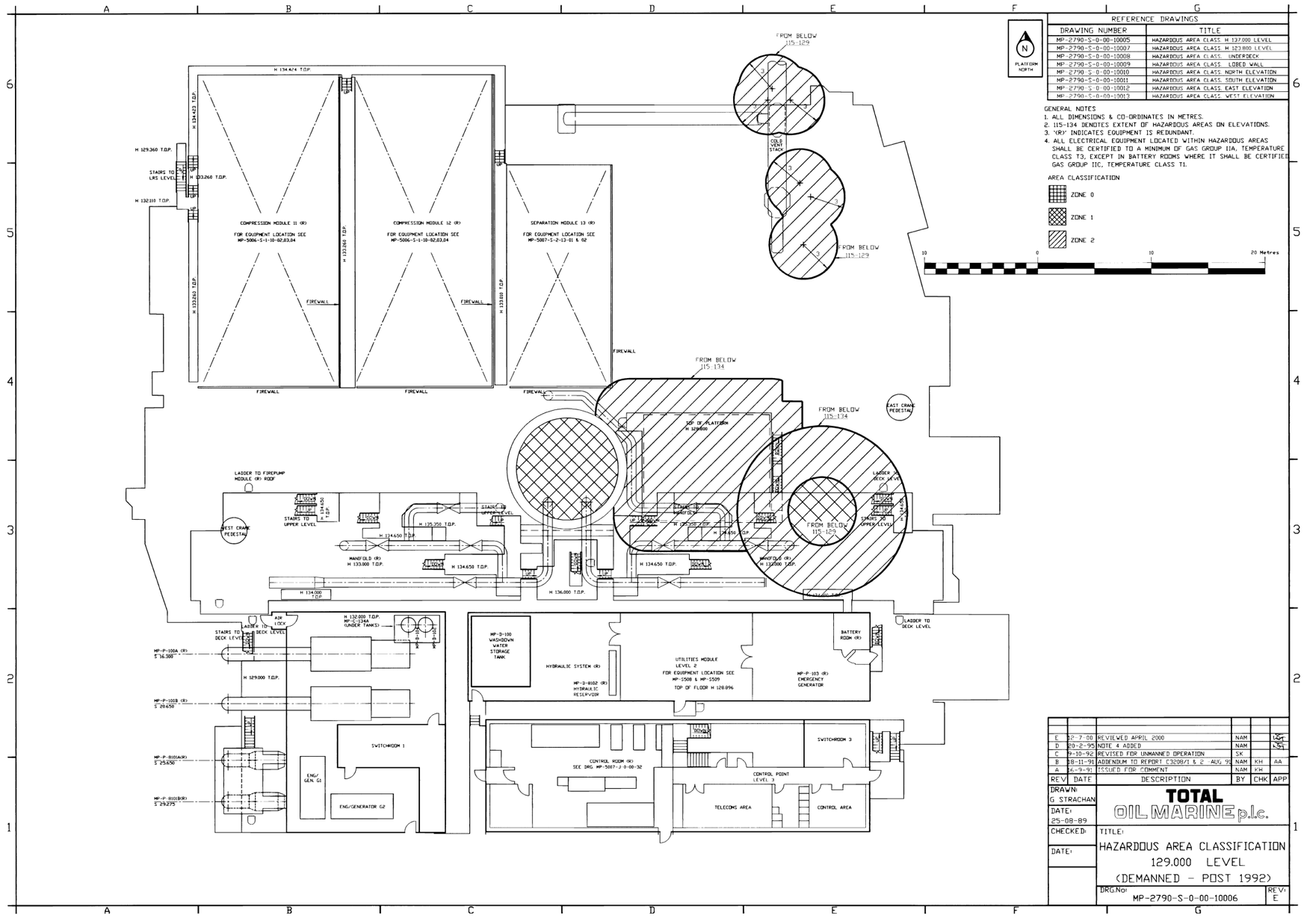

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Figure 4.17 Hazardous Areas – 129,000 Level

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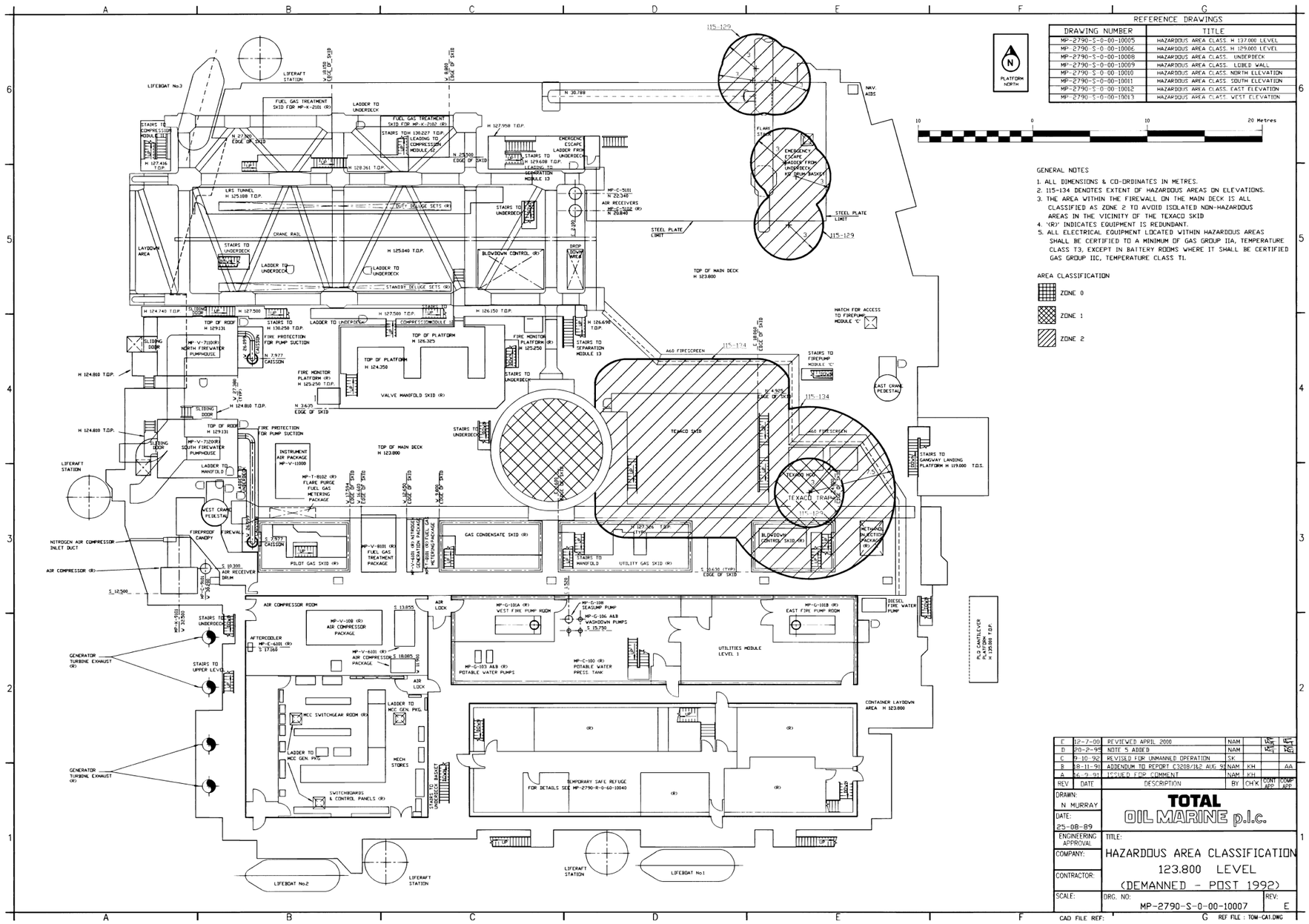

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Figure 4.18 Hazardous Areas – 123,800 Level

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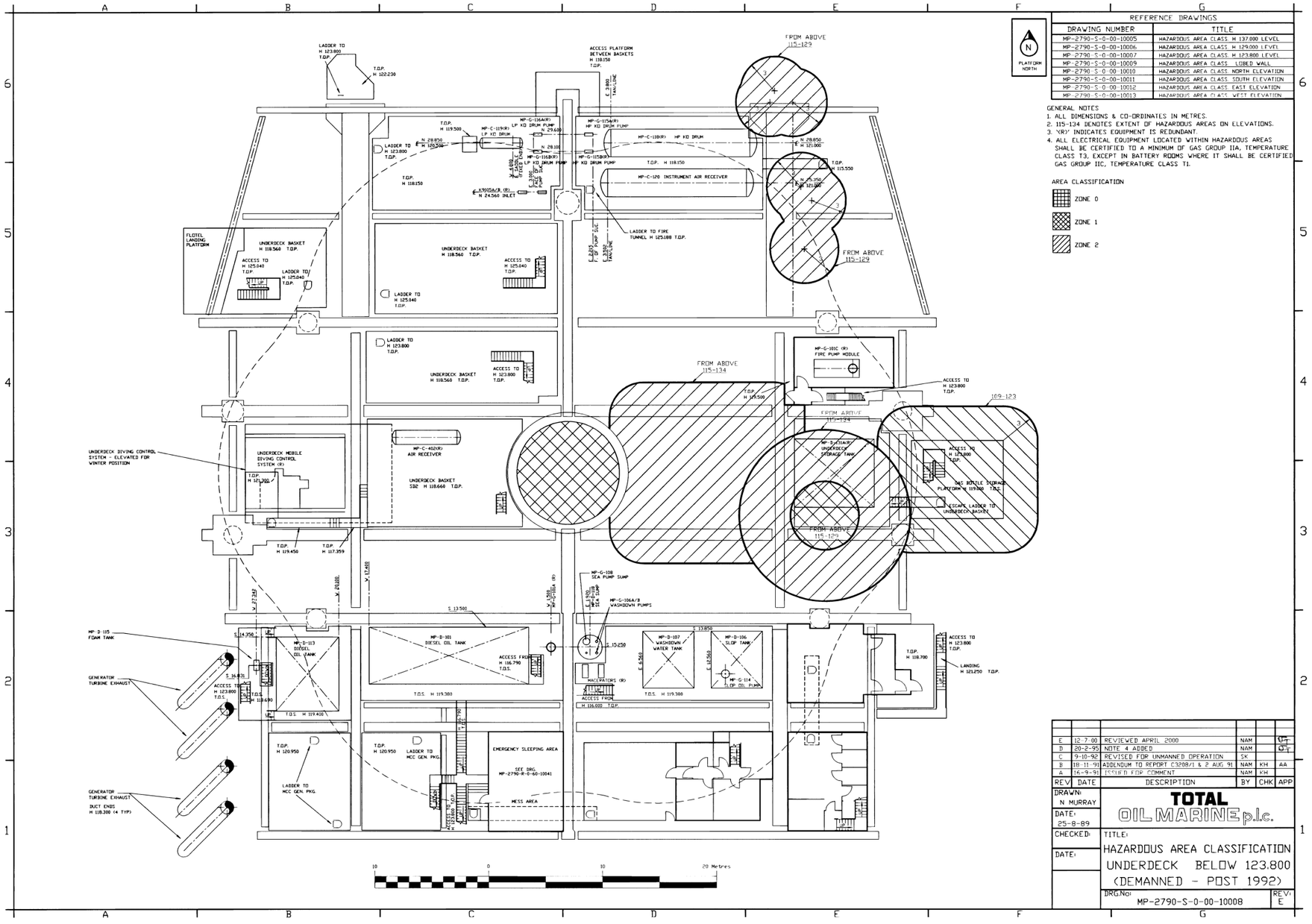

Figure 4.19 Hazardous Areas – Underdeck Below 123,800 Level

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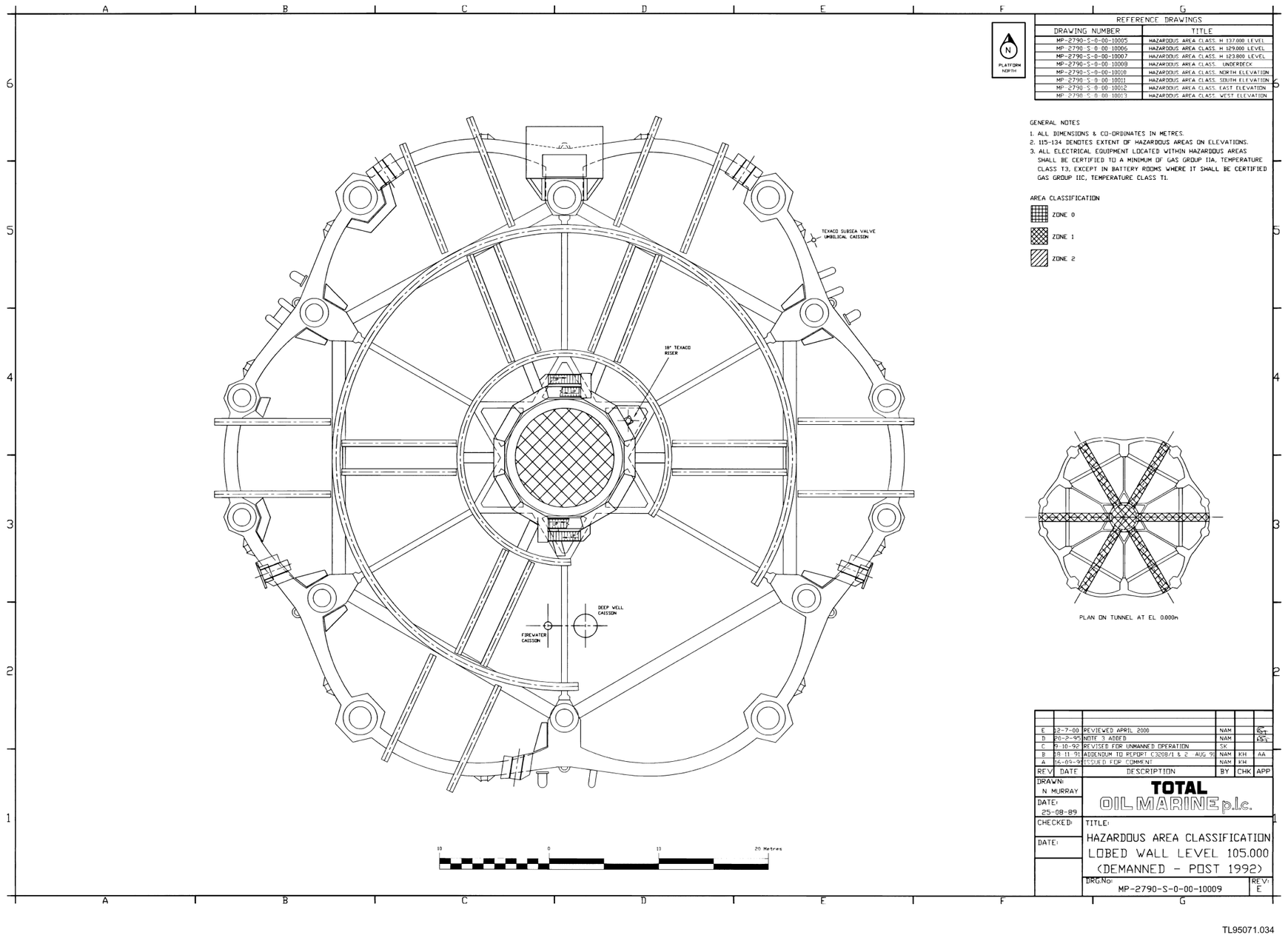

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Figure 4.20 Hazardous Areas – Lobed Wall 105,000 Level

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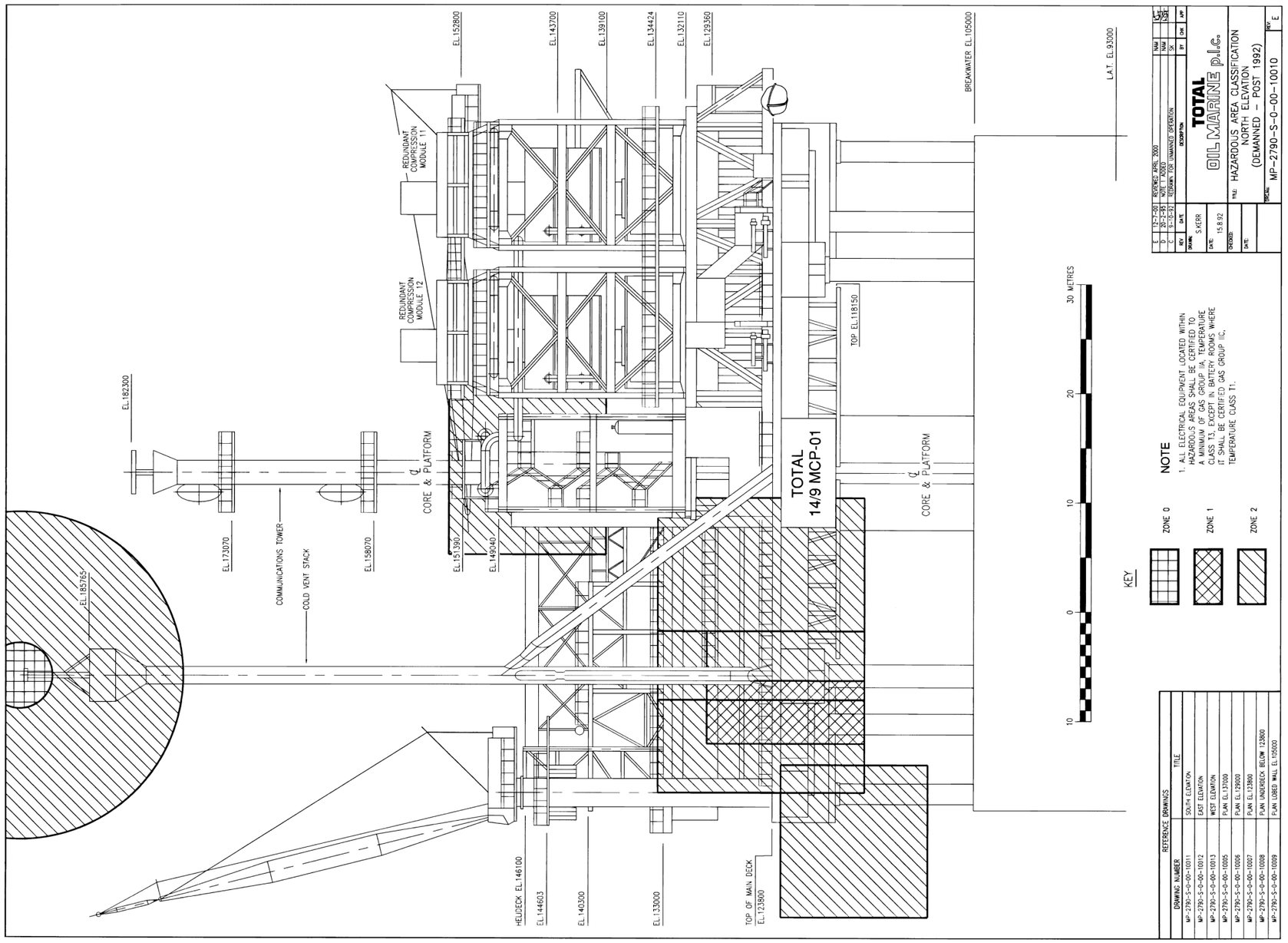

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Figure 4.21 Hazardous Areas – North Elevation

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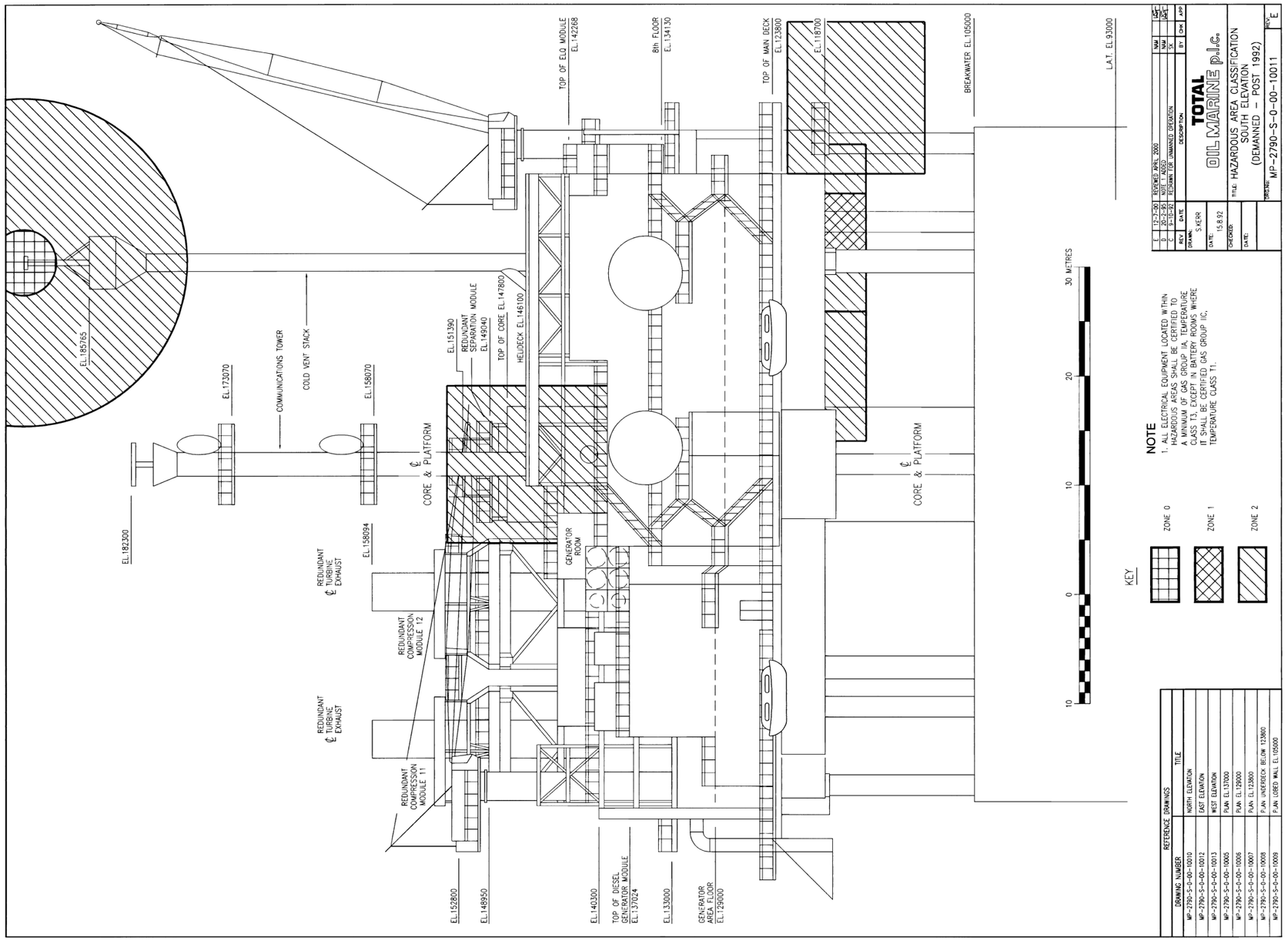

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Figure 4.22 Hazardous Areas – South Elevation

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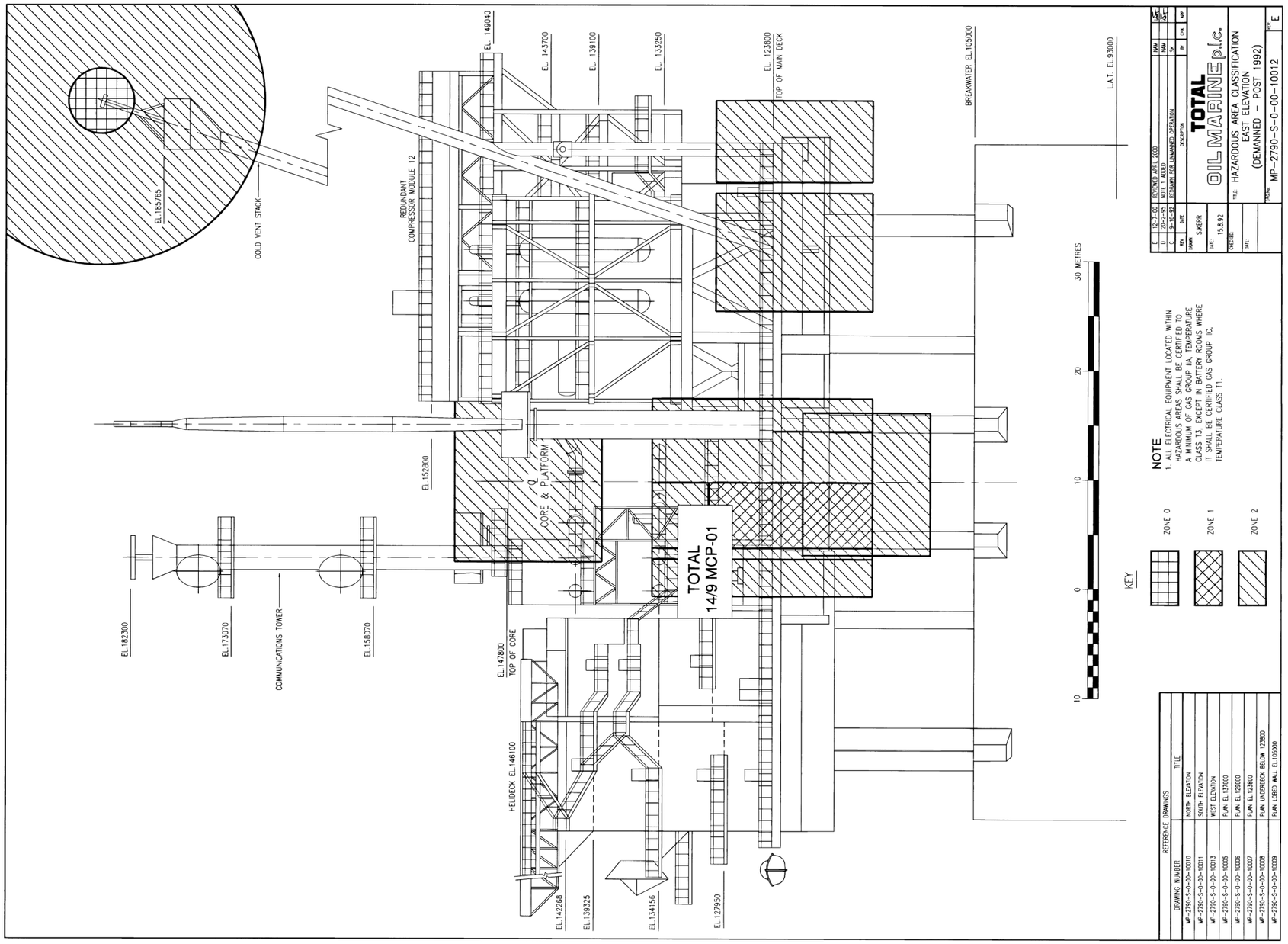

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Figure 4.23 Hazardous Areas – East Elevation

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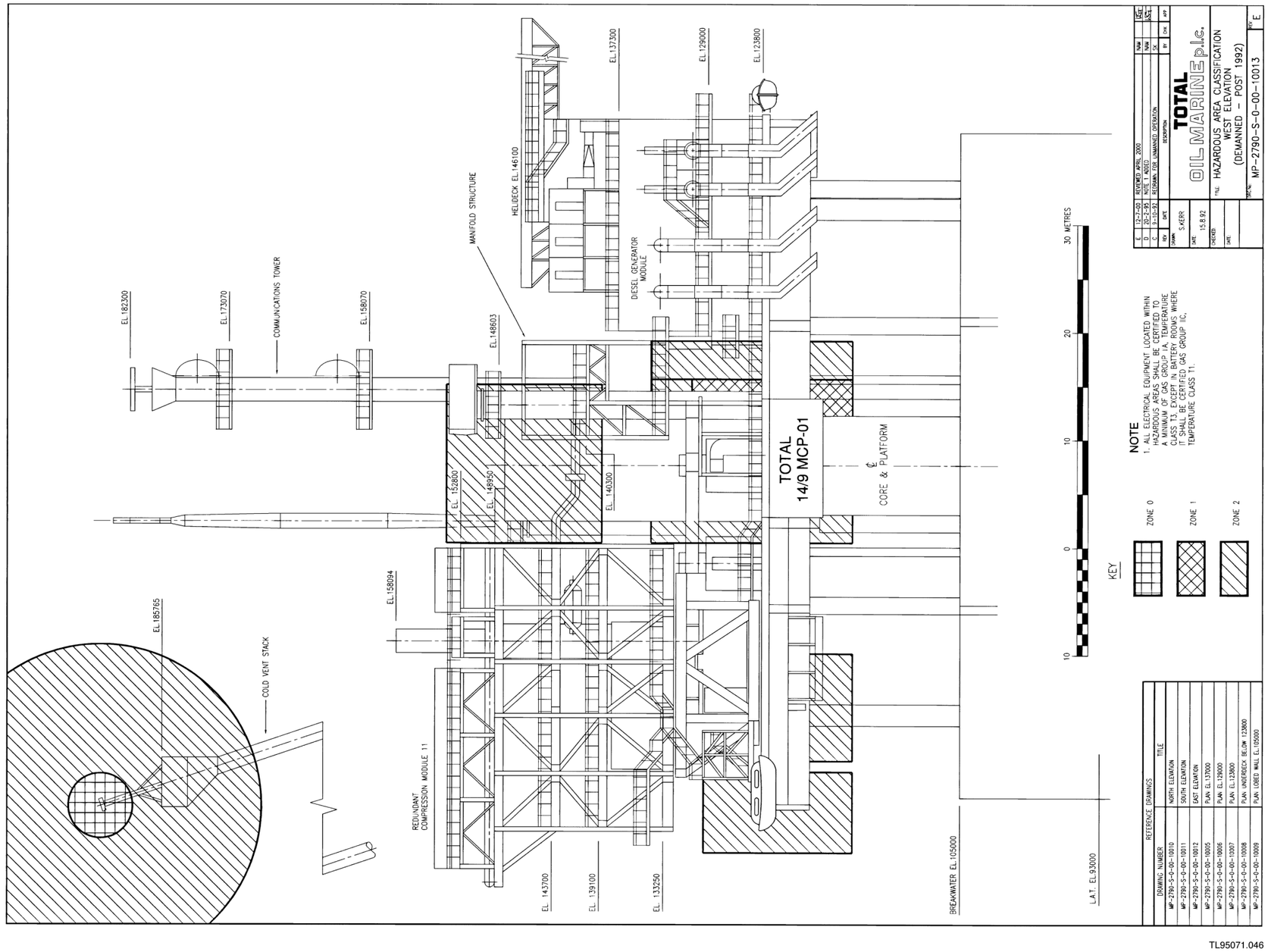

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Figure 4.24 Hazardous Areas – West Elevation

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1.0 INTRODUCTION

The diesel oil system is required for bulk storage and supply of diesel oil as fuel for the platform power generators, washwater pump and any portable diesel driven equipment brought onboard during the manned periods.

The system equipment includes bulk storage tanks, transfer pumps, filter coalescers and header tanks. The storage tanks location is shown in Figure 5.1.1 and the filtration and header tanks location in Figure 5.1.2.

1.1 System Operation

Diesel fuel transfer between storage and header tanks for G1 and G2 generators in an intermittent operation using two of the three transfer pumps, one in operation, and one on standby. Supply to G1 and G2 power generators is by gravity feed on a continual basis from header tanks. Supply to G3 generator internal tank is via the third diesel transfer pump, which is started and stopped from the DCS control. Replenishment of diesel stock in the storage tanks and replacement of the diesel coalescer filters is a manual operation requiring onboard intervention.

1.2 System Control

Two of the diesel transfer pumps (G105A and G105S) operate on demand from high/low levels in the diesel distribution system header tanks. The third (G105C) is started from the DCS with a 1-hour timer to stop. Alarm and trip signals are available on the distributed control system in MCP-01 control point within St Fergus control room.

2.0 DESCRIPTION

2.1 Process Description

The diesel storage tanks are charged as required by bunkering from supply vessels at approximately 3-monthly intervals. In order to minimise the hazard potential and still provide adequate autonomy of supply, the total stored inventory is nominally limited to a maximum of 110m^3 but additional capacity, allowing up to 180m^3, is available and is used to facilitate extended periods between visits during the winter. At the east supply station, a 4in flexible hose with self-sealing couplings is used to connect the supply boat to the platform. The west supply station is not currently fitted with hose, as this cannot be reached using the platform crane. The supply stations are interconnected with supply lines feeding both storage tanks. Normally bunkering will be via the east hose landing station. The west hose landing station can be reinstated, if needed, to facilitate bunkering from the flotel during major maintenance periods. Diesel fuel from storage tanks D101 and D113 is then transferred, on demand, to the header tanks D102 and D104 by transfer pumps G105A/C which operate in an automatic duty/standby basis, and manually to G3 using pump G-105S with DCS control.

The diesel is cleaned by two filter coalescer units (C134A/B) which were originally configured to operate in parallel on a duty/emergency/standby basis requiring manual changeover. A modification was made to facilitate remote fuelling of G3 and subsequently they are configured so that C134A serves fuel to G1 and G2, whilst C134B is dedicated to the G3 supply. Each unit consists of an inlet prefilter to take out solid particles and a coalescer which reduces the water content.

After filtration, the diesel passes from C134A to the header tanks from where it is gravity fed as follows:

- Power Generator G1 Automatic Fill
- Power Generator G2 Automatic Fill

The feed to power generator G3 is to an internal tank (D8102) from which the machine is fed via an integral lift pump.

The remaining consumers supply is by manual fill operation, which requires re-routing by valves and manual operation of a transfer pump.

- East hose station for deck users
- West hose station for deck users
- Washwater pump from east hose station

2.2 Process Control

The diesel transfer pumps G105A/C/S take their electrical supplies from switchboards ES1 and ES2. Each starter cubicle is fitted hand/off/auto and duty/off/standby selector switches and local field start/stop units are located at the pumps. For normal operation, the pumps will be selected auto/duty.

The pumps G105A and G105C are started by low level switch LLC1-310 located in the header tank and stopped by high level switch LHCO-310. Duty/standby of the two pumps is selected from the Fisher control system.

Pump G105S is started manually from DCS and is fitted with a one hour timer to fill G3 tank.

The pumps are protected against dry running by low level switches LLCO-307 and LLCO-309 located in the storage tanks and against high discharge pressure by high pressure trips PAH-361, PAH-424, PAH-360 on each pump discharge.

2.3 Alarms Trips

TAG NO	FUNCTION/LOCATION	SP	ACTION/REMARKS
LLCO-307	Low Low Level in Storage Tank D101		Trip Pump
LLCO-309	Low Low Level in Storage Tank D113		Trip Pump
PTAHH-361	Pump G105A High Discharge Pressure		Trip Pump
PTAHH-424	Pump G105C High Discharge Pressure		Trip Pump
XA-10704	Electrical Fault on Pump G105A		Trip Pump
XA-10714	Electrical Fault on Pump G105C		Trip Pump
XA-10709	Electrical Fault on Pump G105S		Trip Pump
PDTAH-648	Filter Coalescer Unit C134A High Differential Pressure		Alarm Alarm
LAH-434	High Level in Header Tank D102		Alarm
LAL-311	Low Level in Header Tank D102		Alarm

2.4 Major Equipment Descriptions

2.4.1 Storage Tanks D101/D113

Storage Tank D101 has a working capacity of 155m3 and is equipped with two level gauges LG-326A/B, a level indicator LU-333 and level transmitter LT-333 for monitoring tank level. Storage tank D113 has a working capacity of 79m^3 and is equipped with two level gauges LG-327A/B, a level indicator LI-334 and Level Transmitter LT-334 for monitoring tank level. The two tanks are interconnected by a common vent line, header and consumer day tanks overflow return line and a balance line fitted with two free fall fir valves operated by remote wire pull release at main deck level.

Both tank overflow and drain lines are routed to the sea sump.

2.4.2 Header Tanks D102/D104

The two-header tanks have a total working capacity of 3.4m^3. The tanks are interconnected by common drain pipework which is routed to the main storage tanks via a remote operated dump valve. An overflow from D102 ties in to the drain line downstream of the dump valve. A supply line to consumers is also routed from D102.

2.4.3 Transfer Pumps G105A/C/S

The pumps are vertical shaft driven suspended type submerged below the liquid low level with the motor mounted on the top of the tank. G105A and G105S are mounted on D101, G105C is mounted on D113. The pumps are centrifugal type and are rated for delivery of 95 litres/minute for a differential head of 17 metres, corresponding to charging D102/D104 at the correct rate. The additional pressure head in charging G3 tank (D8102) means that this delivery rate is reduced in that service.

2.4.4 Filter Coalescers C134A/B

The purpose of the unit is to improve the quality of the diesel fuel prior to supplying the various consumers. It is a two stage containing vertical cartridge type removable filters to collect any solid particles in the diesel.

The second stage contains vertical cartridge type removable coalescer filters which knocks out any entrained water in the fuel and also any salt. automatic diesel/water interface level control is via LCV-428/LCV-429 which discharges via the effluent drain system to the sea sump. the interface can also be checked via level gauges LG-422/LG-423. Differential pressure across the complete unit C134A/C134B is monitored by a differential pressure transmitter incorporating a high alarm.

C134B is used to supply G3 and for deck users. Differential pressure monitoring of this unit is local only via PDI-650 and PDI-651 across the first and second stages.

3.0 SYSTEM STARTUP

3.1 Storage Tank Filling

(1) Check tanks D101 and D113 drain valves are closed.

(2) Check tanks balance line valves are open.

(3) Check isolation valve at west hose station is closed.

(4) Request supply boat to come to east side of platform.

(5) Connect hose end to crane hook and lower to supply boat.

(6) Request confirmation from supply boat to hose connected to fill point.

(7) Open isolation valve on supply line to D101.

(8) Open isolation valve on supply line to D113.

(9) Open isolation valve at east hose station.

(10) Request supply boat to commence pumping diesel.

(11) Monitor integrity of hose during transfer to ensure no leakage.

(12) Monitor tank levels and on approach to required level be prepared for shutdown.

3.2 Transfer to Header Tanks D102 and D104 via C134A

(1) Check route from transfer pumps G105A and C discharge to coalescer filter units and open all in line valves.

(2) Close drain valves on both coalescer filter unit, pre filter and coalescer filter.

(3) Open isolation valve upstream of LCV-428 on coalescer filter unit.

(4) Open inlet and outlet valves on coalescer filter unit.

(5) Open inlet and outlet valves on duty in line strainer and close drain valve.

(6) Open inlet valve to header tanks D102 and D104.

(7) Close drain valve on header tanks and crossover valve to other users.

(8) Close the isolator and select duty for either transfer pump - G105A on ES1 or G105C on ES2 (select ‘A’ duty, C standby on Fisher system).

(9) Switch control mode selector to auto and the pump will start.

(10) Monitor the header tank levels to ensure the pump stops when the level high cut out point is reached.

(11) Close the isolator and select standby and auto for the other transfer pump.

3.3 Supply to Continuous Diesel Consumers (G1 and G2)

(1) Open outlet valve from header tanks D102 and D104.

(2) Open fire valves on supply lines to power generators and G1 and G2 day tanks.

(3) Check route between header tanks outlet and power generators days tanks and open all in line valves.

Note: Day tanks will now fill by gravity feed from header tanks.

3.4 Supply to Intermittent Diesel Consumers and G3 via C134B

(1) Check route from transfer pump G105S to coalescer filter unit 'B' and open all inline valves.

(2) Close drain valves on coalescer filter C134B, prefilters and coalescer filter.

(3) Open inlet and outlet valves on coalescer filter C134B.

(4) Open valves on line to G3 fuel tank and ensure overflow is lined up back to main storage tank.

(5) Ensure drain valves are losed on G3 fuel tanks and crossover valves to D102 and D104 are closed.

(6) Close the isolator and select duty for G105S.

(7) Pump G105S can now be started from the Fisher system which starts a 1 hour run timer. This ensures that enough diesel is pumped into G3 tanks to maintain engine running if topped up on a daily basis.

(8) During the 1-hour run to top up G3, the deck user stations can be used by simply opening the local block valves and using the handfill nozzles.

4.0 SYSTEM SHUTDOWN

4.1 Storage Tank Filling

(1) When required level is reached in D113, close isolation valve on supply line.

(2) When required level is reached in D101, request supply boat to stop pumping diesel.

(3) Disconnect hose from supply boat fill point.

(4) Connect hose end to crane hook and lift to storage position.

Note: Hose contents to be drained to D101 during this operation.

(5) Close isolation valve on D101 supply line.

(6) Close isolation valve at east hose station.

4.2 Coalescer Filter Unit Cartridge Changeover

(1) Select duty transfer pump to G105A and C and fill header tanks.

(2) Top up G3 then shut down G105S.

(3) Close inlet and outlet hand valves on selected unit.

(4) Open pre filter and coalescer filter drains on isolated unit.

(5) Remove top covers and change filter elements in pre-filter and coalescer filter.

(6) Refit top cover.

(7) Close pre filter and coalescer filter drains.

(8) Open inlet hand valve and charge unit with diesel.

(9) Check top covers for leakage.

(10) Open outlet hand valve - unit now back in service on duty.

(11) Replace pump selection to auto.

5.0 REFERENCE DRAWINGS AND DIAGRAMS

- MP-2790-B-0-15-10049 P&ID Diesel Oil Storage and Pumps
- MP-2790-B-0-15-10050 P&ID Diesel Oil Filters and Day Tanks
- MP-2790-B-O-15-10051 Utility Flow Diagram Diesel Oil System

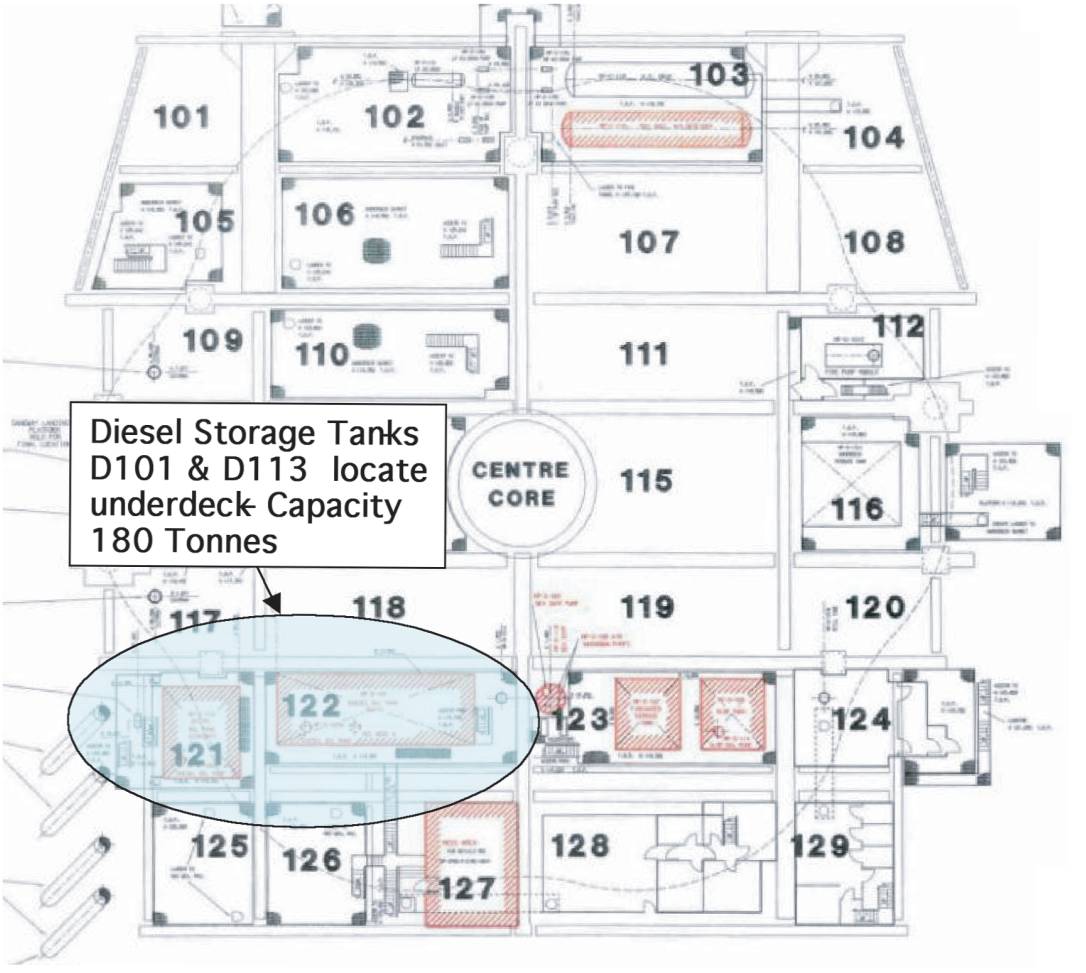

Figure 5.1.1 Location of Diesel Storage Tanks

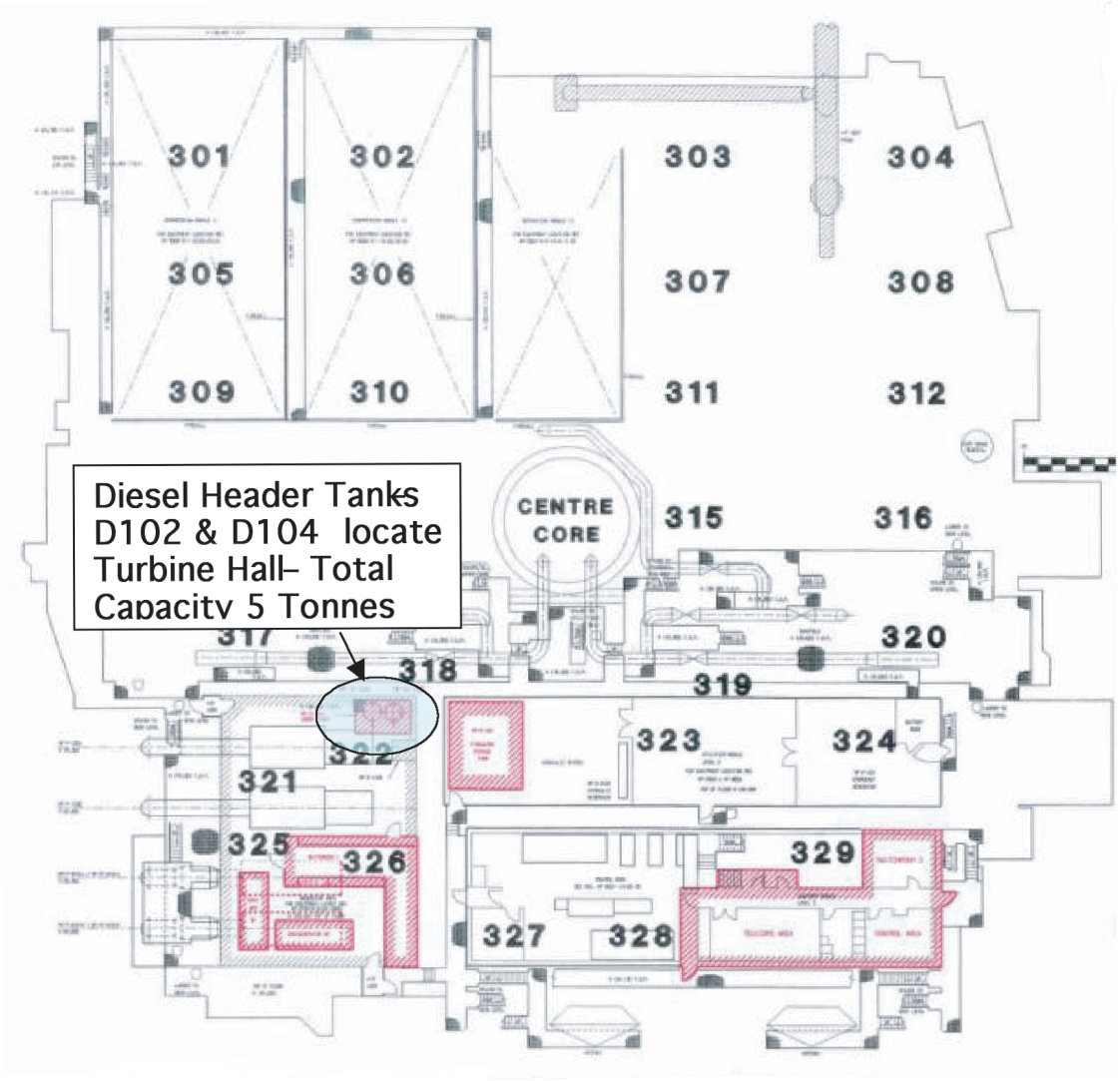

Figure 5.1.2 Location of Diesel Header Tanks

CONTENTS

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1.0 DESCRIPTION

The centre core is located in the middle of the platform and consists of a 9m diameter concrete cylinder rising from seabed level within the caisson wall, to an elevation of 148m. The structure acts as a support for concrete deck beams, and houses the four redundant 32in Frigg risers, and the two 12in Tartan export risers with their associated ESD valves. Access to the equipment is via 11 structural platform levels tied into the core structure, each with a central space which allows use of craneage within the area for both work and rescue purposes.

Six tunnels, each approximately 45m in length, radiate from the centre of the core base. The tunnels are identified sequentially from 'A' to 'F'. Datum point north is between 'A' and 'F'. Annular caisson seals stop ingress of seawater at the tunnel ends.

Four of the tunnels accommodate the 32in Frigg pipelines entering and leaving the platform as follows: 'A' - Line 1 North, 'C' - Line 1 South, 'F' - Line 2 North, 'D' - Line 2 South. Remaining tunnels 'B' and 'E' are available for future use. The floor of each tunnel is below the level of the core base, thus forming individual sumps for the catchment of residual water.

Entry is via the main doorway at 132m, namely Level 11. The ten intermediate levels are located between this point and the core base, with space varying between 4 and 20m according to installed facilities. Access between each level is by ladder.

The four redundant 32in Frigg import and export risers remain tied to the east and west manifolds and these terminate near the core base at Level 1. End caps with drain valves are fitted to the base of these pipes. The redundant 24in bypasses remain in situ at Level 7. The two 12in Tartan export risers penetrate the east core wall at elevation 128m and run down the core wall to tie into Frigg lines at the core base. ESDV-4260 and ESDV-10000 are fitted to Lines 1 and 2 Tartan export risers respectively, at Level 7. Block and bleed isolation valves are fitted to these risers at Level 6. (Specific valve operations are covered in the Tartan skid procedures.) The 2in bleed line also penetrates the east core wall at level 128m.

Ventilation within the core is via vent fans MPK111A/B and exhaust from MPK112.

Fire and gas detection is covered by gas heads fitted above the 12in riser valves and in the HVAC exhaust fan ducting. U/V detectors at Levels 0, 8 and 10 and MACs at Levels 1 and 11. Fusible loops are situated to ensure ESD closure in the event of fire in that area.

Structural monitoring is carried out via strain gauges fitted in tunnels 'A', 'C', 'F' and 'D'. Signals are transmitted to a dedicated panel in Switchroom 3.

2.0 SAFETY CONSIDERATIONS

The following hazards should be addressed:

- High pressure gas pipelines
- High pressure hydraulic systems
- Difficult access and egress
- Work at various levels
- Remote work locations

- Instability of underfoot and overhead conditions
- Work carried out lower than Level 6 is subject to special conditions and is normally restricted.

3.0 SAFETY PROCEDURES

3.1 Access to Centre Core - General

- Primary access to the centre core is to be by the main entrance on the south side only
- Entry is not allowed without prior agreement by the Shift Supervisor
- The control room is to be informed of the names of all persons entering and leaving the centre core

3.2 Number of Persons

The minimum number of persons allowed to enter the centre core is two and the maximum eight in all circumstances. Access to the upper level (Level 11) can be by a single person, assuming that person is carrying out visual checks only.

3.3 Access Needing Work Permit

Any work, including entry for visual checks, in the centre core below ESDV-4260/ESDV-10000 level (Level 7) is to be by work permit only, supplemented by a Complementary Enclosed Space Permit.

Note: In response to concerns regarding the mechanical integrity of the caisson seals around the 32in pipelines at core base access beneath Level 6, such work is subject to special justification before being permitted.

The names of all people working in the core below Level 6 are to be recorded on the Enclosed Space Permit. At all times whilst in the centre core, personnel must work in close proximity to one another, and at the same level.

3.4 Gas Checks

Prior to commencement of work, the Safety Officer is to check the centre core to determine the level of oxygen and the presence of any gas.

3.5 Detection Equipment

The Safety Officer will supply suitable oxygen and gas detection equipment for worksites in the core and ensure that all personnel working in the core are instructed in the operation of this equipment.

3.6 Visits by Safety Officer

During the time that work is taking place in the centre core the Safety Officer is to make regular visits to all worksites to check the levels of oxygen and the presence of any gas.

3.7 Firefighting Equipment

The Safety Officer will ensure that suitable portable firefighting equipment is placed at all sites prior to the commencement of work and that all personnel working at the site are conversant with its use.

3.8 Training

3.8.1 Breathing Apparatus

All personnel entering the centre core below Level 6 are to be given specific training on the use of the breathing apparatus sets provided.

3.9 Communications

Depending on the diversity of work locations, a person or persons are to be nominated as Radio Men.

In this context they are to be provided with portable UHF radios to enable communications to be maintained with the control room.

3.10 Work Restrictions

No work is to take place at any level above the lowest level at which any group of persons is working. Persons can be in transit above working levels subject to all persons being aware of such activity.

In addition, works of an incompatible nature are not to take place simultaneously in the centre core.

Any work carried out at or below Level 6 requires specific justification and will be subject to individual assessment by platform supervision/management.

3.11 Lifting Restrictions

No lifting operations are to take place over the centre core whilst work is taking place within the core. The exception to this would be lifting taking place to support the core works.

3.12 Emergency Lighting

Prior to the commencement of any work, it is to be determined that any emergency lighting provided is sufficient to enable escape in any emergency situation.

3.13 Unrestricted Access - Crane

At all times, sufficient unrestricted access must be maintained for the crane work basket to travel the full height of the centre cores. Work within the core should be timed to coincide with platform crane availability to maximise rescue facilities.

4.0 EMERGENCY SITUATIONS

4.1 Rescue

In the event of a person or persons having to be rescued from the centre core, the OIM, assisted by his Supervisors and Safety Officer, will determine the best means to conduct such a rescue.

In this context he will consider the use of available equipment in the following order of priority:

- Crane with work basket attached
- Manually, by Rescue Team

Therefore, suitable manual rescue equipment is to be placed at the appropriate levels to aid the rescue team.

4.2 Platform Emergency

In the event of **any** platform emergency, persons working in the centre core are to proceed as follows:

(1) All work to stop and be made safe.

(2) Radio contact should be made with the control room to:

- Confirm status and number of personnel in core
- Confirm requirement to evacuate core

(3) Providing it is safe to do so, these persons should be instructed to evacuate the centre core using the ladders provided and proceed to their normal muster points.

(4) In the event that safe evacuation is not possible, they should be instructed to descend to the level affording best safety, to radio the control room with status and await further orders.

(5) Depending on the emergency situation, the OIM will determine the safest means of evacuation (refer to Step (4) above) and act accordingly.

5.0 RESPONSIBILITIES

- Shift Supervisor and Safety Officer to ensure the area is safe prior to access and commencement of any works
- The Control Room Operator should log all personnel movements to and from the core in a dedicated register
- The Safety Officer must ensure that emergency rescue equipment is available and that personnel drilled in its use are onboard prior to any work in the core

6.0 OPERATING PROCEDURES

Duties within the core comprise the operation and checks of ESDV-4260, ESDV-10000, and associated hand valves and bleeds. Water removal from core tunnels, routine checks on ventilation system, F&G system maintenance, structural monitoring inspection, communication system maintenance, and various inspection programmes.

6.1 Valve Operations

ESD valve operation is automatic, with closure on any platform shutdown signal or on remote operation from the CCR. Valve closure can also be initiated from the local control panel, from the remote shutdown point external to main core entrance gate, or on fusible air loop failure. A handjack facility is available at the local control panels and should be used to break any differential pressure across these valves.

A block and bleed system is fitted to both 12in risers down stream of the ESD valves. This comprises two block valves with 2in bleed, fitted to each riser.

Passive fire protection in the form of a protective coating has been applied to the 12in risers in the vicinity of the ESD and hand valves. Darchem boxes provide fire protection to all individual valves and these can be unclipped and removed for maintenance or inspection purposes.

Two manually operated 12in block valves are situated downstream of the ESD on each 12in riser. 2in bleed lines are fitted between both sets of block valves. These bleed connections are normally blanked off. Spools are retained onsite for connection to the common 2in bleed vent line which ties into the platform cold vent system, thus providing a block and bleed facility for maintenance purposes. Because the foregoing operation would effectively bypass the ESD system, it would only be carried out under a procedure with specific guidelines.

6.2 Water Removal

The floor of the tunnels are below the core base; water leakage might enter from the 32in pipework seawater caisson seals. Water condensed from the atmosphere also collects in the tunnels.

Situated at the entrance of tunnel B is the seepage pump G113A which is submerged in sump tank D111A. The pump is controlled by high and low level switches which are within this tank. The pump discharges upwards to elevation 120m passing through the centre core wall to the sea. The pump is fed from ES1, compartment FF1. A manual/auto facility is available.

A portable air pump would be lowered to the core base. By use of the following procedure, excess water from the various tunnels may be discharged to the sea. An air line, made up of interconnected hose lengths, will have to be lowered from available connection at Level 10. It should be tied off at each level within the core. There should be an isolation valve fitted on the lower end of the hoses.

(1) Connect the supply to the pump and turn on using the isolation valve.

(2) Place the pick-up hose to pump any water from tunnels ‘A’ – ‘C’ – ‘D’ – ‘F’ to the tunnel ‘B’.

(3) Place the portable air pump pick-up into tunnel B and pump the accumulated contents of this tunnel into seepage sump tank D111A.

(4) As D111A fills, the high level switch in the tank will start G113A discharge to the sea. Once stabilisation has been achieved, the pumps may be left in this mode of operation. Returning to ESI, G113A can be observed running at its circuit breaker.

(5) When the G113A stoplight is seen, it is to acknowledge that D111A low level switch is activated, stopping the pump (because tunnel B contents have now been discharged overboard). Air to the portable pump must now be turned off, dewatering being complete.

6.3 Ventilation

The core and tunnels are ventilated by supply fans MP-K-111A/B, selected duty and standby, and powered from ESI, FF2, and ES2, G2 respectively. Heaters situated in the air flow ducting are disconnected and removed from operation. The fans are fitted with back-draught dampers and are situated in a safe area on the south-west side, adjacent to Switchroom 2. Air is ducted from these fans to the core base, and flowrate can be controlled by manual dampers mounted in the ducting.

An extraction system is provided by exhaust fan MP-K-112 powered from ESI, 2G2. Air is withdrawn from the area near the core base and ducted to the extract fan which is situated to the north-west of Switchroom 2. Extract can be used in individual tunnels by means of flexible ducting.

The ventilation system would normally be shut down. It should be put online for at least 1 hour prior to any entry to centre core. Fans will be automatically shut down on core fire or gas detection.

6.4 32in Pipework Caisson Seals

The four 32in pipework caisson seals which are situated at the end of tunnels, 'A', 'C', 'F' and 'D' have a critical temperature rating of ^{o}C.

As a result of this, temperature sensors are fitted to Frigg Lines 1 and 2 outlet pipework in tunnels 'C' and 'D'.

Three temperature sensors are fitted to each pipe and operate on a two-out-of-three voting system giving a Level 2 platform shutdown if 0^{o}C is reached. A full description of this system is given in Tartan skid procedures.

Note: Low temperatures may be expected down stream of Tartan export tie-in points due to pressure drop between Tartan and Frigg systems.

There is some concern over the mechanical integrity of the caisson seals which has occasioned specific hazard and risk assessments to be carried out. This now restricts the scope and period of work which may be carried out in this area.

7.0 SECURITY SYSTEM

Entry to the centre core is via the doorway at Level 11, which is kept closed. Access is by agreement with the control point.

Within the core at Level 11, the grating floor extends across the entire circumference of the area. At the north side, the ladder access to the lower levels is normally covered by a hinged hatch which would be locked and protected by an electronic security link. The central shaft is covered by a hatch which can only be removed by crane.

For details of additional security arrangements refer to Section 5 Chapter 12.

CONTENTS

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1.0 INTRODUCTION

In the not normally manned status the retained process equipment on MCP-01 is to be operated remotely using telemetry control to provide the following main functions on the Tartan gas skid:

- Capability to flow gas from the Tartan system to either of the two 32in Frigg lines
- Capability to back flow gas from the Frigg system to the Tartan pipeline network
- Pig arrival from the 18in Tartan Riser
- Capability to close pipeline barrier valves and to blow down platform topsides

All other functions such as ESD reset, topsides repressurisation or pig removal require platform manning.

2.0 DESCRIPTION

2.1 General Overview

A number of separate fields and platforms are linked by the Tartan gas pipeline system. The Claymore platform and its associated subsea Scapa field, is situated 24 miles South of MCP-01 line via an 18in line.

The Ivanhoe/Rob Roy fields, and their associated Amerada Hess 001 platform are situated 40 miles south south-east of MCP-01. Oil is exported to Claymore via a 14in line and gas is exported to Tartan via an 8in line.

The Tartan platform, with associated Petronella and Highlander subsea developments is situated 31 miles south south-east of MCP-01. Oil is exported via a 24in line to Claymore, and gas is exported via an 18in line to MCP-01.

The Piper 'B' platform is situated 29 miles south-east of MCP-01. From there, oil is exported to Flotta via a 16in line and gas will be exported to MCP-01 via a 18in line which ties into the MCP-01/Claymore spur. Actual pipeline lengths are shown in Figure 5.4.1 and for tie-in details refer to Figure 5.4.2.

Fiscal gas metering is carried out on individual export platforms. The metering carried out on MCP-01 is used for local flow indication only.

H_2S and H_2O are monitored by the individual export platforms and local shutdown will be initiated if readings exceed parameters. No monitoring facility exists on MCP-01.

Pigging facilities are available on gas lines between Amerada Hess, Tartan and MCP-01. No such facilities exist on the Piper 'B' export line.

A telemetry system provides essential inter-platform data, Tartan being the 'host' station. This data is also transmitted to Flotta and St Fergus via Mormond Hill. Inter-platform safety guidelines and operating procedures are detailed in the Pipeline Emergency and Operating Procedures manual.

2.2 General Process

Commingled gases from export platforms Tartan, Piper 'B' and Amerada Hess are imported to MCP-01 via an 18in line and riser. A subsea valve, namely ESSV-4300 and its associated hand-operated block and bleed valves are situated on the import line approximately 500m east of the platform (refer to Figure 5.4.3). ESDV-4301 is fitted near the top of the 18in riser and is classed as a platform barrier valve.

The Tartan skid is situated at deck level on the east side of the centre core. It comprises pig receiving facilities, three gas metering runs, pressure control system, blowdown system, and pressure, temperature and flow monitoring. Two 12in export risers leave the skid to join Frigg Lines 1 and 2 at the base of the centre core. Barrier valves ESDV-4260 and ESDV-10000 with associated manual block and bleed valves are fitted to risers joining Frigg Line 1 and Line 2 respectively.

ESSV-4300 and ESDV-4301, 4260 and 10000 are all fail-close valves, fail-safe activation being provided by the use of spring return actuators.

The temperature on the two 32in Frigg lines is monitored to protect export tunnel caisson seals from low temperatures.

2.3 Safety Overview

All operational staff who are involved with the running of the Tartan gas transportation system should be familiar with the contents of the Pipeline Emergency Procedures Manual and must comply with the guidelines contained therein.

Firecover for the skid is provided by manually-operated firewater hydrants. Passive fire protection in the form of a protective pipework coating has been supplied to the import and export risers adjacent to the barrier valves and to critical pipework within the skid area. The underdeck basket which houses ESDV-4301 is also protected by fireproofing. ESDVs 4260 and 10000 and their associated block valves are contained within fireproof Darchem boxes. Access to the valves is gained by the removal of slip-on panels.

Gas detection is covered in the skid area by two sets of three gas heads operating on a two-out-of-three voting system, and one set of four gas heads operating on a two-out-of-four voting system. ESDV-4260 and ESDV-10000 are individually covered by sets of three gas heads, operating on a two-out-of-three voting system. The sets of block valves for these ESDVs are also similarly covered.

Fire detection is provided by five UV detectors fitted within the skid area. Three of these operate on single flame detection, while the remaining two operate on a coincidental signal.

Added protection is provided by a pressure air system which is fitted with frangible bulbs designed to break at 68^{o}C. This protection is fitted throughout the skid area, and also extended to cover the HCU cabinet which supplies the hydraulic pressure holding the barrier valves in the open position. Loss of air pressure from this loop results in a Level 1 ESD. A similar system, in the form of air pressure contained within a fusible plastic loop, is fitted in the area of ESDVs 4260 and 10000 and their associated individual control cabinets. A fusible loop is also fitted above the control cabinet supplying ESDV 4301. Three MACs are located with the skid area.

For fire and gas cause and effects, refer to matrix drawing MP-2790-W-O-33-10014 Sheets 2 and 3.

Emergency blowdown of the skid is to the flare stack via a cold vent system from the blowdown valves ESDV-4353A/B. The system is designed to fully depressurise the pipework between inlet and outlet platform barrier valves within a time span of 15 minutes. Activation may be automatic from a fire and gas panel signal, or manually from the control area. A manual bypass is available for both blowdown valves.

ESDV-4301, 4260 and 10000 are classed as pipeline emergency valves and required to be inspected and tested on a regular routine basis as dictated by SI 1029.

2.4 Responsibilities

During attended and manned periods, the OIM is responsible for all works and operations carried out on the Tartan skid. He must be informed of any non-routine operations. The Control Room Operator is responsible for monitoring and control of instrumentation and equipment relative to the running of the skid. He is also responsible for communicating with all other parties associated with the Tartan gas pipeline system.

2.5 Operating Parameters

The following parameters should not be exceeded:

	MAX	MIN
Gas flowrate in risers and skid	2.5Mcm/d	0.1Mcm/d
Sealine and import riser pressure	110bar	18bar
Skid and export riser pressure	110bar	149bar
Let down pressure across skid	12bar	73bar
Import riser temperature	0°C	Ambient for 48 hrs
Skid temperature	-29°C	Ambient
Export risers temperature	-29°C	Ambient
32in Caisson seal temperature	-10°C	Ambient
Tartan Export H_2O		63ppm
Piper 'B' Export H_2O		63ppm
AH001 Export H_2O		43ppm
Piper B Export H_2S		3.3ppm
Tartan Export H_2S		3.3ppm
AH001 Export H_2S		3.3ppm

Notes: (1) The maximum and minimum allowable working pressures for the Tartan skid will be guaranteed by either high/low pressure trips or overpressure relief systems.

(2) Temperature should not be allowed to fall below the water dewpoint temperature at the line operating pressure.

2.6 Alarms, Trips and Relief Valves

TAG NO	FUNCTION/LOCATION	SP	ACTION/REMARKS
XA-4383	Pig Approaching	-	Alarm - Monitor System
XA-4384	Pig in Trap	-	Alarm
XA-4381	Pig Trap Door Open	-	Alarm
PTAH-4339	Pig Trap Pressure	0.1bar	Alarm - Don't open Pig Trap
PAL-4307	MOV-4307 Hydraulic Supply	100bar	Check System
PAL-4308	MOV-4307 Hydraulic Supply	100bar	Check System
PAL-4200	ESSV-4300 Hydraulic Supply	800psig	Check System
PAL-4234	ESSV-4300 Air Supply (fusible loop)	30psig	Check System
PAL-4301A	ESDV-4301 Hydraulic Supply	120bar	Check System
PAL-4301B	ESDV4301 Air Supply (fusible loop)	4.5bar	Check System
PAL-4303	MOV-4303 Hydraulic Supply	100bar	Check System
PAL4-260A	ESDV-4260 Hydraulic Supply	120bar	Check System
PAL-4260B	ESDV-4260 Air Supply (fusible loop)	4.5bar	Check System
PAL-10001	ESDV-10000 Hydraulic Supply	120bar	Check System
PAL-10002	ESDV-10000 Air Supply (fusible loop)	4.5bar	Check System
PTAL-4331A/B/C	Tartan Riser (two-out-of-three voting)	100bar	Level 1 ESD and Blowdown
PTAH-4331A/B/C	Tartan Riser (two-out-of-three voting)	148bar	Platform Isolation
PTAL-4346A/B/C	Export Line 1 (two-out-of-three voting)	50bar	Level 2 ESD and Blowdown
PTAH-4346A/B/C	Export Line 2 (two-out-of-three voting)	148bar	Platform Isolation
PTAL-4352A/B/C	Export Line 2 (two-out-of-three voting)	50bar	Level 2 ESD and Blowdown
PTAH-4352A/B/C	Export Line 2 (two-out-of-three voting)	148bar	Platform Isolation
TTAL-4325	Export to Line 1	-10°C	Close PCV-4345B
TTAL-4328	Export to Line 1	-10°C	Close PCV-4351B

TAG NO	FUNCTION/LOCATION	SP	ACTION/REMARKS
TTALL-11117A/B/C	Frigg Line 1 Skin Temp	-10°C	(2003 Voting) Close ESDV426
TTALL-11118A/B/C	Frigg Line 2 Skin Temp	-10°C	(20003 Voting Close ESDV10000)
GD-11141/2/3	Centre Core Base (2003 Voting)	20% to 60%	2 x 60% Level 1 ESD
GD-11100/1/2	HCs on Export Riser to Line 1 (2003 Voting)	20% to 60%	2 x 60% level 1 ESD
GD-11103/4/5	ESDV 4260 (2003 Voting)	20% to 60%	2 x 60% Level 1 ESD
GD-11106/7/8	HVs on Export Riser to Line 2 (2003 Voting)	20% to 60%	2 x 60% Level 1 ESD
GD-11109/10/11	ESDV to 10000 (2003 Voting)	20% to 60%	2 x 60% level 1 ESD
UV-11112A to D	Centre Core Levels 0, 8, 10	-	Level 1 ESD
MAC-11113A/B	Centre Core Levels 1 and 11	-	Alarm
GD-11119/20/21	Tartan Riser (2003 Voting)	20% to 60%	Level 2 ESD
UV-11122/23	Tartan Riser	-	Coincidental - Level 1 ESD
GD-4241/3/5	Tartan Skid (2003 Voting)	20% to 60%	Level 2 ESD
GD-4242/4/6/7	Tartan Skid (2004 Voting)	20% to 60%	Level 2 ESD
UV-63A/B/C	Tartan Skid	-	Single UV - Level 1 ESD
PAL-111123	Tartan Skid Fusible Loop	1bar	Level 1 ESD
MAC-64A/B	Tartan Skid	-	Alarm
PSV-4336	Pig Trap	181bar	-

3.0 STARTUP

The following should be read in conjunction with reference to P&IDs MP-2790-B-0-53-10002 Sheets 1, 2, 3 and 4.

3.1 Pre-start Checks

(1) Blowdown valves and associated bypasses closed.

(2) Manual vents and drains closed.

(3) Hydraulic supply available to MOVs and ESDVs.

(4) Instrument air supply available to PCVs and BDVs.

(5) Hand valves in correct position for required meter tube line-up.

(6) Ensure that the following valves are closed: ESDV-4301, 4260, 10000; HV-4302, 4304 and 4306; Rotork valve 4305; PCV-4351A and 4354B; MOV-4303 and bypass.

(7) Ensure that the following valves are open: MOV-4307 and 4308.

(8) Ensure that the required orifice plate is fitted in carrier of online meter tube.

(9) Check ESSV-4300 is open.

3.2 Startup to Frigg Line 1

(1) Calculate Frigg Line 1's approximate pressure at MCP-01 by subtracting St Fergus inlet pressure from the Frigg export pressure. Divide the answer by 2 and add this amount to the St Fergus pressure figure.

(2) Inform all relevant parties of intended startup log same.

(3) Close MOV-4303.

(4) Crack open ESDV-4301 and pressurise pipework up to MOV-4303. When differential pressure clears, ESDV-4301 can be fully opened.

(5) Give PCV-4345B an open command and open the valve from the panel controller in the control room.

(6) Open the bypass round MOV-4303 and pressurise through the skid and down to ESDV-4260.

(7) Monitor pressure and close MOV-4303 bypass when the skid pressure equals that in Frigg Line 1.

(8) Open ESDV-4260.

(9) Close PCV-4345A or B.

(10) Open MOV-4303.

(11) Slowly open PCV-4345A or B until required flow is reached.

(12) Check all process and metering indications on panel.

(13) Inform relevant parties that the skid is online and log.

3.3 Shutdown to Frigg Line 1

(1) Close PCV-4345A or B.

(2) Check metering display to ensure that flow has stopped.

(3) Close ESDV-4260.

(4) Inform all relevant parties of shutdown and log same.

3.4 Startup/Shutdown – Frigg Line 2

As per Line 1 but substitute PCV-4345B with PCV-4351B and ESDV-4260 with ESDV-10000.

Frigg Line 2 pressure at MCP-01 should be calculated using Line 2 pressures at Frigg and St Fergus.

4.0 NORMAL OPERATION

4.1 Pipeline Pigging

Extreme care will be exercised during operation of the pig trap due to the potential hazard of hydrocarbons escaping to the atmosphere. Pig trap opening will require a specific Permit to Work.

Tartan is responsible for all organisation and communication relative to pigging operations. The line will be pigged from Tartan to MCP-01 only during periods of normal gas flow.

Skid valve configuration at launch of pig should be as follows:

- ESSV-4300 Open
- ESDV-4301 Open
- MOV-4303 Open
- HV-4302, 4304, 4306 Closed
- MOV-5305 Closed

Gas flow should be kept as steady as possible during the pig run.

4.1.1 Pig Arrival

Receipt of pig on platform will be indicated by ‘PIG ON PLATFORM’ switch SA4383. Fluctuations will also be noted on PT433 as the pig comes up the riser. The pig will come to rest at MOV-4303 flow ‘T’. Arrival of pig should be logged and Tartan should be advised.

4.1.2 Pig Recovery

(1) Pressurise the pig receiver by opening the ball valve and cracking the needle valve on 2in bypass line to pig trap around HV-4302 and MOV-4305.

(2) Handjack open HIV-4302 and HV-4304. Open HV-4306 via its manual handwheel. Open MOV-4305 by the Rotork actuator switch.

(3) Close MOV-4303 thus routing the gas flow through the pig trap. Pig in trap will be indicated by switch SS4382. MOV-4303 can now be opened.

(4) Close ESDV-4301, 4260 and 10000. Isolate and depressurise hydraulic supplies to these valves. Ensure that MOV-4307 and 4308 are open. Crack open bypass valves on BDV-4353A/B and depressurise the skid.

(5) Introduce N_2 to cold vent purge pipework when skid pressure has dropped to 1bar (to maintain flare purge).

(6) When indication lamp shows that the pig trap is fully depressurised, HV-4302, 4304, 4306 and MOV-4305 should be closed. The pig trap is now isolated by a double block and bleed.

(7) Introduce N_2 purge to pig trap until LEL drops to acceptable level for opening of door. **Stop all hot work**. When satisfied, stop N_2 purge and open atmospheric bleed test point on south side of trap to **ensure** that no pressure remains (the bleed valve handle forms an interlock with the door opening mechanism, thus ensuring that the pressure check is made).

(8) Remove cover from catchment drain band beneath pig trap door. This will prevent spillage of any residual condensate or sludge.

(9) Open the pig trap door by levering the toothed handle to pivot the mating closing mechanism to its open position.

(10) The door can now be swung open and the pig pulled from the trap. Drain catchment bund tundish to tote tank for disposal.

Note: It is possible to run two pigs into the trap simultaneously. This would avoid opening the trap on the arrival of each pig during any extensive pigging programme.

(11) The mating faces of the pig trap and door should be thoroughly cleaned and the rubber door seal checked for damage. An adequate stock of seals and their associated lubricant grease (Kluber Sytheso Pro-AA) should be kept available.

(12) The door should now be closed. Close the atmospheric bleed valve. N_2 purge the trap and leave under positive N_2 pressure. Remove all N_2 connections and reinstate.

(13) Advise all relevant parties of pig recovery and of intention to resume normal gas flow.

(14) Open valves on 2in HV-4302/MOV-4305 bypass line and slowly pressurise pig trap to check integrity of door seal. Trap should then be depressurised and the manual vent valve left in the open position.

4.1.3 Time Factor for Pig Run

Timescale in days can be calculated using the following formula:

$$\frac{\text{Volume of line in } m^3 \text{ x pressure in barg (average of each end of line)}}{\text{Flowrate in } m^3/\text{day}}$$

in which = Volume of line in m^3 is $9500m^3$.

Flowrate in m^3/day is given by the following formulae:

- While the pig is located between Tartan and the WYE piece, take the Tartan flowrate
- Once the pig has passed the WYE piece, take (Tartan flowrate) - (Claymore consumption)

4.2 Changeout of Metering Orifice Plate

(1) Close the relevant meter tube upstream and downstream isolation valves and depressurise the tube using manual vent valve.

(2) Raise the plate to upper chamber of the carrier and close the slider valve. Open carrier vent valve to check that body is fully depressurised.

(3) Remove the carrier top cover plate and raise the orifice plate and its plastic housing seal from the carrier.

(4) Fit new plate of required beta size within its plastic housing seal and fit within top section of carrier. Close carrier vent and refit top cover plate (a new gasket should be fitted).

(5) Open slider valve and lower plate into position in lower chamber of the carrier.

(6) Close meter tube manual vent valve and slowly repressurise the meter tube while checking carrier to cover for any leaks.

(7) If a different size of orifice plate is fitted then the constants in the tube flow distributed control system should be changed as follows.

(8) Limits for the flow range of the various orifice plates have been defined as follows:

- Beta 0.3 20 to 42 x 10^3 sm^3/hr (0.48 to 1.00Mcm/d)
- Beta 0.4 30 to 65 x 10^3 sm^3/hr (0.72 to 1.56Mcm/d)
- Beta 0.5 30 to 110 x 10^3 sm^3/hr (1.20 to 26.4Mcm/d)

4.3 Backflow

Reverse flow of Frigg gas to the Tartan sea line may be necessary to sweep off spec gas from the Tartan sea line. There may also be a requirement to supply utility gas to platforms on the pipeline system.

Reverse flow will be controlled by the platform accepting the reverse flowing gas. Accurate metering should also be carried out on the host platform. No reverse flow metering facility exists on MCP-01. Backflow can only be carried out when the Frigg line pressure exceeds the Tartan sea line pressure. A differential pressure of 4bar would be suitable.

4.3.1 Backflow Constraints

The lowest pressure that can be tolerated in the 18in line for backflushing to start is dependent on the point of liquid formation and the temperature drop that will be caused if the pressure differential is too great.

The point of liquid formation in the case of Tartan gas is 70 to 75barg (1015 to 1087psig) and in the case of Ivanhoe/Rob Roy gas is 105barg (1523psig). A decision must therefore be made on the minimum allowable pressure in the line dependent upon the gas mixture existing in the pipeline.

The temperature drop is dependent on pressure differential and is approximately 4°C per 10bar differential (c. 7°F per 145psig differential). The minimum temperature permitted in the Tartan Riser at MCP-01 is 0°F (32°C). This corresponds to maximum pressure differentials as follows depending on the prevailing Frigg pipeline operating conditions.

4.3.2 Backflow Preparations

There is no requirement to alter the skid line up for provision of reverse flow. Gas will flow naturally through the skid when the Frigg line pressure exceeds the Tartan sea line pressure. It may be assumed that flow control will be carried out on the import platform. Alternatively, PCV-4351 and 4345 may be used as flowcontrollers, although the valves will be operating with flow reversed. Meter Tube 2 is dedicated to backflow facility, line-up will require a platform visit. Backflow configuration should be programmed on the Fisher control system.

Total will send Tartan, Claymore and Piper 'B' a telex informing them of the intention to commence backflushing.

Once the piping is properly configured and 18in line pressure is reduced to Total's satisfaction, a telex will be sent by MCP-01 OIM/GPTO informing them, if necessary, that Total are ready to start backflushing and they should be ready to flare the off-specification gas as required.

4.3.3 Backflow Monitoring

Backflow will continue until import platform utility gas requirements are satisfied.

In the case of off-spec gas, backflow should continue until the offending platform can demonstrate that all off-spec gas has been disposed of and that H_2S or H_2O levels are within acceptable parameters. This should be confirmed by telex. It may be necessary for a Total representative to visit the import platform to witness metering procedures and the arrival of Frigg gas.

4.4 H_2S/H_2O Content Monitoring

Monitoring is carried out continuously at AH001 export, Tartan import and export, and on Piper 'B' export. No monitoring is carried out on MCP-01. Spot checks may be carried out during platform visits by dewscope or chemical analysis for H_2O and by chemical analysis or draeger tube for H_2S.

The Duty Shift Supervisor and Control Room Operator are responsible for monitoring pipeline H_2S and H_2O. Contents figures should be logged at regular intervals. The maximum H_2S content to be monitored by export platform analysis is 5ppm. Anything over this will not be displayed (eg 5ppm indication could be 100ppm actual). The common high alarm setting is 2.8ppm. The trip setting is 3.3ppm.

If high H_2S content is indicated, the situation must be evaluated in order to determine the extent of peak. At this stage, a decision must be taken to accept flow of the high H_2S slug or to prepare for pipeline backflush.

The maximum H_2O permitted to be exported in gas flow is 63ppm for Tartan and Piper 'B', and 43ppm for AH001. Anything in excess of these figures should be dealt with under the same considerations as for high H_2S.

The following guidelines should be addressed and considered for acceptable levels of off-spec gas.

4.4.1 Guidelines for Acceptable Levels

		D	E	F
	$H_2O < 63$	H_2S, 3.3	$3.3 < H_2S < 5$	$H_2S > 5$
A	$H_2O < 63$	Gas on spec	Acceptable for no more than 48 hours	Unacceptable
B	$63 < H_2O$	< 75 Acceptable for no more than 48 hours	Acceptable for no more than 48 hours	Depending on extent of the peak, liaise with GPTO and/or Duty Engineer, St Fergus and Tartan
C	$H_2O > 75$	Acceptable for no more than 12 hours	Prepare for backflushing procedure	

Note: Specifications are = $H_2O < 63$ppm
$H_2S < 3.3$ppm

Therefore, depending on level of H_2S and H_2O in gas, various cases can be encountered:

AD = On spec - no worry
AE and AF = On spec
H_2S too high - follow the instructions
B/DEF = Water too high - follow the instructions
C/DEF = Depending on H_2S level

4.4.2 Actions

Should the H_2S and H_2O content reach unacceptable levels, the OIM or GPTO should consult with relevant OIM to determine the cause and likely duration of the problem. The guidelines should be used in deciding the most appropriate solution.

4.5 Pipeline Emergency Valves

ESD valves are as follows:

- ESDV-4300 Gas import subsea
- ESDV-4301 Gas import riser
- ESDV-4260 Gas export 12in riser to Frigg Line 1
- ESDV-10000 Gas export 12in riser to Frigg Line 2

4.5.1 Communication (SF/MCP-01 Control)

If an ESDV has operated so as to block the flow within a pipeline, the duty shift supervisor should inform without delay the OIM/GPTO and the shift supervisors in control rooms of other Installations to which the pipeline is connected.

The OIM/GPTO shall ensure that this notification has reached OIMs of said other Installations.

Note: GPTO to assume OIM's responsibilities for the 'unmanned' mode of operation.

4.5.2 Permission of Reopen

An ESD valve should not be reopened until reasons for its closure have been established to the OIM's/GPTO's satisfaction and he has personally authorised its reopening.

Before giving his authorisation, the OIM shall ensure that the persons notified in Appendix 1 been consulted.

The OIM:

- Approves and authorises the implementation of procedures prepared for maintenance on an ESDV and for ESDV-4260, ESDV-10000 and ESDV-4301 handjacking
- Gives authorisation for statutory tests required by SI 1029

The Shift Supervisor:

- Organises pipeline ESDV statutory tests as per SI 1029 requirements

4.5.3 Maintenance on ESDV

Maintenance on any part of the ESDV system which temporarily impairs or prevents ESDV closure should only be carried out:

- With ESDV in closed position
- Under an approved procedure
- Under the sole authorisation of the OIM

Note: ESDV system includes control systems used for valve operation, ie local and remote panels, platform emergency shutdown system.

4.5.4 Tartan Line ESDV Operation

Normal Operation

These valves can be opened or closed in the normal manner from the control room valves keypad.

4.5.5 ESD Operation

The following items will close ESDV-4301, ESDV-4260 and ESDV-10000:

- ESD signal from fire and gas or process ESD
- Operating local 'CLOSE LEVER' (located on hydraulic cabinet)
- Operating the 'remote' 'CLOSE LEVER':
  - Located near the valve in the underdeck basket for ESDV-4301
  - Located at centre core entrance for ESDV-4260 and ESDV-10000
- Loss of fusible loop (fire or physical damage)
- Pressure drop in air system, tripping PSL
- Also on being given signal for CCR if PSL does not clear 4.5bar in 60 seconds – this applies to ESDV-10000 only
- Loss of hydraulic pressure

Note: For full details refer to ESD logic diagram MP-2790-J-0-33-10005 Sheets 1, 2 and 3.

4.5.6 ESSV-4300 (Subsea Valve)

The following items will close ESSV-4300 (subsea valve):

- Level 0 Shutdown from ESD PLC
- Loss of fusible loop (fire or physical damage)
- Loss of hydraulic pressure
- Pushbutton on local hydraulic control panel
- Pushbutton from control room/TR

Note: For full details of control logic refer to ESD logic diagram MP-2790-J-0-33-10005 Sheets 1, 2 and 3.

4.5.7 ESDV Reopening

Only when the requirements detailed in Paragraph 4.5.2 have been satisfied.

Note: If closure on an ESD signal, a local reset must be activated to enable reopening.

4.5.8 Crack Opening Procedure (Handjacking)

Handjacking procedure describes the handjacking operation of ESDV-4301.

Equalising DP Across the ESD Valve

Shift Supervisor should ensure that there is no significant DP across the valve before opening it, ie using Tartan sea line as source, handjack open ESDV-4301 with MOV-4303 closed to equalise across ESDV-4301.

Note: The valve crack opening movement cannot be done safely using the main hydraulic system, therefore the handjack system has to be used.

4.5.9 Crack Opening Procedure (Handjacking)

Handjacking procedure describes the handjacking operation of ESDV-4301. The same procedure applies for ESDV-4260 and ESDV-10000.

Procedure

For the crack opening operation, the shift Supervisor should ensure that:

- The platform is in safe and stable operating conditions
- Appropriate communications are available:
  - Prior to handjacking

    Close hydraulic supply valve

    Open handjack isolation valve (lower red handled valve)
  - Handjacking

    Operate handjack until ESDV-4301 is cracked open
  - Reinstatement of hydraulic cabinet to its normal operation configuration

    When pressure across ESDV-4301 has equalised:

    (1) Close handjack isolation valve.

    (2) Open normal supply to actuator.

    (3) ESDV-4301 will now close due to spring return actuator.

(4) Request normal open from CCR (local reset will be required if closed from an ESD signal).

(5) Top up handjack reservoir when complete.

Note: The valve control cabinet should be attended at all times when in handjack mode.

In any emergency situation, or on instruction from the control room, the valve can be closed by opening the hydraulic supply valve thus depressurising the actuator hydraulic pressure.

4.5.10 Reference Documents

SI 1029/1989 and Health and Safety Executive Instruction for application/guidance notes.

4.6 Statutory Reporting Requirements for Testing and Operation of Emergency Pipeline Valves

Note: OIM to be substituted by GPTO when Platform is in unmanned mode.

4.6.1 Equipment

The recognised emergency pipeline valves on MCP-01 are:

- Tartan Export to Frigg Sea Line 1: ESDV-4260
- Tartan Export to Frigg Sea Line 2: ESDV-10000
- Tartan/Claymore/MCP Sea Line: ESDV-4301

These valves are required to be tested on a routine basis. There are also statutory requirements related to their operation.

4.6.2 Safety Considerations

The testing and inspection of the emergency pipeline valves are to demonstrate that the required reliability is being attained.

4.6.3 OIM's Responsibilities

Under Section 7 of SI 1029 regulations it details the responsibility of the OIM for any movement of emergency pipeline valves.

(1) Where SI 1029 Reg 7(1)(b) requires the OIM's authorisation for opening the ESDV, this does mean the OIM's **sole**, exclusive, authorisation. The decision to reopen a pipeline ESDV cannot be delegated to any other person.

(2) Where SI 1029 Reg 7(1)(a) requires the OIM to ensure that the OIM of connected platforms and the control centre, ie St Fergus, are notified that the ESDV has closed, this may be done through the control room with an approved procedure delegating the work.

However, it is still the OIM's responsibility to ensure that his counterparts are notified and, if he has no confidence in the other Installation's procedures to convey the information to his counterpart, then he has to contact the OIM directly. It still remains the OIM's responsibility to ensure that the information has reached his counterpart.

(3) Where SI 1029 Reg 7(12)(b) requires the OIM to be satisfied with the reason for the ESDV closing after advice, it is still the responsibility of the OIM to be satisfied by the reason. If he has any doubt, he may wish to take further advice before authorising the reopening of the valve.

(4) The exception to all the above is for the purpose of testing the ESDV. This is supported in the Guidance Note 10.3.1 which says the tests should only commence with the approval of the OIM who should also be informed immediately the tests are completed. In this way, the OIM is always aware of the status of the ESDVs.

4.6.4 Shift Supervisor's Responsibilities

(1) It is the responsibility of the Shift Supervisor to arrange for all tests and inspections to be carried out as well as to ensure that close liaison is maintained with the OIM at all times.

He will keep the control room of other Installations connected to the involved sea line informed of the tests.

The Shift Supervisor is also in charge of collecting all test results as well as supporting documents and filing same.

To send a copy to the Pipeline Engineer who will field for a 5-year period.

Note: Test checksheets and inspection reports should be signed by the Shift Supervisor and the Inspector responsible for carrying them out, before being submitted to the OIM for signature.

(2) He will also advise the OIM of the cause of any ESD and carry out actions which will enable the OIM to satisfy himself that all necessary actions have been taken which will allow the ESDVs to be opened.

4.6.5 Maintenance Supervisor's Responsibilities

It is the responsibility of the Maintenance Supervisor to ensure that any defects found on the barrier valves are repaired as soon as possible and to provide required support for all tests and inspections to be carried out.

4.6.6 Procedure

Regulation Requirements

(1) The regulations state that at periods not exceeding 3 months, emergency pipeline valves shall be examined externally for leaks, damage or corrosion and an operational test where the closure of the valve is witnessed.

The closure test described in the regulations allows the possibility, on some of the closure tests, for only a partial movement of the valve. On MCP-01, the valve will be fully closed for all tests.

(2) The visual inspection of the valve will be every 3 months and involves checking the valve, control line and actuator mechanism for any leaks, external damage or corrosion as well as their protection (fire, impacts and explosion).

This inspection must be recorded and countersigned by the OIM or a person nominated by him.

A record of this test must be kept on the platform and a copy sent to the Pipeline Engineer.

(3) Every 3 months an operations test of the valve will be carried out. This test will alternate between one where the valve is operated from the local control panel and one using the platform ESD system.

Each test record shall be signed by the test personnel and countersigned by the OIM or a person nominated by him.

A record of this test must be kept and a copy sent to the Pipeline Engineer.

(4) Annually, there will be a rate of pass test carried out on the barrier valves. This test will monitor the rate of pressure increase over a period of time sufficient to enable calculations to be carried out which will establish the rate of pass into an accurately measured volume of the process system. Care must be taken to ensure that this test is carried out accurately.

Each test record shall be signed by the test personnel and countersigned by the OIM.

A record of this test must be kept onboard and a copy sent to the Pipeline Engineer.

4.6.7 MCP-01 ESDV Tests and Inspections

At 3-monthly Intervals

- Externals visual inspection
- Full closure tests

On an Annual Basis

- Rate of pass test

4.6.8 Procedure for 3-monthly Interval Tests and Inspections

(1) Carry out visual examination.

(2) Check valve indicator is in fully open position.

(3) Check valve indicator showing open in CCR.

(4) Close valve by either one of the following methods:

(a) By activation of a Level 2 shutdown.

Note: Level 1, Level 0 or Level Black could also be used for the same effect.

or

(b) By operation of (i) local shutdown vent valve, or (ii) remote shutdown vent tube.

Note: Both methods (i) and (ii) to be tested.

Note: Closure of valve by (a) or (b) to alternate on a 3-monthly basis.

(5) Check valve travel during closure for smooth operation (less than 60 seconds).

(6) Check valve indicator is in fully closed position.

(7) Check valve indicator showing closed in CCR.

(8) Complete report.

4.6.9 Procedure for Annual Rate of Pass Test

(1) Close valve, isolate and depressurise hydraulic supply.

(2) Depressurise topsides gas inventory to cold vent.

4.6.10 Pipeline ESDV Closure Reporting

The responsibilities of the OIM are well detailed in Paragraph 4.6.3. However, SI 1029 states that, on closure of an ESDV as a result of an ESD or the local control panel, OIMs on other offshore Installations connected to the pipeline must be notified.

Due to the sophisticated communications between the Installations associated with MCP-01, the telephone links should be used for this purpose.

The matrix (Appendix 1) details the Installations to be notified throughout the Frigg and associated system, and the agreed communications procedures between offshore Installations and St Fergus Terminal (refer to Appendix 2).

4.6.11 Time Factor

It is important that the test periods are strictly adhered to. SI 1029 is quite specific on the 3-monthly timescale.

4.6.12 Reference Documents

- SI 1029
- Guidance notes in support of the Offshore Installations (Emergency Pipeline Valve) Regulations 1989 SI 1989/1029
- MCP-01 emergency shutdown valve survey programme Rev 01/PAH

4.7 Gas Venting/Blowdown

On a platform ESD approximately $20m^3$ of gas is trapped within topsides pipework. This is vented off to the vent stack by the opening of blowdown valves PCV-4353A and B, which are fitted on the outlet and inlet sides of the Tartan skid respectively. Complete depressurisation should be completed within a 15-minute period. Both blowdown valves are fail-open and each has a manual bypass facility.

Blowdown can be initiated as required from either the St Fergus or local control rooms. For logic governing automatic activation refer to ESD logic diagram MP-2790-J-0-33-10700 Sheet 5.

4.7.1 Maintenance/Function Test

For testing of the BDVs, the platform must be manned or attended and maintenance mode should be selected on the control room keypad. Prior to any tests, the BDVs should be blocked in. The selection of maintenance mode inhibits the Level 2 ESD signal being sent from a BDV closed limit switch.

Note: When the platform is attended or manned, all remote BD signals are inhibited.

4.7.2 Restart from Blowdown

Restart procedure is as follows:

(1) Enter maintenance mode and close BDVs.

(2) Operate PT-4331, PT-4346 and PT-4352 inhibit keyswitches.

(3) Check all Level 0 and Level 1 shutdowns are reset.

(4) Level 2 ESD reset is actioned.

5.0 REFERENCE DRAWINGS AND DIAGRAMS

- MP-2790-W-0-33-10014 (Sheet 2)
- MP-2790-W-0-33-10014 (Sheet 3)
- MP-2790-J-0-33-10700 (Sheet 5)
- MP-2790-B-0-53-10002 (Sheet 1)
- MP-2790-B-0-53-10002 (Sheet 2)
- MP-2790-B-0-53-10002 (Sheet 3)
- MP-2790-B-0-53-10002 (Sheet 4)

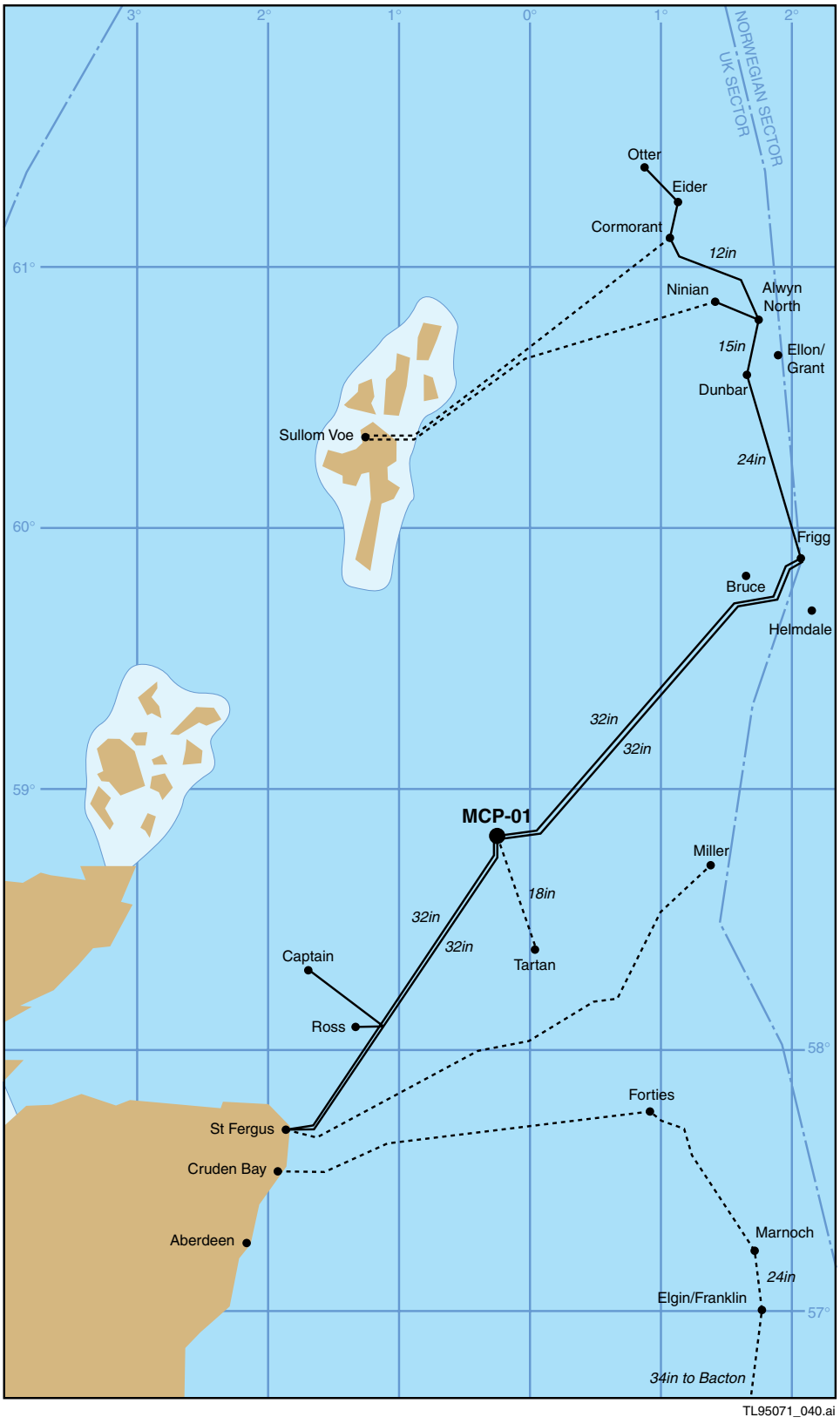

Figure 5.3.1 Oil and Gas Pipeline Systems

APPENDIX 1 PIPELINE ESDV CLOSURE – NOTIFICATION TABLE

INSTALLATION VALVE IDENTITY	NAB	FRIGG QP	MCP-01	TARTAN	CLAYMORE	ST FERGUS
NAB ESDV-5481		Notify				Inform
Frigg Qp ESDV-M28.1	Notify					Inform
Frigg Qp ESDV-M3.1 ESDV-CM3.1 ESDV-M28.6			Notify			Inform
MCP-01 ESDV-10000				Notify	Notify	Inform
MCP-01 ESDV-4260				Notify	Notify	Inform
MCP-01 ESDV-4301				Notify	Notify	Inform
Tartan ESDV-200			Notify		Notify	Inform
Claymore ESV-534			Notify	Notify		Inform
St Fergus GOV-501 GOV-1501	Inform	Inform	Notify			

Priority 1 = Notify
Priority 2 = Inform

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APPENDIX 2 REPORT FORM FOR TESTING AND IDENTIFICATION OF ESDVs

Form of Inspection Report SI 1989 No 1029 Regulation 8(3) **Report to the Secretary of State for Energy** **Of Examination and Testing Under Inspection Scheme** **For an Emergency Pipeline**	
Identity of Pipeline:	
Identity of Emergency Shutdown Valve (*) ESDV	
Name of Pipeline Owner:	Total E&P UK PLC
Identity of Installation:	MCP-01
Name of Installation Owner:	Total E&P UK PLC
Name of Installation Manager:	
Nature of Examination or Testing:	Visual Inspection (See Checklist) Full Automatic Local Operation
Date(s) Carried Out:	
Name of Person Performing Examination or Testing:	
Reference or Procedures Used:	Operating Procedure No
Damage or Defects Revealed:	
Remedial Work Carried or to be Carried Out:	

I certify that the above particulars are correct

Signature of person responsible:

.....

.....199

Particulars of signatory:

Name:.....

Position: .....

Signature of OIM or his nominee:

.....

.....199

Particulars of Signatory:

Name:.....
(Block Capitals)

Position: .....

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APPENDIX 3 VISUAL INSPECTION CHECKLIST

Date of Inspection: ..... Pipeline:.....

ESV Tag No:.....

Details of Inspection

A Hydraulic/Pneumatic Control Station

1. External Leaks: .....
2. External Damage: .....
   .....
3. External Corrosion: .....
   .....
4. Other Observations: .....
   .....

B Actuator

1. External Leaks: .....
   .....
2. External Damage: .....
   .....
3. External Corrosion: .....
   .....
4. Other Observations: .....
   .....

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APPENDIX 4 MCP-01 BARRIER VALVE SURVEY PROGRAMME

Total	Offshore Operations	MCP-01	
	Instruction No 22415	Page:	2/2
	Pipeline Import/Export ESDVs (SI 1029)	Revision:	02
		Date:	27/10/92
		Visa:	

Practical Information for MCP-01 Emergency Shutdown Barrier Valves Survey Programme

Inspection Type

Visual: Close visual inspection of valve and actuator mechanism to identify any external leak, external damage, or external corrosion.

Local: Operational test of valve by full closure and reopening, activiated and witnessed locally.

Remote: Operational test of valve by full closure and reopening, activated by the ESD system.

Controlled: Operational test of valve by full closure and reopening, activated by control system.

Date of Inspection	ESDV-4260			ESDV-10000			ESDV-4301			ESSV-4300
	Visual	Local	Remote	Visual	Local	Remote	Visual	Local	Remote	Controlled
Oct 91	xxx		xxx	xxx		xxx	xxx		xxx	xxx
Jan 92	xxx	xxx		xxx	xxx		xxx	xxx		
Apr 92	xxx		xxx	xxx		xxx	xxx		xxx	xxx
Jul 92	xxx		xxx	xxx	xxx		xxx	xxx		
Oct 92	xxx		xxx	xxx		xxx	xxx		xxx	xxx
Jan 93	xxx	xxx		xxx	xxx		xxx	xxx		
Apr 93	xxx		xxx	xxx		xxx	xxx		xxx	xxx
Jul 93	xxx	xxx		xxx			xxx	xxx		
Oct 93	xxx		xxx	xxx		xxx	xxx		xxx	xxx
Jan 94	xxx	xxx		xxx	xxx		xxx	xxx		
Apr 94	xxx		xxx	xxx		xxx	xxx		xxx	xxx
Jul 94	xxx	xxx		xxx	xxx		xxx	xxx		
Oct 94	xxx		xxx	xxx		xxx	xxx		xxx	xxx
Jan 95	xxx	xxx		xxx	xxx		xxx	xxx		
Apr 95	xxx		xxx	xxx		xxx	xxx		xxx	xxx
Jul 95	xxx	xxx		xxx	xxx		xxx	xxx		
Oct 95	xxx		xxx	xxx		xxx	xxx		xxx	xxx

Notes: (1) All inspections/tests to be carried out on the first of each month.

(2) The 'remote' operational test may be carried out one month before or one month after the planned date.

(3) An automatic platform shutdown will qualify the remote test providing it occurs within the required period.

(4) The ESDV report forms No 22502 and 22503 should be duly completed by the responsible person offshore and forwarded to AXE/PIPE.

(5) A copy of the reports should be held on the Installation for a period of 2 years.

(6) Testing of ESSV-4300 to be co-ordinated with Texaco. Operational test to be activated from control point or hydraulic control panel on an alternative basis.

CONTENTS

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1.0 INTRODUCTION

The platform drains system comprises 'oily water drains' which are routed to the sea sump (MP-D-118), and 'open drains' which collect surface water and are routed overboard for disposal of uncontaminated, hydrocarbon-free water. The only exception to this is the helideck drains which are piped overboard, thus avoiding the potential hazard of containing volatile hydrocarbons in the sea sump.

Effluent drains from sink and toilet facilities are routed directly overboard.

2.0 DESCRIPTION

2.1 Drains

Pipework from the following surface water drains is routed directly overboard: helideck, quarters roof, generator module roof, utilities module roof, firewall canopy and Modules 11, 12 and 13 deck areas.

Oily water drains from the following are routed to the sea sump (MP-D-118): diesel tanks MP-D-101 and MP-D-113, drip trays from diesel day tanks MP-D-102 and MP-D-104, G1, G2 and G3 bund drains, coalescer filters MP-C-134A/B, generator area floor drains, slop oil tank MP-D-106 overflow and drain, east deck laydown area, and floor drain in lower utilities adjacent to washdown pumps.

2.2 Sea Sump MP-D-118

The sea sump MP-D-118 is a vertical cylinder, 0.635m in diameter and 63m in length and is used to store oil/water mixtures. The top of the sea sump is located in the top of the deep well casing within the utilities module. A restriction orifice is fitted to the bottom of the sump to dampen the effect of wave action on the operating liquid level within the sump. The sump is vented to atmosphere via a flame arrestor.

The sea sump is designed to contain, without leakage, approximately 7.5m^3 of waste oil and has a normal working capacity of 3.4m^3 between sea sump pump MP-G-108 operating levels. The rated holding capacity of the sea sump is based on the premise that the depth of oil below the seawater level will be six times that of the oil above it.

2.3 Sea Sump Pump MP-G-108

The sea sump pump MP-G-108 is used to control the sea sump oil level by pumping oil and oily water from the sea sump to the slop oil storage tank MP-D-106. The sea sump pump is fed from ES1, cubicle RH1. It is a vertically-mounted, eight-stage, centrifugal pump with a design capacity of 4.75m^3/hr at 3.25bar. The pump suction is located just above the mean sea level (94m), thus ensuring that the pump is always submerged in oil.

Operation of the sea sump pump is by manual function only. LAHH-319 is an indication that the pump requires to be started. LLC-0321 stops the pump automatically. Local stop/start pushbuttons are positioned in the lower utilities.

2.4 The Slop Oil Tank MP-D-106

The slop oil tank MP-D-106 is used to store oil which is pumped up from the sea sump. It is a rectangular tank 4.5m wide x 5m long x 2.5m in height. It is located on the underdeck level beneath the utilities module. The tank is vented to atmosphere via a flame arrestor. The overflow is situated at a height of 2.05m.

The tank contains the slop oil pump MP-G-114. It has a total working volume of 46m^3 and an operating capacity of 19m^3 between level switches LAH-317 and LLCO-387. The tank is also fitted with level gauge sightglasses.

2.5 Slop Oil Pump MP-G-114

Slop oil pump MP-G-114 is a centrifugal submerged suction type pump with a discharge capacity of 5.7m^{3}/hr at 10bar. It is shaft-driven from a motor fixed to the top of the slop oil tank. Electrical supply is from ES1, cubicle RG3. Discharge pipework runs to the 'tote' tank laydown area above the Tartan skid, where portable tanks are filled with slop oil for disposal onshore.

Stop/start pushbuttons are positioned adjacent to the slop oil tank, and at the 'tote' tank laydown area.

3.0 STARTUP

3.1 Sea Sump Pump MP-G-108

(1) Switch on isolator at ES1, cubicle RH1, and select 'REMOTE'.

(2) Start pump from local PB in lower utilities. Check local ammeter for run indication.

(3) Adjust discharge isolation valve to obtain 1bar reading on PI-348.

(4) Crack instrument vent valve at PI-348 and take sample to ensure 'oil' is being pumped.

(5) Monitor level in slop oil tank.

3.2 Slop Oil Pump MP-G-114

(1) Switch on isolator at ES1, cubicle RG3, and select 'HAND'.

(2) Ensure that pump discharge valve at slop oil tank, and isolation valve at 'tote' tank laydown area, are closed.

(3) Start pump from local PB at slop oil tank and open discharge valve. Monitor pressure on PI-471. If all OK, stop pump.

(4) Note level in slop oil tank.

(5) Connect flexible hose to coupling on discharge line in 'tote' tank. Feed hose into fill hatch and secure same.

(6) Start pump from local PB and slowly open discharge valve to introduce flow to 'tote' tank.

(7) Monitor rising level in 'tote' tank closely. Avoid oil spillage.

4.0 NORMAL OPERATIONS

4.1 Routine Duties and checks

Normal operation is to order 'tote' tanks for slop oil disposal on a regular basis. This ensures that low levels are maintained in the slop oil tank, thus maintaining a useful operating capacity.

It is not necessary to wait for a high level indication in the sea sump before pumping out the oil. This should be done in conjunction with the frequency of use of the oily water drains. Regular checks should be made on the consistency of liquid being pumped from the sea sump by taking samples from the vent point at PI-471. Emulsified oil indicated the pump suction to be near the oil/water interface. It should be noted that levels in the sea sump can vary by 2m due to tidal rise and fall.

Regular checks should be made on the level in the slop oil tank. This level should be kept as low as possible by punctual ordering of 'tote' tanks for oil disposal.

4.2 Precautions

- Surface water drains must not be confused with oil water drains with disposing of hydrocarbons
- Oily water drains which are not frequently used should have their 'U' trap liquid seals topped up on a regular basis

5.0 SHUTDOWN

5.1 Sea Sump Pump MP-G-108

(1) Stop pump at local PB in lower utilities.

(2) Close discharge valves.

(3) Switch off isolator at ES1, cubicle RH1.

5.2 Slop Oil Pump MP-G-106

(1) Stop pump at local PB at 'tote' tank.

(2) Close discharge valve at 'tote' tank, withdraw flexible hose and close fill hatch.

(3) Switch off pump isolator at ES1, cubicle RG3.

(4) Close discharge valve at slop oil tank.

(5) Log slop oil tank level.

6.0 REFERENCE DRAWINGS AND DIAGRAMS

- MP-2790-B-0-17-10060 Surface Water Drains
- MP-2790-B-0-17-10061 Oily Water Drains System

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CONTENTS

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1.0 INTRODUCTION

The power generator system produces and distributes all electrical supply requirements for normal platform operation in any platform status ie not normally manned, attended or manned. The system equipment consists of two 218kW output generator package units, a 665kW output generator package unit and two emergency switchboards with distribution systems. Emergency services whose operation affects personnel safety whether directly or indirectly also have battery backup.

The 665kW output unit and Switchroom 2 locations, the two 218kW output units, Switchroom 1 and Switchroom 3 locations are shown herein.

1.1 System Operation

In the not normally manned state, the load requirement of about 149kW is supplied by one of two generator package units, each rated at 218kW, operating as duty and standby. A third generator package, rated at 665kW serves as an emergency backup unit in the event of the other two units being unavailable, and as the maintenance generator to supply power for equipment used during the periods when the platform is manned ie major maintenance flotel-supported periods. Occasionally it is required during periodic visits when power load requirements exceed the output capability of one of the other units. This would be the case if the east crane were in use.

1.2 System Control

The duty generator package unit runs continually and automatic startup of the standby or emergency unit will occur in the event of a trip on the duty unit. The temporary loss of volts will result in load disconnection and the method of automatic start reconnection is staggered to avoid excess transients on the generator. Uninterruptable power supply systems require to be switched manually from St Fergus control room.

2.0 DESCRIPTION

2.1 Process Description

In the not normally manned condition, operation is with either generator package unit G1 (P10202A) or G2 (P10202S) supplying the load demand. Should the duty generator fail, loss of volts shall auto-start the standby machine and connect it to switchboard ES1. Generator G3 (P8102) also auto-starts on loss of volts, but has a time delay to allow the standby generator preferential start.

The three generators are only capable of independent running ie isochronous operation, therefore automatic changeover of generators always results in a temporary blackout. On changeover, automatic check sequences ensure that a machine is not being closed onto a live switchboard.

Normally the two emergency switchboards are connected via two normally closed circuit-breakers and an automatic interlock system prevents unsynchronised supplies being switched across interconnectors.

Each emergency switchboard distributes power at 440V 50Hz to the following main users:

- Emergency services
- Lighting panels
- 240V UPS for process control, fire and gas, ESD, telecomms and PA system
- 24V dc for protection and interposing relays, remote input/output modules and communications modules

2.2 Process Control

Each generator set and selected distribution circuit-breakers is monitored and controlled either locally on MCP-01 or remotely from St Fergus. Remote operation is via the process and utilities control system. A realtime mimic single-line diagram is available on St Fergus control visible display unit. The various control functions are accessible via the control logic from this point.

2.2.1 Power Generator G1/G2

The local control panels are located in Switchroom 1 and have local/remote mode selector switches with local start/stop and emergency stop facilities. Alarms and trips are displayed on a conventional alarm annunciator. Alternator bearing and winding temperatures, battery amps and volts and generator protection are included.

2.2.2 Power Generator G3

The local control panel is located in Switchroom 2 and has local/remote mode selector switch with local start/stop and emergency stop facilities. Alarms, trip displays and battery amps and volts are also included. The general arrangement of the panel front is shown in Figure 3.

2.2.3 Distribution System

Open circuit-breaker and close circuit-breaker controls, together with circuit-breaker status monitoring, are provided for the following:

- Generator G1 Incomer CB1 Switchroom 1
- Generator G2 Incomer CB2 Switchroom 1
- Generator G3 Incomer CB3 Switchroom 2
- Spare 2000A Incomer CB4 Switchroom 2
- Interconnectors ES1 to ES2 CB7/CB8 Switchroom 1/2
- Feeder UPS No 1 CB5 Switchroom 1
- Feeder UPS No 2 CB10 Switchroom 2
- Feeder UPS No 1 Bypass CB6 Switchroom 1
- Feeder UPS No 2 Bypass CB9 Switchroom 2
- Incomer UPS No 1 Dist Brd CB11 Switchroom 1
- Incomer UPS No 2 Dist Brd CB12 Switchroom 3
- Interconnector UPS 1-UPS 2 DBs CB13/CB14 Switchroom 1/3

In addition, fault signals are provided for CBs 1, 2, 3, 7 and 8.

2.3 Alarms and Trips

TAG NO	FUNCTION/LOCATION	SP	ACTION/REMARKS
	Power Generator G1/G2		
XA-10305A	Battery Charger Fail		Alarm
XA-10305B	Battery Charger Undervolts		Alarm
TSL-10354	Jacket Water Temperature Low		Alarm
TSH-10355	Exhaust Temperature High		Alarm
XA-10320	Rotating Diode Failure		Alarm
XA-10321A	Generator Protection Operated		Alarm
XA-10321B	Frequency Deviation		Alarm
XA-10321C	Voltage Deviation		Alarm
TSH-10362	Winding Temperature High		Alarm
XA-10308	Engine Failed to Start		Trip
LSH-10356	Fuel Line Broken		Trip
LSL-10363	Water Level Low		Trip
TSH-10357	Water Temperature High		Trip
TSH-10358	Oil Temperature High		Trip
PSL-10359	Oil Pressure Low		Trip
SS-10360	Overspeed		Trip
SY-14228	Emergency Stop/Fire and Gas		Trip
TSH-10361	Enclosure Ventilation Failed		Trip

G1 and G2 alarms are relayed to the St Fergus/MCP-01 control room from individual signals which cover groups of alarms as listed below:

Group 1 - Engine Trip Alarms

- Engine failed to start
- Overspeed
- Emergency stop
- Fire and gas
- Engine combustion air flaps
- Enclosure ventilation failure

Group 2 - Engine Lub Oil Trips

- Oil temperature ‘HIGH’
- Oil pressure ‘LOW’

Group 3 - Engine Water Trips

- Water level 'LOW'
- Water temperature 'HIGH'

Group 4 - Engine Fuel Trip

- Fuel line 'BROKEN'

Group 5 - Engine Water Alarm

- Jacket water temperature 'LOW'

Group 6 - Exhaust Temperature Alarm

- Exhaust temperature 'HIGH'

Group 7 - Battery System Alarms

- Battery charger 'FAILED'
- Battery 'UNDERVOLTS'

Group 8 - Generator Winding/Diode Alarm

- Winding temperature 'HIGH'
- Rotating diode 'FAILURE'

Group 9 - Generator Protection Operated

- Generator protection 'OPERATED'
- Field suppression 'ON'

Group 10 - Voltage/Frequency Deviation

- Frequency 'DEVIATION'
- Voltage 'DEVIATION'

Group 11 - Inhibits on Run-up/Down

- Oil pressure 'LOW'
- Frequency 'DEVIATION'
- Voltage 'DEVIATION'

TAG NO	FUNCTION/LOCATION	SP	ACTION/REMARKS
	Power Generator G3		
EAL-8605A	Battery No 1 Undervolts		Alarm
XA-8606A	Battery No 1 Charger Failed		Alarm
EAL-8605B	Battery No 2 Undervolts		Alarm
XA-8606B	Battery No 2 Charger Failed		Alarm
LAH-8610	Fuel Tank Level High		Alarm
LAL-8610	Fuel Tank Level Low		Alarm
TAL-8607	Jacket Water Temperature Low		Alarm
LAL-8608	Jacket Water Level Low		Alarm
TAH-8609	Jacket Water Temperature High		Alarm
TAH-8614	Exhaust Temperature High		Trip
XA-8631	Generator Overload		Alarm and Trip Incoming Breaker
XA-8629	Overcrank Engine Failed to Start		Trip
PAL-8626	Oil Pressure Low		Trip
SAH-8623	Engine Overspeed		Trip
TAHH-8609	Jacket Water Temperature High Stage 2		Trip

2.4 Major Equipment Descriptions

2.4.1 Power Generation Unit G1/G2

The generator set consists of a turbocharged eight-cylinder Kelvin diesel engine with mechanical governor driving a Leroy Somer alternator with a rating of 218kW, three-phase, 440V, 50Hz at 1000rpm. The engine has dual-starter facilities, primarily an electric start powered by 24V sealed battery backed up by a hydraulic start charged either via the engine-driven pump or manually. The unit has its own skid base diesel tank with 24-hour operation capacity. The skid is contained within an acoustic hood with exception of the water cooler which is located outside the generator area west side. The engine exhaust discharges to the same location. The enclosure has two ventilation fans both running in normal operation. Fire and gas detectors are located within the enclosure and fail-safe dampers close automatically on fire detection pending a CO_2 release.

2.4.2 Power Generation Unit G3

The generator set consists of a turbocharged 16-cylinder Caterpillar diesel engine with mechanical governor driving a Brush generator with a rating of 665kW, three-phase, 440V, 50Hz at 1000rpm. The engine has twin starter facilities electrically powered by 24V sealed batteries. The unit has its own diesel tank with 24-hour operating capacity at full load. The module houses the power generation unit, pressurised by two supply fans operating on a duty/standby basis, and is protected by a CO_2 extinguishant system and fire and gas detection.

2.4.3 Emergency Switchboards

Refer to drawings:

- MP-2790-P-0-01-10001
- MP-2790-P-0-01-10002
- MP-2790-P-0-01-10007

The emergency switchboards ES1 and ES2 together supply all platform loads. In normal operating conditions, the two boards are interconnected. ES1 houses the incomers for generators G1 and G2. ES2 houses the incomer for generator G3 plus a spare incomer to allow future connection of an external supply (eg flotel).

The switchgear for ES1 is the withdrawable type in a back-to-back arrangement and for ES2 is the withdrawable type with front access only.

All emergency services are fed from these switchboards through outgoing fuses, circuit-breakers or starters. Most equipment has a standby with 'A' and 'B' equipment being fed in general from a different switchboard to allow normal operation of the plant with a switchboard isolated.

2.4.4 240V UPS

Refer to drawings:

- MP-2790-P-0-01-10005
- MP-2790-P-0-01-10006
- MP-2890-P-0-01-10011

The purpose of the Uninterruptible Power Supply (UPS) is to power safety equipment for a period of at least 4 hours in the event of loss of power generation. The equipment supplied is as follows:

Telecomms Equipment

- Line of sight terminals, multiplexers and supervisory equipment
- UHF local radios
- VHF marine radios
- HF marine radios
- Aeronautical radios
- Video surveillance system
- Meteorological equipment

- Data comms equipment
- Public address system
- Tropo system

Control Equipment

- Process and Utility Controller (PUC)
- Fire, gas and ESD
- Remote Input/Output (RIO)

In normal operating conditions, the above equipment has a total load demand of around 30kW. When generated power is lost and battery power is required, the tropo system trips after a time delay of 10 minutes to allow a remote controlled changeover of the system to the Claymore platform. Each battery system is sized for 30kW for 10 minutes and 15kW for 4 hours.

The UPS consists of two fully redundant inverter systems each with battery, charger, inverter, static switch and bypass transformer. Each inverter system feeds a distribution board through an incoming circuit-breaker. Where necessary, safety equipment is fed through dual outgoing feeders.

An interconnector between the two UPS distribution boards allows the maintenance of each half in turn. Any outage of either UPS will automatically close the interconnector.

2.4.5 24V dc Systems

24V dc loads requiring UPS supplies are fed via transformer/rectifier units.

The control circuits for emergency switchboards ES1 and ES2 are 24V dc supply with one unit located in each switchboard. Each power generator unit G1, G2 and G3 has a 24V dc supply with battery charger system for engine starting motor.

3.0 STARTUP

3.1 Black Start

Starting the power generation after a period of time when no ventilation has been running and all battery systems have been depleted is as follows:

(1) Ensure that generator and switchboard areas are gas free.

(2) Select required generator on local at mode selector switch.

(3) Select incoming circuit-breaker on manual.

(4) Ensure that all outgoing supplies from the switchboard are isolated.

(5) Start the engine using the hydraulic start system.

Note: Fire and gas system shutdown may have to be overridden.

(6) Close the incoming circuit-breaker to energise the switchboard.

(7) Reinstate auxiliary supplies to control panel, enclosure fans, radiator cooler fan and switchroom ventilation fans.

(8) Power supplies can then be reinstated to areas checked as gas free.

(9) Return incoming circuit-breaker to auto.

(10) Return generator mode selector switch to remote.

3.2 Normal Start for Unit Changeover

To start the standby generator for routine changeover is as follows:

(1) Select local position on mode selector switch.

(2) Start the engine using the electric start system.

(3) Select the in-service incoming circuit-breaker on manual.

(4) Open the in-service incoming circuit-breaker.

(5) On detection of generator volts, the standby incoming circuit-breaker will close automatically.

(6) Stop the offline generator and return its incoming circuit-breaker to auto.

(7) Return the online generator mode selector switch to remote.

4.0 NORMAL OPERATIONS

The normal operation activity in the not normally manned state is confined to monitoring the system condition via the VDU display in the St Fergus control room. The monitoring data should be logged on a regular basis. Any alarm condition arising must be assessed and if considered necessary the duty machine should be shut down.

5.0 SHUTDOWN

A Level 0 ESD electrically isolates the entire platform with all three generators tripped or start inhibited.

A Level 1 ESD results in all three generators tripped or start inhibited.

Fire or gas detection in Switchroom 1 trips G1 and G2 but power generation is restored via G3.

Fire or gas detection in G1 or G2 enclosure trips the relevant machine.

Gas detection within the module for G3 causes total electrical isolation within the module and trip of G3. If this generator is operating, loss of volts will start G1 if selected standby. G2 if selected standby it will not start due to the interrelation between equipment in Switchroom 2 and R103.

Fire detection within the module for G3 causes partial electrical isolation within the module and trip of G3. If this generator is operating, loss of volts will start G1 or G2 whichever is standby.

6.0 REFERENCE DRAWINGS AND DIAGRAMS

- MP-2790-P-0-01-10000 Overall Single Line Diagram
- MP-2790-P-0-01-10001 (Sheet 1) MP-P-10101A Single Line Diagram
- MP-2790-P-0-01-10001 (Sheet 2) MP-P-10101A Single Line Diagram
- MP-2790-P-0-01-10002 MP-P-10101B Single Line Diagram
- MP-2790-P-0-01-10007 MP-P-10101B Single Line Diagram
- MP-2790-P-0-01-10005 Inst Power Distribution
- MP-2790-P-0-01-10006 Telecomms Power Distribution
- MP-2790-P-0-01-10011 Telecomms Power Distribution
- MP-2790-P-0-01-10008 Layout Module MP-V-8102
- MP-2790-P-0-01-10054 Layout Generator Area/Switchroom 1
- MP-2790-R-0-02-10039 Layout Control Area

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1.0 INTRODUCTION

The freshwater system supplies the sinks and showers in the Temporary Refuge (TR)/mess area. The system includes a bunkering supply line, storage tank and distribution pipework.

The location of the storage tank is shown in drawing MP-2790-S-0-00-10000.

2.0 DESCRIPTION

2.1 Process Description

The freshwater storage tank is charged as required by bunkering from supply vessels. At the east supply station a 4in flexible hose with self-sealing coupling is used to connect the supply boat to the platform. The storage tank is routinely chlorinated by manual dosing with sodium hypochlorite. A mixer mounted in the storage tank creates circulation to evenly mix the sodium hypochlorite in the water. The consumers are gravity fed from the storage tank.

2.2 Major Equipment Descriptions

2.2.1 Freshwater Storage Tank

The freshwater storage tank C104 has a capacity of 7950 litres and is fitted with a level gauge LG312 for monitoring of the tank level. An overflow line to prevent over-filling the tank is routed overboard via an open drains. A 2in atmospheric vent is mounted on top of the tank and a 2in nozzle with isolation valve is used for chlorination purposes. A horizontally-mounted mixer at the end of the tank maintains circulation for mixing the sodium hypochlorite with the water and prevents stagnation.

A restriction orifice in the supply line to the storage tank controls the flow during bunkering operations.

3.0 STARTUP

3.1 Storage Tank Filling

(1) Request supply boat to come to east side of platform.

(2) Connect hose end to crane hook and lower to supply boat.

(3) Request confirmation from supply boat of hose connected to fill point.

(4) Open isolation valves on supply line to storage tank C104.

(5) Request supply boat to commence pumping fresh water.

(6) Monitor integrity of hose during transfer to ensure no leakage.

(7) Monitor tank level and on approach to overflow level be prepared for shutdown.

4.0 NORMAL OPERATIONS

During bunkering operations, a water sample is taken from the sampling point at the east hose station and check for iron and chlorine content.

On each visit to the platform, a sample is taken from the storage tank and checked for chlorine content. The result should give a figure of 0.4mg/1 of free chlorine. If less than this figure, sodium hypochlorite has to be added to the storage tank to increase the chlorine content to the required figure.

5.0 SHUTDOWN

5.1 Storage Tank Filling

(1) When the overflow level is reached in storage tank C104, request the supply boat to stop pumping fresh water.

(2) Disconnect the hose from the supply boat to fill point.

(3) Open the drain valve at the east hose station for draining hose contents on recovery.

(4) Connect hose end to crane hook and lift to storage position.

(5) After hose and fill line are drained, close the drain valve at the east hose landing.

Note: A low point drain fitted with a restriction orifice is located in the utilities module. This line has continuous open flow to ensure emptying of supply line after bunkering operations.

(6) Close the isolation valves on the supply line.

6.0 REFERENCE DRAWINGS AND DIAGRAMS

- MP-2790-S-0-00-10000
- MP-2790-B-0-51-10048 Freshwater/Flushing Water System

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1.0 INTRODUCTION

The hydraulic supply system is required for the operation of the subsea valve ESSV-4300, ESDV-4301, 4260 and 10000 and MOV-4303, 4307 and 4308.

The system equipment consists of the Hydraulic Control Unit (HCU) and its associated hydraulic fluid reservoir, two hydraulic supply pumps, PSV press relief system, hydraulic fluid filtration system, ESSV-4300 termination frame and umbilical, individual control cabinets for ESSV-4300, ESDV-4301, 4260 and 1000 and a common control cabinet for MOV-4303, 4307 and 4308, N_2-charged bladder type hydraulic accumulators, instrument air and electrical supplies, ESDV and MOV handjack facilities.

1.1 System Operation

Pressurised hydraulic fluid is required to hold the spring return actuators fitted to the subsea valve and all ESD valves in the open (online) position, and for the movement of the double-acting actuators fitted to the three MOVs.

1.2 System Control

Hydraulic pressure is controlled by the operation of the pumps on demand from high and low pressure switches. ESD function is controlled by the use of air and electrically operated SOVs acting on the hydraulic supply systems to individual valves, where the pressurised hydraulic fluid supply is re-routed to allow the valve actuator to move to its fail-safe position.

2.0 DESCRIPTION

2.1 Process Description

Hydraulic supply fluid, namely Isacc Bentley HW-540, is provided by the HCU. The fluid is stored within a reservoir tank and is supplied to the system under pressure by the two hydraulic pumps, MP-G-4000 and MP-G-4001, selected duty and standby respectively. Three N_2-charged bladder type accumulator bottles are fitted to the system on the discharge side of the pumps, and these act as a storage capacity for the hydraulic energy generated by the pumps. Similar accumulator bottles are fitted at MOV-4303, 4307 and 4308, and these are dedicated as backup to the main hydraulic supply, thus ensuring fail-safe operation of the double-acting actuators, fitted to these valves.

Individual hydraulic supplies are routed from the HCU to all ESDV control cabinets. A similar supply is dedicated to the subsea valve via the topsides umbilical terminal frame. A common supply feeds the control cabinet for the three MOVs.

All the foregoing valves are also provided with a hydraulically operated manual handjack facility.

2.2 Process Control

The operation of the hydraulic supply pumps is controlled by the cut-in switch PSL4214 and cut-out switch PSH4230. The maximum pressure generated is 3000psi. Pressure relief valves are incorporated in the system to protect against overpressurisation.

PSLL4211 starts the standby pump.

The discharge flow from the pumps is filtered by two sets of in line stainless steel filter strainers operating on a duty/standby basis. DPSH4213 provides remote indication of filter blockage.

At this point, the main discharge flow takes two separate routes. The first supplies the manually-operated pressure regulators which control the output pressure to the individual ESDV and MOV logic control cabinets. The second route is dedicated to the control and operation of the subsea valve. This supply is split into two identical hydraulic control loops (Stream 1 and 2) comprising shutdown and reset logic. Primary pressure is controlled by manual regulators PCV-4209 and 4210 and control loop selection is dictated by SOV4300A/B and the selector by switches V1 or V2.

Logic from PSL4234 on the fusible loop air pressure ties into the system on the single output line downstream of the control Streams 1 and 2. A block and bleed isolation facility is fitted on the main output supply line. Control for ESD valves is carried out by their dedicated control cabinets which operate on remote, manual, ESD and fire and gas signals to isolate and vent off the pressurised hydraulic fluid from the fail closed spring return actuators, thus ensuring valve closure. A similar control cabinet is dedicated to MOVs 4303, 4307 and 4308 and, although the MOV actuators are double acting, the logic ensures movement to the fail-safe position (FO).

Hydraulic fluid, which is vented from the hydraulic supply system due to the movement of ESDV-4301 and MOV-4303/7/8, is routed back to the hydraulic reservoir. Fluid vented from ESDV-4260 and 10000 is routed to the sump tank at the centre core base. Fluid is vented from the subsea valve actuator or directly to the sea; as this fluid is biodegradable there is no risk of pollution.

2.3 Alarms, Trips and Relief Valves

TAG NO	FUNCTION/LOCATION	SP	ACTION/REMARKS
LAL-4226	HCV Hydraulic Fluid Reservoir		Alarm
LALL-4227	HCV Hydraulic Fluid Reservoir		Stop MP-G-4000/4001
PAL-4214	MP-G-4000/4001 Discharge Pressure	2500psi	Alarm
PAH-4230	MP-G-4000/4001 Discharge Pressure	3000psi	Alarm
PDAH-4213	Filters		Alarm
PALL-4211	Start Stand By Pump	2300psi	Alarm - Check System
PAL-4307	MOV-4307 Hydraulic Supply	100bar	Alarm
PAL-4308	MOV-4308 Hydraulic Supply	100bar	Alarm
PAL-4234	ESSV-4300 Hydraulic Control Air Supply (Fusible Loop)	30psi	Check Fusible Loop System
PAL-4200	ESSV-4300 Hydraulic Supply	800psi	
PAL-4301A	ESDV-4301 Hydraulic Supply	120bar	Check Hydraulic Supply System
PAL-4301B	ESDV-4301 Hydraulic Control Air Supply	4.5bar	Check Hydraulic Supply System
PAL-4303	MOV-4303 Hydraulic Supply	100bar	Check Hydraulic Supply System
PAL-4260A	ESDV-4260 Hydraulic Supply	120bar	Check Hydraulic Supply System

TAG NO	FUNCTION/LOCATION	SP	ACTION/REMARKS
PAL-4260B	ESDV Hydraulic Control Air Supply (Fusible Loop System)	4.5bar	Check Fusible Loop System
PAL-10001	ESDV-10000 Hydraulic Supply	120bar	Check Hydraulic Supply System
PAL-10002	ESDV-10000 Hydraulic Control Air Supply (Fusible Loop)	4.5bar	Check Fusible Loop System
PSV-4215	MP-G-4001 Discharge	227.6bar	Refer to Drawing MP-2790-B-0-56-10057
PSV-4216	MP-G04000 Discharge	227.6bar	Refer to Drawing MP-2790-B-0-56-10057
PSV-4217	Common Supply Line to Hydraulic Accumulators	280bar	Refer to Drawing MP-2790-B-0-56-10057
PSV-4233	Supply to NC Hydraulic Accumulator Bottle	280bar	Refer to Drawing MP-2790-B-0-56-10057
PSV-4240	HCU Outlet Line	174bar	Refer to Drawing MP-2790-B-0-56-10057
PSV-4242	HCU Supply to MOV-4303/7/8	152bar	Refer to Drawing MP-2790-B-0-56-10057
PSV-4241	HCU Supply to ESDVs	132bar	Refer to Drawing MP-2790-B-0-56-10057

2.4 Major Equipment Descriptions

2.4.1 Hydraulic Control Unit - HCU

The HCU is housed in two stainless steel cabinets which are located within the firewall on the north side of the Tartan gas metering skid. Both cabinets are fitted with hinged doors for access. Windows are incorporated to provide a clear view of panel facia mounted equipment.

The first cabinet (No 1) houses the two hydraulic supply pumps MP-G-4000 and 4001, the ‘inline’ strainer filters, the dedicated operation and control system ESSV-4300, PSVs, and filtered air supply point for hydraulic fluid filtration pack. The facia panel contains the following: PI4207 (pump output), PI4218 (accumulator press), PI4201 (output press), PI4207 (regulated press Stream 1). Also fitted to this facia panel are the Tartan skid fusible loop fast charge button, subsea valve ‘close’ switch HCL4205, reset button HCH4206 and manual pressure control regulators PCV-4209 (Stream 1) and PCV-4210 (Stream 2).

Also contained in this cabinet is an undersized redundant stainless steel hydraulic reservoir.

The second cabinet (No 2) contains the hydraulic reservoir with top-mounted fluid filtration pack, PSVs, two identical and interchangeable supply manifolds comprising pressure reduction regulators and isolation valves on individual output lines to ESD and MOV actuators.

Output from these manifolds is classed as Streams 1 and 2. The output from each stream is divided in two with one common supply to the ESDV-4301, 4260 and 10000 and the other supplying MOV-4303, 7 and 8. The Streams 1 and 2 are operated on a duty/standby basis. The following is displayed on the facia panel:

- Hydraulic supply pressure from Stream 1 to MOV-4303, 7 and 8
- Hydraulic supply pressure from Stream 2 to MOV-4303, 7 and 8
- Hydraulic supply pressure from Stream 1 to ESDV-4301, 4260 and 10000
- Hydraulic supply pressure from Stream 2 to ESDV-4301, 4260 and 10000

Both panels are fire protected by fusible loops systems.

2.4.2 ESSV Umbilical Termination Frame

The termination frame is mounted in a purpose-built basket beneath the north-east deck. The frame provides termination both hydraulically and electrically for the 'multiplex' umbilical which carries supplies for the 500m distance to the subsea valve. The umbilical is supported to ensure that no stress is placed on it when connected.

The termination frame is fitted with three 'Kenmac' block and bleed isolation units providing isolation for the hydraulic valves. Only one of these units is online at any one time, with the remaining two being spares.

The terminal frame is connected to the HCU, unit by a 1/2in supply line.

2.4.3 Hydraulic Reservoir

This is a rectangular stainless steel tank with an operating capacity of approximately 500 litres when the system is pressurised. The tank is filled manually and access is gained by removal of a top-mounted filter cap. The tank is fitted with LSL-4225, LSLL-4227 and a calibrated sightglass. An overflow line and drain plug are fitted.

2.4.4 Hydraulic Pumps MP-G-4000, MP-G-4001

The pumps operate on a duty/standby basis. Selection is from the Fisher control system.

Both pumps are electrically driven with MP-G-4000 being fed from ES1, cubicle FH3, and MP-G04001 fed from ES2, cubicle F3.

Local stop buttons are located at the pumps.

2.4.5 Hydraulic Filters

The two primary Fairey Arlon filter units operate on a duty, standby basis. DP is monitored by DPSH-4213, which activates a remote alarm signal. These filters are fitted with disposable elements and are designed for flowrates of 100 litres/min at 690bar. A local indicator is fitted on top of each filter housing and filter condition may be observed by colour change on this unit, with a change from 'yellow' to 'red' indicating filter clogging.

The secondary filter system, namely the 'OL' filter package, is fitted to the top of the hydraulic reservoir. An air driven pump circulates hydraulic fluid from the reservoir through a filter element which is fitted in a transparent bowl housing.

Air supply to the unit is filtered and the supply valve is located in the main HCU cabinet. An 'ON/OFF' (pull) switch is fitted on top of the packaged unit.

This system should be put online for a half-hour period at fortnightly intervals.

2.4.6 Hydraulic Accumulators

Hydraulic accumulators contain N_2 pressurised bladders. Compression of the bladders by hydraulic fluid discharged from the pumps results in a reservoir of hydraulic power until equilibrium is reached between bladder and fluid pressure. This source of energy is continually renewed each time the hydraulic pump cuts in.

These accumulators are located between the two HCU cabinets. One of these accumulators is left blocked in and fully pressurised and is designed for emergency backup only. The supply to this accumulator is fitted with a dedicated PSV and this unit should not be confused with the others when making any associated valve movements.

MOV-4303/7/8 are each fitted with two accumulators. NRVs are fitted upstream of the supply tappings to these units, thus ensuring hydraulic energy is always available to move the valves to 'fail safe' should the main hydraulic system fail.

2.4.7 ESDV and MOV Control Cabinets

Individual stainless steel control cabinets are located at ESDV-4301 at deck level above the valve and opposite ESDV-4260 and ESDV-10000 in the centre core. A single cabinet for MOV-4303/7/8 is located within the north-east corner of the Tartan skid.

All ESD cabinets operate on the principle of SOVs isolating the supply pressure and venting of the trapped fluid via the return line to the storage reservoir. This allows the compressed actuator spring to expand, thus closing the valve. ESD closure can be activated from remote pushbutton in St Fergus, and local control rooms, from fire and gas signal, from ESD signal, from process shutdown, from loss of fusible loop pressure, and from individual cabinet pushbutton.

Each ESDV cabinet has gauges indicating supply air pressure, supply hydraulic pressure and output hydraulic pressure. Alarms give indication of low air and hydraulic supply pressures. Each cabinet is fitted with a quick-charge button for the fusible loop systems.

The cabinet for the MOVs houses the control system for the three valves. Electrically operated SOVs respond to ESD signals by diverting the flow of the hydraulic supply, if necessary, thus swinging the valves to fail-safe positions. Gauges are fitted which indicate the hydraulic supply pressure to each MOV.

Handjack facilities and their associated reservoirs are fitted in each control cabinet.

2.4.8 Fusible Loops

Fusible loops are designed to rupture at 69ºC. Fusible loop systems are fitted above the HCU cabinets, above all ESD valve cabinets and above the Tartan skid. The systems are pressurised with air, which acts on SOVs within the control cabinets. Air is supplied to the system via dedicated regulators on the assumption that this will compensate for any small leaks, but would not replace air lost in the case of a fire scenario and consequential loop rupture.

The system is designed so that the loss of air pressure results in ESD/ESSV closure. A 'fast-charge' button which bypasses the supply regulator is fitted to control cabinets for recharging systems.

3.0 STARTUP

3.1 ESSV-4300 Operation via Control Streams 1 and 2

(1) Ensure fusible loop is fully pressurised.

(2) Ensure hydraulic reservoir contains sufficient fluids.

(3) With no pressure on the system, the following pressure switches should indicate alarm status:

- PSL-4214
- PSL-4211
- PSL-4200

(4) Open the isolation ball valves on the supply lines to both hydraulic pumps MP-G-4000 and MP-G4001.

(5) Ensure that all pressure gauge isolation valves are open.

(6) Ensure that all pressure switch isolation valves are open and vent valves closed.

(7) Open the upstream isolation valves for pressure regulators PCV-4209 and PCV-4210.

(8) Open the isolation valve on the Kenmack bleed/block/bleed valve assembly and close the two vent valves.

(9) Open the upstream and downstream isolation valves on the duty hydraulic filter. The standby filter isolation valves should be closed. Also open the isolation manifold for DPSH-4213, downstream valve open, equalising valve close, then upstream valve open.

(10) Start the hydraulic pump and allow pressure to build up to 3000psi.

(a) Check pressure on PI-4218 and P-4212.

(b) PSL-4214 should go healthy.

(c) PSLL-4211 should go healthy.

(11) Open the downstream isolation valve from pressure regulator PCV-4209.

(12) Select valve V1 on keyswitch assembly, ie open valve till keyswitch is removed, insert in V2 and close valve.

(13) Using HS-4300, select SOV-4300A and operate to the open position.

Note: Please note that whether either of the two solenoids are being opened, the manual latch must be operated on the solenoid before the valve will open.

(14) Adjust pressure regulator PCV-4209 clockwise to obtain an outlet pressure of 1650psi. Check pressure on gauges PI-4207 and PI-4208.

(15) Check HCL-4205 is closed.

(16) Manually operate HCH-4206 to the open position and hold in for a sufficient period to allow the double-piloted slide valve to hydraulically latch open allowing fluid through SOV-4300A and open the double-piloted slide valve on the main hydraulic outlet line.

(a) Pilot pressure of 3,000psi should be indicated on PI-4304.

(b) Hydraulic outlet pressure of 1650psi should indicate on PI-4201 when re-set on SOV-4300A is pulled.

(c) PSL-4200 should go healthy.

(d) Subsea valve should open.

(17) Vent outlet pressure by operating HCL-4205.

(a) PSL-4200 should alarm.

(b) PI-4201 should show zero pressure.

(c) PI-4204 should show zero pressure.

(d) Subsea valve should close.

(18) Select valve V2 on keyswitch assembly.

(19) Using HS-4300 select SOV-4300B and operate to the open position. Re-set SOV-4300B.

(20) Check HCL-4205 is closed.

(21) Manually operate HCH-4205 to the open position and hold in for a sufficient period to allow the double-piloted slide valve to hydraulically latch open allowing fluid through SOV-4300B and open the double-piloted slide valve on the main hydraulic outlet line.

(a) Pilot pressure of 3,000psi should be indicated on PI-4202.

(b) Hydraulic outlet pressure of 1605psi should indicate on PI-4201.

(c) PSL-4200 should go healthy.

(d) Subsea valve should open.

(22) Vent outlet pressure by operating HCL-4205.

(a) PSL-4200 should alarm.

(b) PI-4201 should show zero pressure.

(c) PI-4202 should show zero pressure.

(d) Subsea valve should close.

(23) Using HCH-4205 reinstate the hydraulic outlet pressure.

(a) PSL-4200 should go healthy.

(b) Subsea valve should open.

3.2 ESSV-4300 Operation via Fusible Loop

(1) Vent the air pressure from the fusible loop.

(a) PSL-4201 should show zero pressure.

(b) PSL-4200 should alarm.

(c) PSL-4234 should alarm.

(d) PSL-4224 should show zero pressure.

(e) Subsea valve should close.

(2) Reinstate the fusible loop air pressure.

(a) PI-4201 should show 2,000psi pressure.

(b) PSL-4200 should go healthy.

(c) PSL-4234 should go healthy.

(d) Subsea valve should open.

(3) Remove keyswitch key to open both valves on the keyswitch assembly. Hold both resets out and change over handswitch HS-4300 from Line 'A' to 'B'. No discernible pressure jump should occur on pressure gauge PI-4201.

(4) Repeat operation with HS-4300 from Line 'B' to 'A'.

3.3 ESSV-4300 - Normal Resets

(1) To open valve - if valve has been closed manually from the Fisher control system:

(a) Give the valve an open command from the Fisher control system.

(b) Reset online solenoid valve by pulling down black knob (SOV-4300A or SOV-4300B).

(c) Valve will now open.

(2) To open valve - if valve has been closed by local HCU shutdown switch HCL-4205:

(a) Reset shutdown switch HCL-4205 to 'normal' position.

(b) Depress button HCH-4206 and hold in for 5 seconds.

(c) Valve will now open.

(3) To change over solenoid valves 4300A and 4300B without closing valve:

(a) Close HV-240 output valve (yellow handle).

(b) Open keyswitch valve V1 or V2 (both valves should not be open).

(c) Pull down reset button on solenoid to be used.

(d) Change over selector switch position.

(e) Close keyswitch valve V1 or V2.

(f) Open HV-240 output valve.

3.4 ESDV Operation (4301)

(1) Ensure supply pressure is healthy on PI-4212.

(2) Ensure no pressure showing downstream of PCVs 1 and 2 (hand regulators).

(3) Ensure supply valve to ESDV-4301 within HCU cabinet is open.

(4) Ensure inlet and return valves in ESDV-4301 control cabinet are open.

(5) Ensure control cabinet handjack system is isolated.

(6) Ensure control cabinet air pressure is healthy.

(7) Ensure control cabinet hydraulic supply bypass is closed.

(8) At HCU, slowly adjust PCV 1 or 2 (as required) until hydraulic supply pressure gauge shows 110bar.

(9) Give ESD-3401 an open signal from the Fisher control system.

(10) ESDV-4301 will open.

Note: If valve closed on an ESD signal then the reset button on the local control panel will require to be pushed to clear ESD logic.

3.5 ESD Operation (4360 and 10000)

(1) As per Paragraph 3.4 Steps (1) to (10) (substitute 4260 or 10000 for 4301).

Notes: (1) The facility exists to close ESDV-4260 and 10000 by the operation of the 'EMERGENCY' hand valves located adjacent to the centre core doorway.

(2) This facility simply vents air from the fusible loop/control system thus closing the ESDVs.

3.6 MOV Operation (4303)

(1) Ensure supply pressure is healthy on PI-4212.

(2) Ensure no pressure is showing downstream of PCV 3 and 4 (hand regulators).

(3) Ensure supply valve to MOV-4303 within HCU cabinet is open.

(4) Ensure inlet supply and return valves at MOV-4303 control cabinet are open.

(5) Ensure cabinet handjack system is isolated.

(6) Ensure cabinet supply bypass valve is closed.

(7) At HCU slowly adjust PCV 3 or 4 (as required) until hydraulic supply pressure gauge shows 130bar.

(8) Give MOV-4303 an open or closed signal (as required) from the Fisher control system.

(9) MOV-4304 will open or close.

Note: For operation of MOV-4307 or 4308, repeat Steps (1) to (9) above with 4307 or 4308 substituted for 4303.

4.0 SHUTDOWN

4.1 ESSV and ESDV Closure

For full logic details refer to Tartan Gas Transportation Procedure 4.5.5 and 4.5.6.

Closure can be carried out from the HCU cabinet by reducing the hydraulic supply pressure to a selected valve by use of the manual pressure regulators.

5.0 REFERENCE DRAWINGS AND DIAGRAMS

- CPL-MCP-SGA-12281 HCU Cabinet No 1
- CPL-MCP-SGA-12280 HCU Termination Frame
- CPL-MCP-JSM-12276 HCU Schematic
- CPL-MCP-JSM-12277 HCU Schematic
- MP-2790-B-0-56-10059 Hydraulic Interconnection Diagram
- P&ID CPL-MCP-PPI-12278 HCU Control System
- MP-2790-B-0-56-10057 HPU and Distribution P&ID
- MP-2790-B-0-56-10040 SHT 2 ESD 4301 Control Panel
- MP-2790-B-0-56-10040 SHT 4 ESD 4260 Control Panel
- MP-2790-B-0-56-10040 SHT 5 ESD 1000 Control Panel
- MP-2790-B-0-56-10040 SHT 3 MOV 4303, 7 and 8 Control Panel

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1.0 INTRODUCTION

The air system is required to produce and distribute air at a quality suitable for the operation of all Platform instruments.

The air system does not include a dedicated plant air header. However, the capacity of the system will allow limited use of 'dry' air for plant air purposes. The system equipment consists of two electrically driven 'screw' type air compressors, filters, driers and wet and dry air receiver.

The air compressor and air drier package are housed in an ISO container on the north deck. The wet air receiver is located adjacent to this container and the dry air receiver is located in an underdeck basket near the north-east corner of the platform.

1.1 System Operation

The system is designed to operate continuously with the two compressors, and two air drier banks, operating on a duty/standby basis.

1.2 System Control

Control is via a panel located within the ISO container. The units can be started locally, or remotely from the Fisher control system.

Alarm and trip signals are displayed on control room VDUs. The startup of the standby machine is automatic. The drying and regenerating cycles of the air driers is by automatic switching.

1.3 Special Features

- Three gas detectors operating on a two-out-of-three voting system are fitted on the air supply ducting
- A maximum short-term flowrate of 360m^3/hour of instrument air can be produced. This quantity is based on both compressors running with maximum regeneration

WARNING: COMPRESSED AIR CAN BE DANGEROUS IF HANDLED CARELESSLY OR USED INCORRECTLY. NEVER POINT A COMPRESSED AIR HOSE AT ANYONE OR USE IT TO REMOVE DUST FROM CLOTHING. NEVER APPLY COMPRESSED AIR DIRECTLY ONTO THE SKIN SINCE IT IS EASILY ABSORBED INTO THE BLOODSTREAM AND DEATH COULD RESULT DUE TO EMBOLISM (AIR IN BLOOD STREAM).

USE ONLY COMPATIBLE CONNECTIONS.

2.0 DESCRIPTION

2.1 Process Description

2.1.1 Design Parameters

Instrument air is supplied at 180m^3/hour at pressure between 5.5 and 8.7bar with a dewpoint of -40°C.

2.1.2 Instrument Air Production

Compressed air is supplied by means of a complete containerised package unit (MP-V-11000) consisting of the following equipment:

- Two Tecair 2000/22 compressors MP-K-11001 and MP-K-11002
- Two Silicair drier units MP-KH-11005A and MP-KH-11005B
- Drier pre-filters MP-KH-11004A and MP-KH-11004B
- Drier after filters MP-KH-1106A and MP-KH-11006B
- Local control and alarm indication panel
- Compressor lube oil systems
- Combined oil and discharge air cooler
- Electric space heaters

Atmospheric air is filtered as it is drawn into the suction of the compressor. It then passes through the intake controller prior to being compressed by the air screw unit. Oil is separated from the air by the separator receiver and purifier prior to reaching the air discharge cooler. Water is separated from the discharge air by a condensate trap which dumps to overboard.

Wet air is stored in the air receiver MP-C-9101, which is situated outside the compressor package container. Air from this receiver is piped back to the compressor package unit where it is filtered prior to passing through the drier. On leaving the onstream drier, part of the air stream is diverted to regenerate the second drier.

On leaving the drier, the dewpoint of the main air stream is checked by a mixture analyser unit. It is then filtered prior to leaving the compressor package unit for storage in the dry air receiver MP-C-120.

2.1.3 Instrument Air Distribution

The supply headers distribute the instrument air to the following process and utility areas:

- Tartan skid
- Hydraulic control system
- Wash water system
- Generator areas 1, 2 and 3
- Control area
- TR area
- Centre core
- Purge gas system

- The diesel supply system
- RIOs 1 and 3
- East crane

2.2 Process Control

The air compressor and drier packages are controlled by the local control panel which interfaces with the DCS, thereby transferring and receiving information to/from the local and St Fergus control rooms. The local control panel has switching facilities for compressor and drier duty/standby selection, and for local/remote compressor start/stop.

Alarms and trips are displayed on a conventional alarm annunciator on the front of this control panel.

Refer to P&IDs MP-2740-0-B-0-53-10053 and MP-2790-0-B-0-53-10054 for compressor, drier and control panel details, and drawing SAS1019 for general details.

2.2.1 Compressor Start/Stop Control

The start/stop and load/unload sequences are controlled by the falling pressure switches, which are fitted on a common tapping from the main air discharge line downstream of the moisture analyser.

- PSL-16649 starts stand by compressor. Deactivates run on timer
- PSL-16648 starts duty compressor. Deactivates run on timer
- PSH-16647 unloads both compressors. Activates run on timer. Deactivates drier

Load and Unloading

Both compressors operate at constant speed with load/unload function provided by signals from the above pressure switches acting on SOV-16604 and 16612 for MP-K-11001 and MP-K-11002 respectively. The function of the SOV is to divert air flow to act on the air intake controller for load/unload function as required.

2.2.2 Instrument Air Driers

The following drier sequences are carried out by means of a drier changeover control unit which operates on a times cycle: 5 minutes drying, 4.5 minutes regeneration and 0.5 minutes equalising pressure between the two on line drier vessels.

Wet air passes through a switching valve assembly and is directed upwards through a desiccant bed of activated alumina which absorbs the moisture from the air. A portion of the dry outlet air is used to regenerate the desiccant in the alternate drier. Wet air from the regeneration cycle is vented to atmosphere.

On completion of the regeneration cycle, the vent valve closes thus pressurising the vessel with dry air to full system pressure. The inlet valve is then opened allowing full airflow through the regenerated bed.

The repressurisation stage of the regenerated drier is necessary to eliminate the possibility of sudden pressurisation which would agitate and fragment the desiccant bed.

Drier selection is via the duty drier selector on the Fisher control panel. Activation is on automatic signal from the air compressor run-up sequence.

High moisture alarm MAH-10569 causes automatic switching of the duty/standby units.

For full details of system and control logic refer to drawing SAS 1047, P&ID MP-2790-B-0-53-10054 and SAS PL-2290.

2.2.3 Instrument Air Distribution

Refer to P&I/D MP-2790-B-0-53-10056. Dry air supply to the instrument air receiver MP-C-120 is controlled by PCV-16825 on the inlet to the vessel, which ensures that no air is routed to storage if the supply pressure is less than 6bar. An NRV is fitted on the outlet line from the vessel.

Where necessary, pressure reduction is made locally to the instrument air consumers.

2.3 Alarms, Trips, and Relief Valves

Setpoint (SP) Units: Temperature: -°C Pressure: bar

TAG NO	FUNCTION/LOCATION	SP	ACTION/REMARKS
XA-10503	K-11001 Fault		Alarm
XA-10523	K-11002 Fault		Alarm
TAHH-10540	Common Discharge to wet air receiver	30°	Alarm
PALL-10525	Air Distribution	5bar	Alarm + Level 2 ESD
MAH-10569	High Dewpoint	-30°C	Alarm + Drier Changeover
GD-13000	Air Intakes two-out-of-three Voting	20% and 60%	Alarm + Level 2 ESD
GD-13001	Air Intakes two-out-of-three Voting	20% and 60%	Alarm + Level 2 ESD
GD-13002	Air Intakes two-out-of-three Voting	20% and 60%	Alarm + Level 2 ESD
MAC-13001	Manual Activation Call		Alarm
PSV-16605	MP-K-11001 Discharge	10.5	
PSV-166013	MP-K-11002 Discharge	10.5	
PSV-16624	MP-K-11005A - Absorber No 1	10.5	
PSV-16625	MP-K-11005A - Absorber No 2	10.5	
PSV-16637	MP-K-11005B - Absorber No 1	10.5	
PSV-16638	MP-K-11005B - Absorber No 2	10.5	
PSV-16824	MP-C-120 Dry Air receiver	10.0	
PSV-10552	MP-C-11009 Wet Air Receiver	10.5	
TSH-16606	MP-K-11001 Discharge Temp	100°C	Alarm/Trip

TAG NO	FUNCTION/LOCATION	SP	ACTION/REMARKS
TSH-16614	MP-K-11002 Discharge Temp	100°C	Alarm/Trip
PAH-10571	MP-C-120 Air Pressure	9bar	Alarm
PAL-10571	MP-C-120 Air Pressure	5.5bar	Alarm

2.4 Major Equipment Descriptions

2.4.1 Air Compressors MP-K-11001 and MP-K-11002

TECHNICAL DATA		
Rota Nova	Model	R 2S UF
Screw-type compressor model	RC	B 100
Operating pressure	bar psi	6.5 to 15 90 to 213
Air delivery according to DIN 1945	m^3/min cfm	up to 3.6 (4.3) up to 128
Power required (full load) with fan	kW HP	15 to 22 20 to 30 (40)
Speed of main rotor	-1/min RPB	max 6.500 (7.700) max 6.500 (7.700)
Fan speed	-1/min RPM	max 2.700 max 2.700
Separator tank, nom capacity	l qts	ca 17 (19) ca 17 (19)
Oil filling quantity	l qts	5.5 to 6.0 5.5 to 6.0
Machine weight (without oil)	kg lbs	ca 120 (180) ca 265 (397)
Compressed air connection	mm inch	20 3/4in
Fan size	mm inch	380 15in
Max outlet temperature	°C °F	100 212
Max Room temperature	°C °F	40 102
Amount of heat to be carried off: 96% of drive output (refer to RC cooling air quantity chart)		

2.4.2 Air Driers MP-KH-1005 A/B

The driers are identical units designed for removing water from a compressed air stream prior to distribution to the instrument air network. The driers are designed to give a discharge dewpoint of -40°C at operating line pressure.

The vertically-mounted desiccant packed absorber vessels form the nucleus of the plant. Each absorber is fitted with its own pressure gauge, activation valves outlet NRV and PSV.

A small purge line, complete with flow orifice, connects the two absorbers just upstream of the discharge NRV. Situated between the two absorbers is a control panel which houses the timers and other equipment necessary for sequencing the driers. The control panel has a hinged cover which incorporates a start pushbutton to start the drying and activation sequences.

The driers are packed with solid granular desiccant (activated alumina) which absorbs water vapour at normal temperatures. It is then regenerated to restore full absorption capacity, by purging with a flow of dry air to release and disperse the moisture evolved. The cycle of absorption and regeneration does not change the mechanical or physical properties of the desiccant, which does not 'wear out' and is virtually everlasting. The unit is designed for continuous operation. Refer to GA drawing P12290 for detail.

2.4.3 Instrument Air Drier Pre Filter MP-KH-11004A/B

The purpose of the pre-filter is to remove any oil mist from the compressed air stream prior to entering the air drier. The moisture is removed by a liquid trap. Two identical units, comprising cartridge type filters and associated liquid trap are fitted in parallel and operate on a duty/standby basis. A dirty filter is indicated on PID-16616.

2.4.4 Instrument Air Drier After Filter MP-KH-11006A/B

The purpose of this filter is to remove desiccant dust or particles picked up by the compressed air flow passing through the driers. Two identical units, comprising cartridge type filters, are fitted in parallel and operate on a duty/standby basis. A dirty filter is indicated on PDI-16645.

2.4.5 Air Receiver MP-C-9101

The receiver provides a storage and surge facility for 'wet' compressed air, upstream of the air diers. It also collects freewater generated by compression and cooling. This water is dumped overboard from an automatic liquid trap. The unit is a vertical pressure vessel with a capacity of 1.62m^3.

2.4.6 Instrument Air Receiver

The receiver provides a storage and surge facility for dry compressed air for the instrument air supply network. The unit is a horizontal vessel with a capacity of 43m^3.

3.0 STARTUP

3.1 Pre Startup Procedures and Tasks

3.1.1 Utilities

Operation of the instrument air facilities requires the use of electrical power for compressor drive motors, controls and instruments, and for container heating and lighting.

3.1.2 Instrument Air Production

General

(1) Check that all instruments are functional.

Ensure that isolation and, where applicable, drain valves to and from items of instrumentation are in the correct position.

(2) Check that shutdown systems are functional and online.

(3) Ensure that communications are fully established and are functioning manually.

3.1.3 Compressor Unit (Following Extended Shutdown)

The following procedure must be carried out following any extended compressor shutdown (more than 3 months):

(1) Rotate the screw compressor manually several times in the direction of rotation.

(2) Fill 0.25 litres of oil (same oil as in separator receiver) into the intake connection pipe after removing the intake filler cap with the unit shutdown.

(3) Rotate the screw compressor again manually in the direction of rotation.

(4) Check the oil level in the separator container and top it up if required, as per following procedure:

(a) Switch off the unit and prevent it from being switched on unintentionally.

(b) Allow one minute after stopping the compressor.

(c) Unscrew the cap of the inlet connection pipe manually with the oil container discharged.

(d) Check oil level with the dipstick. Its reading is only correct if it has been screwed in totally.

(e) Top off oil of the same oil type up to the maximum level, if required.

(f) Tighten the screw cap manually.

(g) Switch on the unit.

(h) Check for impermeability and replace the O-ring, if required.

(5) The compressor should be checked for 15 minutes on startup if the foregoing has been carried out.

3.1.4 Normal Pre-start Checks - Compressor Units/Drier Units

(1) Check oil level in separator receiver.

(2) Check aftercooler moisture trap is online and clear of water. Ensure that bypass is closed.

(3) Check compressor discharge valves are open.

(4) Ensure MP-C-9101 moisture trap is clear of water and trap is online. Check bypass is closed.

Drier Units

(1) Put both 'A' and 'B' drier pre-filters online.

(2) Check that pre-filter moisture trap is clear of water, the trap is online and bypass closed.

(3) Put both 'A' and 'B' instrument air filters online.

(4) Check drier vessel drain valves are closed and pipework blanked off.

(5) Open outlet valve from each drier bank.

3.1.5 Control Panel

(1) Ensure local/remote selector switch is at 'OFF' position.

(2) Ensure power is available at control panel. Check 'POWER'.

(3) Check condition of annunciator lamps. Replace defective bulbs.

3.1.6 Distribution System

(1) Ensure all isolation valves are closed at flexible hose connection points.

(2) Ensure PCV-16825 block valves are fully open.

(3) Ensure C-120 drain valves are closed and pipework blanked off.

3.2 Startup Procedures and Checks

Ensure that all pre-start checks have been carried out on the system.

3.2.1 Startup Air Compressors and Driers

(1) Push in the local 'stop' buttons at both local stop/start stations.

(2) Select the duty machine on the local control panel. When is 'A' selected as 'Duty', compressor MP-K-11001 will be the first machine to start if the system pressure falls. MP-K-11002 will automatically be selected on 'standby' and will start if the duty machine cannot maintain system pressure.

(3) Select the local/remote selector switch to remote.

(4) Reset both local stop/start stations and compressors will run.

(5) When pressure reaches 5bar, press 'start' button on 'duty' drier. Drier will then come onstream.

(6) System will now operate under pressure switch control.

(7) On startup following prolonged shutdown, the system will require to run for 24 to 48 hours to dry out the drier medium, before a satisfactory dewpoint is established.

3.3 Interdependence with Other Systems

Instrument air is essential for the operation of the following process, utility and safety systems:

- Hydraulic control system
- ESD systems
- Tartan gas flow control
- HVAC systems
- CO_2 systems
- I/O unit purge supply
- Purge gas system

3.4 Different Startup Conditions

The temporary loss of platform power supplies will result in load disconnection. The method of reconnection of intermittent loads such as the air compressors will be as and when the cut in pressure switch dictates. Therefore immediate restart is not automatic.

4.0 NORMAL OPERATIONS

The normal operation activity is confined to verification of normal operating parameters by regular monitoring of the VDU display screen in the St Fergus control room.

4.1 Routine Duties and Checks

4.1.1 Logging

System operation should be verified and recorded by means of a regular logging procedure. Actual operating conditions should be compared to the design parameters. Also, values displayed on the VDU should be cross-checked against actual plant readings during platform visits.

4.1.2 Operating Checks

The following checks should be carried out during platform visits:

(1) Compressor oil levels.

(2) Drier operation and water dewpoint check.

(3) Correction operation of moisture traps by manual draining of air receivers.

(4) Correct operation of standby compressor by shutting down the duty machine.

(5) Correct operation of compressor run on timer following offloading by high pressure switch.

(6) Correct drier changeover by operation of selector switch.

(7) Correct drier changeover by simulation of high dewpoint alarm.

(8) Readings and function checks should be recorded on logsheet/PM sheets provided.

4.2 Fault-finding on Compressors and Driers

The following pages contain information to be used as guidance for basic troubleshooting on the air compressors. The following table is dedicated to the drier system.

REMEDY OF MALFUNCTIONS		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Wrong sense of rotation	Phases reverse	Reclamp two feedline phases
Unit does not start	No current	Check
	Main and control fuses feed line	Check and tighten, if required
	Loose cables or fuses	Check and tighten, if necessary
	Motor protection switch has switched off	Unlock (in the control box)
	Contact thermometer (combined thermovalve) is interrupted - defective	Check and replace it, if defective
	Contact thermometer switches off due to excessive temperature	Check oil level, oil cooling and thermal bypass
Unit takes too long to start	Time for Y-delta switchover:	Time setting must be:
	• Too long	• Put back
	• Too short	• Put forward
	Unit is pressure – loaded	Check solenoid and relief valves and replace them, if required
	Voltage fluctuations in the mains	Check
	Low ambient temperature compressor oil viscous	Heat unit
	Oil too viscous	Use adequate oil types

REMEDY OF MALFUNCTIONS		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Unit stops before reaching final pressure	Response of the motor protection relay or the motor protection Combined thermovalve switches off due to excessive temperature. Short-circuit in the control line replace	Check setting of motor protection relay, correct it, if necessary. Check pressure setting at pressure control device, correct it, if necessary. Check feed line for Phase failure: • Oil • Cooling • Thermo bypass • Determine cause • Defective fuse
Differential pressure	Excessive temperature between air end and separator cartridge	Replace separator cartridge
Motor protection relay (therm over-current relay) switches off the unit	Unit is blocked and remove it Phase failure Excess load setting at the pressure control device and setting of the motor protection relay, correct it, if required Excessive ambient temperature	Determine cause Check feedline Check pressure Supply cooling air

REMEDY OF MALFUNCTIONS		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Contact thermometer switches off due to excessive temp	Lack of oil	Check oil level in the oil receiver and it up if required
	Oil filter contaminated	Replace oil filter cartridge
	Thermostat defective	Replace thermostat
	Oil cooler contaminated	Clean oil cooler with air and oil, if required
	Incorrect installation: • Room ventilation • Cooling air stream • Thermal short-circuit	Observe recommendations for inst the unit
	Contact thermometer defective or wrong setting	
Safety valve blows off	Safety valve defective	Replace safety valve
	Purifier cartridge clogged	Replace cartridge
	Unit does not discharge (continuous operations)	See ‘Symptom’
	Unit is not switched off automatically (intermittent operation)	See ‘Symptom’
Oil in the compressed air	Oil intake pipe with nozzle in the oil gauge glass contaminated	Clean oil intake system
	Purifier cartridge damaged	Check cartridge, replace it, if necessary
	Oil level in the oil container too high or too much condensate in the oil	Observe oil level marking, drain and renew oil if necessary

REMEDY OF MALFUNCTIONS		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Unit is not discharged in continuous operation, unit is not switched off automatically in intermittent operation (ie safety valve blows off)	Upper shift point of pressure control device too high	Reset pressure control device
	Solenoid valve defective	Replace solenoid valve
	Relief valve defective	Replace relief valve
	Minimum pressure valve jammed	Check minimum valve, clean and/or repair it if necessary
Unit constantly discharges a small amount of air	Solenoid valve/relief valve defective	Replace solenoid valve/relief valve
	Electric feed line to solenoid valve interrupted	Remove interruption
	Auxiliary contact at the Y contactor defective	Check switch and replace it, if required
No or too little free air delivery	Intake filter contaminated	Replace filter insert
	Intake control or intake flap is jammed or is incorrectly set	Check control and flap, clean bearing and guides, check stroke
	Leakage in the system	Check and seal it
Intake control does not close at 1bar pressure	Setting cylinder defective nozzle clogged or frozen	Replace/clean filter.

5.0 SHUTDOWN

5.1 Process Shutdown

(1) The system will be shut down on any platform Level 0 or Level 1 shutdown.

(2) Any two-out-of-three gas detectors in the compressor air intakes indicating 60% LEL will shut down the air compressors and their auxiliary power supplies.

(3) PALL-10525 set at 5bar on distribution system will give Level 2 ESD.

(4) TAHH-16606 set at 100°C on MP-K-11002 discharge will trip this machine.

(5) TAHH-16614 set at 100°C on MP-K-11002 discharge will trip this machine.

5.2 Normal (Planned) Shutdown

Before shutting down the duty compressor, the standby machine should be ready to start in order to satisfy instrument air requirements. If it is necessary to take a machine out of service for maintenance, the following procedure should be followed:

(1) Set the standby machine to manual mode (ensure discharge valve is open).

(2) When air system if fully pressurised and the duty compressor is in the unload condition, start the standby machine. Check that the machine runs unloaded.

(3) Select standby machine to 'DUTY' and select 'AUTO'.

(4) Push in stop button for original duty machine.

(5) Check that online machine loads and unloads automatically.

(6) Lock off electrical supply to offline compressor and lock closed discharge valve.

(7) Vent off trapped compressed air via aftercooler moisture trap bypass drain line.

6.0 REFERENCES AND DRAWINGS

6.1 Vendor References

- No 044 - SAS Ltd Operating and Maintenance Manual for Instrument Air Compressor System Tag No MP-V-11000
- No 045 - Certification Manual for Air Compressor and Drier Equipment Tag No MP-V-11000

6.2 List of Drawings

Safety Air Services Ltd Drawings

- SAS1019 Air Compressors General Arrangement
- PL2290 Air Driers General Arrangement
- SAS1047 System Logic Diagrams

Total Drawings

- MP-2790-B-0-15-10052 Instrument Air Flow Diagram
- MP-2790-B-0-10-10053 Air Compressors P&ID
- MP-2790-B-0-10-10054 Air Driers P&ID
- MP-2790-B-0-10-10056 Air Distribution PID

CONTENTS

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1.0 INTRODUCTION

Two main radio links provide telephone and data communications - ie the satellite link to Mormond Hill and the line-of-sight radio link to the Tartan Platform. This forms the basis of the primary and secondary links. Backup and emergency communications are provided by means of HF radiotelephone and VHF marine and air-band radios.

Telecommunications equipment is located in three main areas; the telecoms area, the control point within the control area on Level 3, and at the emergency command centre within the TR on Level 1.

Two communication racks 'A' and 'B' contain marine and air-band radio equipment necessary for normal and emergency operations. Communications rack 'A', along with the video surveillance system, is located at the control point. Communications rack 'B' and PA rack 'B' are located at the emergency command centre within the TR. All other equipment is located within the telecoms area. (Refer to drawings MP-2790-Z-67-10001 and MP-2790-Z-67-10002 Sheets 1 and 2 for equipment layout.)

2.0 POWER REQUIREMENTS

Dual 24V dc UPS supply is required for communication racks 'A' and 'B'.

Additional dual 24V dc UPS and 240V ac UPS supplies are required for the line-of-sight radios and associated equipment located in the telecoms area. The foregoing supplies have a minimum of 3 hours' battery backup facility.

PA systems 'A' and 'B' require 240V ac UPS supplies, which are fed from independent distribution boards.

Normal 240V ac UPS supplies are required for all hand-portable radio battery charger units.

3.0 SHORE COMMUNICATIONS

Communications to St Fergus are provided via the satellite link, operated by Total, DMS and Eutelst. In addition, a secondary path exists over the line-of-sight link via the Tartan Platform. This method for provision of communications allows for two independent alternate paths to shore from MCP-01.

General alarm outputs for the main radio systems are connected to the telemetry system for display at St Fergus. In addition, remote management of the main telecommunications equipment is provided by a Telecommunications Management and Diagnostics System (TMDS), giving more detailed information of the status of the main communications equipment in Level 3.

3.1 Line-of-sight to Tartan

The two dishes associated with this link are positioned on the upper and lower levels of the radio tower. This link is used to relay Tartan and AH001 telemetry. It also provides a route for inter-platform and telemetry data.

4.0 ONBOARD RADIO SYSTEMS

A single channel Motorola 'MC Compact' radio repeater (aerial radio tuner) is situated in the telecoms area. A low loss feeder cable runs from this equipment to the antenna located on the second level of the radio tower.

Motorola 'MC Micro' base stations are located at the control point and within the emergency command centre.

Motorola MX1000 IS hand-portable radios are available for use and a spare battery is supplied for each one.

A total of four channels are available. One full duplex channel will operate via the repeater and three simplex channels can be used for radio-to-radio communications.

5.0 VHF − AM AERONAUTICAL RADIOS

Two JOTRON rack mounted air-band radios are provided along with two non-IS hand-portable radios and battery chargers. A sufficient supply of batteries is provided to ensure that each hand-portable radio can operate for a complete 24-hour period, assuming a realistic 10% transmit and 90% receive ratio during a 24-hour period.

Two speech channels on the satellite link are utilised to connect each of the two JOTRON radios to the remote control units at St Fergus. These channels shall provide voice communications from the St Fergus Control Room Operator to helicopters approaching the Platform.

One JOTRON air-band radio is situated at the control point and the other is installed in the ECC.

6.0 VHF − FM MARINE RADIO

A Sailor Compact VHF marine band radio is located at the control point.

An EXD muster point VHF radio with battery is installed in the ECC. This radio is designed to operate at all levels of shutdown for a period of up to 2 hours, and provide an emergency communication link to the Tartan and Claymore Platforms.

Antenna for the marine radio is located at the top of the radio tower.

VHF hand-portable radios are available for personal use. Battery charging for 12 radios is available at the control point.

7.0 HF − SSB MARINE RADIO

Two Sailor Compact HF − SSB marine radios with control units are available. One is installed at the control point and the other is in the ECC. The aerial turning units and whip antennas are located at the antenna gantries on the south side and south-west corner of the platform to optimise coverage to shore.

8.0 LIFEBOAT RADIOS

Each lifeboat is fitted with a VHF FM marine band radio. The battery charger necessary for the powerpack for these radios is installed in the TR area to facilitate charging of the spare battery unit between maintenance visits.

9.0 EAST CRANE COMMUNICATIONS

PA/GA coverage is provided by one loudspeaker installed within the crane cab and fed from the ‘B’ PA system, with an additional loudspeaker, fed from the ‘A’ PA system located on the gantry facing the cab.

A RADAC II IS radio, suitable for use in Zone 1 areas is fitted in the crane cab.

10.0 PUBLIC ADDRESS SYSTEM

In order to comply with regulations, the system is designed as two combined PA and general alarm systems completely independent from each other, identified as PA systems 'A' and 'B'. Cable routing is different for each system.

The rack containing the 'A' system is located in the telecoms area with the ACU installed at the control point. PA rack 'B' and ACU are located in the ECC.

Each system contains its own integral Self Diagnostic Management System (SDMS) which continuously checks the status of the system. The 'System Healthy' status is displayed at St Fergus via the telecontrol system.

A telephone link interface via the PABX enables telephone access to the PA system from St Fergus.

There are five PA access control units located as follows:

- 1 x control point
- 1 x emergency command centre
- 1 x lifeboat No 1
- 1 x lifeboat No 2
- 1 x lifeboat No 3

All lifeboat ACUs are Zone 1 rated and each unit is cabled directly to both the 'A' and 'B' PA systems. Access to, and operation of, either system, is independent on the status of the opposite system. Call buttons for the General Alarm and Prepare to Abandon Platform Alarm are provided at the control point and ECC ACUs only. In addition, buttons for alarm override, and 'All Zones' PA facility are also provided.

PA/GA coverage of the Platform is limited to the not normally manned operational areas only and is considered as one complete zone, while extended cover to the flotel is considered as an additional zone.

An all-station intercom facility is available between the five ACU units.

11.0 TELEPHONE SYSTEM

A MITEL SX2000 Light telephone exchange provides the facility for voice communications to St Fergus and to the public telephone network. (Refer to drawing MP-2790-Z-0-00-10073 for General Arrangement.)

All external telephones are certified for Zone 1 use. Two dedicated lines, one to the St Fergus and one to the Tartan exchange, provide 'hotline' telephone facilities between all the control rooms.

Two 'HOTLINE' telephone extensions are fitted at the control point and are designated as the 'St Fergus Hotline' and the 'Tartan Hotline'.

A standard group 3 facsimile machine is located at the control point on a dedicated extension port.

12.0 FLOTEL COMMUNICATIONS

During periods of extended maintenance work, the flotel alongside the MCP-01 shall require communications to the platform and to St Fergus. This is achieved via an 8-channel line-of-sight radio system.

The eight channels are as follows:

- 3 x inter-platform circuits from the flotel to MCP-01
- 4 x tie-lines from flotel to St Fergus
- 1 x data circuit to shore

Access to the public network is provided by the four circuits to St Fergus.

PA and GA extension to the flotel is by cable connection to their radio/control room and passage control, thus allowing platform alarm status to be monitored while the flotel is alongside.

13.0 VIDEO SURVEILLANCE SYSTEM

A slow scan video surveillance system is fitted on the platform transmitting operational and safety information of specific areas to the St Fergus control room.

The video surveillance rack is installed at the control point with local monitors and control functions.

The slow scan pictures are displayed on two monitors in the St Fergus control room, and remote control of the offshore cameras is available from a keyboard control panel located on the telecoms console.

14.0 REFERENCE DRAWINGS AND DIAGRAMS

- MP-2790-Z-0-67-10002 (Sheet 1 of 2) Control Point Layout
- MP-2790-Z-0-67-10003 (Sheet 2 of 2) ECC Layout
- MP-2790-Z-0-67-10003 (Sheet 1 of 1) Telecoms Network Links
- MP-2790-Z-0-67-10001 (Sheet 1 of 1) Telecoms Area Layout
- MP-2790-E-0-00-10073 Voice Communication Systems

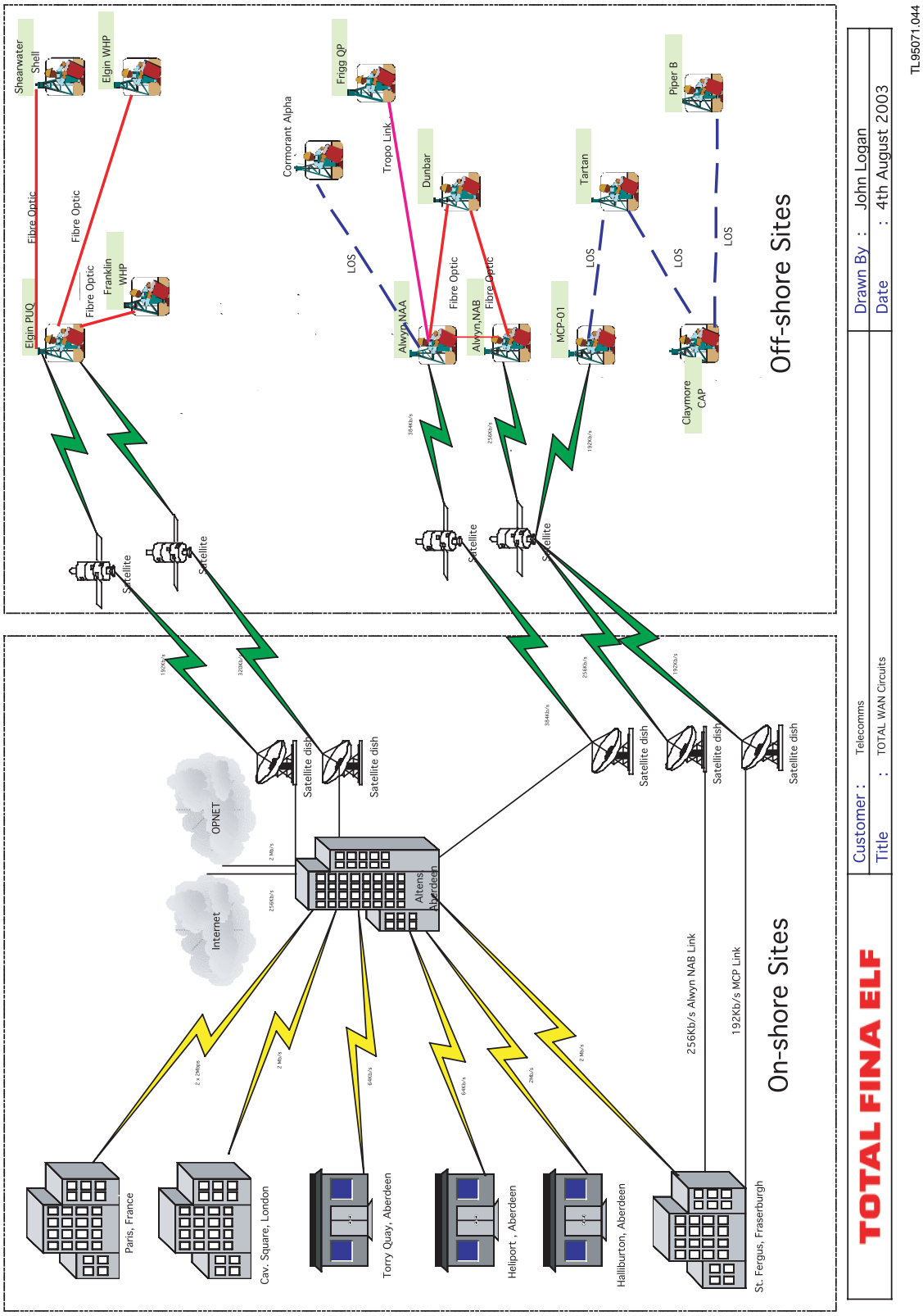

Figure 5.9.1 Total WAN Circuits

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1.0 INTRODUCTION

This chapter covers description and operating guidelines for the Heating, Ventilation and Air Conditioning (HVAC) systems required on MCP-01 following its conversion to a not normally manned platform.

It should be noted that each system operates on a ventilation philosophy, and not pressurisation, which was the design prior to demanning.

The HVAC system comprises:

- Level 3 control area
- TR area/mess area
- Switchroom No 1
- Switchroom No 2

Each system is controlled from an individual local control panel and indication of fan and fire damper status is displayed on the Fisher control system.

Each system has independent fire and gas cover. Running indication of fans is displayed on the Fisher control system. A common alarm facility is supplied from each HVAC control panel.

2.0 TECHNICAL DESCRIPTION OF SYSTEMS

2.1 Level 3 Control Area

This area comprising the control and telemetry areas is served by HVAC plant located externally below the helideck.

Three air movement systems are used to ventilate the area comprising:

- Supply
- Recirculation
- Extract

The functions of each system are described in the following paragraphs.

2.1.1 Supply

This system provides the module with a supply of air intended primarily for cooling and heating purposes.

Plant used in this system essentially comprises an inlet duct pre-heater, air filter, duty and standby mixed flow fans, fire dampers and distribution ductwork.

2.1.2 Recirculation

This system provides an extract and energy conservation purpose by operating in conjunction with modulating dampers, which automatically adjust the amount of air recirculated and exhausted. Thus, on warm days, the system will remove warm air from the module and exhaust it to the atmosphere. On cooler days, however, warm air will be removed from the module to be mixed with cold ambient air in the supply system, keeping the module at a stable temperature.

The main function of such air recycling is to reduce heating power requirements.

Plant used in this system essentially comprises duty and standby mixed flow fans, modulating dampers, recirculation ductwork and fire damper.

2.1.3 Exhaust

This system essentially serves the purpose of extracting warm air from the Switchroom 3 area. A small amount of air is also extracted from the toilet by this system. This system is extract only and exhausts all air to atmosphere. There are no connections to recirculation ductwork and no modulating dampers are fitted to the system.

An extract duct is also fitted to the underfloor area. Under normal conditions, a small amount of air is extracted which can be increased for CO_2 extract by operating the manual volume control damper located adjacent to the HVAC control panel.

Plant used in this system essentially comprises duty and standby mixed flow fans, exhaust ductwork and fire damper.

2.1.4 Controls

All HVAC plant serving the Level 3 control area is controlled from a control panel located within the telemetry area.

This control panel operates the system on a continuous basis and houses the pneumatic and electronic temperature controls.

Briefly, all systems operate continuously with the recirculation control being achieved by a pneumatic system, which monitors recirculation outlet temperature and adjusts modulating dampers to regulate the proportion of air being recirculated and exhausted. The control of fresh air inlet electric heating is achieved by an electronic system which monitors ambient temperature and operates heating accordingly.

Design operating conditions of the system are as follows:

- Ambient temperature:
  - Max 20ºC
  - Min -3ºC
- Internal temperature:
  - Max 27ºC
  - Min 10ºC

- Air volumes:
  - Supply 3.82m^3/s
  - Recirc 2.47m^3/s
  - Extract 1.18m^3/s

The module is not designed to be pressurised.

2.2 TR Area/Mess Area

This area, comprising part of Level 1 accommodation, and the west underdeck area, is served by HVAC plant located externally on Level 1.

This system is only required to operate whilst the platform is manned, and will therefore remain inactive for most of the time.

Three air movement systems are used to ventilate the area, comprising:

- Supply
- Recirculation
- Extract

The functions of each system are described in the following paragraphs.

2.2.1 Supply

This system provides the module with a supply of air intended for heating and ventilation purposes.

The supply of air is made up from a varying combination of fresh and recirculated air depending on ambient temperature conditions and internal temperature requirements.

Heating is provided in the form of main duct heaters, which raise air to a minimum temperature of 15ºC, and locally mounted trimmer heaters, controlled from wall-mounted thermostats, give individual control of further heating.

The supply ductwork is fitted with a pre-heater, re-heater and various trimmer heaters, duty and standby mixed flow fans, air filter and fire dampers.

2.2.2 Recirculation

This system provides an extract and energy conservation purpose by operating in conjunction with modulating dampers, which automatically adjust the amount of air recirculated and exhausted.

The main function of the recirculation system is to provide adequate ventilation in the module and achieve low heating requirements by utilising warm air present in the area.

Plant used in this system essentially comprises duty and standby mixed flow fans, modulating dampers, recirculation ductwork and fire dampers.

2.2.3 Extracts

The extract system provides the sole function of extracting air from the toilet area and exhausting it directly to the atmosphere.

There are no connections to recirculation ductwork and no modulating dampers are fitted to the system.

Plant used in this system comprises duty and standby axial fans, exhaust ductwork and fire dampers.

2.2.4 Controls

All HVAC plant serving the TR area/mess area is controlled from a control panel located within the workshop area.

This control panel operates the system when required. Starting the system is achieved by depressing the 'start' button with the 'stop' button being depressed to stop the system when not required.

Similar to the Level 3 control area, this system operates the recirculation control on a purely pneumatic basis, with all heating being controlled from electronic controls.

All other functions are automatically controlled from within the panel.

Design operating conditions for the system are as follows:

- Ambient temperature:
  - Max 20ºC
  - Min -3ºC
- Internal temperature:
  - Max 20ºC
  - Min 18ºC
- Air volumes:
  - Supply $1.46m^3/s$
  - Recirc $0.9747m^3/s$
  - Extract $0.091m^3/s$

The module is not designed to be pressurised.

2.3 Switchroom No 1

This area, comprising a partitioned area located within the generator area, is ventilated by means of a supply fan and overpressure exhaust damper.

The main function of the ventilation for this area is cooling but, should extremely low temperatures occur, module heating may be required which is supplied by a duct mounted heater.

The mixed flow supply fans (duty/standby arrangement) supply clean filtered air to the switchroom area; the air is then exhausted through the pressure relief damper to atmosphere.

There is no recirculation facility in this system.

The area, although not specifically required to be pressurised, is pressurised to enable air to be exhausted from within the space.

Plant used in this system comprises duty and standby mixed flow fans, pre-heater, air filter, supply and exhaust ductwork and fire dampers.

2.3.1 Controls

HVAC plant serving Switchroom 1 is controlled from an HVAC control panel located within the area. The panel is designed to operated continuously with electronic temperature controls being located in the panel which control the electric inlet air heater.

Design and operating conditions for the system are as follows:

- Ambient temperature:
  - Max 20ºC
  - Min -3ºC
- Internal temperature:
  - Max 30ºC
  - Min 10ºC
- Air volumes:
  - Supply 1.21m^3/s

2.4 Switchroom No 2

This area, comprising electrical switchgear room adjacent to the emergency generator is serviced by HVAC plant located externally above the area.

The purpose of the ventilation system is to provide ventilation and cooling to the area, the system, similar to that of Switchroom No 2 comprises simply a supply system and overpressure exhaust through a pressure relief damper. There is no heating or cooling plant fitted to this system.

The plant used in this case comprises duty and standby axial flow fans, distribution ductwork and fire dampers. Fitted within the externally mounted air handling unit, is some old, redundant equipment comprising - DC purge fan assembly and electric air heater. These items are isolated and will not operate.

The emergency generator area, located next door is supplied with ventilation air only from Switchroom No 2 HVAC system. Should the generator be run, a separate large capacity fan will start to supply air for the engine and radiator cooling purposes.

2.4.1 Controls

Both the switchroom and the generator fans are controlled from an HVAC control panel located within Switchroom No 2.

This control panel operates the system on a continuous basis without need for any operator attention other than routine inspection and maintenance.

2.5 Fire and Damper Operating Philosophy for All Areas Except Switchroom No 2

2.5.1 HVAC Fire Dampers

All fire dampers are fitted to ventilation duct penetrations through 'A' rated divisions.

The dampers are of 'state of the art' design and specification, being constructed from stainless steel, with control enclosures outwith the insulated duct casing.

Each damper control enclosure contains:

- Actuator
- Open/close status microswitches
- Frangible bulb rated at 68ºC
- Quick exhaust valve
- Operating pipework with two connections to damper
- Fitted externally to each damper on normal air supply line will be a three-way valve for maintenance purposes

Dampers are controlled on a zone basis from one control point located near the entrance door to the area. The piping arrangement allows one solenoid valve, operated by the fire and gas system, to control the normal air supply to all fire dampers in the zone. The damper solenoid valve is powered directly from the F&G panel using a 24V dc supply and operating on a fail-safe basis ie de-energising to close dampers.

A manually operated three-way valve is fitted to each zone panel which will by-pass the SOV, this is intended for use in the event of SOV malfunction.

Since the dampers are fitted with a frangible bulb, provision has been included to allow opening of the damper should the frangible bulb be broken. This is intended for use during smoke clearing purposes after a fire when the frangible bulbs may have ruptured.

This is achieved by operating a manual three-port valve which feeds air through the vent port of the frangible bulb valve to open the actuator.

The damper control point, being located near the area entrance door, comprises the following:

- Panel isolation three-way valve
- Air supply filter/regulator unit

- Solenoid valve (F&G controlled) - 24V dc
- Manual valves - two three-way, clearly labelled white on red:

FIRE DAMPER FRANGIBLE BULB NORMAL BYPASS

FIRE DAMPER SOV BYPASS NORMAL BYPASS

All dampers are fitted with status indication switches which indicate status at the HVAC control panels. In addition, each damper will be fitted with a manual status indication pointer and a local three-way valve to facilitate maintenance.

2.5.2 CO_2 Fire Dampers

These dampers are fitted for the sole purpose of relieving excess CO_2 pressure from within the module when CO_2 is released in the event of a fire.

A control system identical to 'normal' fire dampers is used. The CO_2 dampers have a separate dedicated system per area, with control by one SOV on a zone basis. SOV being powered by F&G panel - 24V dc.

Control points for CO_2 dampers are located outwith the protected area, allowing control of the dampers without requiring access to the areas.

CO_2 dampers remain normally closed with an F&G signal (upon CO_2 release) energising the control solenoid and initiating air to open the damper. This feature to operate in conjunction with F&F signal to release CO_2.

Status indication of CO_2 dampers consists of one open and closed lamp per zone on the HVAC panel.

Hand valve labels shall be as shows:

CO_2 DAMPER FRANGIBLE BULB BYPASS NORMAL BYPASS

CO_2 DAMPER SOV BYPASS NORMAL BYPASS

Again, the CO_2 dampers can be manually controlled from the damper control panel similar to the HVAC dampers.

2.5.3 Switchroom No 2 - Fire Damper Operating Philosophy

All inlet and outlet ducts associated with the ventilation of the G3 generator room and Switchroom No 2 are fitted with fire dampers. These dampers operate automatically in response to signals from the fire and gas detection and protection systems.

The fire dampers associated with the engine room ventilation system are normally closed, but open when the engine ventilation fan starts. The fire dampers on the remainder of the system are normally open.

A test facility for these dampers is available from pushbuttons on the local control panel within Switchroom No 2.

3.0 OPERATING INSTRUCTIONS

3.1 General

With the exception of the TR area/mess area, all other systems are designed to run continuously, requiring the minimum of attention, other than routine maintenance. The control panels are fitted with the necessary individual alarm indication and a common alarm facility which is relayed to St Fergus.

Minor alarms, such as high pressure drop on a filter which do not cause problems to the operation of the system and do not require immediate action, are shown by illuminating the relevant fault lamp on the HVAC panel.

More serious problems, such as high or low temperature within the area, which could have an effect on the operation of the equipment, are linked to the common alarm. In this instance, it is necessary for St Fergus to organise a visit to the platform to further investigate the problem.

Maintenance required on the systems will comprise a visual and audible check on major components during the regular fortnightly platform visit, and an annual maintenance routine, carried out on all components.

The exception to the norm is the TR room/mess area, which is not used when the platform is in the normal unmanned status. Only when the platform is attended by personnel is the HVAC system manually started and subsequently manually stopped when personnel leave the platform.

Required actions to be carried out by personnel for the correct operation are listed in the following sheets.

3.2 Level 3 Control Area HVAC System

3.2.1 Routine Checks

(1) HVAC control panel (telemetry area)

(a) Check status lamps, ensuring that normal operating status prevails.

Should any alarm be illuminated, appropriate technical action should be taken.

(b) Note hours run readings on fans.

These should be within 500 of each other. Fans should be manually changed over from duty to standby on a regular basis to prevent bearing Brinelling.

Before changing over fans, inspect duty fans whilst running to ensure satisfactory operation.

If so, change over fans by operating the manual changeover keyswitch.

Inspect running fans to ensure satisfactory operation.

(2) Inspect room temperature chart recorder (if fitted) to ensure that no excessive temperatures are being experienced.

(3) Note reading of external filter condition gauge. If nearing critical pressure, ensure that new filters are procured for replacement on next visit.

3.3 Switchroom No 1 HVAC System

3.3.1 Routine Checks

(1) HVAC control panel (Switchroom No 1)

(a) Check status lamps, ensuring that normal operating status prevails.

Should any alarm lamp be illuminated, appropriate technical action should be taken.

(b) Note hours run reading on fans.

These should be within 500 of each other. Fans should be manually changed over from duty to standby on a regular basis to prevent bearing Brinelling.

Before changing over fans, inspect duty fans whilst running to ensure satisfactory operation.

If so, change over fans by operating the manual changeover keyswitch.

(2) Inspect room temperatures and temperature chart recorded (if fitted) to ensure on excessive temperatures are being experienced.

(3) Note reading of filter condition gauge. If nearing critical pressure, ensure that new filters are procured for replacement on next visit.

3.4 Switchroom No 2 HVAC System

3.4.1 Routine Checks

(1) HVAC control panel (Switchroom No 2)

(a) Check status lamps, ensuring that normal operating status prevails.

Should any alarm lamps be illuminated, appropriate technical action should be taken.

(b) Fans will change over automatically from duty to standby.

(c) Inspect fans whilst running to ensure satisfactory operation.

(2) Inspect room temperatures and temperature charge recorded (if fitted) to ensure that no excessive temperatures are being experienced.

(3) In order to reduce the possibility of damper seizure, it is prudent to operate the dampers regularly by means of the damper test pushbutton.

Ensure that this button is depressed for 10 seconds minimum to ensure full closure of dampers.

3.5 TR Area/Mess HVAC System

3.5.1 Routine Checks

Start Procedure

The TR area/mess area system will remain inactive for the majority of the time, being started only when personnel are onboard the Installation.

The starting procedure requires the following actions to be taken:

(1) Open fire dampers by operating the damper control panel isolation valve.

(2) Start panel by depressing the 'ON' button.

The start sequence will be initiated commencing with supply fan and ending with heating. This cycle will take approximately 2 minutes.

(3) Check panel for alarm lamps.

(4) Providing no alarms appear, the HVAC system is now fully operational.

Stop Procedure

To stop the system, the actions required are:

(1) Depress 'STOP' button, which will stop all plant.

(2) Operate duty/standby fan changeover switch, ensuring that the alternative fans are run on the next visit.

(3) Ensure that panel isolator switch remains in 'ON' position.

This ensures that the common alarm is operational during the standby period.

(4) Close the fire dampers by operating the damper control panel isolation valve.

3.6 Fire Damper Cold Damper Pneumatic Control Panels

(1) Check to ensure that all bypass valves are in normal position.

(2) In order to reduce the possibility of damper seizure, it is prudent to operate the dampers regularly by means of the panel isolation valve.

This can be done with the system operational, by simply turning the air inlet valve (left-hand side of panel) to depressurise the panel. Depressurisation will take approximately 3 seconds, upon which the valve should be turned to supply air to the panel again.

Note: This procedure will close dampers whilst fans are running, which will cause an HVAC system shutdown. The system will automatically restart upon opening of dampers.

3.7 Perform General Checks on Plant and Equipment to Ensure Components are in a Safe and Reliable Condition

Whilst the system is operational, the following routine checks should be carried out:

(1) Carry out audible and visual checks on plant and equipment, ensuring that all are in safe and reliable condition.

(2) Inspect reading of externally mounted filter condition gauge.

(3) Ensure that damper panel bypass valves are in 'normal' position.

4.0 LEVEL 3 - CONTROL AREA

4.1 HVAC Control Philosophy

The control area, located on Level 3 of the accommodation module, comprises mainly control and telemetry areas with small areas used for electrical distribution and UPS equipment, corridors and stairs.

This level is served by supply ventilation to all areas, recirculation from control and telemetry areas and extract from PS, toilet and telemetry areas. Telemetry areas are fitted with ventilation pressure exhaust dampers, set at 60Pa with additional CO_2 overpressure dampers, set at 60Pa, for use only during CO_2 discharge.

The HVAC panel will be located in Level 3 and shall control all H&V equipment serving this level.

The operating philosophy of the system shall be to operate a constantly running ventilation system which maintains a temperature of 18 to 21ºC in the areas served. Fresh air make-up duct shall be fitted with a frost heater to protect against icing problems.

The system will generally operate on a recirculated air basis in order to minimise heating loads. The HVAC controls will adjust the recirculation dampers to maintain the desired room temperature.

Being fitted to an unmanned platform, the system will be fitted with automatic controls which will maintain its operation during failure of certain components. In addition, components will be so controlled that individual failure will result only in isolation of that component and the remainder of the system will continue to operate.

The system startup sequence features sequenced start of items in order to reduce high starting currents being demanded at a single instance.

4.2 Level 3 Control Area - Major Equipment Description

4.2.1 Fresh Air Inlet Modulating Damper - MP-T-11237A

This damper shall modulate in conjunction with recirculation and exhaust dampers, MP-T-11237B and C. All three dampers are controlled from a central pneumatic control system. This controller shall monitor recirculation duct and inlet temperatures and motor the dampers accordingly. Modulating dampers will be pneumatically operated. Fresh air inlet damper to have minimum position setting in order to balance inlet - extract volumes.

4.2.2 Fire Dampers

- MP-T-11233A, E, F and three Existing Dampers - Normal HVAC
- MP-T-11233B, C, D - CO_2 Overperssure

These dampers shall be controlled in a zone basis using 1 off SOV and manual control valves. Control will be direct from the F&G panel, with CO_2 overpressure dampers being opened by SOV energisation in parallel with CO_2 release.

Status microswitches on fire dampers shall be connected to show an 'All Dampers Open', and 'All Dampers Closed' annunciation lamp in the HVAC panel. Closed status signal of HVAC damper zone to be relayed to F&G panel. HVAC panel logic will demand all HVAC dampers open, before supply fan can start. Similarly, closure of damper zone will cause HVAC system shutdown by stopping the supply fans.

HVAC fire dampers shall be normally open, closing on F&G command.

CO_2 overpressure dampers shall be normally closed, opening upon F&G command to release CO_2.

4.2.3 Heater Battery - Existing HB2

Controlled by a temperature detector mounted din the fresh air intake, the heater shall energise at incoming air temperature of 2ºC or less, in two operations. The heater shall be fitted with two overheat protection thermostats; one auto reset, 100ºC, one manual reset 175ºC. Over-temperature will initiate panel fault lamp.

The heater will only operate if supply fan is operational and will be directly shutdown by command from F&G system.

4.2.4 Filters PF1, 2

Air filters will be fitted with a differential switch monitoring differential pressure over the filter bank.

Alarm setpoint - 450pa, giving visual alarm at HVAC panel.

In addition, a magnahelic gauge, (0 to 500Pa) will be fitted in parallel with the 'Diff' pressure switch in order to give visual indication of filter condition. Both of these items will be mounted within a weatherproof enclosure which has a transparent cover.

4.2.5 Supply Fans - MP-K-11240A/B

Comprising Duty and Standby

Fans will be equipped with speed sensors pre-set to 85% running speed to initiate system normal status or, if 85% rpm is not seen, fan changeover will occur. Supply fan must operate continuously, failure of both supply fans will shut down HVAC system and initiate common alarm.

Existing speed sensors etc shall be reused, type - Pepperl and Fuchs.

4.2.6 Room Reheater - MP-T-11255

Controlled directly by a room-mounted thermostat, setpoint 20ºC.

Overheat protection is provided by two thermostats; one auto reset, set at 175ºC, one manual set at 100ºC.

4.2.7 Extract and Recirculation Fans MP-K-11241A/B (Recirc) Existing Extract Fans EF09, EF10

Individually controlled by speed sensors as per described for supply fan, extract and recirc' fans will only run upon correct operational status of supply fan. HVAC panel logic will provide delayed start on recirc' and extract fans upon successful start of supply fan.

Existing Pepperly and Fuchs speed sensors to be reused.

4.2.8 Room Temperature Detectors

Fitted at suitable points in the area concerned, these detectors will raise a visual and common alarm on HVAC control panel if temperatures drop below 4ºC and exceed 30ºC.

An overheat protection interlock is linked to the high temperature detector which isolates heating and drives modulating dampers to full fresh air in the event of high room temperatures being detected.

Common alarm will be relayed to St Fergus.

This alarm to remain on until manually reset on platform.

4.2.9 Control Panel Design Features

The HVAC control panel serving the equipment in Level 3 shall comprise a floor-mounted panel located within the control area.

The panel shall incorporate a mimic panel showing a simple schematic of the system with LEDs so positioned to indicate system status at a glance.

The control panel will operate on a 240V 50Hz power supply and will interface with switchgear panels ES1, ES2, the fire and gas panel, and associated field elements. The HVAC panel control circuit will receive power from both ES1 and ES2 and will feature a power supply changeover relay within the panel.

Damper status, pressure switch and thermostat circuits will operate on 24V dc supply and will be protected by Zenner barriers.

Interface between the F&G system and HVAC control panel will comprise two shutdown signals, one for fans, and one for heating battery being sent back to ES1 and ES2 switchboards. The HVAC panel will also provide volt-free contacts for annunciation of the following at the F&G panel:

- Fan running signals for supply and extract fans (four fans)
- Common alarm
- HVAC fire damper zone closed (ie all HVAC fire dampers closed)

The panel will self start (ie from a black start) and will operate on a continually running basis. It will also incorporate manual fan changeover and will feature sequential start of a major load components to reduce electrical loadings during start conditions.

The panel will be fitted with an anti-condensation heater controlled by a panel-mounted thermostat.

4.2.10 Control Panel Indication and Controls

- *HVAC Panel*
  - 'ON-OFF' Isolator (Mounted within panel)
- *Supply Fans*
  - Hours run meter per fan
  - Run/standby/failed lamps per fan
- *Recirculation Fan*
  - Hours run meter per fan
  - Run/standby/failed lamps per fan
- *Extract Fan*
  - Hours run meter per fan
  - Run/standby/failed lamps per fan
- *Pre-heater On lamps for Stage 1, Stage 2*
  - Fault lamp
- *Filter*
  - Dirty lamp
- *Fire Dampers*
  - Zone open lamp
  - Zone closed lamp
- *CO_2 Dampers*
  - Zone open lamp
  - Zone closed lamp
- *Room Temperature*
  - Low lamp
  - High lamp

- *General*
  - Fan 'A/B' duty changeover switch
  - Common fault lamp
  - Reset buttons
  - Lamp test

4.2.11 Instrument Schedule and Alarms

- Modulating Damper Control System (dampers free issue), comprising:
  - Pneumatic controller
  - Three-off pneumatic positioners Tag No XY-16694, 5, 6
  - Return air temperature sensor Tag No TS-16693
  - Pressure filter regulator
- Pre-heat temperature detector suitable for external fitting:
  - Setpoints Stage 1 - 4ºC Tag No TS-16683
    Stage 2 - 2ºC
- Differential pressure switch (air filter), suitable for external fitting:
  - Setpoint 450Pa Tag No PDS-16685
- Room temperature alarm thermostats, suitable for internal fitting:
  - Setpoints Low - 4ºC Tag No TSL-16688
    High - 30ºC Tag No TSH-16687
- Local heater battery control thermostat:
  - 1 off setpoint 21ºC Tag No TS-16689

4.2.12 Start/Stop Logic

Start Sequence

(1) On selected on panel.

(2) F&G healthy signal, energising control circuit.

(3) Supply fan starts.

(4) Supply fan established.

(5) +30 secs, recirc fan starts.

(6) Recirc fan established.

(7) +30 secs, extract fan starts.

(8) Extract fan established.

(9) +60 secs, heating controls initiated.

(10) Heater battery energises (if required).

Stop Sequence

(1) F&G signal de-energises control circuit.

(2) All HVAC supplies isolated.

OR

(1) Duty supply fan stops, standby fails to start.

(2) Interlocks cause heating and recirc and extract fans to stop.

OR

(1) Off selected at panel.

(2) Loss of control circuit stops all HVAC supplies.

5.0 TR AND MESS AREAS

5.1 HVAC Control Philosophy

The TR and mess areas, located on Level 1 and underquarters, comprises emergency living areas emergency command centre, kitchen, toilet washroom.

All areas are served by supply ventilation with extract from toilet/washroom only and recirculation from all other areas. Each level is fitted with a pressure relief damper set at 60Pa.

The emergency command centre is fitted with a CO_2 overpressure relief damper set at 60Pa for use only during CO_2 discharge.

The HVAC control panel will be located in Level 1 workshop and will control all H&V equipment serving TR and mess area.

The operating philosophy of the system shall be to operate a ventilation system which maintains a temperature of 18 to 21ºC in the areas served. The system will be used intermittently only when the platform is manned. The system shall generally operate on a recirculated air basis in order to minimise heating loads. The electrical control of heating shall operate in conjunction with a pneumatic system which shall operate modulating fresh air/recirc/exhaust dampers.

Under normal conditions, the system shall be manually started and stopped by visiting personnel, and shall be operational only for the duration of the visit.

Common alarm shall only operate when panel is energised with system operational.

The system will be shut down by interlocks with the F&G panel.

System startup features sequenced start of items in order to reduce electrical loadings.

5.2 Major Equipment Description

5.2.1 Fresh Air Inlet Modulating Damper - MP-T-1126A

This damper shall modulate in conjunction with recirculation and exhaust dampers, MP-T-1126B and C. All three dampers are controlled from a central pneumatic control system. A central control unit shall monitor supply duct temperatures and motor the dampers accordingly. Modulating dampers will be pneumatically operated.

Fresh air inlet damper to have minimum position setting in order to balance inlet - exhaust volumes.

5.2.2 Fire Dampers

- MP-T-11261 A - K - normal HVAC
- MP-T-11261 M - CO_2 Overpressure

These dampers shall be controlled in a zone basis using 1 off SOV and manual control valves. Control will be direct from the F&G panel with CO_2 overpressure dampers being opened by SOV energisation in parallel with CO_2 release.

Status microswitches on fire dampers shall be connected to show an 'All Dampers Open', and 'All Dampers Closed' annunciation lamp in the HVAC panel. Closed status signal of HVAC damper zone to be relayed to F&G panel. HVAC panel logic will demand all HVAC dampers open, before supply fan can start. Similarly, closure of damper zone will cause HVAC system shutdown by stopping the supply fans.

Normal HVAC fire dampers shall be normally open, closing on F&G command.

CO_2 overpressure dampers shall be normally closed, opening upon F&G command to release CO_2.

5.2.3 Pre-heat Battery - MP-T-11259A

Controlled by a temperature detector mounted in the fresh air intake, the heater shall energise at incoming air temperature of 2ºC or less, one stage. The heater shall be fitted with two overheat protection thermostats; one auto reset, 100ºC, one manual reset 175ºC.

Overtemperature will initiate panel fault lamp.

5.2.4 Filters PF1, 2 - MP-T011263A

Air filters will be fitted with a differential switch monitoring differential pressure over the filter bank.

Alarm setpoint - 450Pa, giving visual alarm at HVAC panel.

In addition, a magnahelic gauge (0 to 500Pa) will be fitted in parallel with the 'Diff' pressure switch in order to give visual indication of filter condition. Both of these items will be mounted within a weatherproof enclosure which has a transparent cover.

5.2.5 Reheat Battery - MP-T-11259B

Comprising a two-stage duct mounted electric heater battery, it will be controlled by a two-stage thermostat fitted to the supply duct within the module. The controls shall be set to maintain supply duct temp at 18ºC.

The re-heat battery and room heaters shall only operate if the supply fan is running and will also be protected by two overheat protection thermostats; one auto reset 100ºC, and one manual reset 175ºC.

One common command from F&G panel shall shut down all heating.

5.2.6 Supply Fans - MP-K-11240A and B

Fans will be equipped with speed sensors pre-set to 85% running speed to initiate system normal status or, if 85% rpm is not seen, fan changeover will occur. Failure of both supply fans will shut down HVAC system and raise common alarm.

Pepperl and Fuchs speed sensors to be free issued by fan vendor.

5.2.7 Room Reheater - MP-T-12259C-F

Controlled directly by a room-mounted thermostat, with setpoint 20ºC.

Protected by overheat protection thermostats, auto and manual, and logic based upon fan operating status.

5.2.8 Recirculation Fans MP-K-11257A and B

Individually controlled by speed sensors as per described for supply fan, extract and recirculation fans will only run upon correct operational status of supply fan. HVAC panel logic will provide delayed start on recirculation and extract fans upon successful start of supply fan.

5.2.9 Extract Fans MP-K-11258A and B

These fans shall comprise duct-mounted axial fans and will not be fitted with speed sensors. Fan changeover will be an automatic system based upon MCC starter status. Extract fans, like recirculation fans, will only operate upon correct operational status of supply fan.

Extract fan start will be sequenced 30 seconds after recirculation fan start.

5.2.10 Control Panel Design Features

The HVAC control panel serving the equipment in Level 1 and underquarters shall comprise a floor-mounted panel internally located within the workshop.

The panel shall incorporate a mimic display showing a simple schematic of the system with lamps or LEDs so positioned to indicate systems status at a glance.

The control panel will operate on a 240V 50Hz power supply and will interface with switchgear panels ES1 and ES2 and the fire and gas panel. The HVAC panel control circuit will receive power from both ES1 and ES2, and will feature a power supply changeover relay within the panel.

Damper status, pressure switch and thermostat circuits will operate on a 24V dc supply and will be protected by Zenner barriers.

Interface between the F&G system will comprise two shutdown signals; one for fans, and one for heating battery. The HVAC panel will also provide volt-free contacts for annunciation of the following at the F&G panel:

- Fan running signals for supply and recirculation fans (four fans)
- Common alarm
- HVAC fire damper zone closed (ie all HVAC fire dampers closed)

The panel will be started and stopped manually. It will incorporate manual fan changeover and will feature sequential start of major load components to reduce electrical loadings during start conditions.

The panel will be fitted with an anti-condensation heater, controlled by a panel-mounted thermostat.

5.2.11 Control Panel Indication and Controls

- *HVAC Panel*

  'ON-OFF' isolator (mounted within panel)

- *Manual Control*
  - 'START' button
  - 'STOP' button
- *Supply Fans*
  - Hours run meter per fan
  - Run/standby/failed lamps per fan
- *Recirculation Fan*
  - Hours run meter per fan
  - Run/standby/failed lamps per fan
- *Extract Fan*
  - Hours run meter per fan
  - Run/standby/failed lamps per fan
- *Preheater*
  - On lamps
  - Fault lamps

- *Filter*
  - Dirty lamp
- *Reheater*
  - On lamps, Stage 1, Stage 2
  - Fault lamp
- *Fire Dampers*
  - open lamp
  - Zone closed lamp
- *CO_2 Dampers*
  - Zone open lamp
  - Zone closed lamp
- *Room Temperature*
  - Low lamp
  - High lamp
- *General*
  - Fan 'A/B' duty changeover switch
  - Common fault lamp
  - Reset buttons
  - Lamp test

5.2.12 Instrument Schedule and Alarms

- Modulating Damper Control System (dampers free issue), comprising:
  - Pneumatic controller
  - Three-off pneumatic positioners Tag No XY-16675, 6, 7
  - Supply air temperature sensor Tag No TS-16674
  - Pressure filter regulator
- Preheat temperature detector, suitable for external fitting:
  - Setpoint -4ºC Tag No TS-16660

- Differential pressure switch (air filter), suitable for external fitting:
  - Setpoint 450Pa Tag No PDS-16662
- Reheat temperature detector, suitable for internal duct fitting:
  - Setpoint - 18ºC Tag No TS-16663
- Re-heat battery thermostats - 4 off:
  - Setpoint - 21ºC Tag No TS-16678
    Tag No TS-16679
    Tag No TS-16680
    Tag No TS-16681

5.2.13 Start/Stop Logic

Start Sequence

(1) On selected on panel.

(2) F&G healthy signal, energising control circuit.

(3) Start button activated.

(4) Supply fan starts.

(5) Supply fan established.

(6) +30 secs, recirculation fan starts.

(7) Recirculation fan established.

(8) +30 secs, extract fan starts.

(9) Extract fan established.

(10) +60 secs, heating controls initiated.

(11) Heater battery energises (if required).

Stop Sequence

(1) F&G signal de-energises control circuit.

(2) All HVAC supplies isolated.

OR

(1) Duty supply fan stops, standby fails to start.

(2) Interlocks cause heating, recirculation and extract fans to stop.

OR

(1) Off selected at panel or manual stop pushed.

(2) Loss of control circuit stops all HVAC supplies.

6.0 SWITCHROOM 1

6.1 HVAC Control Philosophy

The Switchroom 1, located in the generator area, comprises a partitioned area containing electrical equipment.

The area is served by supply ventilation and pressure relief dampers (set 60Pa). A CO_2 relief damper is fitted which will operate in conjunction with the F&G system upon CO_2 release (set 60Pa).

The HVAC panel serving the area will be located within the switchroom.

The operating philosophy of the system shall be to operate a constantly running ventilation system to maintain a temperature of between 15 and 20ºC within the area.

The system will operate on a 100% fresh air basis with a three-stage pre-heater being fitted on the fresh air inlet and a two-stage filter unit fitted to the supply duct.

6.2 Major Equipment Description

6.2.1 Fire Dampers

- MP-T-9170A, 9108A (existing dampers) - normal HVAC
- MP-T-11244 A - CO_2 Overpressure

These dampers shall be controlled in a zone basis using 1 off SOV and manual control valves. Control will be direct from the F&G panel with CO_2 overpressure dampers being opened by SOV energisation in parallel with CO_2 release.

Status microswitches on fire dampers are connected to show an ‘All Dampers Open’, and ‘All Dampers Closed’ annunciation lamp in the HVAC panel. HVAC panel logic will demand all HVAC dampers open, before supply can start. Similarly, closure of damper zone will cause HVAC system shutdown by stopping the supply fans.

HVAC fire dampers shall be normally open, closing on F&G command.

CO_2 overpressure dampers shall be normally closed, opening upon F&G command to release CO_2.

6.2.2 Heater Battery - MP-T-11243A

Controlled by a temperature detector mounted in the room area intake, the three-stage heater shall help maintain air temperature of 18ºC. The heater shall be fitted with two overheat protection thermostats; one auto reset 100ºC, and one manual reset 175ºC.

Overtemperature will initiate panel fault lamp.

6.2.3 Filters PB1, HV2

Air filters will be fitted with a differential switch monitoring differential pressure over the filter bank.

Alarm set point – 450Pa, giving visual alarm at HVAC panel.

In addition, a magnahelic gauge (0 to 500Pa) will be fitted in parallel with the 'Diff' pressure switch in order to give visual indication of filter condition.

6.2.4 Supply Fans - MP-K-1125A and B

Comprising duty and standby fans, these will be equipped with speed sensors pre-set to 85% running speed to initiate system normal status or, if 85% rpm is not seen, fan changeover will occur. Supply fan must operate continuously, failure to both supply fans will shut down HVAC system and raise common alarm.

6.2.5 Room Temperature Detectors

Fitted at suitable points in the area concerned, these detectors will raise a visual and common alarm on HVAC control panel if temperatures drop below 4ºC and exceed 30ºC.

An overheat protection interlock will isolate heating on detection of excess temperature within the area.

6.2.6 Control Panel Design Features

The HVAC control panel serving the equipment in Switchroom 1 shall comprise a wall-mounted panel located within the area.

The panel shall incorporate a mimic panel showing a simple schematic of the system with lamps or LEDs so positioned to indicate system status at a glance.

The control panel will operate on a 240V 50Hz power supply and will interface with switchgear ES1 and ES2 and the fire and gas panel. The HVAC panel control circuit will receive power from both ES1 and ES2 and will feature a power supply changeover relay within the panel.

Damper status, pressure switch and thermostat circuits will operate on a 24V dc supply and will be protected by a Zenner barrier.

Interface with the F&G system will comprise one shutdown signal, for supply fans. The HVAC panel will also provide volt-free contacts for annunciation of the following at the F&G panel:

- Fan running status for supply fans (2 off)
- Common alarm
- HVAC fire damper zone closed (ie all HVAC fire dampers closed)

The panel will self start and will operate on a continually running basis. It will also incorporate manual fan changeover on a monthly basis and will feature sequential start of major load components to reduce electrical loadings during start conditions.

The panel will be fitted with an anti condensation heater, controlled by a panel mounted thermostat.

6.2.7 Control Panel Indication and Controls

- *HVAC Panel*
  - 'ON-OFF' isolator (mounted within panel)
- *Supply Fans*
  - Hours run meter per fan
  - Run/standby/failed lamps per fan
- *Heater*
  - On lamps, Stage 1, Stage 2, Stage 3
  - Fault lamp
- *Filter*
  - Dirty lamp
- *Fire Dampers*
  - Zone open lamp
  - Zone closed lamp
- *CO_2 Dampers*
  - Open lamp
  - Closed lamp
- *Room Temperature*
  - Low lamp
  - High lamp
- *General*
  - Fan 'A/B' changeover switch
  - Common fault lamp
  - Reset buttons
  - Lamp test

6.2.8 Instrument Schedule and Alarms

- Heating temperature sensor, suitable for internal fitting:
  - Setpoints Stage 1 - 14ºC Tag No TS-1670
    Stage 2 - 16ºC
    Stage 3 - 18ºC
- Differential pressure switch (air filter), suitable for external fitting:
  - Setpoint 450Pa Tag No PDS-16702
- Room temperature alarm thermostats, suitable for internal fitting:
  - Setpoints: Low - 4ºC Tag No TSL-16703
    High - 30ºC Tag No TSH-16704

6.2.9 Start/Stop Logic

Start Sequence

(1) On selected on panel.

(2) F&G healthy signal, energising control circuit.

(3) Start button activated.

(4) Supply fan starts.

(5) Supply fan established.

(6) +60 secs, heating controls initiated.

(7) Heater battery energises (if required).

Stop Sequence

(1) F&G signal de-energises control circuit.

(2) All HVAC supplies isolated.

OR

(1) Duty supply fan stops, standby fails to start.

(2) Interlocks cause heating, recirculation and extract fans to stop.

OR

(1) Off selected at panel or manual stop pushed.

(2) Loss of control circuit stops all HVAC supplies.

7.0 SWITCHROOM 2

7.1 HVAC Control Philosophy

Switchroom 2 and the G3 generator room are housed within a self-contained module with a dividing wall separating the generator room from the switchroom.

The area is served by supply ventilation fans and pressure-relief dampers. Fire dampers are fitted on inlet and outlet ducting.

Note: Fire protection is from a fixed halon system, therefore no CO_2 dampers are required.

The HVAC panel serving the area is located within the switchroom.

The operating philosophy of the system is to operate a constantly running ventilation system to prevent the area reaching high temperature. A locally-mounted thermostat will start the standby fan if the room temperature reaches 20ºC.

No heating is incorporated in the system and operation is on a 100% fresh air basis.

7.2 Major Equipment Description

7.2.1 Fire Dampers

MP-T-8110, 8111, 8112, 8113, 8114, 8115

These dampers are controlled on a zone basis using 1 off SOV. Control will be direct from the fire and gas panel. The dampers may be operated manually from the local HVAC panel.

Status microswitches are connected to show damper status on indication lamps on the control panel.

The HVAC fire dampers are normally open, closing on F&G command.

XA-14300 indicates fire dampers closed on the Fisher control system.

7.2.2 Supply Fans

MP-K-8104A and B

Comprising duty and standby fans, the logic of the fan control circuitry is that the standby fan will start and run in parallel with the duty fan if the room temperature exceeds 20ºC. In addition, there is an automatic changeover facility on failure of the duty fan. The fans are housed in an enclosure above the module and draw air through a meshed wall in this enclosure, through an attenuator and a salt filter to the inlet of the axial flow fans. Each fan is fitted with a back-draught damper and can deliver 3000CFM of air.

Supply Fan K-8105

The engine ventilation system is self contained and supplies air to the generator room only. This fan is also located above the module in a self-contained housing with louvered air inlet and attenuator. The fan is fitted with a back-draught damper and supplies unheated air at a rate of 53000CFM.

This air circulates round the engine and alternator and discharges through the south wall of the generator room via an attenuator, fire damper, shut off damper and outlet louvered grille.

The fan is designed to start in conjunction with the G3 start signal and to stop 90 seconds after engine shutdown.

8.0 REFERENCE DRAWINGS AND DIAGRAMS

- MP-2790-R-0-60-10120
- MP-2790-R-0-60-10121
- MP-2790-R-0-60-10122
- MP-2790-R-0-60-10069
- MP-2790-R-0-60-10100
- MP-2790-P-0-12-10378
- MP-2790-R-0-60-10098
- MP-2790-R-0-60-10099
- MP-2790-P-0-12-10395
- MP-2790-R-0-02-10085
- MP-2790-R-0-01-10102
- MP-2790-P-0-12-10394

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1.0 INTRODUCTION

The washwater system is required to supply a salt water washdown facility to the helideck and Tartan skid areas, and to supply a limited firefighting capability to the hydrants adjacent to the Tartan skid. A supply is also routed to the flushing water tank.

The system equipment consists of two electrically-driven subsea washdown pumps and their associated risers, which are located in the deep well casing, the top of which is situated in the redundant lower utilities module.

A portable diesel-driven, manually operated pump, is available as backup to the washdown pumps. Suction supply for pump is contained within storage tanks onboard the platform. These tanks are replenished by the washdown pumps.

Pressure within the discharge pipework is regulated by pressure control valves.

1.1 System Operation

The system is designed to operate only when there is a requirement for washwater if it is considered necessary to use the Tartan skid fire hydrant facility.

1.2 System Control

The washdown pumps can be started locally from pushbuttons or remotely from the Fisher control keypad.

The control of the portable diesel-driven pump is purely a manual function. The two header tanks for this pump are located on different platform elevations, and liquid levels are controlled by a pneumatically-operated valve fitted on the interconnecting pipework between the tanks.

2.0 TECHNICAL DESCRIPTION

2.1 Process

Washdown pumps MP-G106A and B, located in the deepwell casing supply seawater to the system at a discharge pressure of approximately 9bar. This pressure is reduced to 5.8bar by PCV-473, prior to distribution to the hosereel/hydrant system.

Salt water storage tank MP-D-100, with a capacity of $42m^{3,}$ is located in the upper utilities module. Salt water storage tank MP-D-107, with a capacity of $38m^{3,}$ is located in the underdeck area below the utilities module. These two tanks are filled manually from the washdown system by opening the 2in bypass for FO16875. The tanks are kept full at all times, thus ensuring maximum suction supply is always available to the portable diesel-driven pump MP-G-13011A. This pump is located on the deck area east of the redundant utilities module and will be used to supply the hydrants if electrical power was not available to the washdown pumps, or as backup to the washdown pumps in an emergency situation.

The diesel-driven pump can be operated with the system in closed loop by using FO16875 to provide the necessary circulation flow.

A supply from the washwater system is used to top up the toilet flushing water header tank MP-D-119.

2.2 Alarms

TAG NO	FUNCTION	SP	ACTION/REMARKS
PTAL-8802	Washwater Distribution	5.5bar	Alarm
PTAH-8802	Washwater Distribution	12bar	Alarm
PAH-410	Washdown Pump Discharge	10bar	Alarm
LAH-14005	MP-D-107 High Level	100%	Alarm
LAL-14005	MP-D-107 Low Level	10%	Alarm

2.3 Process Control

Washdown pumps MP-G-106A and B can be started and stopped from their local pushbuttons or from the MCP-01 or St Fergus control rooms via the DCS interface.

Washwater system pressure is controlled at 5.8bar by PCV-473 which is situated on the washdown pumps' discharge pipework. If MP-G-13011 is used to supply the system, pressure is reduced to 5.8bar by PCV-472.

Filling of MP-D-100 and MP-D-107 is a manual function where a flow from the washdown pumps is routed to MP-D-100 by opening the bypass around FO16875. The overflow from MP-D-100 is routed to MP-D-107. The overflow from MP-D-107 is routed overboard.

MP-G-10311 takes its suction from MP-D-107. The outlet line from MP-D-100 to MP-D-107 is fitted with a normally closed air-operated ball valve XV-14811, which will open on low level being detected in MP-D-107, thus ensuring the full capacity of both tanks is available for MP-G-10311. This valve resets automatically.

The entire system is self draining to MP-D-107 via FO16872 and FO16873.

The toilet flushing water tank MP-DP-119 is fitted with a ball-cock system and is filled automatically when the washwater system is charged.

2.4 Chemical Dosing

The washwater storage vessels MP-D-100 and MP-D107 and associated pipework require to be dosed with corrosion inhibitor and biocide for long-term protection and bacteria inhibition.

Dosing is from manual fill-points on the top of each tank. The following should be added to the system:

- EXXON COREXIT 3340 BIOCIDE (MIX AT 100 PPM) QUANTITY FOR SYSTEM = 26 LITRES
- EXXON COREXIT 7742 CORROSION INHIBITOR (MIX AT 200 PPM) QUANTITY FOR SYSTEM = 8 LITRES

The above chemicals are harmful and the manufacturer's safety and protection guidelines should be complied with.

3.0 MAJOR EQUIPMENT DESCRIPTION

3.1 Seawater Washdown Pumps MP-G-106A and B

These pumps are British Plunger type P83/5A, five-stage centrifugal pumps. The pumps are vertically-mounted in the deepwell casing.

Each pump is capable of delivering 79.5m^3/h against a pressure of 7.6bar. Motive power is provided by 30kW electric motors rotating at 2400 rpm.

3.2 Portable Washwater Pump MP-G-13011A

This pump package comprising the pump and diesel powered driver are supplied by GODIVA Ltd.

The diesel engine is manufactured by RUGGERINI Ltd. It is a two-cylinder unit with a rated output of 34HP or 25kW at 3000 rpm.

The engine is started by the use of a manually charged spring powered starter unit, or may be 'PULL' started by using a piece of rope.

The pump is a GODIVA GD2500 unit. It is a centrifugal pump and it is directly coupled to the driver. It is rated to deliver 60m^3/h against a pressure of 11.5bar.

3.3 Seawater Storage Tank MP-D-100

This tank is located in the redundant upper utilities module. It has a capacity of 42m^3. It is fitted with a level glass, atmospheric vent and chemical dosing point.

3.4 Sea Water Storage Tank MP-D-107

This tank is located in the underdeck area below the utilities module. It has a capacity of 38m^3. It is fitted with a level glass, atmospheric vent, chemical dosing point, overflow and drain facilities. LT-14005 is fitted near the base of the tank. This instrument is used to control the function of XV-14011. It also interfaces with the DCS system to give a remote indication of the tank liquid levels.

3.5 Hydrants and Hose Reels

A hydrant connection point and washwater hosereel are located at the following areas in the vicinity of the Texaco skid:

- Deck level south-west of centre core
- Deck level south-west of Texaco skid
- Deck level south of Texaco skid
- Deck level north-east of Texaco skid
- Deck level south-east of Texaco skid

A single washwater hosereel is located at the west side of the helideck.

4.0 SYSTEM STARTUP/SHUTDOWN

4.1 Pre-start Procedures and Tasks

4.1.1 Special Precautions

The washdown pumps and associated pressure control valves, level control valve, instrumentation and the D100 storage tank are all situated within decommissioned areas of the platform. Entry to these areas will be by PTW only.

4.1.2 General Checks

- Check electrical supplies are available to G106A and B
- Check all stop buttons are out
- Check G106A and B discharge valves are closed
- Check overboard discharge from G106A and B is closed
- Check all instruments are online
- Check status of XV-14011
- Check PCV-472 and 473 are online with bypass closed
- Check status of hand valve on D100 fill line (MP-2-FW-A2-164)
- Check D107 drain is closed
- Check all hydrants and hose reels are closed
- Check G13011 is topped up with diesel
- Check G13011 lube oil level

4.1.3 Startup

(1) Start G106A with discharge valve cracked open to pressurise the system.

(2) Open G106A discharge valve fully when downstream pressure 9bar.

(3) Open G106B discharge valve.

Alternatively, system can be charged from G13011 as follows:

(1) Fit G13011 discharge couplings to dedicated fittings on washwater pipework.

(2) Start G13011.

(3) Crack G13011 discharge valve to charge system.

4.1.4 G13011 Start Instructions

(1) Connect suction hose to suction eye.

(2) Check oil level. When checking oil level, the unit should be on level ground, otherwise false reading will be obtained. Refer to engine manufacturer's instruction book for approved list of lubricating oils, and capacity.

(3) Ascertain there is sufficient diesel fuel in the tank.

(4) Connect delivery hose to delivery valve outlet.

(5) Close down delivery valve - screw down handwheel clockwise. It is possible to prime the pump with the delivery valve open provided that the rubber clack seating is in good condition.

(6) Move speed control lever to middle speed position. Press 'RESET' button on starter motor and with crank-handle wind clockwise until red springs appear in the inspection window. To start engine now operate trip level.

REMEMBER: Green springs visible - unwound
White springs visible - for hot starting
Red springs visible - for cold starting

WARNING: Do not operate spring starter with engine decompressed as this may cause severe damage to the starter.

(7) Pull primer operating lever down to blank off the exhaust gas outlet. Keep speed at middle position to avoid black exhaust smoke.

(8) When water/vapour is emitted from ejector nozzles, the pump is primed.

(9) Open delivery valve, but do not release clapper handle until pumping commences.

Note: Under some circumstances, air may still be present in the suction hose when water reaches the pump. If the clapper handle is released before the pump delivers water, the prime may be lost.

(10) Adjust speed control and delivery valve to give required output.

4.1.5 Shutdown

Note: If G13011 has been in used the D100 and D107 levels should be replenished prior to system shutdown.

(1) Shutdown G106A and B or G13011 (whichever was online).

(2) Drain low points on system.

(3) Add inhibitor as required to D100 and D107.

5.0 REFERENCE DRAWINGS AND DIAGRAMS

- MP-2790-B-0-30-10046
- MP-2790-B-0-30-10047

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CONTENTS

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1.0 INTRODUCTION

Six CCTV cameras are mounted at strategic points throughout the platform. These cameras allow monitoring to be carried out from both MCP-01 and St Fergus control rooms.

Dedicated cameras cover vulnerable access points onboard the platform. These points are fitted with security links which activate an alarm on the DCS system.

The foregoing is referred to as the MCP-01 video surveillance system.

2.0 TECHNICAL DESCRIPTION

2.1 Video Surveillance

Six cameras are used to give visual coverage of the required areas. All cameras located in exterior areas are certified for Zone 1 use. The camera locations and individual characteristics are listed below:

- Radio tower – fixed – security surveillance
- East underdeck – pan and tilt with wash/wipe
- Centre core top - pan and tilt - security surveillance
- MCP-01 control point - fixed
- East manifold - pan and tilt, wash/wipe - security surveillance
- South underdeck - fixed - security surveillance

The main control equipment for the system is mounted within the ‘video surveillance rack’ situated in the MCP-01 control. An operating console is located in the main St Fergus control room along with two ceiling-mounted 17in monitors.

The system allows control of cameras by the St Fergus or MCP-01 operators. However, in order to avoid multiuser control of an individual camera, the St Fergus operator gas priority end may override his MCP-01 counterpart.

An interface within the rack provides video outputs from all cameras to the video matrix and to the slow scan transmitters No 1 and 2.

Operators’ keypads enable users to select individual camera signals for display. Information from the MCP-01 video surveillance rack is transmitted to St Fergus on the satellite radio link.

See schematic diagram D/163/2994 for details. Each operator is provided with a keyboard with camera control facilities as follows:

- Pan left/right
- Tilt up/down
- Zoom in/out
- Focus rear/far
- Wash on/off
- Wipe on/off

The video surveillance rack provides coded digital signals corresponding to the selected camera functions. The telemetry receiver provides switched outputs to control the camera functions.

2.2 Security Systems

Security systems are situated at strategic points to detect the presence of any unauthorised personnel. The areas covered are the helideck, the centre core ladder access and access from the south breakwater stairway.

The helideck system comprises three motion-sensing voting cameras.

The access hatch and the centre core ladder system at Level 11 within the centre core, and the access gate to the breakwater south stairway, are also covered by security systems, which use fibre optic cables. In each case, a 'weak link' is dislodged if the access gates are moved, thus breaking the fibre optic light beam and triggering the appropriate alarm.

2.3 Alarms

TAG NO	FUNCTION	ACTION
XA-16000	Security Link - Breakwater Access	Follow Company Guidelines
XA-16002	Security Link - Centre Core Access	Follow Company Guidelines
XA-16003	Security Link - Helicopter Approach	Follow Company Guidelines

3.0 SYSTEM OPERATIONS

3.1 Introduction

The video surveillance system on the MCP-01 platform is remotely controlled via a keyboard at the St Fergus terminal.

In addition, a panel-mounted control unit is mounted on the video surveillance rack to provide local control when required.

3.2 Powering Up

3.2.1 MCP-01

The video surveillance system is powered from the platform 240V supply (by others) which is fed to the equipment rack. The rack then distributes 240V ac to all equipment including cameras.

(1) Switch on the 240V supply to the video surveillance rack.

(2) Set power switch on all rack equipment on the 'ON' position.

Apart from when carrying out maintenance work, the MCP-01 equipment will remain permanently switched on.

3.2.2 St Fergus Terminal

All items of equipment are powered by individual mains power supplies. It is only necessary to switch on the power to the individual units.

3.3 Priority System

The system will allow simultaneous control of two different cameras by the control positions. However, in order to avoid multiuser control of a particular camera a 'first come first served' priority system is employed. For example, when the St Fergus operator has control of a particular camera, the local operator may not take control of that camera until St Fergus control is completed.

3.4 Monitors

3.4.1 Adjustments

All monitors are fitted with front panel user controls as follows:

- Power 'ON/OFF' switch
- Power indicator
- Vertical hold
- Horizontal hold

- Brightness
- Contrast
- Underscan

3.5 Telemetry Control

Telemetry control refers to commands sent from any of the control units to control the selected camera functions. The following telemetry controls are available to cameras as detailed:

- Camera 1 - wash, wipe
- Camera 2 - wash and wipe
- Camera 3 - pan, tilt, zoom, focus
- Camera 4 - fixed camera
- Camera 5 - pan, tilt, zoom, focus, wash and wipe
- Camera 6 - pan, tilt, zoom, focus, wash and wipe
- Camera 7 - pan, tilt, zoom, focus

3.5.1 Pan and Tilt

The term ‘pan’ refers to horizontal movement of the camera and ‘tilt’ to vertical movement.

To avoid continuous rotation of the camera when using the pan and tilt controls, adjustable limit switches are built into the pan and tilt heads to restrict camera movement to the required field of view.

Movement of a selected camera is achieved by use of the control unit joystick. Camera movement continues until the joystick is released, or the limit switch is reached.

3.5.2 Zoom Controls

The zoom control allows the magnification of the viewed image to be increased or decreased as required.

To increase the image magnification:

- Press the ‘ZOOM IN’ button, releasing it when the desired degree of magnification is reached

To reduce the image magnification:

- Press the ‘ZOOM OUT’ button, releasing it when the desired reduction in magnification is reached

3.5.3 Focus Control

The focus controls enable the camera to be focused correctly on any particular image at any zoom setting.

To focus on a distant object:

- Press the 'FOCUS NEAR' button, releasing it when the he focus is sharp

Note: The focus control should normally be set as follows:

(1) Zoom fully in.

(2) Adjust the focus controls to produce a sharp image.

(3) Use the zoom control to display the desired image magnification; the focus should remain sharp for all zoom settings. Should the camera position be altered by use of the pan and tilt controls, it will be necessary to readjust the focus.

3.5.4 Wiper Control

The wiper control is used to clear rain or moisture from the front glass on camera housings. The wiper will operate so long as the 'WIPE' control is depressed.

3.5.5 Wash Control

Operation of this control produces a jet of water onto the selected camera housing front glass for as long as the control is held depressed.

4.0 REFERENCE DRAWINGS AND DIAGRAMS

- D/163/2994
- C/162/3074

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1.0 NAVAID SYSTEM

1.1 Introduction

The requirement for navigation aids for the 'not normally manned' platform remains unchanged apart from the extended battery backup facility which is provided with the existing system.

The system comprises warning lights situated at the north-east, north-west, south-east and south-west corners of the platform at deck level. Foghorns are located at the north-east and south-west corners.

1.2 Technical Description

The complete navaids system is supplied by Tideland Signal Ltd. The main control for the system is from the panel MP-P-17101 which is located in the Level 3 control room area. Local control panels are situated at each corner of the platform adjacent to the individual navaid stations. These panels are numbered as follows:

- MP-P-17107A - north-west corner
- MP-P-17107B - north-east corner
- MP-P-17107C - south-west corner
- MP-P-17107D - south-east corner

The 'main' 'white' duty and standby lights are positioned at the north-west and south-east corners, and the 'subsidiary' 'red' lights are on the two remaining corners. Fog signal station No 1, MP-P-17107B is on the north-east corner, and fog signal station No 2, MP-P-17107A is on the south-west corner.

A battery backup package is located at each navaid station. Battery backup is designed to give 96 hours of system operation in the event of loss of main power.

All navaid lights have automatic switching to their standby units in the event of failure, and the foghorns also incorporate a duty/standby facility with automatic changeover.

The duty 'main' lights are activated from a light-sensitive switch ('sun' switch), which is located near the west side of the helideck. All other lights are activated from local light-sensitive switches.

The duty 'main' lights are equipped within individual cooling fans which start in conjunction with activation of the lights. These lights are also equipped with double-filament lamps, which incorporates automatic rotation to the display position in the event of online filament failure.

The local individual control panels are fitted with ac and dc circuit-breakers, isolating switches, test and reset buttons.

All navaid lights flash the morse signal for the letter 'U' at 15-second intervals.

All fog stations sound the morse signal for the letter 'U' at 30-second intervals. Foghorns will operate continuously when the platform is unmanned.

1.3 Operating Procedures

(1) Ensure that all switches on individual station control navaid lights and foghorns are switched to 'ON'.

(2) Ensure that all switches are positioned at 'O' for 'ON' at main control panel in the control room area, and that all alarm indications are clear.

(3) Providing power supplies are healthy and all alarms are clear, the navaid lights will now operate automatically on control from the light-sensitive photocells.

Note: To override the photocells, there is a switch on the main control panel tagged 'SUN SWITCH IN OPERATION' which can be switched to position 'I'. The 'MAIN' lights will now flash continuously. A status indication lamp on the panel will show 'GREEN' when system is **not** in override.

(4) Foghorns will operate when switched to position 'O' on the main control panel. They are disabled when switched to position 'I'.

Note: A 'MUTE' switch for the foghorns is available at the west side of the helideck.

1.3.1 Control facilities

(1) Fog Station No 1 press to sound PB.

(2) Fog Station No 2 press to sound PB.

(3) Lamp test.

(4) Fog Station Mute Override PB.

(5) Fog Station No 1 disable switch.

(6) Fog Station No 2 disable switch.

(7) Light Station No 1 disable switch.

(8) Light Station No 2 disable switch.

(9) Photo cell override switch.

1.3.2 Alarms

The following alarms are available on the main control panel.

- Fog station No 1 fault
- Fog station No 1 charge fail
- Fog station No 2 fault
- Fog station No 2 charge fail
- Light station No 1 fault

- Light station No 1 charge fail
- Light station No 2 fault
- Light station No 2 charge fail
- Sun switch 'in control' indicator
- Fog stations 'MUTED' indicator

Note: The common alarm signal XA-14514 is relayed to the MCP-01/St Fergus control rooms. A platform visit will be necessary to establish the cause of the alarm signal.

1.4 Drawings/Diagrams

- Figure 1 - Light Station Single Line Diagram
- Figure 2 - Fog Station Single Line Diagram
- Drawing 8255/01 (Sheet 1 of 1) Single Line Overview

2.0 WEATHER MONITORING SYSTEM

2.1 Introduction

The MAREX weather monitoring system is designed to provide realtime weather information for shipping and aircraft purposes, and to allow continual monitoring of conditions on the not normally manned platform.

Display units are located in both the MCP-01 and St Fergus control rooms.

2.2 Technical Description

The MAREX compact weather station panel displays wind speed, wind direction, barometric pressure, humidity and air temperature.

2.2.1 Wind Speed and Direction Sensors

(Refer to Figure 5.15.1.)

A combined anemometer and wind direction transmitter are used to give remote sensing of wind velocity and direction. The unit is located at the top of the radio mast so as to be free from any wind turbulence caused by the platform structure.

The anemometer is caused to rotate by wind airflow. The cups are attached to a central spindle which rotates a magnet within a coil stator thus generating an ac current which varies according to wind speed.

Wind direction is transmitted from a bearing-mounted vane, operating a magslip transmitter. Signals from the anemometer and direction vane area displayed on digital meters on the MAREX panels in the MCP-01 and St Fergus control rooms.

2.2.2 Meteorological Sensors

The instrument shelter, located on the west side of the helideck houses a barometer, a hydrometer and a thermometer.

The air temperature is measured by a highly accurate platinum resistance thermometer in the range of –100 to +100ºC.

Humidity is measured by a capacitive electrical element which is sensitive to the moisture of the air. This instrument has a range of 0 to 100% Relative Humidity (RH) with an accuracy of plus or minus 3%.

The barometric pressure is measured by a resonant cell transducer mounted in a master unit with the ambient pressure being sensed through an air pipe, which is terminated by a static pressure head. The range of the instrument is 800 to 1100MB.

2.2.3 Display Unit

(Refer to Figure 5.15.2.)

The measurement of the various parameters are shown on the central display units.

Wind speed is given on a three-digit display which can show:

- Instantaneous read-out of actual wind speed
- A 10-minute mean average speed
- A 3-second maximum gust for 10-minute period

Wind speed can be displayed in meters per second (m/s), miles per hour MPH, knots (kn) or kilometres per hour (km/hr).

Wind direction is shown to three digits of a compass rose.

Air temperature is given as a three-digit display to the nearest 1/10 unit. Centigrade or Farenheight may be chosen as the measured scale.

Humidity is displayed as a three-digit percentage, and barometric pressure is shown on a five-digit display to the nearest 1/10 unit.

2.3 Operating Procedures

The MAREX Compact Weather Station

(1) Press ‘ON’ button. Observe button illuminates.

(2) Select power ‘ON’ for RH. Observe supply indicator illuminates.

(3) Select power ‘ON’ for Barometric display. Observe supply indicator illuminates.

(4) Select power 'ON' for air temperature. Observe supply indicators illuminates.

(5) Select desired range and display on Processed Wind Data channel. All displays should now show digital interpretation of measures parameters.

3.0 REFERENCE DRAWINGS AND DIAGRAMS

- INTL 8225/01 Single Line Cable Diagram Aids to Navigation 'Syncrolan 91'

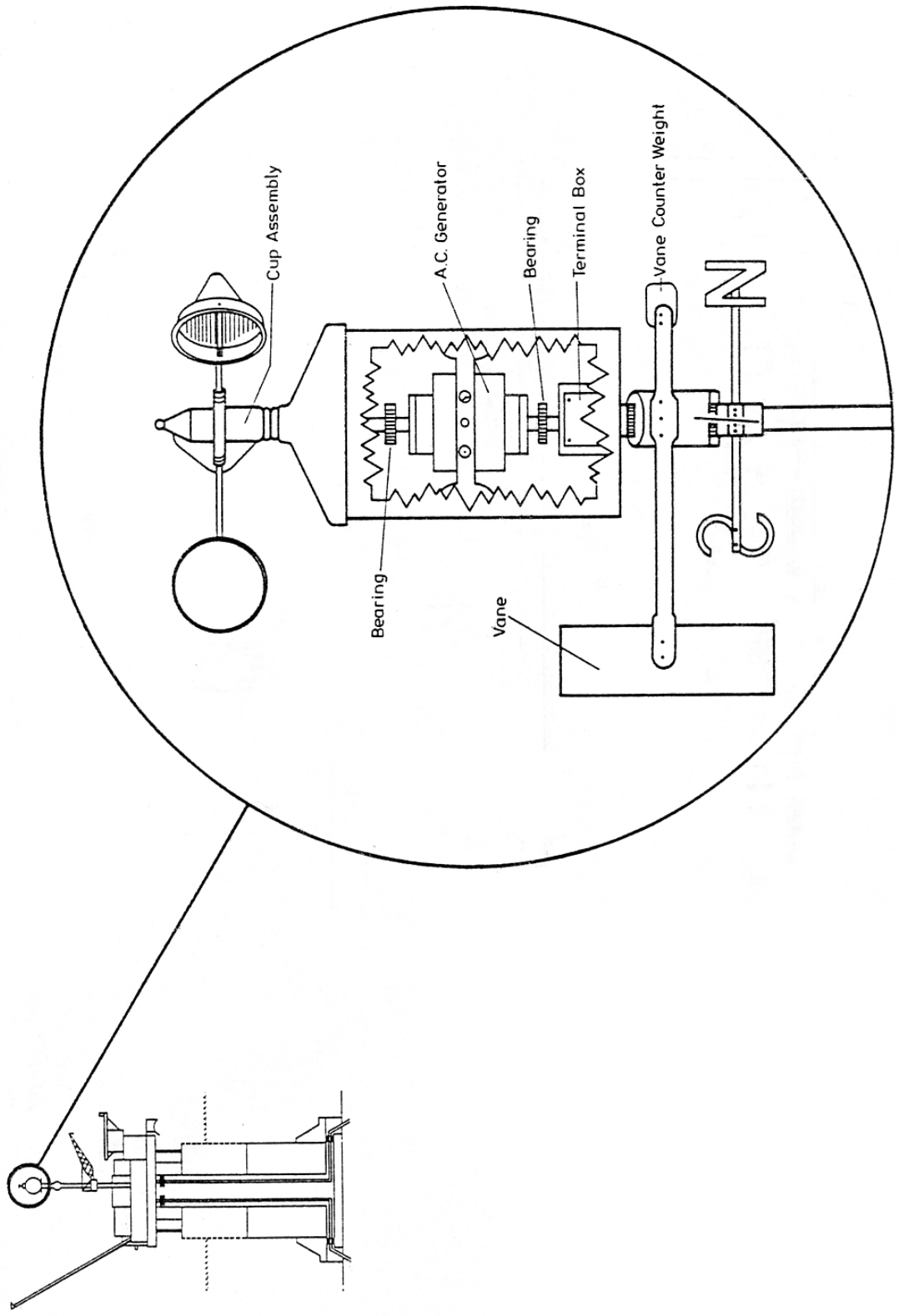

Figure 5.13.1 Location and Details of Anemometer Sensor

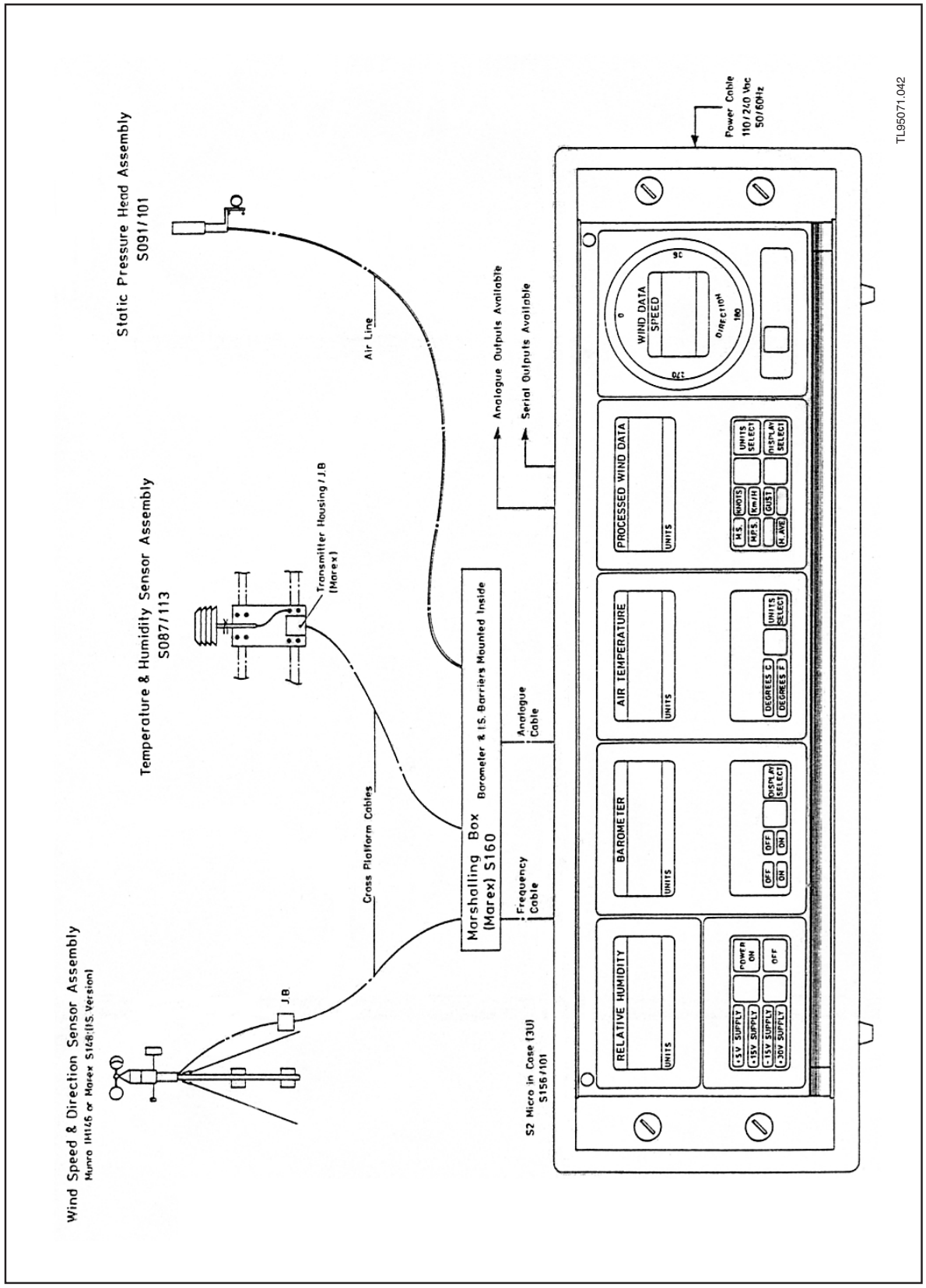

Figure 5.13.2 5020 Compact Weather Station Block Diagram

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1.0 CRANE

The Installation is equipped with a pedestal crane located on the east side approximately on the centreline and at an elevation of +146.0m. The crane is electro-hydraulically operated and is fitted with the following protection devices:

- Audible alarms on the slewing arcs to warn of obstructions such as radio tower, centre core etc
- Automatic boom hoist (luffing) disengagement at a predetermined angle
- Safe load indicators and alarm – electronic MIPEG system fitted
- Overload indication on hoisting and luffing motions at safe working load plus 10% which gives alarm indication only
- A boomhead camera system is fitted giving the operator full visual feedback for all lifts

Boom rests are provided for boom support during periods of inactivity or if operations are halted. Crane operation must cease, with boom clear of the helideck height-restricted sectors, during helicopter operations. The crane is designed for a maximum 10 tonne lift at all radii to a maximum of sea state 3, and may be operated, without recourse to the Offshore Installation Manager, when the maximum steady wind does not exceed 25 knots. The crane may be operated in exceptional circumstances and only at the discretion of the Offshore Installation Manager at wind speeds up to 35 knots.

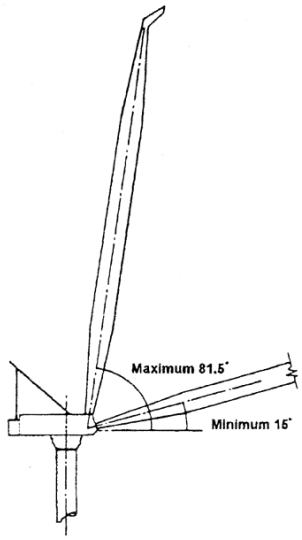
The location of the crane together with its boom length dictates the working area. The available working area is restricted as a result of the location of the compression modules which prevent the use of the boom at maximum depression if working north of the Installation centreline.

Note: When determining the optimum load from a supply vessel, consideration must be given to the sea state.

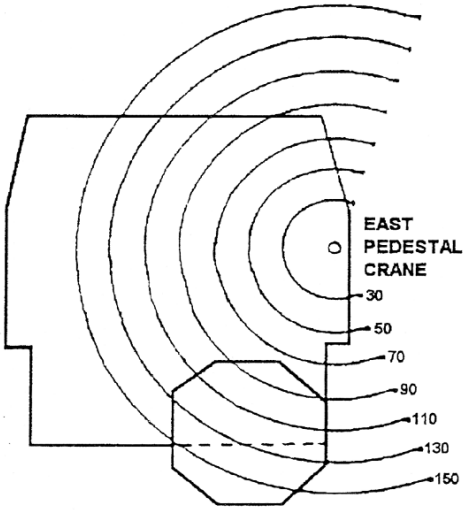
2.0 MCP-01 EAST CRANE LOAD LIMITATION

- *Platform Lifts*
  - Wind limitation: 40 knots (21m/s)
  - Maximum SWL: 10 tonnes
  - This can be lifted between min radius (81.5° boom angle), to max radius (15° boom angle)
- *Sea Lifts*
  - Wind limitation: 40 knots (21m/s)
  - Sea state limit: Sea state 1 to 3 max SWL 10 TE
  - This can be lifted between min. radius (81.5° boom angle), to a radius of 30m (50° boom angle)
  - Sea state 4 to 6 SWL 7.5 tonnes
  - Sea state 7 SWL 5 tonnes

    Note: In all cases, maximum radius for sea lift will be 30m (100ft), and boom angle 50^{o}.



EAST PEDESTAL CRANE



CRANE OPERATING RADIUS

TL95071.043

Figure 6.1 Crane Details

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1.0 INSPECTION, REPAIR AND MAINTENANCE

1.1 General

For the purposes of inspection, repair and maintenance, the Installation can be divided into two main parts:

(1) All equipment above and on the main deck, including tankage and service equipment located in the various stilling tubes. This equipment is subsequently referred to as 'topsides equipment'.

(2) The concrete primary structure and all other secondary equipment items including their supporting plates and brackets from the base of the structure to the top of the concrete deck beams. This second category is essentially structural eg beams, columns, concrete etc and is subsequently referred to as 'marine structure'.

1.2 Definitions

To acquaint the Offshore Installation Manager with the terms used in the Guidance Notes (refer to Paragraph 2), the following items are defined.

1.2.1 Splash Zone

Defined as that part of the structure between Lowest Astronomical Tide (LAT) and Highest Astronomical Tide (HAT) plus the crest height of the 50-year storm wave. For the MCP-01, this may be defined as the area between 93m and 114.2m above the seabed.

1.2.2 Atmospheric Zone

Defined as the area above the splash zone and within the centre core.

1.2.3 Submerged Zone

Defined as the area below the splash zone and outwith the centre core.

1.2.4 Primary Structure

Defined as that part of the Installation which collectively forms the basic strength of the structure ie that part which holds the deck equipment above the water.

1.2.5 Secondary Structure

Defined as all items and fittings etc which are attached to the primary structure and do not contribute to its basic strength.

2.0 LEGISLATION

The appropriate legislation covering inspection, repair and maintenance is The Mineral Workings (Offshore Installations) Act 1971. This act enabled The Offshore Installations (Construction and Survey) Regulations 1974 (Statutory Instrument 1974 No 289) to be implemented. The detailed ramifications of this legislation are to be found in 'Offshore Installations: Guidance on Design and Construction' which was published by the Department of Energy in 1974 and has been subsequently updated by the issue of amendments.

3.0 DOCUMENTATION

Reflecting DCR and PFEER obligations, a Written Scheme of Examination (WSE) to ensure that maintenance and inspection of safety critical elements is effected.

Each offshore Installation must have an annual verification report by an independent verifier. The mechanism controlling this is the SAP maintenance system and its function is documented therein.

4.0 SURVEYS

In order to maintain the commitments, it is necessary to carry out a programme of surveys, designated Major, Annual and Additional.

4.1 Major Survey

This is conducted periodically as defined in the relevant WSEs, allowing sufficient time for the survey to be completed and a new survey includes all the elements of an annual survey plus a general underwater examination and a close underwater visual inspection to cover the areas required by the Certifying Authority.

4.2 Annual Survey

The survey consists of a close visual inspection of the upper structure of the Installation down to and including the splash zone. It includes determination of marine growth thickness, evidence of corrosion, conditions of fenders, helideck, walkways and handrails, Temporary Refuge – particularly personnel protection systems, escape routes, radio tower, cold vent stack, crane pedestal, drains, vents and any other specific areas or items of equipment as required by the Verifying Authority.

4.3 Additional Surveys

Additional surveys are needed following any major damage or deterioration to the structure or after any modifications.

Note: The full requirements of surveys can be found in 'Periodic Surveys of Offshore Fixed Installations for Recertification for Offshore UK Waters' issued by Lloyd's Register of Shipping.

4.4 Cumulative Input

At the discretion of the Verifying Authority, the results of annual surveys may be accepted as cumulative input to the major survey on a full or partial basis.

5.0 INSPECTION OF TOPSIDE EQUIPMENT

The inspection tasks relating to the topsides equipment are implemented in accordance with the Total In-service Inspection Manual which meets or exceeds all Statutory Instruments.

The manual, referred to above, has sections which detail the various equipment schedules relating to the topsides as follows:

- Lifting Equipment Section A.5.1.1.7
- Vessels Section A.5.3
- Piping and Risers Section A.5.9
- Surface Safety Systems Section A.5.5
- Structure etc Section A.5.2.1

6.0 ITEMS MERITING REGULAR ATTENTION

The design of the Installation makes it inherently very stable and it will be able to withstand the environmental loading to which it is subjected with an adequate factor of safety. There are, however, items which can reduce the factor of safety and it is the object of the following paragraphs to draw the attention of the Offshore Installation Manager to the significance of these items.

6.1 Marine Fouling

The extent of marine fouling is significant because it affects the overall stability of the structure. The extent of fouling is assessed annually during the structural inspection programme. The status of fouling is reviewed annually in order to assess the need for cleaning.

6.2 Riser Pipes

Calculations have shown that during adverse weather conditions high stresses can be generated in the pipelines adjacent to the structure.

Regular inspections of the risers and associated equipment within the tunnels and centre core are carried out in accordance with the Pipeline Inspection Scheme under Statutory Instrument SI 1972/No 2885, as defined by the Pipeline Inspection Engineer

6.3 Soil Deterioration

Deterioration of the soil foundations of the structure, which might result in changes of the Installation tilt attitude (eg differential settlement), has been monitored through periodic theodolite measurements, the records of which are kept by the Inspection Department – Altens. No significant tilt has occurred since installation.

6.4 Structural Steelwork

All accessible Installation steelwork is inspected at least once every 5 years. Areas which are subjected to severe stress, such as the crane pedestal, are inspected annually. All structural members of modules are, where accessible, visually inspected on an annual basis.

7.0 REPAIR AND MAINTENANCE

Two types of repair and maintenance programmes will be in operation during the life of the Installation:

- *Planned Maintenance and Service*

  Planned maintenance and service will cover all above deck machinery and equipment, and will be carried out in accordance with equipment manufacturer's recommendations or those established by Total.

  Where practicable, planned maintenance is carried out to coincide with survey requirements.

- *Adhoc Maintenance or Repair/Replacement*

  Adhoc maintenance or repair/replacement will be Adhoc maintenance or repair or replacement – undertaken on the basis of inspection results, each case being dealt with separately and on its own merits.

For the marine structure, the type of programme described in '*Planned Maintenance and Servivce'* above will be implemented with all maintenance and repair work carried out under the supervision of the Offshore Engineer, and with the agreement of the Certifying Authority. The Offshore Installation Manager must familiarise himself with all the work going on both above and below sea level. Maintenance records are retained for examination by the Certifying Authority should they so wish.

8.0 MODIFICATIONS

Records are maintained at Total, Altens, Aberdeen, of all modification work carried out. These are subject to Certifying Authority approval and a dossier containing proposed modifications is circulated to all departments concerned before commencement of the work.

9.0 NOTIFIABLE EVENTS

It is a mandatory requirement that certain events, should they occur, are notified to the appropriate authority eg Certifying Authority, HSE, for electrical damage to equipment and/or systems, structural damage, deformation, cracking and corrosion, and equipment additions, replacements, repairs and alterations.

For alterations or repairs to the structure or any major repairs, replacements or alterations to equipment or systems, the prior approval of the Certifying Authority must be obtained.

10.0 MAJOR REPAIRS TO DATE

During the period 1986 to 1988, resin injection repairs were carried out to a leaking construction joint in the central shaft at the +6m level. To date, these have proved successful with minimal leakage now being observed.