DRILLING SAFETY

PTS 60.2504

Rev 1

JUNE 2006

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AMENDMENTS RECORD SHEET

Chap No.	Sect No.	Description	Issue No.	Date	Rev No.	Date	Appro by: (initial)
All	All	PTS 60.2504 Drilling Safety	1	June 06	1	June 06	IGA

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1. INTRODUCTION

1.1 OBJECTIVES

This document is aimed at both OPU / JV and contractor staff involved in drilling operations. It is intended to:

- identify health, safety and environmental hazards in the drilling operation and provides guidance on how risks can be reduced
- provide guidance on drilling HSE related issues
- describe how to develop the essential core of a HSE Management System (HSE MS) appropriate to drilling operations
- enable an assessment to be made of a contractor's approach to HSE which will assist in the contractor selection process and facilitate better control of HSE in the drilling operation.

1.2 BACKGROUND

Activities on drilling sites and rigs present potential major hazards to health, safety and the environment. This is exacerbated by the diversity of the personnel involved resulting from the use of contractors and subcontractors and the international nature of the business.

Despite our best endeavours accidents still occur, people are injured, the environment may be damaged and OPU / JV assets put at risk.

The basic cause of accidents can be frequently identified as a lack of effective planning or a failure to train personnel to achieve competence. The recognition of all the potential hazards of a drilling operation during the planning stage is essential so that they can be eliminated or at least controlled. Similarly, attention shall be paid to the programme for training personnel to a standard which enables them to perform competently the requirements of their job function and duties.

2. OVERVIEW

2.1 SCOPE OF THE DOCUMENT

This document addresses HSE aspects of the business process activity 'Drilling and Well Operations'.

The HSE Management System (HSE MS) for a drilling operation has effectively the same components as the overall system for the OPU / JV which are described in PTS 60.0102. This section describes many of the requirements of an HSE MS as they relate to a drilling operation. The remaining chapters provide guidance on drilling HSE related issues that might be encountered and may be useful in the development of hazard registers associated with an HSE Case.

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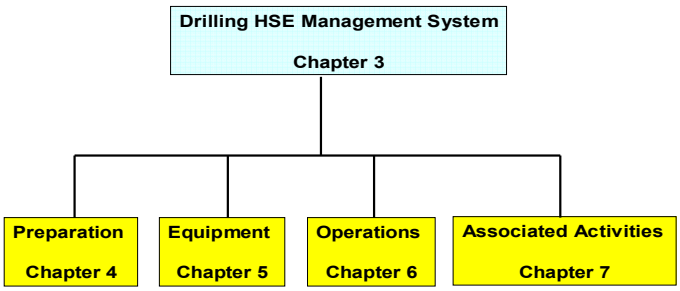
It is not the objective of this document to provide comprehensive guidance on the development of an HSE Case. A great deal of guidance is provided, however, on the management of hazards. Much of this advice is a distillation of experience gained by many knowledgeable staff over a long period.

2.2 RELATIONSHIP BETWEEN THE CHAPTERS

The following chapters of this document are shown in Figure 2.1 indicating their hierarchy.



Preparation

This chapter provides guidance on HSE requirements associated with site preparation, materials procurement, transportation to site, and moving the rig.

Equipment

Hazardous zone policies are detailed, and the background to personal protective equipment requirements. A good deal of information is provided on hardware. Drilling equipment is primarily under the control of the contractor but the OPU / JV Supervisor shall be aware of the HSE related matters in order to verify that proper control is being exercised.

Operations

This chapter covers the HSE aspects of executing the drilling operation.

Associated activities

The operation of drilling a well entails the use of other services such as wireline logging and well testing services. This chapter gives guidance on the hazards associated with such operations and on the responsibilities of the drilling department when such activities are taking place.

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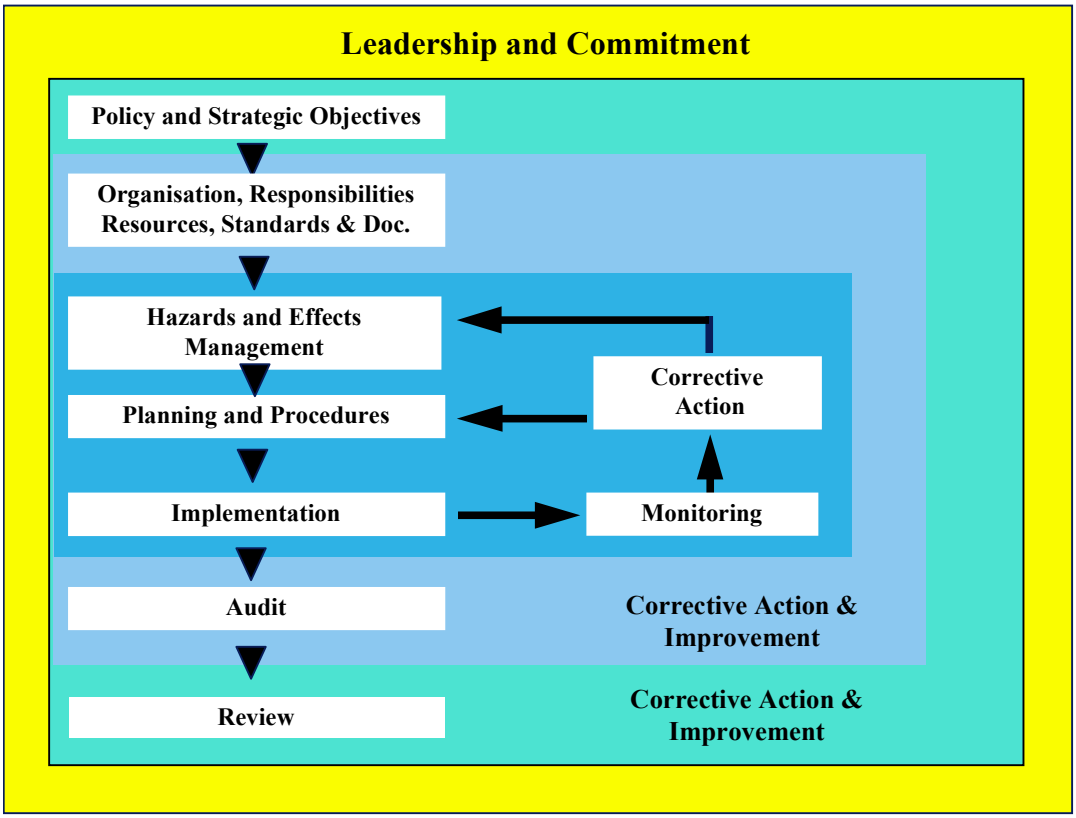
3. DRILLING HSE MANAGEMENT SYSTEM

The text draws in part on work carried out in OPU / JV and single string ventures and consequently reflects the views of a wide variety of staff in a number of areas.

In essence, an HSE Management System is a reflection of the objectives of an enterprise and the manner in which these objectives are to be met as laid down by its senior management. Achievement of the hazard management objectives will be realised through the setting up of an organisation in which responsibility is assigned and to which resources are provided. The standards and procedures through which the objectives will be met are defined by those with the necessary expertise. The implementation of standards is monitored through performance indicators and assured through periodic assurances. Such assurances are reviewed by management who may initiate system changes to facilitate improvement. The system is additionally made live through loops which feedback improvements and corrections at all stages.

The quality management structure is illustrated in Figure 3.1.



3.1 LEADERSHIP AND COMMITMENT

The foundation of an HSE MS is leadership and commitment from the top management of the Company, and its readiness to provide adequate resources for HSE matters.

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Particular attention is drawn to the importance of senior management providing a visible expression of commitment. Failure to do so will undermine the credibility of HSE policy and objectives. Demonstrations of commitment to the HSE MS at different management levels include, amongst others:

- allocating the necessary resources, such as time and money, on HSE matters
- setting a personal example in day-to-day work
- putting HSE matters high on the agenda of meetings,
  being actively involved in HSE activities and reviews, at both local and remote sites
- communicating the importance of HSE considerations in business decisions
- recognition of performance when objectives and targets are achieved
- encouragement of employees' suggestions for measures to improve HSE performance
- participation in internally driven and externally driven initiatives.

Management leadership is also necessary to promote a OPU / JV culture conducive to good HSE performance, in which the HSE MS can function effectively. Senior management can foster active involvement of employees and contractors in improving HSE performance by encouraging a culture of belief, motivation, participation and commitment:

- **Belief** in the OPU / JV will to improve its HSE performance - essential in particular to open, blame-free incident reporting, and in general to effective HSE MS implementation.

- **Motivation** to improve personal HSE performance - based on awareness and understanding, and positive recognition to reinforce desirable attitudes and behaviours.

- **Participation** of staff at all levels - through seeking their views and involvement in HSE MS development, and energetically pursuing suggestions for improvement.

- **Commitment** of staff at all levels is essential if the HSE MS is to be fully effective, and should follow from firm belief, personal motivation and active participation.

3.2 POLICY AND STRATEGIC OBJECTIVES

Within OPU/JVs, departmental policies are derived from the corporate document, which is itself invariably based on Group guidelines, though adapted to take account of specific area needs. Consequently, a good deal of commonality is seen between them. Likewise, contractors follow the same general principles.

Figure I.1 shows the PETRONAS' policy guidelines on health, safety and the environment

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Likewise, contractors are required to support policies which advises that the health and safety of all persons on the installation or worksite, and all others who may be affected by its activities, together with the protection of the environment:

- are of prime importance to the contractor who will seek to maintain the highest practically achievable standards in respect of these
- have equal status with the other primary business objectives
- are line management responsibilities which form an integral part of the duties of all supervisors.

The policy shall also confirm that the contractor will ensure that employees have the required skills and support to meet this commitment, by providing, where necessary, appropriate training and opportunities to gain competence. It shall also state that:

- the contractor promotes active participation of all in its employ in the establishment and observance of measures to safeguard their health and safety at work and to protect the environment
- it expects its subcontractors to work to similar high standards and achieve comparable performance.

To assure the above, it is necessary to perform an HSE assessment at the precontract stage. This may take the form of a questionnaire in the tender document, but will increasingly take the form of reviewing the contractor's HSE Case for the installation or operation. This and other aspects of HSE in the management of contractors is fully described in

- PTS 60.0101 HSE Management System Manual and
- PTS 60.0305 Contractor HSE Management.

The objectives which underpin the health, safety and environmental protection policy can typically be summarized as follows:

- to prevent all workplace injuries, by encouraging active workforce participation in all aspects of safety including participation in the hazard management process
- to provide a safe and healthy workplace
- to eliminate environmentally damaging discharges and emissions through the implementation and monitoring of an effective waste management programme
- to comply with all statutory obligations, through the fulfillment of management responsibilities
- to provide properly engineered and well maintained facilities
- to work with external agencies such as certifying authorities to promote improvements
- to ensure all employees are competent to fulfill their duties
- to prevent use of alcohol or abuse of substances on location
- to prevent vehicle accidents.

Increasingly, companies and contractors are developing substance abuse policies. A

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model OPU / JV policy statement, is shown in Figure I.2.

HSE sensitive positions

Within the policy on substance abuse, reference is made to safety and environmentally sensitive positions, which in the context of well operations include:

- all OPU / JV and contractor line managers and office based supervisors with operational responsibility
- field-- based staff including OPU / JV, contractors' and subcontractors' employees.

The success of a substance abuse policy depends on the commitment and leadership of management. For the purpose of the policy, management is treated in the same manner as those employees holding safety and environmentally sensitive positions.

3.3 ORGANISATION, RESPONSIBILITIES, RESOURCES, STANDARDS AND DOCUMENTS

The responsibility for all well operations aspects of exploration, appraisal and development drilling, and workover operations, lies with the Drilling Engineering group which also sponsors and manages all drilling and most associated contracts.

The responsibility for health, safety and the environment in the well operations process is vested in the Head of Drilling Engineering. In practical terms, elements of this responsibility are delegated through the line.

Operations, in this sense, cover the complete process from planning, through execution, to review and improvement. Thus, for instance, the writer of the drilling programme is responsible for the accuracy and completeness of that programme in the same way as a Driller is responsible for the safe execution of drill floor operations.

Well drilling operations consist of the following main activities in most OPU/JVs:

Plan well

Drilling Engineering staff need to be involved in the earliest phases of planning. The contribution made to feasibility studies and evaluating development options can lead to significant cost and HSE benefits.

Other areas of planning include:

- the preparation of the short term drilling sequence on the basis of the exploration, appraisal, development or work over portfolio
- acquiring the necessary services
- planning for the transport of equipment and personnel.

Prepare for well

Prepare a well design and detailed drilling programme or work over programme covering contingencies and emergency

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procedures Emergency procedures and obtain required internal and external approvals. Order all necessary materials and complete site preparation.

Execute well Secure adjacent wells and facilities as required. Move in, rig up, drill and complete or operations work over wells according to programme, rig down and move or demobilize as appropriate.

Report and Prepare an end of well report which will enable an in-depth analysis of the operation. Apart from being an important record, the report will facilitate cost and HSE improvements in later wells.

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3.3.1 Organizational structure and responsibilities

The OPU / JV shall define, document and communicate, with the aid of organizational diagrams where appropriate, the responsibilities, authorities, accountabilities and interrelations necessary to implement the HSE MS. These shall include those of all personnel who manage, supervise and/or monitor HSE-critical activities. (Refer to PTS 60.0101 HSE Management System Manual for further advice on organizational structure.) Guidance on individual responsibilities for key staff, both OPU / JV and drilling contractor, is given in Appendix II. Any inconsistency between OPU / JV and contractor HSE MS shall be resolved prior to commencement of operations.

The conduct of operations in a manner which takes full account of the health and safety of personnel, protection of the environment and local culture and circumstances is the responsibility of all involved, with each layer of supervision being responsible for their subordinates in accordance with the principle of line responsibility.

Contractor responsibilities

The main contractor is responsible for:

- implementing a management system directed at providing a safe worksite
- implementing an on-site HSE programme
- providing for the safety of contractor and subcontractor personnel
- controlling work and health conditions at the rig site
- training contractor personnel to ensure safe operations
- providing contractor personnel with necessary protective and safety equipment and appropriate training in the use of such equipment
- ensuring that all contractor and subcontractor furnished machinery and equipment is fit for purpose and properly maintained
- developing on-site emergency contingency plans for major scenarios such as blowout fire/explosion, toxic material release, man-overboard, stability control, heavy weather, etc
- liaising with the OPU / JV in the development of plans for emergencies which require the intervention of outside resources
- complying with all applicable laws and regulations
- complying with OPU / JV HSE guidelines, policies, procedures.

OPU / JV responsibilities

The OPU / JV are responsible for:

- verifying that contractor’s HSE policies, standards, and procedures are acceptable to the OPU / JV and conform with applicable laws and regulations
- verifying that contractor's HSE programme is accomplishing the desired HSE objectives
- reporting any hazards to appropriate contractor supervisors when situations exist where safety has been compromised and following up to ensure that appropriate action has been taken to correct the situation
- requiring the OPU / JV 's subcontractor's personnel to observe the rig

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contractor's HSE programme and co-ordinating activities between rig contractor and OPU / JV subcontractor personnel to avoid conflicts
- identifying responsibility for third party equipment maintenance and operability and ensuring that such responsibilities are discharged
- emergency contingency plans requiring co-ordination of third party groups. Such plans will include responses to oil spills, rig evacuation, etc
- monitoring contractor and OPU / JV personnel HSE performance and assisting in the implementation of improvement initiatives.

Role of HSE department

In areas where operations are supported by an HSE department, responsibilities assumed should include the following:

Operational HSE

- Advise on the development and testing of contingency plans and drills
- Advise on governmental HSE regulatory requirements and liaise with governmental agencies as required to ensure that regulations are workable
- Assist in the investigation and analysis of accidents and incidents, and in the preparation of reports. Responsibility for this, however, remains with the line supervisor
- Disseminate information, data and experiences related to HSE in operations
- Participate in formal HSE audits and inspections
- Develop standards and specifications for safety and protective equipment
- Advise on hazards associated with chemicals and other materials produced, or likely to be used in the operations, and advise on exposure limits
- Advise on HSE clauses, and their implementation, in drilling related contracts
- Advise on noise limits and other areas of occupational health
- Liaise with contractor's HSE adviser to assure consistency of advice
- Review risk analysis and hazard assessment of drilling and well test programmes.
- Advise on and assist in the development of standards and practices that will protect the environment
- Liaise with governmental agencies to ensure timely advice of regulatory requirements and compatibility of operations with those requirements.

HSE training

- Assist in the identification of HSE training needs
- Develop and conduct specialist HSE training as required
- Assist in on-the-job HSE training programmes
- Provide HSE awareness material, and training aids
- Contribute to HSE meetings
- Arrange defensive driving training
- Maintain a record of HSE related courses attended by drilling staff and notify refresher requirements. In some areas this responsibility is retained by the line department.

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3.3.2 Management representative(s)

See PTS 60.0101 HSE Management System Manual.

3.3.3 Resources

The changing roles of both OPU / JV and contractor staff with the advent of integrated engineering and incentive contracting strategies need to be addressed in the planning stages of operations. The decision making process shall be agreed prior to start-up and both the numbers and calibre of contractors' staff shall be commensurate with the demands and objectives of the job. HSE audits and operations reviews have frequently found that the demands on the contractor's Toolpusher have been underestimated.

Responsibilities should be agreed and matched by levels of authority. Staff should not be held responsible for areas where they do not exercise control.

In this respect, job descriptions for supervisory staff enables both numbers and competencies to be defined in the contract rather than being modified on an ad-hoc basis after commencement.

A clear job description will also assist in facilitating a smooth transition with respect to the changing role of the OPU / JV Drilling Supervisor.

3.3.4 Competence

General

All staff shall be competent to discharge the responsibilities of their jobs or be in the process of gaining such competence in a supervised manner. Work roles that are key to the HSE management of the operation shall only be performed by those persons who can discharge their responsibilities safely and effectively.

The contractor's Base Manager is responsible for ensuring that all HSE critical activities are covered by standards of competence and an assessment scheme to assure continuing competence is in place. He shall fulfill this requirement in accordance with corporately defined standards.

The contractor's Rig Superintendent is responsible for ensuring that all personnel on the rig (other than those undergoing training who will be under direct supervision) are competent to carry out tasks without risk to the health and safety of themselves and others.

The contractor's capability to provide competent staff is assessed during the prequalification appraisal stage of the contract process and by continuous assessment throughout the course of the contract.

OPU / JV management is responsible for the provision of personnel who are competent to perform their defined roles and will monitor continuing competence

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through the formal annual performance appraisal review.

Qualifications

Contracts should define the qualifications of staff holding key HSE and operational responsibilities. Where such responsibilities include the control of significant hazards, the qualifications shall include a tested practical element (e.g. for a Driller, the possession of a well control certificate which includes a successful simulator exercise endorsement, for a Barge Engineer skills in ballasting and rig stability).

Increasingly, the demands of senior rig supervisory jobs require skills not formerly required of contractor's staff. Contracts should explicitly state the scope of senior job positions and verify that incumbents are qualified to hold them.

Training

Safety training should be based on competence requirements, and take into account development plans. The effectiveness of training will need to be assessed through observation and drills. The OPU / JV Drilling Supervisor on contractor rigs has an important role to play in verifying that contractors fulfill their obligations in the above. Some specific requirements are suggested below.

- The contractor's Rig Superintendent and the OPU / JV Drilling Supervisor have undertaken technical and managerial training in accordance with local legislation and contractual requirements. All supervisory personnel have undergone a programme of training and assessment in dealing with emergency situations, supplemented by a programme of drills and exercises on the installation

- All persons involved in permit-to-work procedures are trained, satisfactorily examined and authorised for the specific worksite.

- Job specific safety training shall be provided for all personnel in safety critical roles

- Everyone working at the site shall have attended an induction briefing covering key HSE procedures and, where necessary, survival training

- Specialist emergency response training shall be carried out for all personnel with specific duties (e.g. fire team training, H_2S training, etc). This subject is further discussed in 6.5.9, also in PTS60.0110 Logistics.

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Specific training requirements

A system shall be set up by each OPU / JV to verify that any person proceeding to the rig possesses the necessary certification as dictated by local circumstances. Outline guidance is given below.

Offshore survival Persons working offshore shall have a valid offshore survival course certificate in accordance with OPU / JV regulations. The nature of the course will depend upon the area of operation but classroom instruction should include:

- methods of escape from a rig
- use of lifeboats
- use of lifejackets and survival suits
- boarding helicopters
- escape from a helicopter

There should additionally be practical training in lifeboat handling, life raft deployment, and underwater escape from helicopters.

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Specialist training

Persons who have a specific responsibility (e.g. fire team, helideck crew) shall have a valid certificate of completion of the appropriate course. In addition to the rig medic, there should be at least one other trained first-aider on shift at all times. These personnel should be involved in regular drills, under the supervision of the medic, to maintain the necessary competence.

Training should also be given to staff that on occasion have to assume responsibilities normally undertaken by others. Particular attention should be paid to areas normally covered by service contractors whose equipment and materials may arrive before the personnel. An example here is the competence requirements to assure the proper storage of explosives and radioactive sources.

Pressure control

Certain key personnel on the drilling unit shall hold a valid certificate of examination from a recognized pressure control course. These personnel are:

- Company Drilling Supervisor
- Well Site Drilling Engineer
- Contractor's Rig Superintendent
- Toolpushers
- Drillers
- Assistant Drillers
- Subsea Engineers

The exam shall have been passed at supervisor level by all except the Drillers and Assistant Drillers. Where subsea wellheads are being used the above listed personnel shall have a subsea endorsement. Where drilling contracts stipulate the requirement for volumetric stripping equipment, supervisory staff of both the OPU / JV and drilling contractor shall be trained in the technique.

High pressure/high temperature

When HP/HT operations are being planned it is recommended that key OPU / JV and contractor personnel attend a course specifically relating to well pressure control requirements for drilling these wells.

Hydrogen Sulphide

When the possible occurrence of hydrogen sulphide is identified, a specific H2S training programme shall be undertaken see 6.5.9 for details

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Induction training Employee

Every contractor shall have an induction programme for new rig employees. This programme shall be carried out regardless of prior experience to ensure awareness of current standards and practices. In addition to emphasizing the responsibilities employees have for their own safety, they shall be instructed on work procedures, safe practices, the station bill and any emergency responsibility associated with their position on the station bill, and the use of personal protective equipment.

Guidelines should be in place for key contractor personnel to observe the new employee's work performance until they are satisfied that the employee can fill the position in a safe and effective manner.

The induction programme shall also provide service contractor personnel and OPU / JV visitors information and instruction commensurate with their duties and length of stay.

Visitors and new employee

Newly arriving visitors and crew members shall be met by a responsible person designated by the OIM who shall update the POB list, assign muster points and allocate lifeboat stations. The OIM or his appointee shall then perform a general **(offshore)** safety briefing.

This briefing shall cover essential safety and survival features of the drilling unit plus general safety practices, rules and procedures. It will at least cover the following:

- alarm signals and how to respond
- lifeboat stations and location of survival equipment
- escape routes and signs
- information about the main hazards (e.g. fire/explosions, falling into sea, gas/oil under pressure, dangerous work areas, H_2S presence, etc)
- issue and use of H_2S escape mask (where appropriate)
- use of breathing apparatus
- use of cascade system
- smoking regulations
- drugs/alcohol/weapons policy
- restrictions on photography (i.e. permit needed)
- protective clothing requirements
- safe handling of chemicals
- personal safety awareness and requirement to report any hazards observed
- supervisors' responsibilities for their area's personnel
- permit-to-work system
- requirement for visitors to be accompanied and guided

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- requirement to report before leaving, so that POB list can be updated.

For those personnel unfamiliar with the drilling unit or its operations, and who will be staying onboard to work or who will be staying onboard overnight, a brief trip around the installation should be arranged. The trip should cover:

- lifeboats, life rafts and survival equipment
- restricted areas
- escape routes
- emergency telephones
- rig office
- radio office
- sick bay
- alarm systems and procedures.

An induction booklet is useful both for detailing the above information and for reference.

Visitors and new employee Appropriate parts of the above requirements relating to offshore operations also apply to land operations. Of particular concern here is mustering procedures, which are complicated by the ease of access to land rigs and the distribution of staff **(onshore)** between rig and camp. There should be no free access to rig sites. A reporting procedure should be in place which tracks the movement of personnel. A 'T-card' system to aid tracking and facilitate the rapid identification of missing personnel is a good method of achieving accurate mustering.

Experience Previous relevant experience is an important factor in accepting the nomination of contractor's personnel for key positions. The required level of experience will vary with the seniority of the position and shall be determined prior to contract. Any subsequent substitution of personnel by the contractor shall be subjected to the same criteria.

3.3.5 Contractors

Contractor selection requirements

Prior to inviting tenders, it is essential to establish or update the requirements for the services needed to carry out the work programme.

All offshore rigs have an operating envelope which determines the limits of operation. This operating envelope takes into account water depths, environmental conditions and operating loads. It is therefore important to determine these parameters prior to inviting rig tenders.

The importance of preliminary well planning to determine drilling unit specifications cannot be overstressed if the appropriate rig requirements are to be stated in the

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tender documents. The application of the Hazards and Effects Management Process during the planning stage is important to help identify such requirements.

Health and environmental issues should also be addressed here, for instance:

- the requirements for 'no negative impact' discharge
- the limiting of noise to below levels known to cause hearing loss
- the provision of mud storage, mixing and treatment systems that minimize the exposure of staff to safety and health hazards
- the provision of adequate recreational facilities, etc

It is important to ensure that the rigs being bid enjoy staff continuity. This will ensure that operations do not start at the bottom of the learning curve. Where a 'mothballed' rig is being contracted, contractor supervisory staff assigned to it should at least have previous experience on a similar unit.

Where possible a straightforward 'shake down' well should be programmed for a newly contracted rig prior to it engaging in more technically difficult and challenging work such as high pressure/high temperature drilling.

Agreement should be sought from Tender Boards to enable proven good performance to be selection criteria.

Reference should be made to PTS 60.0305 Contractor HSE Management.

Review of contractor's HSE MS/HSE Case

During the contractor selection process, when a short list has been made, it will be appropriate to undertake a review of the contractor's HSE Management System and, where applicable, HSE Case for the drilling unit.

The contractor's HSE MS should contain in detail:

- contractor's management system as it applies to safety
- a breakdown of all safety critical activities
- a list of all the documents and standards relevant to the HSE MS
- a remedial action plan, which will address any deficiencies found in the process of documenting the HSE MS.

Since the HSE MS is a 'living' document the last element above is particularly subject to change.

The HSE Case for the drilling unit shall contain:

- information about the operation of the unit and restrictions should safety systems be inhibited or incapacitated

- a description of all the identified hazards, their analysis, and the means by which they are to be controlled

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- details of the HSE Management System as it applies to the unit
- details of the remedial action plan for rectifying deficiencies identified in the preparation of the HSE Case and any subsequent reviews
- a statement that the rig is safe to operate as the hazards have been evaluated and measures have been taken to reduce the risks to a level where effective control can be demonstrated.

Performance monitoring, audit programmes and HSE Case reviews are all vehicles by which HSE Case deficiencies may be identified. Where such deficiencies are assessed by management as necessitating remedial action, the strategy described in 3.7 should be followed.

Reporting relationships

A combined organogram which integrates the individual OPU / JV and contractor organograms is a clear way to depict the reporting relationships between the various parties.

Once established, it is important not to circumvent the agreed reporting route other than in a previously documented manner such as, perhaps, the Emergency Procedures. This can often prove difficult in practice due, for instance, to drilling contractors being unable to get telecommunications licences from the host government. Proper planning may not overcome such difficulties, but it will allow the procedures and organograms to reflect the realities of the situation rather than being in conflict with practice.

Subcontractor HSE

All service and subcontracting companies and their staff are required to work to similar consistent high HSE standards, and achieve comparable levels of HSE performance as the drilling contractor. They will be assessed accordingly. Monitoring of subcontractor's HSE performance is continuous and integral with the monitoring of the drilling contractor's own performance.

Service and subcontractor employees who work at the site are exposed to risk, both as a consequence of the potential hazards of the site and from specific work activity performed. They should be advised of significant location hazards identified in the risk assessment or hazard register, how these are controlled or mitigated, and the emergency procedures and muster arrangements.

All new employees shall attend a HSE induction course prior to commencement of work.

Contractor should specify training, competence and experience requirements for each specified position, together with the responsibility of the contractor for fulfilling and maintaining such requirements. Contract holders are responsible for these

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specifications and for verifying that the contractor meets this obligation. Line supervision has the responsibility for monitoring work performance.

On long term contracts, service and subcontractors are required to provide strategies which identify the methods for assessing staff competence, determining training needs, and defining the system for maintaining the currency of training and competence.

Given the principle that the drilling contractor's senior site representative is responsible for safety on the rig, other line supervisors, including OPU / JV staff, shall report to him on safety issues. Service and subcontractor staff shall also fall under his authority in this respect. The face that they may report to the OPU / JV Drilling Supervisor, as the contract holder, on technical performance matters does not undermine this principle.

The proper exercise of the drilling contractor's authority and responsibility requires that he includes service and subcontractor facilities in his inspections and ensures that they maintain high HSE standards. When the OPU / JV is the contract holder, their representative also has responsibilities in this respect and should ensure that high personnel and equipment standards are maintained.

Joint inspections of service contractor operations will both demonstrate the common cause held by the OPU / JV and the drilling contractor, and improve the drilling contractor's understanding of hazards associated with operations where he has traditionally had little involvement.

The OPU / JV shall make clear to all their service contractors that they endorse the drilling contractor's authority on HSE matters and shall uphold disciplinary measures taken for HSE transgressions.

In integrated engineering contracts where the drilling contractor is not the lead contractor, the most senior person on site shall be ultimately responsible for on-site HSE, in line with the principle described above. If this person does not have a drilling operations background, particular care will need to be taken to ensure that he is equipped to handle all facets of his responsibility, and that the line structure on site is such that he is properly supported.

Detailed guidance on contractor HSE is given in PTS 60.0305 Contractor HSE Management.

3.3.6 Communication

Daily on-site co-ordination meetings are an effective forum for eliminating unwanted simultaneous operations and minimising disruption to operations. Access to information is particularly vital to staff with a planning function, the corollary of this being that they should be able to influence decisions being made. The advent of integrated engineering services should improve information flow, but care needs to be taken that contractors who are not part of the integrated engineering services package are included in this flow.

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It is vital that staff at the rig site and in base offices have a common understanding of ongoing operations and that the quality of information is not compromised through any filtering process. To this end daily reporting should be a joint effort with both OPU / JV and contractor line supervisors being present at both ends when operational (including HSE) information is being communicated and decisions being made.

At meetings between contractor and OPU / JV management, HSE issues should always be on the agenda.

The rig HSE committee should meet (preferably weekly) and be attended by the contractor's Rig Manager who will provide a communications link between site meetings and management meetings.

HSE meetings are held to:

- stimulate a two-way communication between staff and personnel which is relevant and constructive
- monitor and promote HSE consciousness
- report upon unsafe conditions or practices and their correction
- generate suggestions on how to improve HSE performance at all levels.

Regularly scheduled HSE meetings are required. These meetings and any specially convened meetings should be led by appropriate line supervisors. They should ideally be conducted in the language of personnel in attendance, though necessity might dictate the involvement of an interpreter.

HSE meetings should have a structured form with the provision of HSE themes and suitable support material. They should be action oriented, relevant and should encourage participation. A base supervisor should be a regular attendee and report between HSE meetings held in the field and at the base office.

They should include a review of any recent incident and HSE procedures implemented to prevent its recurrence. Every individual shall attend a HSE meeting at least once per crew cycle. Rig site weekly meetings should not be protracted to the point where attendees lose interest. Crews should be given the opportunity to provide input to the agenda.

Each meeting should be documented, and the minutes should include a listing of those in attendance, topics covered and any HSE concerns raised. Minutes should be copied to the OPU / JV Drilling Supervisor and posted on notice boards in relevant languages.

Of critical importance is the resolution of recommended actions. Explanations should be promptly given should recommendations be considered inappropriate or unnecessary. Agreed recommendations shall be followed-up, with actions being monitored, closed-out and assessed for fulfilling the desired aim.

Pre-job, or 'toolbox' meetings, are particularly effective and recommended for the

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purpose of discussing HSE concerns specific to a particular job. Such meetings should be attended by all those involved, including service contractors.

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3.3.7 Documentation and its control

Scope of standards

Standards lie at the heart of an HSE Management System and can be divided into four groups:

Management Set the framework in which the OPU / JV operates and deals with corporate **policies**, objectives, accountabilities and controls.

Engineering, Set the standards by which equipment and materials are procured and by which the control of change is effectively managed

equipment and
material standards

Working standards Set down the way in which day to day work is carried out, monitored and inspected. They include work procedures and particularly those which relate to HSE critical activities.

Competence Describe the competencies needed in a variety of OPU / JV and contractor work roles and how competency is assessed.

Standards are set to:

- secure technical integrity
- define quality and performance requirements
- standardize materials, equipment and documentation
- define working procedures
- transfer knowledge.

Standards provide a means by which performance can be measured and evaluated, and enable corrective action to be identified and executed.

So far as possible, internationally recognized external standards should be used, as this is the best way of achieving consistency through the Group and throughout the industry.

Implementing standards

The management process includes:

- The auditing of contractor rigs, contractor management and, where appropriate, the rig HSE Case, to ensure these conform with OPU / JV standards and operational safety objectives.

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- Preparing the drilling programme and associated documentation, which shall contain information such as:
  - environmental factors for both rig and location
  - well data and objectives
  - well design including casing programme design criteria (for instance H_2S), kick tolerance, drilling fluids, well evaluation requirements, well steering requirements (well path, targets and potential hazards), equipment requirements, BOP requirements, reference documentation and standards, well testing requirements and completion, suspension or abandonment requirements

- agreeing with contractor's Rig Managers a HSE Plan and the monitoring of performance against this

- reviewing incidents with Rig Managers and agreeing and implementing preventive measures

- defining authority levels

- defining and implementing auditable change control procedures

- progressing waste management programmes

- promoting workforce involvement in HSE.

All parties involved in the well operations process exercise their responsibilities and attain their safety objectives by managing the activities described in the drilling contract. They will invariably have their own HSE Management Systems, which will be documented either in a HSE Policy and Procedures Manual, or increasingly, in their rig specific HSE Case. Provided these systems meet the OPU / JV requirement for quality and completeness, it is recommended that they be followed.

The contractor's understanding, commitment and compliance with their own system will be stronger than one imposed upon them. Further, the contractor's knowledge and experience should be utilized during well planning and programming stages.

Contract documents shall include the necessary obligations relating to health, safety and protection of the environment.

Control of standards

The Head of Drilling Engineering is responsible for the specification, maintenance and monitoring of appropriate standards and for specifying their scope and application. Any planned deviation from Group standards shall be approved at Group level and documented.

Reference should be made in this chapter to the standards and reference material to which the Drilling Engineering department conducts its business.
Appropriate, controlled documents should be available on all rigs and in the base

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offices of OPU / JV and contractors.

OPU / JV standards should be reviewed and updated in line with changing technology and practices. Amendments shall be approved by the Head of Drilling Engineering.

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HSE Case control, documentation and revision

The contractor's Base Manager, as the designated 'Asset Owner' of the drilling installation is responsible for maintaining the currency of the HSE Case and for ensuring that any changes that may be proposed are confirmed at the appropriate level and are developed in conjunction with the workforce.

Any change to either the organization described and its responsibilities, the management controls or the installation hardware, will be evaluated to assess the implication of such change on the HSE Case and the conclusions documented.

In the event of any proposed modifications of a substantial nature which constitute material revision, irrespective of whether such modifications may decrease current levels of risk, then such proposals will need to be justified in a revised HSE Case. This will incorporate the proposed revision and be submitted for OPU / JV approval prior to implementation.

Examples of modifications to the management system, the structure of the rig or to plant and equipment which could impact safety and which would normally merit a revised HSE Case submission are:

- changes of operator ship, ownership or the contracting out of the management function
- significant changes in the rig's organizational structure or staff numbers not already allowed for in the HSE Case
- as a result of an unsatisfactory audit of the HSE Management System leading to significant changes or remedial work. This refers to the system itself rather than the effectiveness of implementation
- the conclusions of an investigation into an incident where the actual or potential consequences were significant, which recommend significant changes to the HSE MS or facility design
- the introduction of any major new activities on the rig or in connection with it not already considered in the HSE Case
- Major extensions in the scope or volume of work associated with activities not considered in the HSE Case
- modifications to the rig, or the programme of work it is required to undertake, which has or may have a major impact on safety
- if the rig is to be working alongside or above another installation, a bridging document shall be produced.

3.4 HAZARDS AND EFFECTS MANAGEMENT PROCESS

The Hazards and Effects Management Process (HEMP) has four steps:

- systematic identification of hazards
- assessment of the significance of hazards
- implementation of suitable hazard controls
- planning for recovery in the event of loss of control

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The process is applied by asking a series of questions of each activity. This document lists the drilling activities in sequence although the Drilling Engineer shall ensure that the list includes all activities which are likely to occur during the operation being considered.

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The questions which shall be addressed are:

- have hazards been identified in the process of carrying out this activity?
- are the results of the hazard occurring of consequence? (i.e. is there a risk of injury or loss?)
- are hazards being controlled in any way whilst the activity is being carried out?
- is it necessary to plan for recovery or emergency response in the event of the hazard being released?

If the answer to any of these questions is positive the activity is then regarded as safety critical.

These activities will then need to be addressed at a level which assures effective control. The involvement of staff working with the hazards is important, if the controls developed are to be effective.

3.5 PLANNING AND PROCEDURES

3.5.1 General

For the planning phase of an operation to be effective it should concern itself with the prevention of incidents through the elimination or control of hazards and the mitigation of consequences should the hazardous event occur.

It follows that a process needs to be followed to systematically identify and assess hazards and develop the controls to manage those which cannot be eliminated. This can be achieved by:

- use of Group or locally developed policies, standards and procedures
- making a scouting visit to assess the situation on the ground
- study of legislation and supporting approved codes of practice (where these are available)
- a thorough analysis of the particular operation (see 3.4)
- a study of accident, incident and ill health data from previous operations. For the drilling phase of a new venture, such data may be available from the seismic acquisition phase

Other narrative in this chapter considers the HSE considerations in the well planning process.

Planning the operation

Experience has shown that HSE performance can be optimised through a structured planning process which incorporates:

- comprehensive operational pre-planning incorporating HSE measures to manage identified hazards. Those exposed should be subjected to the latter three phases of the Hazards and Effects Management Process as described in

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3.4

- verification of equipment safety standards before operation start-up
- verifying that an effective HSE Management System is in place before start-up
- an HSE management training programme aimed at senior line management (OPU / JV and contractor) and direct supervisors. This training would include such topics as Job Hazard Analysis, Unsafe Act Auditing (UAA), Safety Training Observation Programme (STOP), waste management and an understanding of the factors which affect behaviour
- detailed documented HSE and contingency planning specific to the drilling campaign prior to operational start-up
- regular combined OPU / JV and contractor management team assurances and inspections according to a planned schedule and focusing on HSE management
- establishment of and adherence to transport management system.

Effective planning is essential for all aspects of the business, with plans based upon known and researched information, and reasoned assumptions. In established OPU / JV, much of the known information is based upon experience. Plans for sustained improvement is contained in the Drilling Engineering Department's HSE Plan.

This plan is prepared annually as part of the OPU / JV total HSE Plan and its implementation is reviewed periodically by the OPU / JV Management HSE Committee. The plan sets out the department HSE objectives and the methods by which it will achieve them, lays down a time scale for implementation, identifies action parties and establishes a review process, both to monitor implementation and to modify the plan according to needs.

The HSE Plan is developed from such things as:

- requirements carried over from the previous year's plan
- audit and inspection findings
- incident findings
- new corporate initiatives
- accident investigation findings
- Tripod incident analysis,
- HSE suggestions from the workforce
- management review action items.

HSE targets

It is essential to set HSE targets that are accepted by management and employees as achievable. Typically, a progressively reducing target is set, which in the long term will lead to accident free performance. Realistic targets can only be set after assessing the scope of work for the period under review and allocating tasks to manage such work. The only way to reach a HSE target is to manage effectively risks which threaten its achievement. Effective management demands that hazards and their controls shall, so far as possible, be addressed in the planning process

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Staff reports shall include HSE-related targets or tasks against which performance can be measured. These should be cascaded down from department and OPU / JV targets. Performance improvements should not be 'demanded' without giving individuals the tools to do the job, such as training and proper equipment.

It shall be verified that drilling contractors and lead service contractors commit themselves and their subcontractors to a programme that enables staff to achieve the performance standards aimed for.

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Site selection

The Exploration Department or Development sections of Petroleum Engineering will determine the sub-surface target of the well to be drilled and sometimes also the well trajectory to reach the target. This should be challenged if proposed site conditions so dictate. Aside from considerations such as access, topography, submarine cables obstructions, etc the hazard of shallow gas and seabed or soil conditions shall be taken into account.

Shallow seismic run at the time of site surveying will give a good (but not infallible) indication of shallow gas in the area. Where practicable, drilling locations approval shall not be sited where there is a risk of encountering shallow gas. Where this is not practicable, additional measures to assure the safety of the operation shall be taken.

Likewise, shallow seismic will give indications of the competence of the seabed to support a jack-up rig or anchor a floating vessel. Soil boring may be required to assess this.

For insurance purposes, drilling contractors require the agreement of a warranty surveyor, acting on behalf of the rig insurers, before siting an offshore drilling unit on location. See 4.2.1 for details of offshore location preparation.

3.5.2 Asset integrity

See PTS 60.0101 HSE Management System Manual.

3.5.3 Procedures and work instructions

Permit-to-work

A permit-to-work system shall be in place which includes procedures for non-routine and critical operations such as hot work, heavy lifts, electrical work, confined space entry and the handling of radioactive materials and explosives. On contracted drilling units working in isolation, the contractor's procedures should be adopted with any necessary changes. They shall define the individuals responsible for authorization, for verifying specified controls are in place and for co-ordination of the system. The permit shall include space for restrictions and controls to be applied while the specified work is being undertaken. When a permit is issued, all relevant personnel shall be informed when the work has started and when it is completed.

Planned work which requires a permit shall be discussed at the daily rig site co-ordination meeting.

Refer to 6.7 for further discussion.

Concurrent operations

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Concurrent operations (also referred to as simultaneous operations) pose problems which demand high levels of co-ordination to control effectively. Detailed hazard identification and risk assessment are required during the planning phase of such an operation. Such assessments will invariably lead to a manual of permitted operations (MOPO) which will define which operations are permitted to be conducted simultaneously and which are not.

Refer to 7.4 for further details.

Adverse weather procedures

Many OPU/JVs are working in areas where operations are adversely affected from time to time by environmental conditions. It is vital in these circumstances for the OPU / JV to develop its own adverse weather policy and procedures suited to the local circumstances. The procedures shall not only address actions on the rig but also outside support requirements.

Before commencing any contract with a mobile offshore unit, the responsibility for decision making in the event of heavy weather, or the forecast of heavy weather, shall be clearly defined and known to involved parties.

Definition

Adverse weather is defined as environmental conditions which may affect the safety of the operation, equipment, and/or personnel if precautions are not taken to protect against the hazard.

Adverse weather will include, severe sea conditions, high wind, ice, icebergs, poor visibility, snow, lightning, torrential rain potentially leading to flooding and sandstorms.

Forecasting

Essential to the ability to take timely action to counter the adverse weather is an accurate weather forecasting service. This service may be supplied on contract either from a local source, if one exists, or from an international weather forecasting service. A good local service will be in a better position to provide short term forecasts which are important for predicting localized storm conditions.

Assistance to the forecasting service can be provided by passing regular weather reports from the site of operations. This in turn should improve the accuracy of forecasting.

The development and movement of adverse weather systems shall be closely monitored such that appropriate preparations are made in a timely manner. In some areas prone to heavy weather, a sector system, whereby progressive action is taken as a storm approaches, shall be developed.

Developing

A procedure shall state the actions to be taken at site to ensure

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a safe system of working during the period of adverse weather and the conditions under which the operations must be suspended.

The procedure shall take into account the nature of the work and set limits for certain operations such as running a BOP stack, running casing or the use of cranes. This will need to be developed in conjunction with the contractor.

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Operations

Some activities carried out on the rig once commenced should be completed without **planning** interruption, examples are the running of a BOP stack or running casing. It is important that the weather forecast is noted on the work instructions. Similarly, when adverse weather is forecast which will affect operations, adequate time must be allowed to take defensive action. Limits on crane operations in respect of wind speed and rig motion must be taken into account.

Contingency plans shall also be drawn up, particularly offshore, for occasions when it may be prudent to reduce the number of personnel on board, reduce the variable deck load, and adjust the draft of the drilling unit. The contractor's operating manuals will indicate what action needs to be taken in this respect.

Safety during

The development of an adverse weather policy for an offshore mobile drilling unit is governed by four major considerations

- minimize risk to personnel
- minimize storm damage to the drilling installation
- minimize storm damage to the conductor, riser, wellhead, and other exposed equipment
- minimize possibility of pollution by ensuring integrity of the well

Each type of drilling installation has its own criteria for reacting to a given storm condition. To a large extent the continued operation of a rig depends upon its design and equipment characteristics. Allowable operating conditions should be detailed in the operations manual.

There are three phases in safety planning during heavy weather when using a floating drilling installation:

Phase I	Stop drilling operations, make the well safe, hang off drill string and make preparations for disconnecting.	
Phase II	Disconnect the Marine Riser, which may involve:	
	a)	Controlled disconnection
	b)	Emergency disconnection
	c)	Move the rig away from the wellhead and orient it to a heading which minimises weather affects on stability. In some cases towing the rig out of the path of the storm may be necessary

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	Note: As well as minimising the effects of the weather on the vessel, this is intended to avoid the possibility of the Lower Marine Riser Package (LMRP) or in shallow water the pontoons, hitting the top of the BOP stack due to rig heave. If an emergency disconnect has taken place, the direction in which the rig is moved away should take account of the water depth to ensure that the LMRP does not hit the seabed.
Phase III	Evacuate personnel from the drilling vessel

3.5.4 Management of change

The effective control of change, be it to personnel, hardware or procedures, is key to assuring the ongoing integrity of the operation.

The change of personnel relates largely to issues of competence and will involve both an assessment of competence and, where necessary, training followed by a handover period. The change of personnel should be controlled to minimise the disruption caused by loss of continuity.

In making hardware changes the integrity of the original design shall be ensured with respect to equipment and the fitness for purpose assured with respect to additions. This requires that appropriate expertise is applied to the change. For instance, the modification of a piece of equipment shall require a review by a suitably qualified 'in-house' engineer, and often need the approval of the equipment manufacturer. A procedure shall be in place which assures that all hardware changes are approved at the appropriate level before being implemented. This may involve external parties such as classification societies.

Changes to programmes and procedures shall be agreed at the level of original approval and involve the input of those affected by the change.

All changes shall be assessed to ensure that they do not inadvertently introduce other hazards. Changes and their consequences shall be documented and disseminated to ensure all involved are fully aware both of the change and its implications. Such documentation will also provide an audit trail.

Major changes may require an amendment of the HSE Case.

3.5.5 Contingency and emergency planning

In preparing for an operation a plan shall be put in place which will detail the methods of recovering from any incident, on the drilling unit or attendant services, which causes injury or poses a threat to the health and safety of personnel or the environment.

The recommended contents of the OPU / JV Emergency Procedures document are given below as is a list of the hazards which may need to be addressed.

It is the responsibility of the person in charge (generally the contractor Toolpusher

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(TP) on a land rig or Offshore Installation Manager [OIM] on an offshore rig) to ensure that the emergency response facilities and materials as specified in the contractor's Emergency Procedures are available and fit for purpose at all times. Emergency response procedures shall address the action to be taken on the drilling unit and the responsible persons in the event of an emergency. It is also essential to identify alternative individuals to assume key duties should normal incumbents be incapacitated. Station Bills shall be posted detailing the action to be taken by all personnel in emergency situations.

Co-ordination between the contractor's and the OPU / JV Emergency Procedures is required to avoid conflict of actions. This applies primarily in the base offices where support services (helicopter, medical back-up, notification to official organizations, etc) will be arranged.
In principle, the contractor should take the lead on the rig in combating the emergency. For contract and resource reasons, the OPU / JV will normally co-ordinate logistics, liaise with outside agencies and otherwise provide intervention needs. The Base Manager of the main contractor and other relevant contractors should always be included in emergency control teams. The co-ordinating link between rig and base office will normally be the OPU / JV Drilling Supervisor on the rig.
These arrangements shall be documented and signed by both contractor and OPU / JV. An emergency exercise shall be performed to test the procedures prior to commencement of the operation. Further drills and exercises shall be performed, particularly during the early stages of a contract, to verify that the roles and responsibilities of all staff (on all shifts) are understood and effectively discharged.

OPU/JV emergency procedures

Documented emergency procedures shall be in place before operations commence. The document shall detail the responsibilities of OPU/JV personnel both on the rig and in the base office in the event of an incident. In addition the principal responsibilities of the drilling contractor's TP/OIM shall be stated with regard to co-ordination with the OPU/JV Drilling Supervisor.

The action to be taken by OPU/JV base office staff with regard to support services (e.g. helicopters) and notifications (e.g. coast guard, hospital government) shall be detailed for each type of incident.

Where documents are normally stored electronically, hard copies of key procedures should be available and the storage system should be connected to an uninterruptible power supply - UPS.

As appropriate to the operation, the document may include procedures for:

- injury/illness requiring medevac to hospital
- injury/illness requiring medevac out of country
- fatal accident/illness
- road accident requiring medevac
- vehicle overdue

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- loss of aircraft
- fuel/chemical spillage
- hydrocarbon spill
- extreme weather conditions
- fire and abandonment
- loss of well control
- H_2S release
- radioactive source/explosives incident
- security breakdown
- bomb scare.

PTS 60.2306 Emergency Management Plan.

Oil spill contingency plan

A plan shall be prepared for combating and cleaning up of oil spills. Reference should be made to current corporate guidance available through Corporate HSE.

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The service may well be provided by a contractor who will have clean-up equipment and his own procedures for its operation.

OPU/JV procedures shall detail the notifications necessary and provision of other contracted services (e.g. supply vessels) and materials dependent on the scale of the spill.

Relief well plan

It is advisable, and in some areas a requirement, to prepare a relief well contingency plan. Of prime importance is having adequate data on the path of the problem well. The plan, which will be site specific, should consider:

- blowout contingency team organization
- acquisition of third party expertise
- sourcing of a drilling unit
- provision of a high volume water supply
- evacuation plan for nearby population
- sourcing of materials (casing, mud, bits, wellheads, etc)
- safe siting of a rig for relief well drilling
- directional services
- possible kill methods.

Well control

Appropriate pressure control technology for drilling and workover operations shall be used.

H_2S procedures

Each OPU/JV shall prepare its own procedures based on local conditions and incidence of the gas. Refer to 6.5 for further discussion on the subject.

Shallow gas

Appropriate procedure for dealing with shallow gas shall be used by OPU.

Drills and exercises

Effective drills address three important objectives which are:

- to **demonstrate** the crew's ability to respond to a wide range of emergencies. Drills improve and develop crew confidence and identify those areas where further attention is needed
- to **train** the crew in both individual proficiency and team work necessary to handle anticipated rig-specific emergencies
- to **test** the emergency equipment.

An effective drill programme should cover:

- a description of the drill, including list of participants

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- realism in the drill
- frequency of drills
- a means of disseminating the results of drills to supervisors
- topics identified during past drills which need improvement
- an objective evaluation of the drill highlighting both areas of success and areas requiring improvement.

Drills should be based upon realistic criteria and carried out, so far as possible, as though the emergency existed. They shall not, however, expose personnel to unwarranted risk.

The following drills shall be carried out at each drilling installation:

- kick/pit drills
- fire drills
- drills in the use of breathing apparatus
- hydrogen sulphide drills (if applicable)
- stretcher drills (e.g. from the rig floor)
- muster and abandonment drills
- medevac exercises.

The frequency of the drills should be established in the annual HSE Plan, but should be sufficiently frequent to assure the competence of all staff.

All drills, whether onshore or offshore, shall include contact being made with base to verify the effectiveness of communications. This shall periodically include the requirement for duty staff to contact the rig to confirm their contact ability.

A timed log of events should be kept by supervisors acting as observers. These logs should be consolidated into a drill report and used for the debrief, and for disseminating information on corrective actions to staff. A copy of the report shall be sent to the base offices of both the drilling contractor and the OPU/JV. Supervisory visits should occasionally include the observation of a drill.

3.6 IMPLEMENTATION AND MONITORING

3.6.1 Activities and tasks

See PTS 60.0101 HSE Management Systems Manual.

3.6.2 Monitoring

This chapter discusses various arrangements that are employed to monitor the implementation of the health, safety and environmental policy at the installation.

Performance monitoring and review will be a key element of the HSE Plan and the part which facilitates enhancement of the plan's quality by highlighting areas for improvement. The HSE performance can be assessed against the criteria considered below.

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Occupational health

Performance in relation to occupational health is measured against OPU/JV standards which shall at least meet legal requirements and in any event ensure the prevention of adverse health effects due to working conditions.

Occupational health issues in drilling operations shall include the safe handling of chemicals, the use of oil-based muds (OBM), the use of radioactive substances, exposure to H_2S, ergonomic issues, protection against the elements and noise control. All of the above should be dealt with through the Hazards and Effects Management Process.

Performance indicators can be derived through the analysis of medical referrals. A typical analysis at a drilling location would be the frequency of skin rashes, which may reflect on work practices and compliance with protective equipment requirements. Another longer term indicator would be the number of persons showing evidence of hearing loss.

The analysis of some of these indicators will need the support of specialist services.

Health Safety and Environment performance monitoring

The measurement of performance in relation to safety is based on such things as injury statistics, the incident potential matrix, TRIPOD DELTA sensing exercises, unsafe act auditing, feedback from drills and exercises and feedback from assurances and inspections.

Environmental protection

A waste management programme shall be part of the HSE Plan and be aimed at achieving short and long term reductions in the volume and toxicity of waste generated. Within drilling operations, reductions can be achieved by such things as slim hole drilling (SHD) and the substitution of chemical products, e.g. using water based mud instead of OBM.

SHD offers onshore the additional and substantial advantage of reducing the location footprint, minimizing road construction and upgrade work, reducing overall drilling associated costs and disturbance of the environment.

Review

The review process will address the meeting of targets documented in the annual HSE Plan. It will also address the success of implementing the action items arising out of all activities which produce recommendations, such as HSE meetings, inspections and incident investigations.

Individual HSE performance targets, normally developed during the annual staff reporting cycle, should also be assessed and, where necessary, further action to achieve attainment agreed.

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Reviews shall also be carried out on all contracts against the contractor's HSE Plan. The reviews should be jointly held and any remedial action jointly agreed.

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Performance indicators

The measure of HSE performance can be obtained by the use of suitable indices which will

- provide a consistent method for collecting and communicating data on incidents
- show by comparison the effectiveness of the HSE management programme, both within the Company and with other companies
- enable an assessment to be made of a contractor's HSE performance relative to the industry
- indicate whether an operation is being managed well or whether management is driven by events.

For performance monitoring to be useful, it is essential that all incidents are reported. Appropriate measures to assure this shall be put in place. Performance criteria with respect to Lost Time Injuries (LTIs) and Total Recordable Case Frequency (TRCF) are set at the beginning of each year and detailed in the HSE Plan. Some proactive indicators would be produced by:

- monitoring compliance with the plan
- monitoring compliance with corrective action requirements arising as a result of HSE meetings, audits, etc
- monitoring changes in the drilling sequence which may have a significant impact upon effective planning.

The OPU/JV and contractor should assess and record the potential outcome of all incidents (including near misses) as a means of reviewing them in terms of 'what might have been the consequences'. Results are presented on an incident potential matrix. Incident report action items together with action parties and completion dates are recorded on the rig HSE information data base and monitored on a regular basis.

Rig inspections are also used to measure performance. This is achieved using a programme of inspections, against predetermined standards and improvement targets. These inspections are carried out both internally, by rig supervisors and members of the workforce, and externally by base management representatives of the OPU/JV, the drilling contractor and services contractors.

An example of such an inspection is that made by the site supervisors. This inspection is conducted by both contractor and OPU/JV personnel against a check list and progressively covers all areas of the installation including service contractor facilities. Each inspection report is reviewed by the base line managers so that appropriate resources can be made available, and any corrective action requirements be given the priority required.

For further information on the subject of performance indicators refer to PTS 60.0601 Performance Monitoring and Reporting.

Line management HSE inspections

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A frequent observation made during drilling technical HSE assurances is that line management visits lack focus and therefore effectiveness. To get the most out of the effort put into rig inspections in general and line management inspections in particular, it is essential that a structured approach be taken.

The following suggest an appropriate structure and give guidance on how to develop it. One of the objectives is to minimize extra administration and to reduce the seemingly never ending job lists which act as demotivators to both OPU/JV and drilling contractor site staff.

The three elements of the inspection are:

- planning
- execution
- feedback/close out.

Planning Inspections made shortly after start-up will place the main emphasis on verifying the effective close out of deficiencies, particularly those associated with HSE management, identified in the pre-start-up audit. The focus will change as the drilling project progresses.

The importance of hardware inspections should not be underestimated. Appropriate and well maintained hardware is essential for the safe conduct of operations and such inspections are also essential to allow a reasoned judgment to be made on such things as:

- the effectiveness of the preventive maintenance system
- the competence of personnel to perform their duties
- the ability of staff to handle their workload

An inspection made during non-routine operations may well focus on the permit-to-work system and the effectiveness of communications, such as briefings and tool box talks, to assure that staffs remain aware of, and in control of, the overall operation.

One made during routine operations may focus on hoisting equipment, to verify the effectiveness of on-site audit and inspection. Electrical Inspections, electrical safety may be addressed, to verify that hazardous zone requirements are fulfilled and that staff are not exposed to electric shocks. Expert assistance should be called on to inspect areas in which the manager lacks expertise. This is particularly important to give assurance that accidents do not arise out of lack of knowledge of the inherent hazards.

The key point is to have a particular HSE objective in mind. The main thrust of the inspection, with respect to HSE, is to ascertain the effectiveness of the systems and where necessary make recommendations for improvements, rather than to focus on the operational 'nuts and bolts'.

Execution All Companies perform rig inspections, with many doing it to a regular schedule. It is generally a multi-purpose visit, addressing a wide variety of

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issues. The more effective ones include a briefing/discussion with all relevant supervisors covering the highlights of the previous period and a look ahead.

It is helpful if supervisory visits are made jointly by Company and contractor representatives and that they hold a joint meeting with their senior site representatives to ensure that a common approach is agreed for follow up action.

There will always be a place for a rig walkabout, but it should not distract from the planned objective. Hardware deficiencies should be looked at in terms of the management system in place to identify and rectify them, rather than merely noting it on a job list for rectification. This is not to minimize the importance of rectification, more to ensure that all deficiencies will be systematically identified and their root causes addressed to prevent similar ones recurring.

Feedback/close For supervisory visits to be both useful and credible there needs to be a **out** process which feeds back the results of the inspection and closes out any remedial action requirements. This will require a degree of documentation.

The written report of the inspection should be concise and should be passed to the rig promptly. Action items, action parties and completion targets should be given.

Since the success of an operation is dependent upon team effort, the feedback should be given to all relevant staff after having identified action parties with the agreement of senior site supervisors. The emphasis should always be on agreed action items as this will increase commitment to successful resolution. So long as the overall objective is not compromised, give and take should be used to obtain such commitment.

Follow up shall be monitored regularly and this may best be done during subsequent visits. Should an agreed remedial action prove not to be feasible, this should be openly discussed and agreement reached on possible alternatives. Clearly, all remedial actions shall be closed out in a time frame commensurate with their importance.

Unsafe act auditing – Hazard Hunt

Experience has shown that a high proportion of accidents result from an unsafe act by an individual. The reason for the unsafe act may well be a reflection on the individual's training or the pressures under which he is working rather than negligence. Whatever the reason, there is a need to be proactive in removing the basic causes of accidents and to carry out an audit of any unsafe acts which still occur.

The objectives of auditing unsafe acts are:

- to reduce the potential for accidents
- to reaffirm and improve the accepted standards of safety
- to improve communication and understanding
- to improve the cultural attitude toward safety.

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The process of unsafe act auditing / hazard hunt is fully described in PTS 60.2003 Unsafe Act Auditing, Many PETRONAS and contractors have adapted the technique – exactly the same as Du Pont STOP initiative, to suit their mode of operation and the culture of the host country. The objectives, however, remain the same.

3.6.3 Records

See PTS 60.0101 HSE Management System Manual.

3.6.4 Non-compliance and corrective action

See PTS 60. 0101 HSE Management System Manual.

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