E&P FORUM

# Guidelines for the Development and Application of Health, Safety and Environmental Management Systems

Report No. 6.36/210

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These Guidelines have been prepared for the E&P Forum by the Safety, Health and Personnel Competence (SHAPC) and Environmental Quality (EQC) Committees through their Health, Safety and Environmental Management Systems (HSEMS) Task Force.

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## The E&P Forum

The Oil Industry International Exploration and Production Forum (E&P Forum) is the international association of oil companies and petroleum industry organisations formed in 1974. It was established to represent its members' interests at the International Maritime Organisation and other specialist agencies of the United Nations, European Union, governmental and other international bodies concerned with regulating the exploration and production of oil and gas. At present the Forum has 52 members made up of 38 oil companies and 14 national oil industry associations, operating in 60 different countries.

The work of the Forum covers:

- monitoring the activities of relevant global and regional international organisations;
- developing industry positions on issues; and
- disseminating information on good practice through the development of industry guidelines, codes of practice, check lists, etc.

## Disclaimer



## Acknowledgments

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# Guidelines for the Development and Application of Health, Safety and Environmental Management Systems

## Contents

# Introduction

The E&P Forum is the international association of oil and gas companies and industry organisations founded in 1974. It is concerned with all aspects of oil and gas exploration and production having international implications, and in particular with safety and health and environmental protection. It represents its members' interests at United Nations (UN) agencies, European Union (EU) and other international bodies.

These Guidelines have been prepared to assist in the development and application of HSEMS in exploration and production operations. Forum Members have participated in the work, to ensure that their collective experience is used and that the Guidelines have wide acceptance.

## Background

Exploration and production activities are subject to extensive legislation and regulation concerning Occupational Health and Safety (OHS). All operators have OHS strategies to satisfy their own operating and regulatory requirements, and Safety Management Systems (SMS) are a principal component of such strategies. SMS guidelines have been developed both by individual companies and by national and international bodies. There is wide recognition of the benefits of objective or goal-setting approaches to safety, a fundamental principle of the SMS approach which draws on the management principles of the International Standard on Quality Systems, ISO 9000. Similarly, environmental aspects are subject to extensive regulation and Environmental Management Systems (EMS) are used to control and manage environmental impacts.

Although there are important differences in the detailed handling of safety and environmental issues, safety and environmental management are tending to converge towards the systems model of ISO 9000. Many E&P Forum Members operate joint Health, Safety and Environment Management Systems, and the American Petroleum Institute (API) has issued recommended practices, such as RP 75, to assist those developing Safety and Environmental Management Programs (SEMP) in the offshore oil industry.

The requirements of health and safety and of environmental protection are not always in harmony. For example, measures necessary to safeguard personnel in emergencies may have adverse environmental effects, and vice versa. However, joint consideration of health and safety and environmental matters provides a framework within which such issues can be resolved, and an appropriate balance struck.

## Purpose and scope

The HSEMS Guidelines have been developed by the E&P Forum to:

- Cover relevant Health, Safety and Environment (HSE) issues in a single document.

- Be relevant to the activities of the E&P industry worldwide.
- Be sufficiently generic to be adaptable to different companies and their cultures.
- Recognise, and be applicable to, the role of contractors and sub-contractors.
- Facilitate operation within the framework of statutory requirements.
- Facilitate evaluation of operations to an international standard(s) as appropriate.

The Guidelines describe the main elements necessary to develop, implement and maintain an HSEMS. They do not lay down specific performance requirements, but recommend that companies set policies and objectives taking into account information about the significant hazards and environmental effects of their operations.

The Guidelines may be used as a template by any operating or contracting company seeking to help assure itself and others (such as regulators, neighbours, partners, clients, insurers) of compliance with stated HSE policies within an objective-setting management system. Furthermore, the Guidelines are intended to support, rather than to suggest replacement of, existing sound, workable and effective company systems and practices.

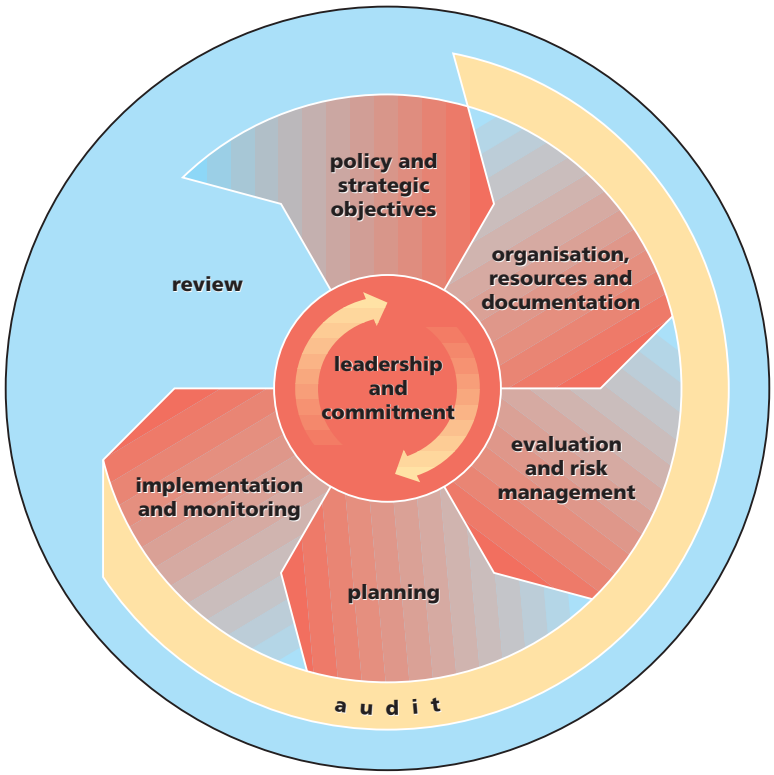
The phrase 'the company should maintain procedures...' is used throughout the Guidelines, however, it is not intended to prescribe that written procedures are necessarily required for all practices. The HSE-criticality of a given operation or situation dictates whether it warrants a formally documented and controlled procedure. In many instances the existing company practices will be less formal but nevertheless fully acceptable. Assuring the suitability of all aspects of the HSEMS remains the responsibility of each company and the Guidelines should be read in this context of self regulation.

## The Health, Safety and Environmental Management System Model

The model Health, Safety and Environmental Management System which forms the basis of these Guidelines is shown schematically in the figure at the top of page 4. Although this indicates a sequence of the HSEMS elements, many of the stages will in practice be addressed at the same time or revisited at different times.

Because the HSEMS will be a part of the overall management system, these Guidelines should strictly refer to the HSE Management Sub-System, but for simplicity the term HSE Management System will be used throughout. This is for convenience and in no way implies that the HSEMS is distinct from the overall management system of the facility or company.

*The Model Health, Safety and Environmental Management System (HSEMS)*




## Structure of the document

The document has two main sections, 'Guidelines' and 'Supplementary'. The Guidelines describe the elements of the HSEMS model and their interrelationships. These—or similar—elements are described by some regulators and companies as 'performance standards'. This term should not, however, be confused with 'performance criteria', which are lower-level specifications for the performance of operations.

The Supplementary section contains additional advisory material under the same headings, including examples of the manner in which the Guidelines may be applied. For convenience, the sections are numbered as in the Guidelines, but with the prefix 'S'.

## Terminology

Different health, safety and environmental management systems and strategies have been developed by different companies and organisations, leading to a diversity of terminology. The terms which are used in this document, are defined in an Annex to the Guidelines section.

Particular attention should be paid to the definition and usage in these Guidelines of the terms 'risk', 'hazard', 'performance criteria', 'audit' and 'review'. References in the Guidelines to a 'company' may be taken to refer to a particular facility or division operating a local HSEMS, as well to the corporate HSEMS. Most of these Guidelines refer to an operating organisation directly responsible for HSE management and performance. 'Company' also includes any contracting organisation which provides services to the E&P industry, and which wishes to develop and operate an HSEMS following these Guidelines.

# Executive Summary of the HSEMS model

**Key elements of the HSEMS model**

The Guidelines describe a management system, outlined in the figure on page 4, for setting and implementing company policy and objectives on health, safety and the environment. Key elements of the HSEMS are shown in the table below.

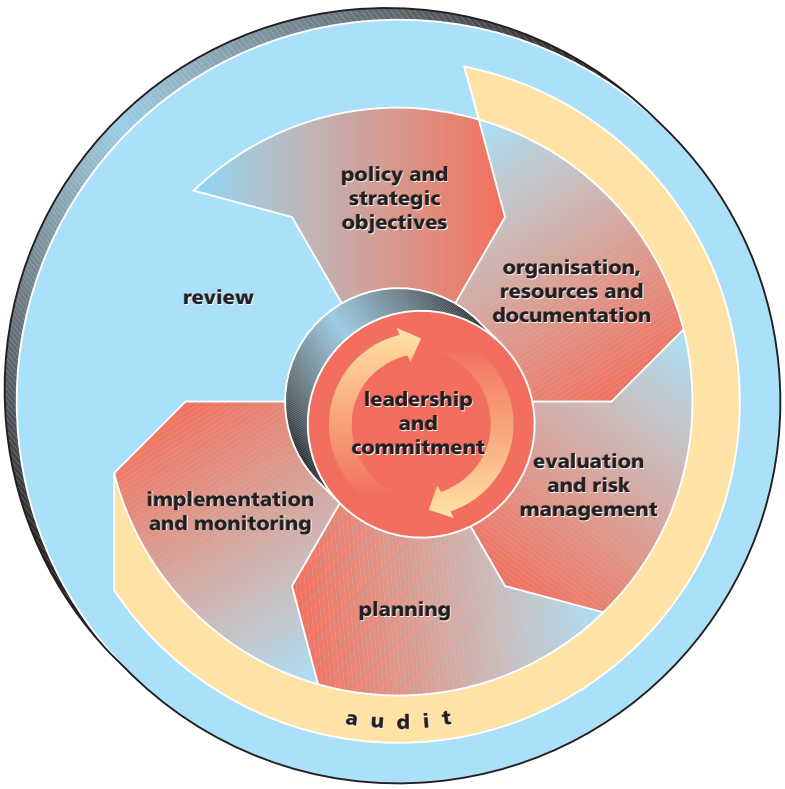
| HSEMS Element | Addressing |
|---|---|
| Leadership and commitment | *Top-down commitment and company culture, essential to the success of the system.* |
| Policy and strategic objectives | *Corporate intentions, principles of action and aspirations with respect to health, safety and environment.* |
| Organisation, resources and documentation | *Organisation of people, resources and documentation for sound HSE performance.* |
| Evaluation and risk management | *Identification and evaluation of HSE risks, for activities, products and services, and development of risk reduction measures.* |
| Planning | *Planning the conduct of work activities, including planning for changes and emergency response.* |
| Implementation and monitoring | *Performance and monitoring of activities, and how corrective action is to be taken when necessary.* |
| Auditing and reviewing | *Periodic assessments of system performance, effectiveness and fundamental suitability.* |

Additional advisory material on each element is given in the Supplementary section beginning on page 29.

GUIDELINES

# 1 Leadership and commitment

*This section addresses the top-down commitment and company culture necessary for the success of the system.*




Senior management of the company should provide strong, visible leadership and commitment, and ensure that this commitment is translated into the necessary resources, to develop, operate and maintain the HSEMS and to attain the policy and strategic objectives. Management should ensure that full account is taken of HSE policy requirements and should provide support for local actions taken to protect health, safety and the environment.

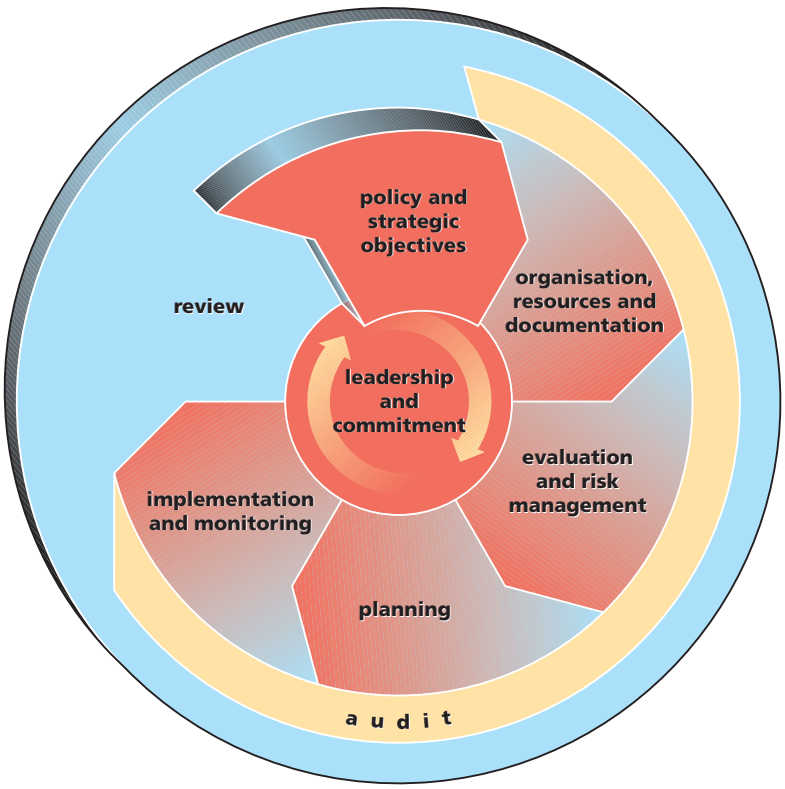
The company should create and sustain a company culture that supports the HSEMS, based on:

- belief in the company's desire to improve HSE performance;
- motivation to improve personal HSE performance;
- acceptance of individual responsibility and accountability for HSE performance;
- participation and involvement at all levels in HSEMS development;
- commitment to an effective HSEMS.

Employees of both the company and its contractors should be involved in the creation and maintenance of such a supportive culture.

# 2 Policy and strategic objectives

*This section addresses corporate intentions, principles of action and aspirations with respect to health, safety and environment and the aim of improved HSE performance.*



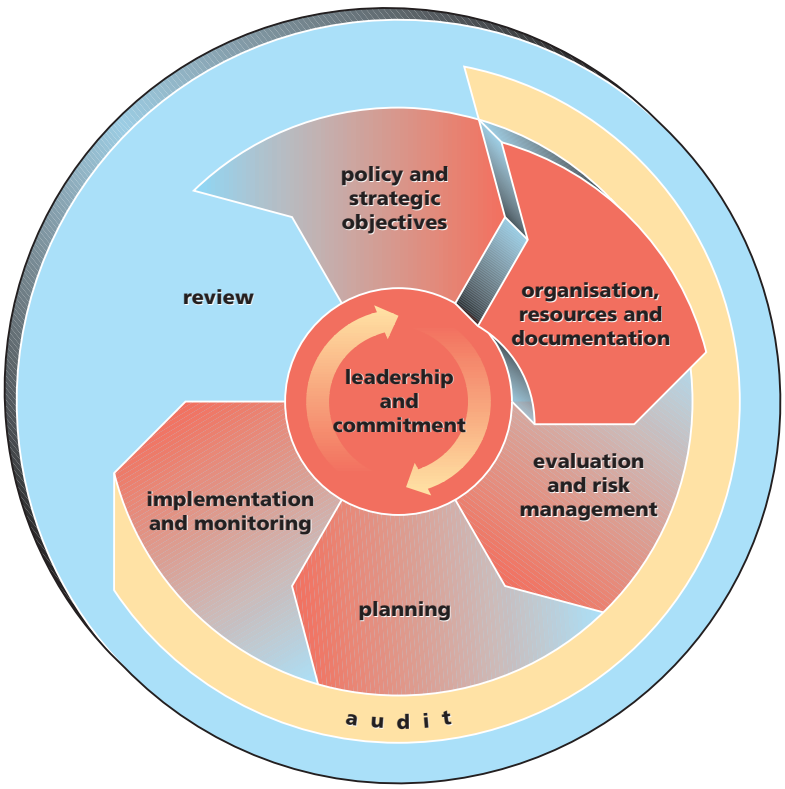

The company's management should define and document its HSE policies and strategic objectives and ensure that they:

- are consistent with those of any parent company;
- are relevant to its activities, products and services, and their effects on HSE;
- are consistent with the company's other policies;
- have equal importance with the company's other policies and objectives;
- are implemented and maintained at all organisational levels;
- are publicly available;
- commit the company to meet or exceed all relevant regulatory and legislative requirements;
- apply responsible standards of its own where laws and regulations do not exist;
- commit the company to reduce the risks and hazards to health, safety and the environment of its activities, products and services to levels which are as low as reasonably practicable;
- provide for the setting of HSE objectives that commit the company to continuous efforts to improve HSE performance.

The company should establish and periodically review strategic HSE objectives. Such objectives should be consistent with the company's policy and reflect the activities, relevant HSE hazards and effects, operational and business requirements, and the views of employees, contractors, customers and companies engaged in similar activities.

# 3 Organisation, resources and documentation

*This section addresses the organisation of people, resources and documentation for sound HSE performance.*




## 3.1 Organisational structure and responsibilities

Successful handling of HSE matters is a line responsibility, requiring the active participation of all levels of management and supervision; this should be reflected in the organisational structure and allocation of resources.

The company should define, document and communicate—with the aid of organisational diagrams where appropriate—the roles, responsibilities, authorities, accountabilities and interrelations necessary to implement the HSEMS, including but not limited to:

- provision of resources and personnel for HSEMS development and implementation;
- initiation of action to ensure compliance with HSE policy;
- acquisition, interpretation and provision of information on HSE matters;
- identification and recording of corrective actions and opportunities to improve HSE performance;
- recommendation, initiation or provision of mechanisms for improvement, and verification of their implementation;
- control of activities whilst corrective actions are being implemented;
- control of emergency situations.

The company should stress to all employees their individual and collective responsibility for HSE performance. It should also ensure that personnel are competent (see section 3.4) and have the necessary authority and resources to perform their duties effectively.

The organisational structure and allocation of responsibilities should reflect the responsibility of line managers at all levels for developing, implementing and maintaining the HSEMS in their particular areas. The structure should describe the relationships between:

- Different operating divisions.
- Operating divisions and supporting services (whether the services are provided on the same facility or from a larger corporate organisation).
- Onshore and offshore organisations.
- Employees and contractors.
- Partners in joint activities.

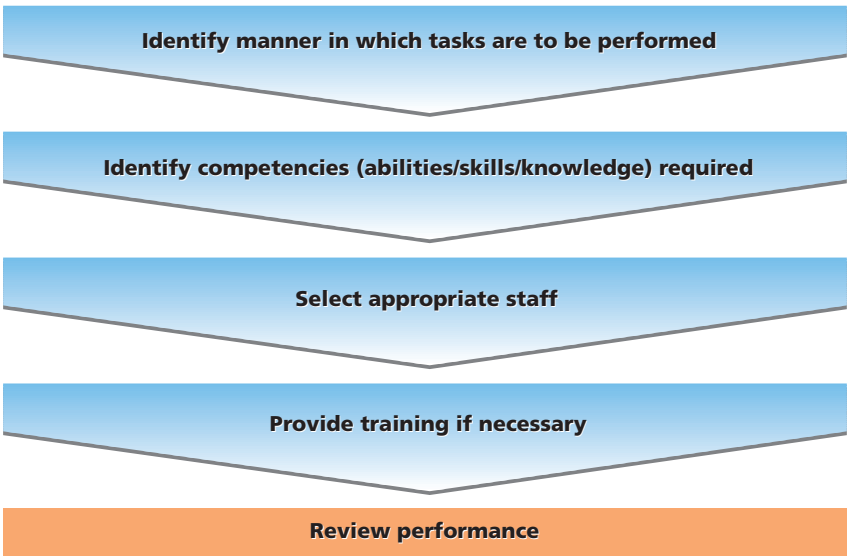
## 3.2 Management representative(s)

A management representative or representatives should be assigned responsibility, authority and accountability for co-ordinating implementation and maintenance of the HSEMS. The representative(s) should be accountable to senior management, but the appointment(s) should not reduce the responsibility of individual line managers for implementing the HSEMS in their areas.

## 3.3 Resources

Senior management should allocate sufficient resources to ensure the effective operation of the HSEMS, taking account of advice from the management representative(s), line management and HSE specialists. Resource allocation should be reviewed regularly as parts of the Review of the HSEMS (see section 7.2), of management of change (see section 5.4) and of risk management (see section 4).

## 3.4 Competence



### 3.4.1 General

The company should maintain procedures for ensuring that personnel performing specific assigned HSE-critical activities and tasks are competent on the basis of appropriate:

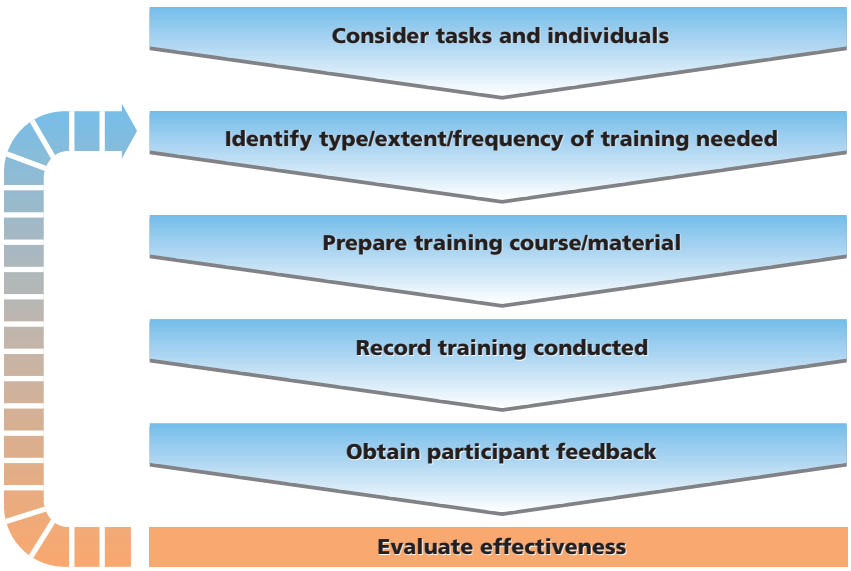
- personal abilities,
- skills developed through experience, and
- acquired knowledge.

Systems for competence assurance should apply both to initial recruitment and to selection for new activities, and to both staff and contractors. The continuing competence of personnel to perform their duties should be regularly reviewed and assessed, including appropriate consideration of personal development and training required to achieve competence for changing activities and technologies (see section 3.4.2). Procedures for competence assurance include, amongst others:

- systematic analysis of requirements for tasks;
- assessment of individuals' performance against defined criteria;
- documented evidence of individual competence;
- programmes for periodic re-assessment.

### 3.4.2 Training

The company should maintain procedures to ensure and increase competence through identification of training needs and provision of appropriate training for all personnel. Training may be provided through formal courses and/or through structured development in the workplace. The extent and nature of training should be sufficient to ensure achievement of the company's policy and objectives, and should meet or exceed that required by legislation and regulations. Appropriate records of training should be maintained (see section 6.3) and refresher training scheduled as required.



Systems should be developed to monitor the effectiveness of training programmes and to introduce improvements where necessary.

## 3.5 Contractors

The company should maintain procedures to ensure that its contractors operate a management system that is consistent with the requirements and provisions of these HSEMS Guidelines and that it is compatible with the HSEMS of the company. Procedures should facilitate interfacing of contractors' activities with those of the company and with those of other contractors, as appropriate. This may be achieved by means of a specific interface document between company and contractor so that any differences may be resolved, and procedures agreed, before work commences. Although all the recommendations in these Guidelines may be applicable to the contracted organisation, the procedures should pay particular attention to the following:

- Selection of contractors, including (amongst other considerations) specific assessment of their HSE policy, practices and performance and the adequacy of their HSEMS, commensurate with the risks associated with the services to be provided.
- Effective communication (see section 3.6) of the key elements of the company's HSEMS, and of the standards of worker and environmental protection expected from the contractor, including agreed HSE objectives and performance criteria.
- Sharing by company and contractor of relevant information which may impact on the HSE performance of either.
- The requirement that each contractor have an effective and relevant training programme which includes records and procedures for assessing the need for further training.
- Definition of methods for monitoring and assessing contractor performance against agreed HSE objectives and performance criteria.

## 3.6 Communication

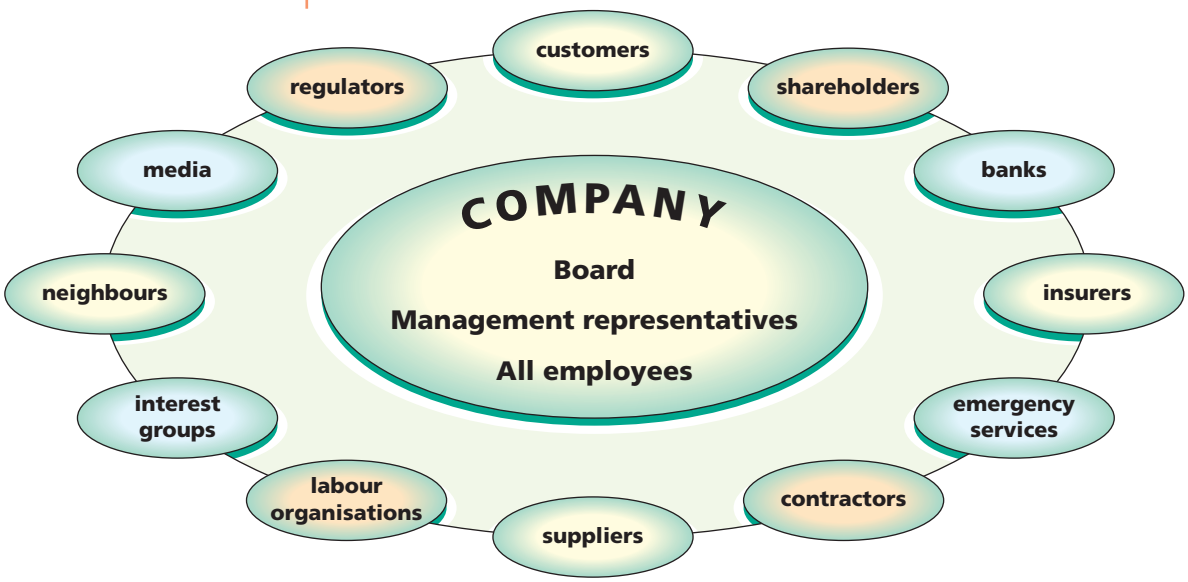
The company should maintain procedures to ensure that its employees, and those of its contractors and partners, at all levels, are aware of the:

- Importance of compliance with the HSE policy and objectives, and their individual roles and responsibilities in achieving it.
- HSE risks and hazards of their work activities and the preventative and mitigation measures (see section 4) and emergency response procedures that have been established (see section 5.5).
- Potential consequences of departure from agreed operating procedures.
- Mechanisms for suggesting, to management, improvements in the procedures which they and others operate.

Maintaining means of external communication in times of emergency is especially important and special contingency arrangements should be in place (see section 5.5).

The company should maintain procedures for communication of HSE information, consistent with its policy and with applicable legislation and regulations. The company should, whilst protecting confidential information, make available its HSE experience to employees, contractors, customers

and companies engaged in similar activities to facilitate improvements in industry HSE performance.




The company should maintain procedures for receiving and responding to communications from employees, contractors, customers, government agencies and the public concerning its HSE performance and management. Community awareness and consultation programmes should be maintained where appropriate, and their effectiveness monitored.

## 3.7 Documentation and its control

### *3.7.1 HSEMS documentation*

The company should maintain controlled documentation to:

- Record the HSE policy, objectives and plans.
- Record and communicate key roles and responsibilities.
- Describe HSE management system elements and their interactions.
- Cross-reference related documentation and describe links with other aspects of the overall management system.
- Record the results of HSE evaluation and risk management.
- Record relevant legislative and regulatory requirements.
- Record, where necessary, procedures and work instructions for key activities and tasks.
- Describe emergency plans and responsibilities, and the means of responding to incidents and potential emergency situations.

Such documentation should cover:

- The company.
- Organisational divisions and business units.
- Individual functions and operations (e.g. facility design, exploration, land acquisition, drilling).
- Contractors and partners.

### *3.7.2 Document control*

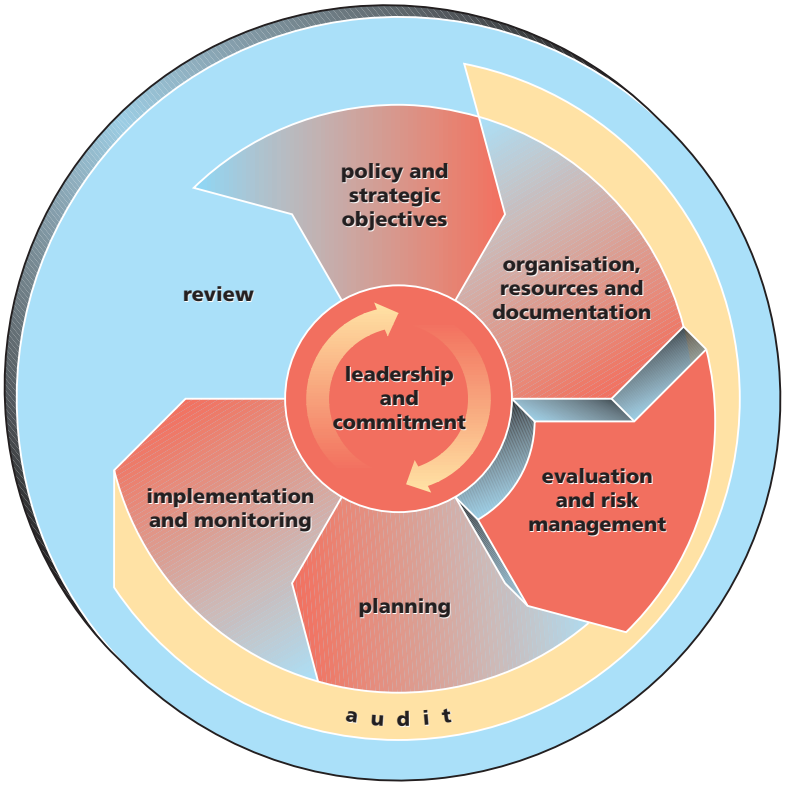
The company should maintain procedures for controlling HSEMS documents to ensure that:

- they can be identified with the appropriate company, division, function or activity;
- they are periodically reviewed, revised as necessary and approved for adequacy by authorised personnel prior to issue;
- current versions are available at those locations where they are needed;
- when obsolete, they are promptly removed from all points of issue and points of use.

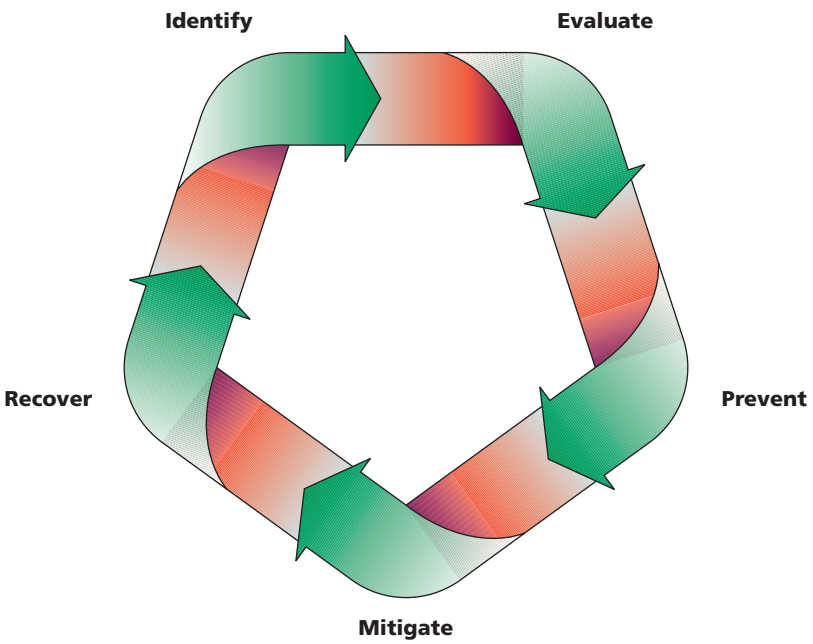
Documentation should be legible, dated (with dates of revision), readily identifiable, numbered (with a version number), maintained in an orderly manner and retained for a specified period. Policies and responsibilities should be established for the modification of documents, and their availability to employees, contractors, government agencies and the public.

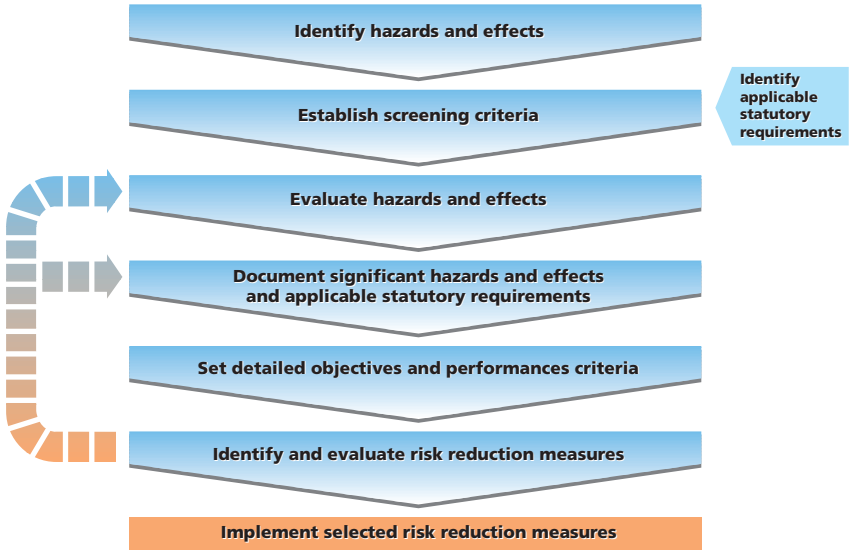
# 4 Evaluation and risk management

*Risk is present in all human endeavours. This section addresses the identification of HSE hazards and evaluation of HSE risks, for all activities, products and services, and development of measures to reduce these risks. The essential steps of Hazard Management are shown in the diagram at the foot of this page.*




***The essential steps of hazard management***






## 4.1 Identification of hazards and effects

The company should maintain procedures to **identify** systematically the hazards and effects which may affect or arise from its activities, and from the materials which are used or encountered in them. The scope of the identification should cover activities from inception (e.g. prior to acreage acquisition) through to abandonment and disposal.

The identification should include consideration of:

- Planning, construction and commissioning (i.e. asset acquisition, development and improvement activities).
- Routine and non-routine operating conditions, including shut-down, maintenance and start-up.
- Incidents and potential emergency situations, including those arising from:
  - *Product/material containment failures.*
  - *Structural failure.*
  - *Climatic, geophysical and other external natural events.*
  - *Sabotage and breaches of security.*
  - *Human factors including breakdowns in the HSEMS.*
- Decommissioning, abandonment, dismantling and disposal.
- Potential hazards and effects associated with past activities.

Personnel at all organisational levels should be appropriately involved in the identification of hazards and effects.

## 4.2 Evaluation

Procedures should be maintained to **evaluate** (assess) risks and effects from identified hazards against screening criteria, taking account of probabilities of occurrence and severity of consequences for:

- People.
- Environment.
- Assets.

It should be noted that any evaluation technique provides results which themselves may be subject to a range of uncertainties. Consequently formal risk evaluation techniques are used in conjunction with the judgement of experienced personnel, regulators and the community.

Risk evaluation should:

- include effects of activities, products and services;
- address effects and risks arising from both human and hardware factors;
- solicit input from personnel directly involved with the risk area;
- be conducted by qualified and competent personnel;
- be conducted according to appropriate and documented methods;
- be updated at specified intervals.

Evaluation of health and safety risks and effects should include, where appropriate, consideration of:

- Fire and explosion.
- Impacts and collisions.
- Drowning, asphyxiation and electrocution.
- Chronic and acute exposure to chemical, physical and biological agents.
- Ergonomic factors.

Evaluation of acute and chronic environmental effects should include, where appropriate, consideration of:

- Controlled and uncontrolled emissions of matter and energy to land, water and the atmosphere.
- Generation and disposal of solid and other wastes.
- Use of land, water, fuels and energy, and other natural resources.
- Noise, odour, dust, vibration.
- Effects on specific parts of the environment including ecosystems.
- Effects on archaeological and cultural sites and artifacts, natural areas, parks and conservation areas.

## 4.3 Recording of hazards and effects

The company should maintain procedures to document those hazards and effects (chronic and acute) identified as significant in relation to health, safety and the environment, outlining the measures in place to reduce them (see sections 4.5) and identifying the relevant HSE-critical systems and procedures.

The company should maintain procedures to record statutory requirements and codes applicable to the HSE aspects of its operations, products and services and to ensure compliance with such requirements.

## 4.4 Objectives and performance criteria

The company should maintain procedures to establish detailed HSE objectives and performance criteria at relevant levels.

Such objectives and performance criteria should be developed in the light of policy, strategic HSE objectives, HSE risks, and operational and busi-

ness needs. They should be quantified, wherever practicable, and identified with defined timescales; they should also be realistic and achievable.

As a follow-up to risk evaluation (see 4.2), the company should maintain procedures to set performance criteria for HSE-critical activities and tasks, which stipulate in writing the acceptable standard for their performance. It should also, at specified intervals, review the continuing relevance and suitability of the criteria.

## 4.5 Risk reduction measures

The company should maintain procedures to select, evaluate and implement measures to reduce risks and effects. Risk reduction measures should include both those to **prevent** incidents (i.e. reducing the probability of occurrence) and to **mitigate** chronic and acute effects (i.e. reducing the consequences). Preventative measures such as ensuring asset integrity (see section 5.2) should be emphasised wherever practicable. Mitigation measures should include steps to prevent escalation of developing abnormal situations and to lessen adverse effects on health, safety and the environment and, ultimately, emergency response measures to **recover** (see section 5.5). Effective risk reduction measures and follow-up require visible commitment of management and on-site supervision, as well as the understanding and ownership of operations personnel.

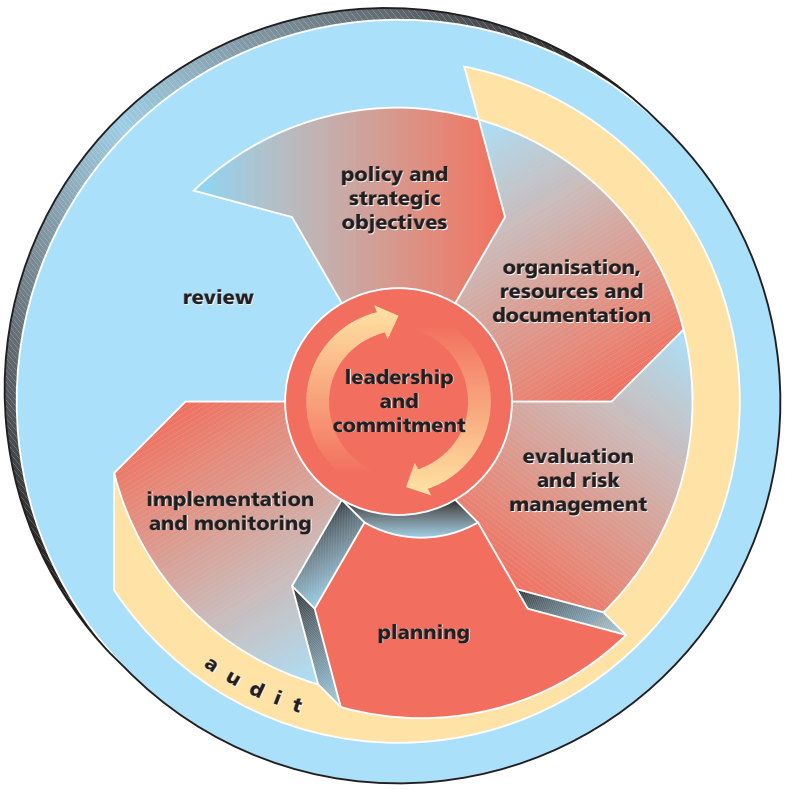
In all cases consideration should be given to reducing risk to a level deemed 'as low as reasonably practicable' reflecting amongst other factors local conditions and circumstances, the balance of cost and benefits and the current state of scientific and technical knowledge.

Procedures should be in place to:

- Identify prevention and mitigation measures for particular activities, products and services which pose potential HSE risks.
- Re-appraise activities to ensure that the measures proposed do reduce risks, or enable relevant objectives to be met.
- Implement, document and communicate to key personnel interim and permanent risk reduction measures, and monitor their effectiveness.
- Develop relevant measures such as plans for emergency response (section 5.5) to recover from incidents and mitigate their effects.
- Identify hazards arising from risk prevention and mitigation and recovery measures.
- Evaluate the tolerability of consequent risks and effects against the screening criteria.

# 5 Planning

*This section addresses the firm planning of work activities, including the risk reduction measures (selected through the evaluation and risk management process). This includes planning for existing operations, managing changes and developing emergency response measures.*




## 5.1 General

The company should maintain, within its overall work programme, plans for achieving HSE objectives and performance criteria. These plans should include:

- a clear description of the objectives;
- designation of responsibility for setting and achieving objectives and performance criteria at each relevant function and level of the organisation;
- the means by which they are to be achieved;
- resource requirements;
- time scales for implementation;
- programmes for motivating and encouraging personnel toward a suitable HSE culture;
- mechanisms to provide feedback to personnel on HSE performance;
- processes to recognise good personal and team HSE performance (e.g. safety award schemes);
- mechanism for evaluation and follow-up.

## 5.2 Asset integrity

The company should maintain procedures to ensure that HSE-critical facilities and equipment which it designs, constructs, procures, operates, maintains and/or inspects are suitable for the required purpose and comply

with defined criteria. Pre-procurement and pre-construction assessment of new facilities and equipment should include explicit assessment of appropriateness to meet HSE requirements and should emphasise design as the best preventative measure to reduce risk and adverse HSE effects.

Procedures and systems for ensuring asset integrity should address (amongst other factors) structural integrity, process containment, ignition control and systems for protection, detection, shutdown, emergency response and life-saving.

Deviation from approved design practices and standards should be permitted only after review and approval by designated personnel and/or authorities, and the rationale for the deviation should be documented.

## 5.3 Procedures and work instructions

### *5.3.1 Developing procedures*

Activities for which the absence of written procedures could result in infringement of the HSE policy or breaches of legislative requirements or performance criteria, should be identified. Documented procedures or standards should be prepared for such activities, defining how they should be conducted—whether by the company's own employees, or by others acting on its behalf—to ensure technical integrity and to transfer knowledge effectively.

All written procedures should be stated simply, unambiguously and understandably, and should indicate the persons responsible, the methods to be used and, where appropriate, performance standards and criteria to be satisfied.

Procedures are required for procurement and contracted activities, to ensure that suppliers and those acting on the company's behalf comply with the company's policy requirements that relate to them.

### *5.3.2 Issuing work instructions*

Work instructions define the manner of conducting tasks at the work-site level, whether conducted by the company's own employees or by others acting on its behalf. In the case of HSE-critical tasks, which have the potential for adverse HSE consequences if incorrectly performed, these work instructions should be documented and communicated to relevant personnel.

## 5.4 Management of change

The company should maintain procedures for planning and controlling changes, both permanent and temporary, in people, plant, processes and procedures, to avoid adverse HSE consequences.

The procedures should be suitable to address the HSE issues involved, according to the nature of the changes and their potential consequences, and should address:

- Identification and documentation of the proposed change and its implementation.
- Responsibility for reviewing and recording the potential HSE hazards from the change or its implementation.
- Documentation of the agreed change and implementation procedure, including:
  - *measures to identify HSE hazards and to assess and reduce risks and effects;*
  - *communication and training requirements;*
  - *time limits, if any;*
  - *verification and monitoring requirements;*
  - *acceptance criteria and action to be taken if breached.*
- Authority for approval to implement the proposed change.

Procedures should describe how the company will interpret, and assess the implications of, new or amended legislation, and how revised regulatory requirements are to be incorporated in the HSEMS.

Separate plans should be established in respect of the HSE management of new operations (relating, for example, to acquisitions, developments, divestments, products, services or processes), or of modified operations where the modification introduces significantly different HSE concerns, to define:

- HSE objectives to be attained.
- Mechanisms for their achievement.
- Resource requirements to achieve HSE objectives.
- Procedures for dealing with changes and modifications as projects proceed.
- Corrective mechanisms which should be employed should the need arise, how they should be activated and how their adequacy should be measured.

## 5.5 Contingency and emergency planning

The company should maintain procedures to identify foreseeable emergencies by systematic review and analysis. A record of such identified potential emergencies should be made, and updated at appropriate intervals in order to ensure effective response to them.

The company should develop, document and maintain plans for responding to such potential emergencies, and communicate such plans to :

- command and control personnel;
- emergency services;
- employees and contractors who may be affected;
- others likely to be impacted.

Emergency plans should cover:

- Organisation, responsibilities, authorities and procedures for emergency response and disaster control, including the maintenance of internal and external communications.
- Systems and procedures for providing personnel refuge, evacuation, rescue and medical treatment.

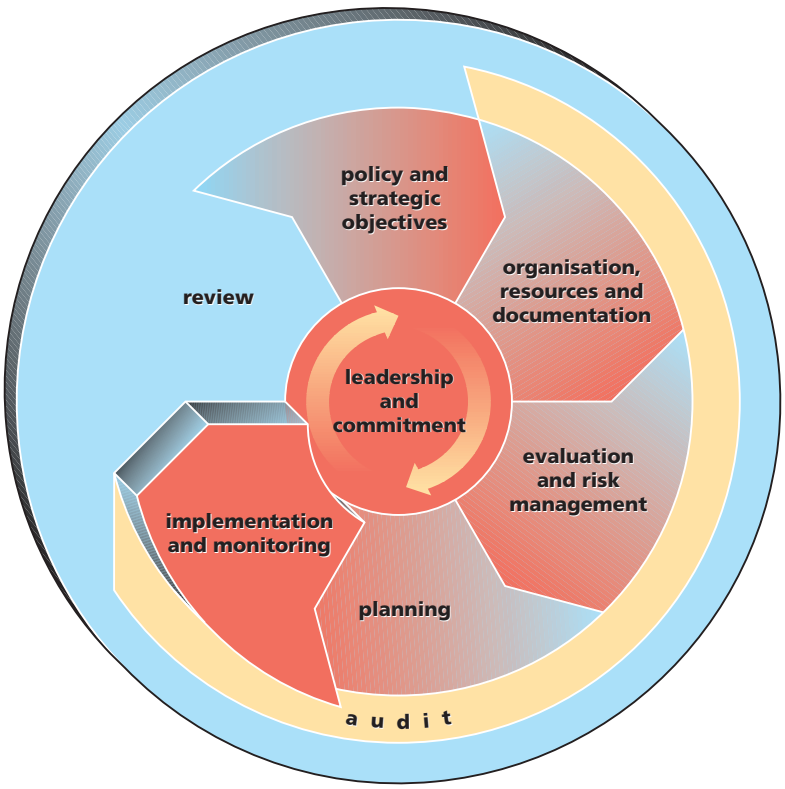
- Systems and procedures for preventing, mitigating and monitoring environmental effects of emergency actions.
- Procedures for communicating with authorities, relatives and other relevant parties.
- Systems and procedures for mobilising company equipment, facilities and personnel.
- Arrangements and procedures for mobilising third party resources for emergency support.
- Arrangements for training response teams and for testing the emergency systems and procedures.

To assess the effectiveness of response plans, the company should maintain procedures to test emergency plans by scenario drills and other suitable means, at appropriate intervals, and to revise them as necessary in the light of the experience gained.

Procedures should also be in place for the periodic assessment of emergency equipment needs and the maintenance of such equipment in a ready state.

# 6 Implementation and monitoring

*This section addresses how activities are to be performed and monitored, and how corrective action is to be taken when necessary*




## 6.1 Activities and tasks

Activities and tasks should be conducted according to procedures and work instructions developed at the planning stage—or earlier, in accordance with HSE policy:

- At senior management level, the development of strategic objectives and high-level planning activities should be conducted with due regard for the HSE policy.
- At supervisory and management level, written directions regarding activities (which typically involve many tasks) will normally take the form of plans and procedures.
- At the work-site level, written directions regarding tasks will normally be in the form of work instructions, issued in accordance with defined safe systems of work (e.g. permits to work, simultaneous operations procedures, lock-off procedures, manuals of permitted operations).

Management should ensure, and be responsible for, the conduct and verification of activities and tasks according to relevant procedures. This responsibility and commitment of management to the implementation of policies and plans includes, amongst other duties, ensuring that HSE objectives are met and that performance criteria and control limits are not breached. Management should ensure the continuing adequacy of the HSE performance of the company through monitoring activities (see section 6.2).

## 6.2 Monitoring

The company should maintain procedures for monitoring relevant aspects of HSE performance and for establishing and maintaining records of the results. For each relevant activity or area, the company should:

- identify and document the monitoring information to be obtained, and specify the accuracy required of results;
- specify and document monitoring procedures, and locations and frequencies of measurement;
- establish, document and maintain measurement quality control procedures;
- establish and document procedures for data handling and interpretation;
- establish and document actions to be taken when results breach performance criteria (see sections 4.4, 4.5 and 6.4);
- assess and document the validity of affected data when monitoring systems are found to be malfunctioning;
- safeguard measurement systems from unauthorised adjustments or damage.

Procedures are required for both active and reactive monitoring. Active monitoring provides information in the absence of any incident, ill-health or damage to the receiving environment. It includes checking that HSEMS requirements (e.g. procedures) are being complied with, and that objectives and performance criteria are met. Reactive monitoring provides information on incidents (including near-miss incidents, ill-health or environmental damage) that have occurred and provides insights into the means of preventing similar incidents in the future.

## 6.3 Records

The company should maintain a system of records in order to demonstrate the extent of compliance with its HSE policy and its requirements, and to record the extent to which planned objectives and performance criteria have been met.

Procedures should be maintained to ensure the integrity, accessibility and control of such records—which should include relevant contractor and procurement records, the results of audits and reviews (see section 7), training records (see section 3.4.2) and employee medical records.

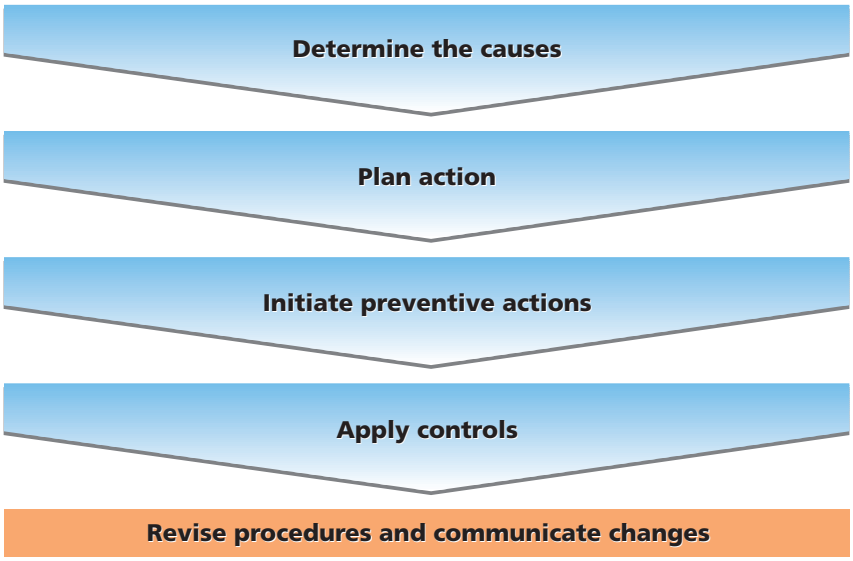
The retention times of records should be established and recorded, and procedures should be maintained regarding their availability and confidentiality.

## 6.4 Non-compliance and corrective action

The company should define the responsibility and authority for initiating investigation and corrective action in the event of non-compliance with specified requirements relating to the HSEMS, its operation or its results. Situations of non-compliance may be identified by the monitoring programme, through communications from employees, contractors, customers, government agencies or the public, or from investigations of incidents (see sections 6.5 and 6.6).

The company should maintain procedures for such investigation and corrective action, by which the management of the individual function or activity concerned, in consultation with the management representative, should:

- Notify the relevant parties.
- Determine the causation sequence and likely root cause.
- Establish a plan of action or an improvement plan.
- Initiate preventive actions commensurate with the nature of the non-compliance.
- Apply controls to ensure that any preventive actions taken are effective.
- Revise procedures to incorporate actions to prevent recurrence, communicate changes to relevant personnel and implement them.




## 6.5 Incident reporting

The organisation should maintain procedures for the internal recording and reporting of incidents which affected, or could have affected, HSE performance, so that the relevant lessons can be learned and appropriate actions taken (see section 6.6).

There should be a defined mechanism for the reporting of incidents to regulatory bodies, to the extent required by law or to such greater extent as the policy of the company on external communication may require.

## 6.6 Incident follow-up

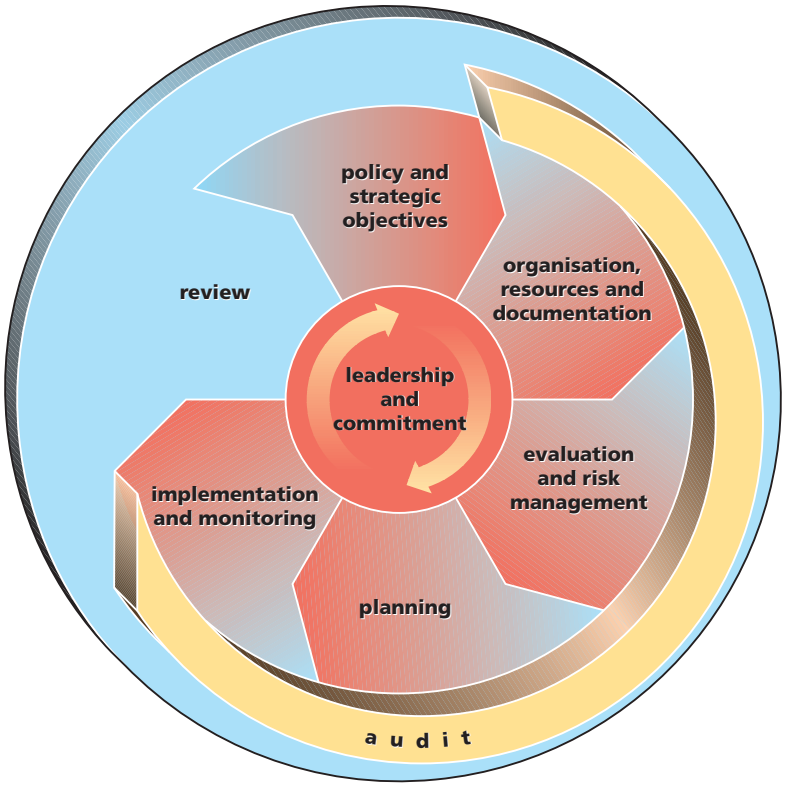
Both the immediate circumstances of the incident, and the underlying HSEMS weaknesses which caused it, should be identified to enable judgements to be made by those responsible for authorising the necessary follow-up action.

The mechanism and responsibilities for follow-up of incidents should be clearly defined. The mechanism should be broadly similar to the procedures for implementing corrective action in cases of non-compliance with the HSEMS (see section 6.4).

The defined responsibilities for follow-up of an incident should be appropriate to the severity of its real or potential consequences.

# 7 Auditing and reviewing

*This section addresses the periodic assessment of system performance, effectiveness and inherent suitability.*




## 7.1 Auditing

The company should maintain procedures for audits to be carried out, as a normal part of business control, in order to determine:

- Whether or not HSE management system elements and activities conform to planned arrangements, and are implemented effectively.
- The effective functioning of the HSEMS in fulfilling the company's HSE policy, objectives and performance criteria.
- Compliance with relevant legislative requirements.
- Identification of areas for improvement, leading to progressively better HSE management.

For this purpose, it should maintain an audit plan, dealing with the following:

- Specific activities and areas to be audited. Audits should cover the operation of the HSEMS and the extent of its integration into line activities, and should specifically address the following elements of the HSEMS model:
  - *organisation, resources and documentation;*
  - *evaluation and risk management;*
  - *planning;*
  - *implementation and monitoring.*

- Frequency of auditing specific activities/areas. Audits should be scheduled on the basis of the contribution or potential contribution of the activity concerned to HSE performance, and the results of previous audits.
- Responsibilities for auditing specific activities/areas.

Audit protocols and procedures should be established and maintained. The following points should be covered:

- Allocation of resources to the auditing process.
- Personnel requirements and specifically that the audit team has:
  - *adequate independence from activities audited to enable objective and impartial judgement;*
  - *the necessary expertise in relevant disciplines;*
  - *support, if necessary, from a wider range of specialists.*
- Methodologies for conducting and documenting the audits, which may involve the use of questionnaires, checklists, interviews, measurements and direct observations, depending on the nature of the function being audited.
- Procedures for reporting audit findings in a controlled manner to those responsible for the activity/area audited, who should take timely action on reported corrective actions and opportunities for improvement (see section 6.6). Reporting should address:
  - *conformity or nonconformity of the HSEMS elements with specified requirements;*
  - *effectiveness of the implemented HSEMS in enabling objectives and performance criteria to be met;*
  - *implementation and effectiveness of corrective actions from previous audits;*
  - *conclusions and recommendations.*
- System for auditing and tracking implementation status of audit recommendations.
- Distribution and control of audit reports.

## 7.2 Reviewing

The company's senior management should, at appropriate intervals, review the HSEMS and its performance, to ensure its continuing suitability and effectiveness. The review should specifically, but not exclusively, address:

- The possible need for changes to the policy and objectives, in the light of changing circumstances and the commitment to strive for continual improvement.
- Resource allocation for HSEMS implementation and maintenance.
- Sites and/or situations on the basis of evaluated hazards and risks, and emergency planning.

The review process should be documented, and its results recorded, to facilitate implementation of consequent changes.

Reviews should be used to reinforce continuous efforts to improve HSE performance.

# Annex: definitions

*For the purposes of these HSEMS Guidelines, the following definitions apply.*

**accident**

See *'incident'*

**as low as reasonably practicable**

To reduce a risk to a level which is 'as low as reasonably practicable' involves balancing reduction in risk against the time, trouble, difficulty and cost of achieving it. This level represents the point, objectively assessed, at which the time, trouble, difficulty and cost of further reduction measures become unreasonably disproportionate to the additional risk reduction obtained.

**company**

An organisation engaged, as principal or contractor, directly or indirectly, in the exploration for and production of oil and/or gas. For bodies or establishments with more than one site, a single site may be defined as a company.

**environment**

The surroundings and conditions in which a company operates or which it may affect, including living systems (human and other) therein.

**environmental effect**

A direct or indirect impingement of the activities, products and services of the company upon the environment, whether adverse or beneficial.

**environmental effects evaluation**

A documented evaluation of the environmental significance of the effects of the company's activities, products and services (existing and planned).

**hazard**

The potential to cause harm, including ill health or injury; damage to property, plant, products or the environment; production losses or increased liabilities.

**health, safety and environmental-(HSE-) critical**

Designates activities, personnel or measures that have been identified as vital to ensure asset integrity, prevent incidents, and/or to mitigate adverse HSE effects.

**health, safety and environmental (HSE) management audit**

An independent, systematic and documented process of objectively obtaining and evaluating verifiable evidence to determine:

- *whether the HSEMS and its results conform to the audit criteria;*
- *whether the system is implemented effectively; and*
- *whether the system is suitable to achieve the health, safety and environmental policy and objectives.*

**health, safety and environmental (HSE) management documentation**

The documentation describing the overall health, safety and environmental management system, and making reference to the procedures for implementing the company's health, safety and environmental management plan.

| | |
|---|---|
| **health, safety and environmental (HSE) management plan** | A description of the means of achieving health, safety and environmental objectives. |
| **health, safety and environmental (HSE) management review** | The formal review by senior management of the status and adequacy of the health, safety and environmental management system and its implementation, in relation to health, safety and environmental issues, policy, regulations and new objectives resulting from changing circumstances. |
| **health, safety and environmental management system (HSEMS)** | The company structure, responsibilities, practices, procedures, processes and resources for implementing health, safety and environmental management. |
| **health, safety and environmental (HSE) strategic objectives** | The broad goals, arising from the HSE policy, that a company sets itself to achieve, and which should be quantified wherever practicable. |
| **health, safety and environmental (HSE) policy** | A public statement of the intentions and principles of action of the company regarding its health, safety and environmental effects, giving rise to its strategic and detailed objectives. |
| **health, safety and environmental (HSE) management** | Those aspects of the overall management function (including planning) that develop, implement and maintain the HSE policy. |
| **incident** | An event or chain of events which has caused or could have caused injury, illness and/or damage (loss) to assets, the environment or third parties.<br>*(The word 'accident' is used by some writers and organisations to denote an incident which has caused injury, illness and/or damage, but the term also has connotations of 'bad luck' in common speech, and is therefore avoided by others. In these guidelines, only the term 'incident' has been used—in the above sense which embraces the concept of 'accident'.)* |
| **maintain (procedures)** | The term 'maintain' as used in these Guidelines should be understood to mean 'establish and maintain' if the procedure which is to be maintained does not yet exist. |
| **monitoring activities** | All inspection, test and monitoring work related to health, safety and environmental management. |
| **performance criteria** | Performance criteria describe the measurable standards set by company management to which an activity or system element is to perform.<br>*(Some companies may refer to performance criteria as 'goals' or 'targets'.)* |
| **practice** | Accepted methods or means of accomplishing stated tasks. |
| **procedure** | A documented series of steps to be carried out in a logical order for a defined operation or in a given situation. |
| **risk** | The product of the chance that a specified undesired event will occur and the severity of the consequences of the event. |
| **screening criteria** | The values or standards against which the significance of the identified hazard or effect can be judged. They should be based on sound scientific and technical information and may be developed by the company and industry bodies, or provided by the regulators. |

# Supplementary

## S1 Leadership and commitment

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

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 HSEMS at different management levels include, amongst others:

- Allocating the necessary resources, such as time and money, to HSE matters.
- Setting a personal example in day-to-day work.
- Putting HSE matters high on the agenda of meetings, from the Board downwards.
- 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 are achieved.
- Encouragement of employees' suggestions for measures to improve HSE performance.
- Participation in internal and external initiatives.

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

- **Belief** in the company's will to improve its HSE performance—essential to open and supportive incident reporting, and to effective HSEMS implementation.
- **Motivation** to improve personal HSE performance—based on awareness, understanding, acceptance of individual responsibility and positive recognition to reinforce desirable attitudes and behaviours.
- **Participation** of staff at all levels—through seeking their views and involvement in HSEMS development, and energetically pursuing suggestions for improvement.
- **Commitment** of staff at all levels is essential if the HSEMS is to be fully effective, and should follow from secure belief, personal motivation and active participation.

## S2 Policy and strategic objectives

A company may choose to publish an integrated HSE policy or it may prefer to treat health, safety and environmental policies separately. Whichever course is adopted, the policies will need to address the topics identified in these Guidelines.

It is important that policy be initiated, developed, actively supported and endorsed by management at the highest level, and be made available in readily understood form to interested parties—e.g. through the company's annual report and in booklets and displays. The company will need to identify any regulatory requirements for HSE policies and to satisfy such requirements.

Health and safety policy may, for example, include commitments to:

- Establish safe and healthy procedures and practices in all operations, and strive towards an incident-free workplace.
- Provide properly engineered facilities, plant and equipment and maintain them in a safe and secure condition.
- Promote openness and participation in health and safety matters.
- Provide training to enable staff to work in a healthy and safe way.
- Undertake health and safety awareness and education campaigns.

The environmental policy may, for example, state commitments to:

- Undertake all operations with proper regard for the environment, and strive to reduce environmental risk to a level that is as low as reasonably practicable.
- Reduce waste and the consumption of materials, fuel and energy.
- Reduce, and avoid where practicable, emissions and discharges.
- Provide staff training and awareness programmes.
- Participate in suitable environmental initiatives.
- Reduce the hazards and adverse environmental effects of new developments to a level that is as low as reasonably practicable.
- Work towards the goal of environmentally sustainable economic development.

The policies of companies with good HSE records typically also refer to, for example, the:

- Importance of effective organisation to successful HSE management.
- Importance of communication with interested parties.
- Need, as in other areas of the business, for a systematic, planned approach to HSE.
- Frequent role of management control failure in causing incidents.

## S3 Organisation, resources and documentation

### *S3.1 Organisational structure and responsibilities*

Support services may include procurement (of materials, contracted services and equipment), personnel, research and development, public relations, safety, environmental, security and occupational health, whether provided by the facility or by the parent organisation.

The allocation of HSE responsibilities will depend upon the nature and structure of the individual company; some examples might be:

- **Senior management**—assume responsibility for developing, resourcing, reviewing and complying with the HSE policy.

- **Finance**—develop and maintain accounting procedures which enable identification and allocation of HSE costs and benefits.
- **All individual function, activity and operations/business unit managers** (e.g. Operations, Drilling, Production, Exploration, Engineering, Services, Marketing, Contracts, Research and Development, Procurement, Petroleum Engineering, Legal, Finance and Site Personnel)—implement the HSEMS in their areas of responsibility (in consultation with employees) and effective two-way communication and training programmes on HSE matters.

### *S3.2 Management representative(s)*

The management representative or representatives need to have sufficient knowledge of the company and its activities, and of HSE issues, to undertake the role effectively. Whilst maintaining overall responsibility for co-ordinating HSE management activities across all functions and groups, representative(s) will act in conjunction with line management in all functions, activities and processes. Line management remains fully accountable for developing and implementing the HSEMS in its area of responsibility.

Some companies may divide the management role among several positions, such as health and safety manager and environment manager, or it may be a significant part of a line manager's duties. If the management representative has other functions to perform, care will need to be taken to ensure that there are no conflicts of interest with HSE responsibilities.

### *S3.3 Resources*

Resource allocation should be considered as it applies to all parts of the HSEMS; issues to consider include, among others:

- Facilities, plant and equipment to meet legislative and regulatory requirements.
- Personnel, equipment and infrastructure to respond to and mitigate emergency situations.
- Availability of management for HSE audits and reviews.
- Resource allocation for new developments.

Depending on the particular circumstances of the company, the management representative and other managers may need support from specialist advisers to accomplish their tasks effectively.

The allocation of necessary and justified resources for HSE matters is widely regarded by staff and other interested parties as indicative of corporate commitment to HSE policy and objectives.

### *S3.4 Competence*

In addition to allocating responsibilities, management will need to determine the level of competence—based on personal abilities, skills, experi-

ence, formal qualification and training—necessary to ensure the capability of personnel to carry out HSE-critical functions. Activities and roles which affect the HSE performance should be included in job descriptions and performance appraisals.

Structured and documented competence assurance systems and procedures help to facilitate the processes of:

- determining the competence requirements of particular activities;
- defining and recording criteria for competence;
- assessing individuals against the defined criteria;
- documenting and certifying competence when necessary;
- identifying aspects where personnel are not yet judged competent;
- training individuals to increase competence in those areas;
- periodic re-assessing of competent personnel;
- assessing competence for job transfers and new activities and technologies.

Training—including refresher courses—helps ensure that:

- All personnel can make an appropriate contribution to good HSE performance.
- New recruits, and staff assigned to new tasks, equipment and procedures, understand their roles and responsibilities for HSE matters.
- Managers understand the HSEMS, have the necessary knowledge to play their part in it, and appreciate the criteria by which its effectiveness will be judged.

### *S3.5 Contractors*

Contractors and sub-contractors play a substantial role in the E&P industry, often working within a facility and alongside a company's own workforce; the activities in which they are engaged (e.g. construction and major maintenance) are typically non-routine and are in exposed situations.

For those reasons, these Guidelines have been designed to apply equally to the operations of a principal or contracting company.

Records and safety statistics have generally indicated that contractors' employees are involved in incidents more frequently than are employees of the principal company. They may be less familiar with site-specific hazards than are the company's own employees. For these reasons it is particularly important to consider how the HSEMS of a company (whether itself a principal or contracting organisation) is interfaced with that of its contractors and sub-contractors. In this context, particular attention is drawn to:

- establishing clear communication between company and contractor staff, at all levels;
- procedures for the management of change;
- Permit to Work systems;
- incident reporting and follow-up;

- emergency plans and their communication;
- audit and review;
- communication of hazards and individual risks, and roles in risk management.

However contracted activities will also need to be considered in other parts of the HSEMS.

### *S3.6 Communication*

Effective communication requires careful consideration of the message to be transmitted—or the information to be sought—and to the most appropriate medium for doing so.

Effective two-way communication on HSE issues, including awareness programmes and campaigns directed towards specific HSE concerns, are important means of motivating staff towards a proper regard for HSE issues.

The need to communicate in an appropriate language and style needs to be borne constantly in mind, particularly when transmitting technical information to non-specialists. HSE-critical procedures and instructions (such as emergency evacuation instructions, and recovery measures in the event of oil spillage) need to be in a language and style that is understood by site staff. Cultural and language barriers to communication (such as those for personnel whose mother tongue is not the main site language) need to be identified. Communications must be tested regularly.

Community awareness and consultation programmes may be effective for responding to legitimate community concerns about the HSE effects of facilities.

### *S3.7 Documentation and its control*

The primary purpose of the documentation is to provide an adequate description of the HSEMS, and to serve as a permanent reference to the implementation and maintenance of that system. Documentation may be in paper, electronic, or other format, but it is important to ensure consistency in approach and content, and in control, review and amendment of procedures.

Proper documentation enhances HSE management efficiency through:

- Channelling information efficiently to where it is used and needed by staff.
- Aiding awareness of responsibilities and correct task performance.
- Avoiding information-dependency on individuals.
- Reducing learning time on new tasks.
- Demonstrating the existence of systems and practices.

In determining the degree of detail of HSEMS documentation, consideration will also need to be given to its use by system auditors to verify that the system exists, and that it is fit for its purpose, given the nature of the hazards and risks and environmental effects involved.

## S4 Evaluation and risk management

### *S4.1 Identification of hazards and effects*

Identification of HSE hazards and effects typically requires the application of specialised techniques and systems, such as hazard and operability studies (HAZOPS), event or fault tree analysis, failure mode and effect analysis (FMEA) or environmental impact assessment (EIA), and the involvement of staff with specific expertise in risk management, HSE issues, design and operations. HSE hazards and effects may also be identified using operational checklists and informal 'hazard hunts' at operating sites. The participation of operational employees in such activities is to be encouraged as a means of increasing their understanding of hazards, risks and effects.

Hazard identification is conducted at an early stage in the design and development of new facilities, equipment and processes. This permits sound HSE practices, systems and equipment to be 'designed-in', and allows a wider choice of risk prevention, mitigation and recovery measures to be employed than with existing facilities. Continuous hazard identification is required at existing facilities to maintain and improve HSE performance.

It is probably in the area of hazard identification and risk assessment that most differences between traditional occupational health and safety strategies and environmental protection programmes will occur. However, there are parallels between the causative events or hazards in the two areas:

| | **Environment** | **Safety and health** |
|---|---|---|
| **Chronic** | Continuous discharge | Occupational exposure |
| **Acute *(incident)*** | Oil spill | Fire/explosion |

### *S4.2 Evaluation*

Evaluation of the risks posed by the identified hazards, however sophisticated the detailed techniques employed (e.g. HAZOPS and HAZAN, QRA, health risk assessment, EIA), requires consideration of both the severity of the consequences of a potential event and the probability of its occurrence:

**Risk = Probability of occurrence x Severity of consequences**

Risks of different events can then be compared and considered against screening criteria. Such criteria are most often a range of considerations or values and can take a variety of quantitative or qualitative forms.

There may be considerable uncertainty attached to the estimate of the probability of an event; the severity of the consequences if the hazard is realised may be more readily and precisely definable. This 'two-factor model' can be used to evaluate the acute safety and/or environmental risks of a specific incident (e.g. blow-out or oil spill).

The evaluation of chronic effects on the environment arising out of a company's operations, however, will need to take account of some 'events' which are regular or continuous, and intentional—such as the discharge of effluent or the operation of gas flares. For such effects:

**Risk** = **Severity of consequences** = **Exposure** x **Degree of harmfulness**
*(e.g. toxicity, disturbance to habitat)*

Similarly, in health risk assessment the probability of some degree of exposure may be 100%; thus:

**Risk** = **Severity of consequences** = **Exposure** x **Degree of harmfulness**
*(e.g. toxicity)*

Regulatory controls, health surveillance programmes or epidemiological studies (within the company or externally) may indicate exposure to health hazards, chronic effects and the need for risk reduction measures. Harmful agents (agents capable of causing chronic and/or acute adverse health effects) include chemicals (e.g. hydrogen sulphide, hydrocarbon vapours, solvents, coating materials), biological agents (e.g. pathogenic organisms causing malaria and legionella) and physical agents (e.g. ionizing radiation, cold and heat stress, dust, noise and vibration). Ergonomic factors (e.g. equipment design and cumulative effects of repetitive movements) relating to the manner in which tasks are performed will also need to be considered.

The results of formal risk evaluation facilitate:

- Assessment of the feasibility of the proposed activity, based on compliance with the defined screening criteria.
- Identification of the need for specific prevention, mitigation and/or recovery measures.
- Identification of permitted operations (e.g. simultaneous operations).
- Identification of monitoring requirements (e.g. for emission and exposure monitoring).
- Prioritisation of opportunities for improvement.

Evaluation of HSE risks requires access to information on the probabilities of specific events and/or on the nature and severity of likely consequences; sources of such information include, for example:

- Internal knowledge and experience of managers and HSE experts.
- Industry frequency and failure rate databases and co-operative research programmes.

- Relevant international, national and company standards and codes of practice.
- Industry and trade association codes of practice and other guidance.

Company and external R&D aimed at identifying hazards and effects, and assessing and reducing the risks associated with them, is to be encouraged.

### *S4.3 Recording of hazards and effects*

Results of the evaluation need to be recorded, together with the data sources and assumptions used. This record is used by operations personnel developing procedures and issuing work instructions and other key personnel to communicate the hazards that have been identified and the measures that are in place to prevent and mitigate the risks of occurrence. The hazards and environmental effects documentation may be joint or separate documents. Inventories of routine emissions to air, water and land may be maintained to monitor and manage effects. Note that there may be legislative and regulatory requirements for such records as evidence of effective application of hazard management.

### *S4.4 Objectives and performance criteria*

The setting and periodic revision of objectives and performance criteria and the continual enhancement of the HSEMS underpins the company's commitment to improvement of HSE performance. Their quantification, and association with specific timetables, is important to establish the credibility of corporate intentions.

HSE objectives and performance criteria will need to take into account previous performance and to reflect any external changes of circumstances as well as any changes in the business itself.

The detailed objectives and performance criteria within the strategic objectives of the company should be developed with the active participation of those who will be responsible for their achievement.

Performance criteria describe the standards to which a particular activity or system element is to perform, and can apply at various levels within the HSEMS. For example, in addition to specifying acceptable levels of outputs or parameters (e.g. effluent quality, occupational exposure levels, lost-time incidents frequency (LTIF), emission/discharge levels), such criteria may establish the nature and frequency of such tasks as:

- Plant maintenance.
- HSEMS reviews and audits.
- Assessment of training needs.
- Hazard and effects identification and risk assessment.
- Testing of emergency plans.
- Testing emergency shut-down and blow-out prevention systems.
- Testing fire detection, protection and alarm systems.
- Process and emission monitoring.

As the basis for control and monitoring, and performance measurement, criteria need to be both readily measurable, and clearly and unambiguously documented. As a minimum, performance criteria satisfy any relevant regulations, although they may frequently be set in the absence of such regulations.

A hierarchy of HSE goals is thus formed, from company strategic objectives (e.g. to minimise adverse HSE effects), through organisational and more detailed local objectives (e.g. to increase efficiency of energy usage by a stated amount) to specific performance criteria (e.g. to ensure emissions of hydrogen sulphide remain below stated levels).

### *S4.5 Risk reduction measures*

Risk reduction measures can reduce HSE risks and effects in a number of ways, for example by:

- preventing acute and chronic incidents;
- reducing the exposure (concentration/duration) of people to harmful agents that are routinely present in the work area;
- reducing emissions/discharges to the environment.

A variety of risk reduction measures may be employed, appropriate to the nature, probability and severity of the HSE risk or effect (e.g. chronic or acute effects, routine or non-routine operations). Prevention measures are designed to prevent the realisation of hazards. Such measures include specific hardware to control hazardous operations and to maintain asset integrity, such as:

- blow-out preventers;
- pressure release systems;
- personal protective equipment;
- security systems.

It is important to realise that they also include organisational and system measures, such as:

- intrinsically safer designs;
- quality assurance, maintenance and inspection procedures;
- safe working practices;
- Permit to Work systems;
- plans that take account of human factors;
- clear and well-communicated work instructions;
- use of Material Safety Data Sheets (MSDS);
- prophylactic medical treatments such as vaccination/immunisation;
- alcohol and drug-use programmes.

Measures are also required to mitigate or lessen the adverse effects, in the event that a prevention measure fails, and are therefore employed during abnormal or emergency situations. Such measures include, amongst others:

- ignition control systems;
- blast walls;

- secondary tank containments;
- passive fire protection;
- gas/fire/smoke detection.

Contingency and emergency planning is addressed more fully in sections 5.5 and S5.5.

## S5 Planning

### *S5.1 General*

As the means of achieving the company's HSE policy and objectives, soundly-based improvement plans are key components of the HSEMS. Such plans require adequate resources and visible commitment from all personnel. Ideally, such plans will form an integral part of the company's overall business plans.

HSE plans may require development for such activities as:

- Acquisitions.
- New developments.
- Existing operations.
- Modifications to existing facilities.
- Abandonment programmes.
- Geological surveys.
- Seismic surveys.
- Exploration or development programmes.

The resourcing requirements and timescales also require definition to ensure that manpower is available and that necessary budget commitments can be made.

Consultation with regulatory authorities and other external bodies drafting legislation, regulations and standards is recommended to ensure that planning takes account (so far as is possible) of future legislative and regulatory requirements.

### *S5.2 Asset integrity*

It is important that accepted codes of practice and standards for key equipment and related activities are followed.

To help assure the integrity of existing and planned facilities, careful attention needs to be paid to the completeness of the engineering process—with specific reference to the design, manufacture, installation, maintenance, testing and inspection of key equipment. In this context, key equipment refers to that identified in the evaluation process as being critical to the continued effectiveness of HSE controls. Particular emphasis needs to be placed on the design of new facilities, and hazard identification at an early stage allows the best risk reduction measures (those that prevent incidents through eliminating hazards at source) to be employed.

Quality assurance measures during the fabrication of key equipment help

ensure that materials and construction are in accordance with design specifications. Installation processes need to be managed and inspected to check that design specifications and manufacturers' instructions are followed, and attention to effective maintenance, testing and inspection systems helps ensure the continuing integrity of key equipment.

All personnel who perform the activities described above, related to asset integrity, are HSE-critical staff and therefore require appropriate experience, qualifications and training to ensure their competence to undertake these important risk reduction measures.

### *S5.3 Procedures and work instructions*

It is important to ensure that those who will be responsible for putting procedures and written instructions into effect are closely involved in their production. Clarity and simplicity of style and language are the characteristics to aim for in writing them, consistent with accurate coverage of the activities which they address.

Providing instruction on the conduct of worksite tasks can take many forms, depending on the complexity of the task, the competence of the people performing it, the inherent hazards and risks associated with it, and the effects that it might have on other aspects of the operation or facility.

Thus, verbal instructions will need to be supported with, or replaced by, written work instructions wherever the absence of written material could prejudice HSE performance. Written work instructions will outline the work scope and reference any particular direction that is to be followed; similar considerations to those for system procedures apply to their development. Monitoring requirements and needs for personal protective equipment can be specified in the work instructions.

For example, in a production facility where hydrocarbons are stored or produced, stringent controls are required and most work is conducted under a 'Permit to Work' system. Within this, the work is defined, the precautions specified, other parties whose activities may be affected are notified, and the permit signed off by all parties involved.

### *S5.4 Management of change*

Any changes in the personnel, equipment, processes and procedures of the company have the potential for adverse effects on health, safety and the environment.

All changes should be considered. These will include not only equipment changes but also organisational restructurings—such as those that result from acquisitions, mergers, new joint ventures and alliances. Plans relating to changes need to address the HSE aspects arising at all stages of the development, to ensure that risks or adverse environmental effects are minimised by effective planning and design.

For the same reasons, plans relating to new installations or modifications to processes and plant need to cover all stages of the development, from feasibility studies, through planning and design, to construction, commissioning, operation, maintenance and eventual decommissioning and abandonment.

Changes which may be HSE-critical should be reviewed prior to implementation, and any necessary amendments made to the HSEMS to ensure that their introduction does not prejudice sound HSE performance.

### *S5.5 Contingency and emergency planning*

Foreseeable emergencies for which planning needs to be undertaken may include:

- fire and explosion;
- failure of key controls (e.g. loss of well control), of power sources, or of services;
- structural failures;
- worksite injuries;
- diving, marine and aviation incidents;
- man overboard or missing person situations;
- spills and unplanned releases of product or other materials;
- loss of radioactive material;
- security breaches and sabotage;
- outbreaks of disease;
- civil disorder and military actions;
- geophysical and natural events;

and other emergency events highlighted by hazards and effects identification.

Emergency response measures include, amongst others:

- emergency shut-down systems;
- fire-fighting devices;
- emergency evacuation procedures;
- rescue craft;
- first-aid equipment and personnel;
- specialist medical treatment;
- oil-spill clean-up systems.

An important point to note about recovery measures is that since they are only required to act in emergency situations—i.e. rarely—emphasis should be placed upon their reliability, which should be assessed through regular and thorough inspection and testing. Account should be taken of the increased risk involved in carrying out drills and testing of emergency procedures.

The emergency plans will need to:

- be clearly communicated;
- be well-rehearsed;
- co-ordinate internal and external emergency response teams;

- pay particular attention to external communication;
- include provision for the reporting and investigation of incidents;
- take account of the environmental effects of measures taken to manage escalating emergency situations (such as the effects of unconstrained fire-water run-off).

## S6 Implementation and monitoring

### *S6.1 Activities and tasks*

Previous sections have described the planning process, from the development of procedures covering broad areas of activity down to the level of issuing work-site instructions for the conduct of specific tasks. The effective practical implementation of these planned arrangements requires that procedures and instructions are followed, at all levels. Company and contractor staff need to be familiar with relevant procedures and instructions before they start work.

### *S6.2 Monitoring*

Monitoring provides the means of measuring performance against established requirements, including objectives, targets and performance criteria. Thus, monitoring may include such activities as:

- Regular monitoring of progress towards objectives and targets achieved by implementation of HSE plans.
- Regular inspection of facilities, plant and equipment against specific performance criteria.
- Systematic observation of the work and behaviour of first line supervisors to assess compliance with procedures and work instructions.
- Regular analysis of discharges, emissions and waste disposal.
- Health surveillance of staff, including exposure monitoring and medical surveillance.

Monitoring facilitates control of HSE-critical activities and processes, and the detail and frequency of measurement needs to reflect the nature and extent of the risks involved, and concentrate on the areas where it produces the most benefit. Thus ‘higher-risk’ facilities, plant, activities and tasks require monitoring in more detail and at a greater frequency.

### *S6.3 Records*

Records are the evidence of the ongoing operation of the HSEMS. Care is to be taken to limit them to the extent necessary for the specific application, but they need to be kept in order and designed to enable assessment of compliance with policy and of the extent to which objectives are being achieved.

Relevant records compiled under other parts of the overall management system need not be duplicated, but means of access to them is to be specified. In addition to legislative and regulatory requirements, and of significant hazards and environmental effects, records should include:

- Reports of audits and reviews.
- Situations of non-compliance with HSE policy, and of improvement actions.
- Any incidents and follow-up actions.
- Any complaints and follow-up actions.
- Appropriate supplier and contractor information.
- Inspection and maintenance reports.
- Product identification and composition data.
- Monitoring data.
- Training records.

Records provide historic information on reported incidents and cases of non-compliance with the HSEMS, and can thus provide useful information on long-term trends. For example, analysis of records of medical treatments might show an increasing frequency of stomach complaints, suggesting a possible problem in the food handling area or potable water system. Similarly, analysis of records of oil in produced water might show a gradual increase over time, indicating a possible change in reservoir fluids or a need for maintenance/modification of the treatment system.

### *S6.4 Non-compliance and corrective action*

Incidents of non-compliance with specified requirements may be sudden and temporary, or they may persist for a long period. They may result from deficiencies or failures in the management system itself, or in plant or equipment, or from human error.

In the investigation of non-compliance the causative mechanism(s) should be fully established and reported, including factors within the management system. Such investigation will enable planning of corrective action, including measures for:

- Restoring compliance as quickly as practicable.
- Preventing recurrence.
- Evaluating and mitigating any adverse HSE effects.
- Ensuring satisfactory interaction with other components of the management system, such as quality management.
- Assessing the effectiveness of the above measures.

The implementation of the corrective action will not be deemed to have been completed until the effectiveness of all the above has been demonstrated and the appropriate changes made in the procedures, documentation and records.

Where corrective action may involve the initiation of a project over a significant time scale, this will form part of the management plan.

### *S6.5 Incident reporting*

It is important that staff report all incidents so that lessons can be learnt and the HSEMS improved. This requires an open approach to communication and a ‘blame-free’ approach to reporting and follow-up.

The key data which reporting systems acquire includes, as appropriate:

- Details of any injuries, occupational illness or adverse environmental effects.
- Details of involved and/or injured person(s).
- A description of the circumstances.
- Details of the event.
- Details of the outcomes.
- Potential consequences.
- The contribution made to the incident by any failures of the HSEMS.

Generally, reporting of incidents resulting in injury or property damage is prompt and comprehensive. However, incidents which do not result in injury or property damage (so-called 'near-misses') are more frequent and their causes may have the potential to bring about a major incident under slightly different circumstances. Such near-misses—and the valuable information they encapsulate—often go unreported, either because their potential significance is not realised or because staff are discouraged from reporting them by, for example, the fear of blame or the complexity of the reporting system.

Thus, reporting systems need to be kept simple to encourage reporting of near-misses and identification of higher-potential near-misses, consistent with the acquisition of key data.

### *S6.6 Incident follow-up*

All incidents, including higher-potential near-misses, require appropriate investigation in order to:

- Establish their root cause and identify actions to minimise the chance of recurrence.
- Satisfy any statutory requirements for reporting and investigation.
- Provide a factual record of the circumstances of the incident.

The investigation process comprises the following basic steps:

- Notification, initial assessment and incident report.
- Decision on the need for further investigation, and appointment of investigation team.
- The investigation itself, comprising review of the incident site and circumstances, interview of witnesses, and analysis of operating conditions, data and other evidence.
- Preparation of investigation report and agreement of remedial actions.
- Issue of report and plan of action for follow-up.

The first step following the report of the initial assessment of an incident is to decide the appropriate level of investigation. This will depend on the seriousness of the incident and its actual or potential consequences. The significance of the actual consequences should be clear, but that of the potential consequences may not. The potential significance of an incident can be established by asking 'what if' questions.

The size and composition of the investigating team will depend on the particular incident. It is important that the team members are properly trained to carry out the task objectively, impartially and effectively. It should be noted that the investigation may be conducted in parallel to an external investigation by the authorities.

The primary function of an investigation is to identify the likely cause(s) of an incident and identify appropriate remedial actions. Thus the team will need to have the support and authority of company management to obtain the necessary information, and to secure agreement for any remedial action identified.

Progress in implementing remedial actions will need to be monitored, and will not be deemed to have been completed until their effectiveness has been demonstrated. Where action may involve the instigation of a project over a significant timescale, this will be integrated into the HSE plan.

## S7 Auditing and reviewing

### *S7.1 Auditing*

Audits may be internal (carried out by personnel from within the company, but independent of the part being audited) or external (carried out using resources selected by the company). In either case the persons conducting the audit will require training to carry out the task objectively, impartially and effectively. The company should identify and make arrangements for independent, external verification of audits where required.

The audit team will require broad knowledge of HSE matters and experience in auditing practices and disciplines; specialist HSE or other technical expertise may also be necessary. Audit teams require personnel with operational experience in the area being audited, or access to such personnel. To ensure audit effectiveness, the company will need to ensure that audit personnel have the support and authority to procure the necessary information.

Audits may suggest remedial measures to overcome problems, or they may simply note the nature of the problems and require the management of the audited function to devise and implement an appropriate solution. In either case, the recommendations should be agreed and followed-up in the next audit cycle, to ensure that necessary improvements have been made.

The audit report will be submitted to line management of the activity/area being audited and to the management representative for distribution and action as appropriate.

In addition to establishing an independent audit procedure, companies may find it beneficial to encourage line management to carry out similar self-assessment procedures.

### *S7.2 Reviewing*

The scope of reviews includes the company and its activities, products and services with a focus on HSEMS and HSE-critical activities. Thus, for

example, a review of the HSEMS elements for designing a new facility would examine the extent to which the HSE objectives for the project required revision, judge whether or not resource allocation to the project was satisfactory in relation to HSE matters, and determine the extent to which any audit recommendations had been successfully implemented.

Reviews are to be carried out by appropriate members of, or competent independent personnel appointed by, the company's senior management. Issues to be addressed as part of the process will typically include:

- Any recommendations which have been made in audit reports, and whether or not these have been implemented.
- The continuing suitability of HSE policy, and possible revision to address, for example:
  - *Emerging/growing HSE concerns in specific areas.*
  - *Developing understanding of HSE issues.*
  - *Potential regulatory developments.*
  - *Concerns of employees, contractors, customers, government agencies and the public.*
  - *Market pressures.*
  - *Changing company activities and locations.*
  - *Changes in the sensitivity of the environment.*
- The continuing suitability of, and possible revisions to, HSE objectives, and consequent amendments to the HSE plan and other HSEMS elements and documentation.

Reports of reviews need to make clear why they were conducted (e.g. routine procedure, organisational changes, developments in understanding of HSE issues, changes in environmental sensitivity, regulatory developments, reported deficiencies in HSEMS).

Reviews should be used to reinforce the continuous efforts to improve HSE performance.