

# **GUIDE FOR MAJOR HAZARD FACILITIES**

## SAFETY MANAGEMENT SYSTEMS

MARCH 2012



**safe work australia**

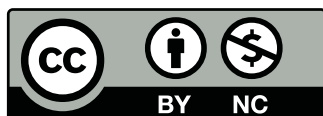


Safe Work Australia is an Australian Government statutory agency established in 2009. Safe Work Australia consists of representatives of the Commonwealth, state and territory governments, the Australian Council of Trade Unions, the Australian Chamber of Commerce and Industry and the Australian Industry Group.

Safe Work Australia works with the Commonwealth, state and territory governments to improve work health and safety and workers' compensation arrangements. Safe Work Australia is a national policy body, not a regulator of work health and safety. The Commonwealth, states and territories have responsibility for regulating and enforcing work health and safety laws in their jurisdiction.

ISBN 978-0-642-33378-0 [PDF]

ISBN 978-0-642-33379-7 [RTF]



### Creative Commons

Except for the logos of Safe Work Australia, SafeWork SA, WorkCover Tas, WorkSafe WA, Workplace Health and Safety QLD, NT WorkSafe, Work Cover NSW, Comcare and WorkSafe ACT, this copyright work is licensed under a Creative Commons Attribution-Noncommercial 3.0 Australia licence. To view a copy of this licence, visit

<http://creativecommons.org/licenses/by-nc/3.0/au/>

In essence, you are free to copy, communicate and adapt the work for non commercial purposes, as long as you attribute the work to Safe Work Australia and abide by the other licence terms.

### Contact information

**Safe Work Australia**

**Phone: +61 2 6121 5317**

**Email: [info@safeworkaustralia.gov.au](mailto:info@safeworkaustralia.gov.au)**

**Website: [www.safeworkaustralia.gov.au](http://www.safeworkaustralia.gov.au)**



# TABLE OF CONTENTS

<b>1. INTRODUCTION</b>	<b>2</b>
1.1 What do the Regulations require?	2
1.2 Components of a Safety Management System	3
<b>2. CONSIDERATIONS FOR DEVELOPING A NEW SMS</b>	<b>4</b>
2.1 Planning	4
2.2 Establishing the SMS	4
2.3 Implementing the SMS	5
<b>3. CONSIDERATIONS FOR FACILITIES THAT ALREADY HAVE A SMS</b>	<b>6</b>
<b>4. ESTABLISHING THE CONTEXT</b>	<b>7</b>
4.1 Elements of the SMS	7
<b>5. COMMITMENT AND POLICY</b>	<b>10</b>
5.1 Safety policy and safety objectives	10
5.2 Commitment	10
5.3 Planning	11
<b>6. IMPLEMENTATION</b>	<b>12</b>
6.1 Organisation and personnel	12
6.2 Operational controls	13
6.3 Duties of operators	14
6.4 Management of change	14
6.5 Design principles and standards	15
<b>7. MEASUREMENT AND EVALUATION</b>	<b>16</b>
7.1 Performance monitoring	18
7.2 Audit	18
<b>8. REVIEW AND IMPROVEMENT</b>	<b>19</b>
<b>APPENDIX A – WHS Regulations</b>	<b>20</b>
<b>APPENDIX B – Definitions</b>	<b>25</b>
<b>APPENDIX C – Further Information</b>	<b>27</b>

# 1. INTRODUCTION

Under the WHS Regulations, operators of major hazard facilities (MHFs) must establish and implement a Safety Management System (SMS) that must be used as the primary means of ensuring the safe operation of the MHF.

A SMS is a comprehensive and integrated system for managing health and safety risks at a major hazard facility.

This Guide provides an overview of what a SMS must contain to comply with the requirements of the WHS Regulations. It is not intended to provide detailed guidance on how to set up a SMS for the first time.

This guidance has been prepared for the operator of a MHF who is responsible for preparing the safety case and coordinating the necessary work prior to applying for a MHF licence or renewal. Most facilities applying for a MHF licence will already have an established SMS. If you are in this position, this guidance will help you identify any gaps between the current SMS at your facility and the WHS Regulations.

However, some facilities may not have a comprehensive SMS in place at the time of applying for a MHF licence e.g. where an operator is applying for a MHF licence for the first time. If you are in this position, the information in this Guide should be supplemented by reading more comprehensive material on the subject to assist you in establishing a compliant SMS. See Appendix C for a recommended list.

This Guide forms part of a set of guidance material for MHFs that includes information on:

- Notification and Determination
- Safety Assessment
- Developing a Safety Case Outline
- Preparation of a Safety Case
- Safety Case: Demonstrating the Adequacy of Safety Management and Control Measures
- Information, Training and Instruction for Workers and Others at the Facility
- Providing Information to the Community
- Emergency Plans.

## 1.1 What do the Regulations require?

The operator of a determined MHF must establish and implement a SMS for the operation of the MHF. The SMS must:

- be comprehensive and integrated with respect to adopted control measures in relation to the occurrence and potential occurrence of major incidents at a MHF
- be implemented, so far as is reasonably practicable, and used as the primary means of ensuring the safe operation of a MHF
- have sufficient focus on major incident safety which includes planning and operations
- comply with all of the requirements prescribed in regulation 558 and Schedule 17, including that the SMS must be documented and readily accessible to persons who use it
- cover the whole facility defined within the Safety Case
- be continually reviewed and revised so that the SMS remains current and effective.

The SMS should not be a pure paperwork system; rather it should reflect the overall safety culture and practical operation of the facility, and should be consistent with the assessment of risk gained from the Safety Assessment.

All persons involved in the operation of a MHF should have knowledge of the SMS prepared for the facility.

Further details of the requirements under the WHS Regulations are set out in Appendix A and definitions of terms used in this Guide are set out in Appendix B.

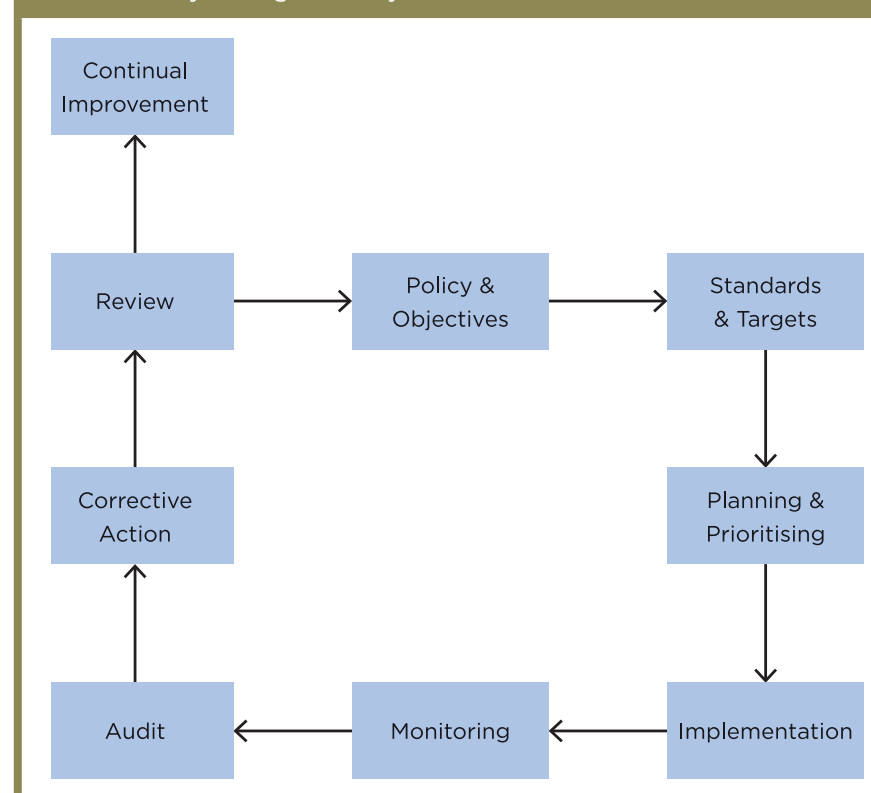
## 1.2 Components of a Safety Management System

The main components of Safety Management Systems correspond with the structural elements of a generic management system specified in AS/NZS 4804:2001 – *Occupational health and safety management systems* (see Figure 1). Key components include:

establishing the context (see Section 4 of this Guide)

- commitment and policy (see Section 5 of this Guide)
- planning and prioritising (see Section 5.3 of this Guide)
- implementation (see Section 6 of this Guide)
- measurement and evaluation (see Section 7 of this Guide)
- review and improvement (see Section 8 of this Guide).

**FIGURE 1:** Safety Management System model



## 2. CONSIDERATIONS FOR DEVELOPING A NEW SMS

This section provides an overview of the issues that should be considered by new MHF operators.

### 2.1 Planning

When establishing a SMS for a MHF where a SMS does not exist, matters that should be considered include the:

- information required e.g. background understanding and explanation of what is needed for those who will be involved in developing and implementing the SMS
- people to be involved e.g. a mix of people and roles for the various stages of system development and implementation
- allocation of time for the various tasks involved. These timeframes should not be underestimated
- technique(s) to be used
- documentation of the development process, such as consultation
- documentation of outcomes such as safe work procedures and worker training materials.

### 2.2 Establishing the SMS

The SMS of a determined MHF must provide a comprehensive and integrated system for the management of all aspects of controlling the risk of major incidents at the facility.

Establishing a SMS involves developing and implementing SMS procedures. For most MHFs, this stage will also involve considerable consultation. It is recommended that operators in this position seek assistance from someone familiar with what is involved (such as consultants) due to the large amount of work required at this stage.

There are some off-the-shelf SMS packages available that may assist in developing a SMS. However, since these are often generic, a certain amount of work is still usually required to tailor the package to suit the particular MHF's operations.

The hazard identification, safety assessment and risk management required by regulations 554–556 provides operators with a clear understanding of what controls are needed to prevent major incidents occurring at a facility, while regulation 559(2) requires all implemented control measures to be adequately supported by the SMS so that they will function effectively each and every time they are needed. The operator therefore needs to check that each control measure in relation to major incidents is adequately supported by relevant systems within the SMS. In practice this is generally not as daunting as it may sound, since most control measures are supported by a few common SMS elements. For example:

- The reliability of all safety instrumented systems (SIS) is assured by a maintenance and inspection program or critical function testing (CFT).
- The reliability of procedural control measures is assured by including them in a competency based training and assessment program (CBTA).

## 2. CONSIDERATIONS FOR DEVELOPING A NEW SMS

Some means of ensuring that systems work together and that links between systems are not broken should be provided when setting up a new SMS. Some operators do this by regular programmed reviews of all documents within the SMS. Some operators with electronic document systems ensure that links between documents are always maintained by providing hot links between them.

### 2.3 Implementing the SMS

Once the SMS procedures have been developed, they then need to be implemented by people who have the appropriate skills and knowledge. Training packages should be developed to explain the SMS and delivered to all workers involved in implementing the SMS. The time and effort involved in fully implementing the SMS should not be underestimated and you should avoid delaying the development of the SMS.

### 3. CONSIDERATIONS FOR FACILITIES THAT ALREADY HAVE A SMS

Most determined MHFs may already have some form of SMS in place at the time they first provide notification of the facility. In general, the task of establishing a SMS that complies with the WHS Regulations is an easier task for these facilities than for those developing a SMS for the first time, as the task is primarily one of conducting a gap analysis between their current SMS and the regulatory requirements and then making the necessary revisions or additions.

Particular attention should be paid to the requirements in Schedule 17 of the Regulations. It is also advisable to check:

- that systems are actually implemented in practice and before the regulator conducts any verification
- that all engineering and procedural controls are covered by the usual support systems, including CFT and CBTA
- whether emergency plans cover all potential major incidents identified in the safety assessment.



## 4. ESTABLISHING THE CONTEXT

The first step in preparing the SMS is to evaluate and understand both the internal and external environment that the MHF operates in, as this can significantly influence the design of the SMS.

Evaluating the MHF's external context may include:

- the social and cultural, political, legal, regulatory, financial, technological, economic, natural and competitive environment, whether international, national, regional or local
- key drivers and trends having an impact on the objectives of the organisation
- relationships with, and values of, external stakeholders.

Evaluating the MHF's internal context may include:

- governance, organisational structure, roles and accountabilities
- policies and objectives, and the strategies that are in place to achieve them
- capabilities, understood in terms of resources and knowledge (e.g. capital, time, people, processes, systems and technologies)
- information systems, information flows and decision-making processes (both formal and informal)
- relationships with, and values of, internal stakeholders
- the MHF's culture
- standards, guidelines and models adopted by the MHF
- the form and extent of contractual relationships.

### 4.1 Elements of the SMS

Establishing the context will lead to the SMS including a number of elements that address the following:

- **higher level system needs** including policies, objectives and structures to achieve those objectives
- **day-to-day safe operation** including operating procedures, work permitting and maintenance management
- **longer term safety** of the facility including risk management, emergency planning, asset integrity management and management of change
- **personnel-related systems** including recruitment, worker induction and training, consultation, contractor selection, and management and training
- the **effectiveness of the SMS** including performance monitoring, auditing, incident investigation and continuous improvement
- **administrative procedures** such as document control.

Different operators have different ways of organising these elements. For example, asset integrity management is treated by different operators as a part of the maintenance management system, an aspect of the risk management system or a stand-alone system. Depending on the complexity of the operations at a facility and the way elements are grouped, a SMS may vary from 12 to 30 principal elements and may include an array of underlying sub-systems, documents, procedures and forms.

Table 1 details a list of common elements that are likely to be present at most MHFs. In many cases the structure of the SMS is influenced by the practices of the broader organisation relevant to the MHF.

Policies	
Leadership, management, accountability and commitment	<ul style="list-style-type: none"> <li>■ Leadership and commitment</li> <li>■ Organisation, accountability, responsibility and authority (including resources)</li> <li>■ Communication, consultation and community involvement</li> <li>■ Planning, objectives and targets</li> </ul>
Hazard and risk management	<ul style="list-style-type: none"> <li>■ Hazard identification</li> <li>■ Risk assessment</li> <li>■ Control measures (e.g. hierarchy, selection, etc.)</li> </ul>
Information and documentation	<ul style="list-style-type: none"> <li>■ Document control and management</li> <li>■ Legal requirements/Regulatory compliance</li> </ul>
Design and construction	<ul style="list-style-type: none"> <li>■ Design</li> <li>■ Construction</li> <li>■ Commissioning</li> <li>■ Decommissioning</li> <li>■ Deconstruction</li> <li>■ Standards</li> </ul>
Incident management	<ul style="list-style-type: none"> <li>■ Reporting</li> <li>■ Investigation</li> <li>■ Analysis</li> <li>■ Follow up</li> </ul>
Management of change	
Contractor management	<ul style="list-style-type: none"> <li>■ Third parties</li> <li>■ Suppliers</li> <li>■ Visitors</li> <li>■ Contractors</li> </ul>
Emergency preparedness and response (can include community communication/consultation)	
Purchasing	<ul style="list-style-type: none"> <li>■ Materials</li> <li>■ Equipment</li> <li>■ Standards</li> </ul>

Policies	
Systems of work/operations and maintenance (sometimes two elements, sometimes one)	<ul style="list-style-type: none"> <li>■ Operations</li> <li>■ Maintenance</li> <li>■ Permit to work</li> <li>■ Other systems of safe work (hot, cold, confined space, heights, excavation, etc.)</li> <li>■ Procedures, etc.</li> <li>■ Critical systems and devices</li> <li>■ Inspection and maintenance requirements</li> </ul>
Personnel	<ul style="list-style-type: none"> <li>■ Selection</li> <li>■ Training</li> <li>■ Competency</li> <li>■ Induction</li> <li>■ Behaviours</li> <li>■ Rewards and discipline</li> </ul>
Monitoring, auditing, review and improvement	<ul style="list-style-type: none"> <li>■ Monitoring and measurement</li> <li>■ Reporting and action tracking/completion</li> <li>■ Auditing</li> <li>■ Review and assessment</li> <li>■ Improvement</li> <li>■ NB: check of effectiveness, not just activity.</li> </ul>
Additional management system elements could be included, such as:	
Health and fitness for work	<ul style="list-style-type: none"> <li>■ Work environment</li> <li>■ Health monitoring</li> <li>■ Return to work</li> </ul>
Environment and waste management	<ul style="list-style-type: none"> <li>■ Pollution minimisation/prevention</li> <li>■ Resource conservation/use minimisation</li> <li>■ Product stewardship</li> </ul>
Quality management	

TABLE 1: COMMON SMS ELEMENTS

## 5. COMMITMENT AND POLICY

The operator of a MHF should define its safety policy and ensure commitment to its SMS. While often generic, the safety policy and the organisational commitment to achieving it set out the framework for the SMS and how it will be followed at the MHF.

### 5.1 Safety policy and safety objectives

A health and safety policy that sets out a high level statement detailing the operator's broad aims for the safe operation of the facility should be created. Policy statements, or Charters in some cases, are usually expressed in general terms (see Example 1 below). The policy is intended to inform all stakeholders, including workers and others, that safety is an important part of all operations and should be reinforced through periodic review and involvement of management.

The policy objectives should be as specific as possible and quantified where possible, as it is easier to measure performance against clear and quantified objectives.

### 5.2 Commitment

A MHF's success at fulfilling its safety policy and achieving its safety objectives is usually proportional to the organisation's commitment to achieving those goals amidst all the other goals competing for its attention, and hence the importance of clear commitment to those safety objectives starting at senior management level.

Regular review of safety performance and performance against the safety objectives at management level reinforces the importance of safety to the organisation's success. While management are required to demonstrate commitment through their actions and involvement, all workers need to be involved for the system to be fully functional and integrated. Everyone at the facility should be aware of the influence that their action or inaction may have on the effectiveness of the system.

#### EXAMPLE 1 – SAFETY POLICY AND OBJECTIVES

##### ***Safety Policy***

These are often expressed in general terms. Common examples of goals include:

- “We are committed to providing a safe work place and safe systems of work for all workers.”
- “We continuously seek ways to improve the health and safety of our workforce and the community.”

##### ***Specific Safety Objectives***

These tend to be more specific and concrete, such as:

- “A reportable injury rate of < x per 1000 hours worked by the workforce.”
- “Complete retrospective HAZOP program for Plant Areas X and Y.”
- “Develop and deliver new CBTA training program for Emergency Response Team.”

### 5.3 Planning

The 'planning' stage of safety management is the work performed to define the scope, boundaries and performance objectives of specific SMS components. Many MHFs achieve this by setting standards for various SMS elements. These standards are different to the performance standards specified in Schedule 17. For example, one of the ways a MHF can achieve its policy objective of "*providing a safe work place and safe systems of work*" is to have an effective Work Permit system. The 'planning' for the Work Permit system might involve the setting of 'standards' similar to those detailed in Example 2 below.

System standards are often specified by the parent business or undertaking of many MHF operators. The local MHF operator then has the simpler task of developing a specific local procedure or work instruction in some cases that meets the requirements of the standard and the requirements of the WHS Regulations.

Some other aspects of the SMS that could be considered during planning are:

- emergency planning, including the development of pre-incident plans
- development of engineering standards for application in particular services throughout the facility and pre-emptive risk studies.

#### **EXAMPLE 2 - PLANNING: EXPECTATIONS/STANDARDS/REQUIREMENTS FOR A WORK PERMIT SYSTEM**

The operator of a MHF decides that the work permit system for the facility needs to meet the following standards:

- The system clearly defines what sort of 'work' must be covered by the permit system.
- The distinction between types of permit (e.g. cold work, hot work, confined space entry) is clearly defined.
- The work to be carried out under the permit is clearly defined on the permit form.
- The permit system includes an effective preparation/isolation step that ensures that equipment covered by the permit can be worked on safely.
- Precautions to be taken by the person carrying out the work are clearly specified on the permit.
- Preparation and isolation is confirmed before the permit is issued.
- Permits can only be issued by qualified permit authorisers.
- Permits can only be received by people who are fully trained in the operation of the permit system.
- The system includes means of ensuring that the permit receiver fully understands the work to be done and its associated safety requirements.
- The system ensures that the work area is made safe to operate before the permit is returned.
- Any requirements for extending the duration of a work permit past the shift on which it was issued are clearly specified.

## 6. IMPLEMENTATION

The implementation part of the SMS is the group of elements directly involved in the day-to-day operation of the facility. Examples include:

- operating procedures
- maintenance procedures
- direct work management, including work permits
- emergency exercise programs
- asset integrity programs
- contractor management and the CBTA systems.

For the purposes of this Guide, this section is divided into the headings for sub-sections in Schedule 17.

### 6.1 Organisation and personnel

The WHS Regulations require all SMSs to contain systems that ensure the facility has people with appropriate responsibilities and necessary skills to implement the procedures and other activities contained in the SMS.

The SMS must also define the roles and responsibilities of individuals to ensure the safe operation of the facility, and the overall means of ensuring they have the necessary knowledge and skills to enable them to perform their allocated tasks and discharge their allocated responsibilities.

Typically these systems could include role statements for all positions of responsibility, a system for defining the skills necessary for all positions (e.g. skills matrix), a training management system complete with specific training modules, and a record keeping system that keeps track of skills gaps and the need for refresher training and upgrades (see Example 3).

There are a number of other personnel and human factor issues that could impact on safe operation. MHFs may decide to include systems that address these factors as part of their SMS, for example:

- management of knowledge
- competency assurance
- staff turnover
- changes in skills or knowledge
- clarity of command structures and responsibilities
- handling workloads
- fatigue and shift work
- communications

handling disputes.

**EXAMPLE 3 - SKILLS MATRIX**

The operator of a chemicals manufacturing MHF has defined the training and skills needed to fill each Operations position at its facility and organised them in a skills matrix. Below is an extract from the matrix. The operator has this linked to a training records database, and uses it to send an advisory notice to the training co-ordinator six months before refresher training is due for each individual. The individual's training status is shown at a glance by a colour scheme on the matrix. Any training that has not been done, or refresher training that is more than three months overdue, is highlighted in red.

Shift A	Induction Refresher	Work Permit System	Emergency Response Team	Tank Farm Operation	Reactor Area Operation	Warehouse Operation
Supervisor A						
Operator A1						
Operator A2						
Operator A3						
Operator A4						
Operator A5						

## 6.2 Operational controls

The operational controls required by the WHS Regulations include all processes and procedures impacting directly on safe operation of plant. For most MHFs, this group of elements is likely to make up the majority of the SMS.

Operational controls likely to be of particular importance to MHFs are the processes and procedures for:

- operating plant and equipment
- maintaining the integrity of that equipment
- permitting work
- starting up plant or commissioning
- shutting down plant or de-commissioning
- achieving safe isolation of equipment
- controlling abnormal conditions
- identifying, handling, and reducing or eliminating human error, including procedural checks
- error reporting
- alarm handling procedures
- fault-tolerant procedures and processes for improving compliance with procedures.

### 6.3 Duties of operators

The SMS must include a description of the policies and procedures that the operator proposes to use to comply with the WHS Act and the following:

- Division 3 of Part 9.3 of the WHS Regulations (Duties of operators of determined MHFs – Management of risk)
- Part 9.4 of the WHS Regulations (Licensed MHFs – Risk management)
- Part 9.5 of the WHS Regulations (Consultation and Workers' Safety role).

Although not specified in the regulations, MHFs may also choose to extend the SMS component to check and ensure compliance with other relevant obligations under the Regulations, such as Chapter 7 – Hazardous Chemicals.

The documented procedures and other SMS components that are relied upon to meet obligations under Chapter 9 of the Regulations must be clearly identified with an annotation or cross-reference identifying the specific provision being complied with.

### 6.4 Management of change

The SMS must contain formal procedures for planning and managing 'modifications' (as defined in Appendix B) at the facility. These are commonly referred to as 'Management of Change' (MoC) process. This is an essential element of a robust and comprehensive SMS, as changes can introduce new major hazards or potential major incidents and can increase the risk arising from existing hazards. There should also be effective management of all changes in the facility including operational, organisational, procedural and equipment changes.

Regulations 559 and 569 require the safety assessment, emergency plan and safety management system to be reviewed, and if necessary revised. The MoC procedure should ensure that these reviews will happen every time a relevant change is proposed.

The MoC process at most MHFs manages more than the health and safety concerns of a proposed change.

The MoC system should at least:

- define the type of change to which it applies. For many MHFs, the system applies to anything other than 'like for like' replacement
- require consultation with all workers or their representatives likely to be affected by the change
- ensure that the proposal for change is reviewed for all health and safety implications by people sufficiently knowledgeable to make informed judgements in their areas of expertise, such as operations or maintenance
- ensure that the proposal is reviewed and approved before it is implemented
- ensure that necessary follow-up activities arising from the change are completed in time, for example updating drawings, equipment registers, procedures, training modules, etc.



## 6.5 Design principles and standards

The SMS must contain an element that documents the design principles and engineering standards that the operator is relying on to ensure safe operation of the facility. Since most standards change over time, the system needs some means of ensuring that it is kept up-to-date.

'Design principles' can take many forms and may include technical, engineering or management principles developed or applied by the operator. Examples include:

- principles for the management of human factors
- standards for development or implementation of operating procedures
- design principles for control rooms and alarm systems
- engineering design standards
- fire protection standards
- maintenance standards
- loss control principles
- 'layers of protection'
- process control systems.

These are often captured in Basis of Design documents for new facilities, but may be harder to collect and document for older facilities. They should be consistent with the approach to risk reduction and safety management in the facility's Safety Case.

The specification of engineering standards should be more detailed than a simple generic statement such as "Flammable liquids storage facilities conform to AS 1940". Many MHFs use corporate-wide engineering standards which can include quite specific details, for example what type of valves are permitted or preferred in certain services, when certain types of level gauges are permitted, mandated or forbidden, and rules for setting alarm set points for various services.

## 7. MEASUREMENT AND EVALUATION

The next SMS elements of the continuous improvement cycle are those involved with measurement and evaluation. It is through measurement and evaluation that the MHF operator knows what elements of the SMS elements are effective.

The two main aspects of this element are:

- measuring or monitoring the performance of specific aspects of the SMS
- evaluating or judging if the performance is sufficient to achieve the function that the system or control is intended to achieve.

Clause 7 of Schedule 17 of the WHS Regulations makes mandatory a number of requirements for performance monitoring at a MHF. Clause 8 of Schedule 17 also requires auditing of SMS performance against the performance standards set by the operator.

### 7.1 Performance monitoring

The operator must have a system in place for monitoring the performance of both SMS elements and control measures.

This involves developing:

- performance standards that are sufficiently detailed for measuring the effectiveness of all aspects of the SMS
- performance indicators for measuring the effectiveness of control measures, including indicators of the failure of any control measure.

In setting performance standards operators should consider the following questions:

- How will I know that this particular SMS system is working effectively?
- Alternatively, what will tell me that the system is not working?

As an example, almost all MHFs have a formal incident investigation system within their SMS. A common performance measure for the system is the length of time taken to fully complete an investigation, and may have a performance standard of 'No outstanding incident investigations > X days', where X is based on some historical evidence of how long an incident investigation should take. While this is a useful measure for showing if the investigation system exists, it gives no indication of how good the investigations are, or whether they are effective in achieving their purpose or identifying direct and underlying causes of incidents so that action can be taken to prevent similar occurrences in the future. A more meaningful performance measure might result from an independent review of the investigation and a rating given for causes being identified and relevant follow-up action items being developed.

Similar thinking is required for developing performance indicators for control measures with appropriate targets. Since control measures tend to be more concrete when compared with SMS elements, assigning performance indicators for control measures may be an easier task than assigning performance standards. It is possible that indicators may be for a group of controls rather than an individual control. However, it is also possible that more than one may be required for a particular control.

Performance indicators should be defined for all control measures, which enable the MHF operator to measure, monitor or test the effectiveness or failure of each control measure. However, it is not necessary to define a separate indicator for each and every control measure individually i.e. it is possible to define an indicator for a group of control measures. Pressure safety valves (PSVs) are an example of such a group (see Example 4). It may also be necessary to define more than one indicator for a control measure or group of control measures. The operator should also determine the method for reporting performance against these indicators and corrective actions to be taken in the event of failure of controls and in the event of the indicators not meeting performance targets.

Performance indicators should measure the performance of control measures and also how well the management system is monitoring and maintaining them. Performance indicators for control measures therefore overlap with the performance standards required for the SMS. Some performance standards for engineered control measures may be adopted from manufacturer's recommendations. However, operators should determine if these are appropriate to the specific conditions of their facility. Performance indicators take many forms and can be quantitatively or qualitatively expressed. In practice, having an effective maintenance system such as a system for testing critical functions is the only practical way to monitor performance of individual control measures.

### **EXAMPLE 4 - PERFORMANCE INDICATORS AND STANDARDS FOR CONTROL MEASURES**

#### ***Examples of performance indicators and standards for control measures***

General standards may be set for completion of testing, calibration or maintenance within a fixed timeframe.

#### ***In the case of a pressure relief or safety valve (PSV)***

The performance indicator is the pressure at which the PSV relieves during a pop test, while the performance standard is that it should relieve within 3 per cent of the set pressure.

A second standard may be that 98 per cent of valves should relieve at their set pressure, with the indicator showing performance against the standard e.g. 90 per cent of these valves met the standard.

A third standard (related to the effectiveness of a PSV) may be that there should be no more than 1 'fail-to-danger' test (i.e. where PSV lifts >10 per cent above set point) every four years.

The corrective action in event of failure (i.e. not relieving at the set pressure) may be replacement, re-calibration or a reduction in the test interval, depending on the valve or service.

The results of monitoring the second and third performance measures should be reported to management, while the first set may be used primarily as a guide for maintenance personnel to determine what their action should be in response to failure. Management review and follow-up should ensure that all fail-to-danger cases are investigated and corrective action taken as required.

### 7.2 Audit

Auditing is the most commonly used means for operators to check the performance of SMS elements against their performance standards. The SMS of a MHF must include a system for managing these audits (e.g. qualifying auditors, scheduling, documenting results and tracking recommendations).

Auditing should look at both implementation and functionality of the systems, that is:

- Does the MHF have a system that meets the required standard?
- Does the MHF follow its own system procedures and are they effective?

Persons unfamiliar with auditing should refer to a recognised standard such as AS4801 or SafetyMAP (see reference section at Appendix C).

## 8. REVIEW AND IMPROVEMENT

The SMS should include some means for the operator to formally review SMS performance and develop improvements based on the results of the review. There are many different ways to review safety performance, but it often consists of reviews by the management committee with health and safety representatives and often assisted by technical specialists.

The review committee is likely to examine data from the operator's performance monitoring system on a regular basis. Some performance indicators may be activity measures and some should be effectiveness measures. The review should identify any gaps, consider what factors might be causing or contributing to those gaps and assign follow-up action items to close any gaps.

If an activity measure shows that a particular system is not being used in the required situations, review by management should consider why that would be happening. For example:

- Are people unaware the system is required in those situations?
- Is the system too cumbersome?
- Are human factors involved?

The actions needed to improve performance may be quite different if effectiveness measures are found to be deficient. For example, if the data showed that the system was being used but incorrectly or that the safety matters that system was meant to manage were breaking down despite personnel using the system as specified, the system may need to be revised.

The safety review system may also include other matters to generate improvements, including incidents at similar facilities in Australia or overseas, or new and emerging issues that may be relevant to the facility's operation.

The system should also provide a means of prioritising action items and improvements, with higher priority being given to higher risk issues. Progress on action items should be formally tracked.

# APPENDIX A — WHS REGULATIONS

## FOR A DETERMINED MHF

Regulation	Requirement
<b>558</b>	<p><b>Safety Management System</b></p> <ul style="list-style-type: none"> <li>(1) The operator of a determined major hazard facility must establish a safety management system for the operation of the major hazard facility, in accordance with this regulation.</li> <li>(2) The operator of a determined major hazard facility must implement the safety management system for the major hazard facility, so far as is reasonably practicable.</li> <li>(3) The safety management system must: <ul style="list-style-type: none"> <li>(a) provide a comprehensive and integrated system for the management of all aspects of risk control in relation to the occurrence and potential occurrence of major incidents at the major hazard facility; and</li> <li>(b) be designed to be used by the operator as the primary means of ensuring the safe operation of the major hazard facility.</li> </ul> </li> <li>(4) The safety management system must: <ul style="list-style-type: none"> <li>(a) be documented; and</li> <li>(b) state the operator's safety policy, including the operator's broad aims in relation to the safe operation of the major hazard facility; and</li> <li>(c) state the operator's specific safety objectives and describe the systems and procedures that will be used to achieve those objectives; and</li> <li>(d) include the matters specified in Schedule 17; and</li> <li>(e) be readily accessible to persons who use it.</li> </ul> </li> </ul>

Regulation	Requirement
<b>Schedule 17</b>	<p><b>Additional matters to be included in safety management system of major hazard facility</b></p> <p><b>1 Safety policy and safety objectives</b></p> <p>1.1 A description of the means by which the operator's safety policy and specific safety objectives are to be communicated to all persons who are to participate in the implementation of the safety management system.</p> <p>1.2 The safety policy must include an express commitment to ongoing improvement of all aspects of the safety management system.</p> <p><b>2 Organisation and personnel</b></p> <p>2.1 The identification (according to position description and location) of the persons who are to participate in the implementation of the safety management system, and a description of the command structure in which these persons work and of the specific tasks and responsibilities allocated to them.</p> <p>2.2 A description of the means of ensuring that these persons have the knowledge and skills necessary to enable them to undertake their allocated tasks and discharge their allocated responsibilities, and that they retain such knowledge and skills.</p> <p><b>3 Operational controls</b></p> <p>3.1 A description of the procedures and instructions for:</p> <ul style="list-style-type: none"> <li>(a) the safe operation of plant (including as to inspection and maintenance); and</li> <li>(b) the mechanical integrity of plant; and</li> <li>(c) plant processes; and</li> <li>(d) the control of abnormal operations and emergency shut down or decommissioning.</li> </ul> <p>3.2 Provision of adequate means of achieving isolation of the major hazard facility or any part of the major hazard facility in the event of an emergency.</p> <p>3.3 Provision of adequate means of gaining access for service and maintenance of the major hazard facility or any part of the major hazard facility.</p> <p>3.4 A description of the roles of persons and of the interfaces between persons and plant.</p> <p>3.5 Provision for alarm systems.</p>

Regulation	Requirement
<b>Schedule 17</b>	<p><b>4 Duties of operators</b></p> <p>4.1 A description of the means by which the operator proposes to comply with the Act and with Division 2 of Part 9.3, Part 9.4 and Part 9.5 of these Regulations.</p> <p>4.2 In relation to each part of the documented safety management system that describes the means of compliance with a provision of Chapter 9, an annotation or cross-reference identifying the specific provision being complied with.</p> <p><b>5 Management of change</b></p> <p>A description of the procedures for planning modifications to major hazard facilities.</p> <p><b>6 Principles and standards</b></p> <p>6.1 A statement of the principles, especially the design principles and engineering standards, being used to ensure the safe operation of the major hazard facility.</p> <p>6.2 A description of any technical standards, whether published or proprietary, being relied on in relation to such principles and standards.</p> <p><b>7 Performance monitoring</b></p> <p>7.1 Performance standards for measuring the effectiveness of the safety management system, that:</p> <ul style="list-style-type: none"> <li>(a) relate to all aspects of the safety management system; and</li> <li>(b) are sufficiently detailed to ensure that the ability of the operator to ensure the effectiveness of all aspects of the safety management system is apparent from the documentation; and</li> <li>(c) include steps to be taken to continually improve all aspects of the safety management system.</li> </ul> <p>7.2 A description of the way in which these performance standards are to be met.</p> <p>7.3 Performance indicators for the effectiveness of control measures implemented, including:</p> <ul style="list-style-type: none"> <li>(a) tests of the effectiveness of the control measures; and</li> <li>(b) indicators of the failure of any control measure; and</li> <li>(c) actions to be taken in reporting any such failure; and</li> <li>(d) other corrective actions to be taken in the event of any such failure.</li> </ul> <p><b>8 Audit</b></p> <p>Provision for the auditing of performance against the performance standards, including the methods, frequency and results of the audit process.</p>



**FOR A LICENSED MHF**

Regulation	Requirement
<b>568</b>	<b>Safety Management System</b> (1) The operator of a licensed major hazard facility must implement the major hazard facility's safety management system established under regulation 558 as revised under Part 9.3 and this Part. (2) The operator must use the safety management system as the primary means of: <ul style="list-style-type: none"> <li>(a) ensuring the health and safety of workers engaged or caused to be engaged by the operator and workers whose activities in carrying out work are influenced or directed by the operator while the workers are at work in the operation of the major hazard facility; and</li> <li>(b) ensuring the health and safety of other persons is not put at risk from work carried out as part of the operation of the major hazard facility.</li> </ul>
<b>569</b>	<b>Review of risk management</b> (1) The operator of a licensed major hazard facility must review and as necessary revise <ul style="list-style-type: none"> <li>(c) the major hazard facility's safety management system</li> </ul>

**INFORMATION TO BE CONTAINED IN SAFETY CASE**

Regulation	Requirement
<b>561</b>	<b>Content</b> (2) A safety case must contain: <ul style="list-style-type: none"> <li>(a) a summary of the major hazard facility's safety management system and the additional matters specified in Schedule 18.</li> </ul>
<b>Schedule 18 5.1</b>	<b>Additional matters to be included in safety case for a major hazard facility</b> At all points in the safety case where the matter addressed is covered by the safety management system, a clear reference to the relevant part of the documented safety management system.
<b>Schedule 18 5.2</b>	A description of those parts of the documented safety management system that address the ongoing effective implementation and ongoing review and revision of the safety management system.

*Consultation is specifically required in developing, implementing, reviewing and revising the SMS*

**CONSULTATION IS SPECIFICALLY REQUIRED IN DEVELOPING, IMPLEMENTING, REVIEWING AND REVISING THE SMS**

Regulation	Requirement
<b>575(1)</b>	<p><b>Operator of major hazard facility must consult with workers</b></p> <p>(1) For the purposes of section 49(f) of the Act (consultation required when carrying out an activity prescribed by the regulations), the operator of a determined major hazard facility must consult with workers at the major hazard facility in relation to:</p> <p>(c) the establishment and implementation of the major hazard facility's safety management system;</p> <p>(2) For the purposes of section 49(f) of the Act, the operator of a licensed major hazard facility must consult with workers at the major hazard facility in relation to:</p> <p>(b) the implementation of the major hazard facility's safety management system;</p>

## APPENDIX B — DEFINITIONS

**Comprehensive system** means a system that is complete, broad, extensive and thorough.

**Integrated system** means a system that is logical, structured, ordered, combined into a whole entity.

**Major hazard facility (MHF)** means a facility:

- at which Schedule 15 chemicals are present or likely to be present in a quantity that exceeds their threshold quantity
- that is determined by the regulator under Part 9.2 to be a major hazard facility.

**Major incident** at a major hazard facility is an occurrence that:

- results from an uncontrolled event at the major hazard facility involving, or potentially involving, Schedule 15 chemicals
- exposes a person to a serious risk to health and safety emanating from an immediate or imminent exposure to the occurrence.

An **occurrence** includes any of the following:

- an escape, spillage or leakage
- an implosion, explosion or fire.

**Major incident hazard** means a hazard that could cause, or contribute to causing, a major incident.

**Modification** is a reference to a change at the facility that has or would have the effect of:

- creating a major incident hazard that has not previously been identified
- significantly increasing the likelihood of a major incident occurring
- in relation to a major incident that may occur, significantly increasing:
  - its magnitude
  - the severity of its health and safety consequences.

**Operate**, in relation to a facility, means conducting the business or undertaking of operating the facility. This will include all phases of operation including normal operation, static storage, transfers, shut down, start-up, commissioning, decommissioning and maintenance.

**Operator**

- in relation to a facility, means the person conducting the business or undertaking of operating the facility, who has:
  - management or control of the facility
  - the power to direct that the whole facility be shut down
- in relation to a proposed facility, means:
  - the operator of a proposed facility that is an existing workplace
  - the person who is to be the operator of a proposed facility that is being designed or constructed.

**Safety assessment** is the process by which the operator of a major hazard facility systematically and comprehensively investigates and analyses all aspects of risks to health and safety associated with all major incidents that could occur in the course of the operation of the major hazard facility.

**Safety case** is a written presentation of the technical, management and operational information covering the hazards and risks that may lead to a major incident at a major hazard facility and their control, and which provides justification for the measures taken to ensure the safe operation of the facility.

**Safety policy** is a statement by the company/business of its commitment, intentions and principles in relation to its overall work health and safety performance, which provides a framework for action and for the setting of its work health and safety objectives and targets.

**Schedule 15 chemical** means a hazardous chemical that:

- is specified in Schedule 15, table 15.1 of the WHS Regulations
- belongs to a class, type or category of hazardous chemicals specified in Schedule 15, table 15.2 of the Regulations.

## APPENDIX C — FURTHER INFORMATION

Australian Standard, AS/NZS 4804:2001 – *Occupational health and safety management systems*.

American Institute of Chemical Engineers, Center for Chemical Process Safety (1994), *Guidelines for Implementing Process Safety Management Systems*.

American Petroleum Institute (1990), API RP750, *Management of Process Hazards*.

American Petroleum Institute (1998), API 9100A, *Model Environment, Health and Safety Management System*.

American Petroleum Institute (1998), API 9100B, *Guidance Document for Model EHS Management System*.

NSW Department of Infrastructure, Planning and Natural Resources (August 2004), (Consultation Draft) *Major Industrial Hazards Advisory Paper No. 4 – Safety Management Systems*.

UK HSE (1998), HSG65, *Successful Health and Safety Management*.

UK HSE (1999), HSG48, *Reducing Error and Influencing Behaviour*.

US Department of Labour, OSHA Standard CFR 29 1910.119, *Process Safety Management*.

WorkSafe Victoria, *SafetyMAP* (Safety Management Achievement Program).

