1. Introduction

The major hazard facility parts of the Occupational Health and Safety Regulations 2007 (OHS Regulations) set out legal duties for control of risks from operating a major hazard facility (MHF). They apply to the operator of a facility who is the employer with management or control of the facility.

To obtain a licence to operate an MHF in Victoria, MHF operators are required to submit a Safety Case which sets out how the facility will be operated safely.

This guidance note assists operators develop and monitor performance standards and performance indicators.

There are two types of standards and indicators required by the MHF regulations (Schedule 10, clause 7).

- Standards and indicators are required for:
  - measuring the effectiveness of the Safety Management System (SMS)
  - measuring the effectiveness of the risk control measures adopted.

Performance measures for these items should be used to provide assurance that the operator is achieving safe operation of the facility by using adequate control measures and satisfactory management systems, and that these are being maintained to provide the protection that is anticipated. In addition, these measures may be used to assist with the demonstrations required by reg 5.2.15(2) (Refer to the WorkSafe guidance note – Requirements for demonstration). The measures will need to be monitored and reported in some manner to the MHF’s management to ensure safe operation is being maintained.
1.1 Features of successful performance monitoring

The following factors are critical for successful performance monitoring:

- information is available on past and current performance of a risk control measure so that any assessment of adequacy is based on actual performance rather than expected or predicted performance
- information is available on the performance of specific components of the SMS and on the performance of the SMS as a whole
- failures of control measures or deficiencies in the SMS are recognised and remedied
- information on performance is provided to relevant people (including management) to ensure that appropriate corrective actions are taken
- understanding of the specific SMS elements needed to ensure ongoing effectiveness and reliability of each specific control measure
- continual improvement occurs.

1.2 Key definitions

Control measure (control): Any system, procedure, process, device or other means of eliminating, preventing, reducing or mitigating the risk of major incidents arising at an MHF. Control measures are the means by which the risk to health, safety and property associated with the major incidents is eliminated or minimised. Controls include physical equipment, process control systems, management processes, operating or maintenance procedures, the emergency plan and key personnel and their actions.

Demonstration: A logical, coherent case or argument to show convincingly that the requirements of reg 5.2.15(2)(a) and (b) are being achieved at the facility. This will involve stating the facility’s case in writing, backed up by some evidence to support the case such as documentation from technical analyses, incident/data trends, observation of the behaviour of equipment, management systems and control measures, records of tests and drills, real-time information, electronic media and other data.

Hazard (related to an MHF): Any activity, procedure, plant, process, substance, situation or any other circumstance that could cause, or contribute to causing, a major incident.

Major incident (related to an MHF): An uncontrolled incident, including an emission, loss of containment, escape, fire, explosion or release of energy, that –
(a) involves Schedule 9 materials and
(b) poses a serious and immediate risk to health and safety.

Performance indicator: An objective measurement of performance against a target or required level of performance established for a particular control measure.

Performance standard: A target or required level of performance established for a particular component of the SMS and the measurement of it to determine whether it is achieved.

Safety Assessment: The Safety Assessment process is consistent with international risk assessment standards, including AS/NZS ISO 31000 Risk management. A Safety Assessment involves an investigation and analysis of the major incident hazards and major incidents to provide the operator with a detailed understanding of all aspects of risk to health and safety associated with major incidents, including –
(a) the nature of each hazard and major incident
(b) the likelihood of each hazard causing a major incident
(c) in the event of a major incident occurring –
   (i) its magnitude and
   (ii) the severity of its consequences to persons both on-site and off-site
(d) the range of control measures considered.

So far as is reasonably practicable: To reduce risk to a level so far as is reasonably practicable involves balancing reduction in risk against the time, trouble, difficulty and cost of achieving it. This requires consideration of:
(a) the likelihood of the hazard or risk concerned eventuating
(b) the degree of harm that would result if the hazard or risk eventuated
(c) what the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk
(d) the availability and suitability of ways to eliminate or reduce the hazard or risk and
(e) the cost of eliminating or reducing the hazard or risk.

More information on key terms is found in other MHF guidance material available from the WorkSafe website and in the definitions of the OHS Regulations (reg 1.1.5).
1.3. Core concepts

- Performance measurements for control measures and the SMS must be included in the SMS.
- The Safety Case must include a detailed description of the performance standards and performance indicators.
- The information contained in the Safety Case needs to be transparent to demonstrate the adequacy of the control measures and the effectiveness of the SMS.
- It may be necessary for each control measure to have more than one performance indicator.
- Performance indicators may be established for groups of control measures rather than controls individually.
- Performance indicator results for control measures may be useful in demonstrating the adequacy of the risk control measures adopted or reviewed in the Safety Case.

2. PLANNING AND PREPARATION

2.1. What and how many measures are required?

Performance measures are required to measure the effectiveness of the SMS and control measures, to enable the continuous improvement of the SMS and to indicate failure of control measures and the actions to be taken in response to any such failure. These two requirements are separate. However, common to both is the need to make sure that all aspects are covered and that there are no gaps. For the measures to be convincing they need to show that all control measures and the full SMS function well, i.e., can be counted on to consistently do the job they are meant to do.

Performance measurement for control measures is designed to show that control measures can be relied upon to do the job for which they were selected. This means that it is most useful if the measures track whether the control is functioning as intended and also what is done when it is not functioning as intended. As a basic example, one measure may be that a test confirming activation of a process trip at a specific value occurs and a second measure may be that a work order to fix this trip, if it is not working as intended, is completed within a specific timeframe. Hence it is possible to group control measures rather than requiring an individual measurement for each separate control (e.g., all process trips may be measured using the above two measures and reported as a group, although the specific set point for each process trip may be different).

The SMS is intended to manage the safety of all aspects of operation at the facility, not just major incident prevention. The SMS performance measurements also need to address all aspects of the SMS, not just those related to major incident prevention. Measures for the SMS should encompass both implementation and functionality. For example, measurement that a management of change process exists and is in use does not necessarily demonstrate that it is working as intended, so additional measures, such as number of incidents arising from poor management of change may also need to be incorporated. In addition, measurements relating to the number of incidents will not confirm that an SMS process exists or is in use.

Performance measures may be classed as leading, lagging, precursor or other. If no incidents occur, the link between leading (or precursor) indicators may not be established while lagging indicators explicitly link to an incident.

There is no prescribed form for performance measurements. Operators should use a means that is appropriate and meaningful to the facility and to the operator’s safety culture. In addition, the measurements should be conveyed in a way that can be understood by workers and by WorkSafe (an external perspective).

WorkSafe has observed that a change in personnel often results in a loss of knowledge on what is being monitored and how this monitoring occurs. If the way data is collected or reported is not transparent or easily understood, this can introduce further problems, such as in a scenario where an MHF has three process areas with 10 hoses used in these areas to unload chemicals. A performance measure of the number of hose tests conducted each year reported results of three and a percentage of 100%. This was not immediately transparent as meaning that all 10 hoses at the facility had been tested (i.e., reported result reflected the three different areas).

2.2. Workforce requirements

While one person may have responsibility for monitoring all of the performance measures for controls and the SMS, others in the workplace usually need to be consulted to establish the appropriate measures that are to be monitored for actual performance of control measures and SMS elements. Some operators gain this through formal workshop sessions or meetings. It may also be appropriate for different people to have responsibility for different performance measures (e.g., specific SMS elements or for different sets of controls such as training, documentation and maintenance/integrity).
2.3. Monitoring performance measures

However the performance measures are established and monitored, it is also important that the results from these measures are reported to the appropriate people within the organisation. For example, the plant manager may not need to know that performance of one specific control is poor but may need to know of trends indicating that groups of controls or elements of the SMS are showing poor performance. This will then mean that appropriate resources can be allocated including personnel and money (ie to fund replacement parts, extra maintenance/inspection, extra personnel, a project to remedy a problem). The involvement of a broad range of functions and skills (eg plant operators, maintenance, technical and safety specialists) in the selection of the performance measures should mean that the measures selected are actually measurable (ie that the data can actually be obtained) and that the people involved in obtaining the performance data understand the purpose and process for it.

2.4. Health and safety representatives

Health and safety representatives (HSR) do not need to be involved in deciding on the performance measures. They should, however, be consulted about the process that is to be followed.

2.5. Project and technical issues

Newly registered facilities (ie those preparing the first Safety Case for the facility) are required under reg 5.2.33 to prepare a Safety Case outline and submit it to WorkSafe for review within 90 days of registration. There is no requirement to address performance measurement at this stage, however, facilities may want to consider what measures they will monitor and how this will occur. Early consideration will enable changes to be made to the measures and to the methodology used for collecting and monitoring them. In addition, it is difficult in the first Safety Case to provide information on performance measures unless measurement has been commenced significantly prior to submission of the Safety Case for licensing.

Facilities reviewing and revising their Safety Case for licence renewal are required to highlight any changes to the Safety Case document or the SMS. Hence significant changes to performance measurement should be identified.

3. Performance indicators for control measures

Performance indicators for control measures establish whether the control measures are performing to a standard that is adequate to ensure that risk is reduced so far as is reasonably practicable. A performance indicator is an objective measurement of performance against a target or required level of performance established for a particular control measure. These measures should lead to corrective action(s) to be taken if the required level of performance is not achieved.

3.1. Tests of the effectiveness of control measures

Historical performance data is usually needed to show individual control measures at a facility consistently do what they are supposed to do, and therefore will achieve the risk reduction assigned to the control measure during the Safety Assessment. The results from performance monitoring of control measures can be used to support the assigned risk reduction.

Tests of effectiveness may include measurement of ability of controls to respond within a specific timeframe and measurement of controls reacting at set points.

3.2. Indicators of failure of control measures

Indicators of failure or poor performance may include the tests of effectiveness but may also include other items such as:

- alarms which indicate failure of specific items (eg power, utilities or out of service/not functional equipment)
- the number of breakdown repairs, this indicates the reliability of the control measure
- a high number of pre-emptive repairs from inspections. While this is a positive indicator of the effectiveness of the inspection it may also be an indicator of poor performance of the vessel or pipework being inspected
- evidence of mal-practice, from field observations and audits etc. This measures poor performance of procedural control measures.
3.3. What actions can be taken to report and correct any failure?
One of the key components associated with the performance measurement of control measures are the actions to be taken to report any failure of a control measure and any corrective action which is to be taken in the event of such a failure. The form of these actions should be clearly defined, eg immediate maintenance/repair request to be raised; supervisor or manager to be informed; alternative controls to be implemented. This process should apply both to a one-off failure and repeated failures. For example a one-off failure may involve an instrument which fails when tested and the action repairs it, while a repeated failure may involve the same instrument repeatedly failing tests (eg at six month intervals) and the action of fixing it does not appear to be resolving the issue. Replacing it with a different type of instrument or altering the testing frequency may ensure that the control is functioning as intended.

3.4. Examples of performance measurement
The following section contains some examples of performance measures for various risk control measures. The MHF regulations do not require the use of any (or all) of these measures. The examples have been provided only to assist operators to devise appropriate measures for their MHF.

<table>
<thead>
<tr>
<th>Control measure</th>
<th>Performance measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effectiveness measures</td>
</tr>
<tr>
<td>Instrument</td>
<td>• equipment activates at set point (or within 1% of set point)</td>
</tr>
<tr>
<td></td>
<td>• responses occur within specified timeframes (eg trip activation closes valve within 1 sec).</td>
</tr>
<tr>
<td>Procedure</td>
<td>• audit/review shows procedure in use and users follow it.</td>
</tr>
</tbody>
</table>
3.5. How many performance measures are required?

The number of control measures on the hazard register will depend on the size and complexity of operations at the facility. For a simple facility it may be possible to monitor performance of each control measure individually. However, some aggregation of the performance data may be necessary for facilities with larger numbers of control measures. This may mean that although each control measure within a group is subjected to a performance measurement, the results are reported for the group rather than each control measure (e.g. number of PSV releases or ‘fail to danger’ test results as a percentage of the total number of PSVs on-site or in an area).

MHF operators may also find the performance history of control measures useful for the demonstrations required in the Safety Case.

4. Performance standards for SMS

4.1. What are performance standards?

Schedule 10(7) requires the operator to have performance standards for measuring the effectiveness of the SMS. These need to relate to all aspects of the SMS. They should be defined in such a way as to provide a meaningful measure of effectiveness. For the purposes of continuous improvement of the SMS, there should also be processes and measures designed to identify and implement improvements to the system itself.

A performance standard for the SMS is a target or required level of performance for a particular component of the SMS and then measuring whether this level is achieved.

4.2. Does the SMS support control measures?

A number of elements of the SMS need to be functioning effectively to maintain the controls’ performance. For example, instrumented and mechanical control systems need to be regularly inspected and tested, while training is needed to ensure procedural control measures are always carried out correctly. Performance measures show that the necessary SMS components are in place for every risk control measure and that these systems are consistently effective and reliable.

Key elements of the SMS which act to support control measures include:
- management of change (MOC)
- maintenance, inspection and testing
- design and procurement
- training
- documentation of operating and maintenance procedures
- performance monitoring and auditing.

Performance measures developed for the SMS should reflect both the SMS’s role at the facility and its function in ensuring that control measures function. To achieve this, performance standards should be established to monitor various components. These may include the completion of key activities (e.g. audits, training, emergency exercises, reviews or revisions of documentation), any elements identified as causes/contributors to an incident in incident investigations and any assessment of the effectiveness of the components.

4.3. Examples of performance measurement

The following section contains some examples of performance measures for various components of an SMS. The MHF regulations do not require the use of any (or all) of these measures. The examples have been provided only to assist operators to devise appropriate measures for their MHF.
<table>
<thead>
<tr>
<th>System expectation (Standard)</th>
<th>Performance measures</th>
<th>Outcome measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safety critical equipment</strong></td>
<td>• selection, design, modification etc in accordance with company standards&lt;br&gt;• equipment tested to schedule&lt;br&gt;• audits of the above processes completed to schedule.</td>
<td>• results from scheduled testing&lt;br&gt;• results from breakdown maintenance&lt;br&gt;• results from incident investigations where safety critical equipment caused or contributed to incident&lt;br&gt;• actions from audits, testing and incidents etc relating to safety critical equipment are completed to schedule to ensure system is continuously improved.</td>
</tr>
<tr>
<td>A system is in place to identify test and maintain the equipment to ensure the required design and reliability standards for safety critical equipment are met.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical integrity</strong></td>
<td>• mechanical assets inspected and tested to schedule&lt;br&gt;• temporary/interim repairs replaced with permanent repair to schedule&lt;br&gt;• reported mechanical defects corrected to schedule&lt;br&gt;• audits of the above processes completed to schedule.</td>
<td>• number of incidents/leaks due to mechanical integrity issues&lt;br&gt;• results from inspection and testing of assets&lt;br&gt;• actions from audits, testing and incidents etc relating to mechanical integrity are completed to schedule to ensure system is continuously improved.</td>
</tr>
<tr>
<td>A system is in place to test, inspect and maintain mechanical assets to applicable standards.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Procedures</strong></td>
<td>• procedures issued and reviewed and revised to schedule&lt;br&gt;• audit of the above processes</td>
<td>• number of procedures current and available for use (eg results from audits)&lt;br&gt;• number of incidents with cause(s) relating to inadequate procedures&lt;br&gt;• actions from audits and incident investigations are completed to schedule to ensure procedures are effective.</td>
</tr>
<tr>
<td>A system is in place for the development, implementation and review and revision of effective operating and maintenance procedures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Training and competence</strong></td>
<td>• required training (including refresher training) for specific jobs completed to schedule&lt;br&gt;• audit on training requirements for specific jobs (eg status against risk matrix, number attending training sessions etc).</td>
<td>number of incidents related to inadequate/insufficient training&lt;br&gt;• findings from survey or tests on competency and knowledge&lt;br&gt;• actions from audits and incident investigations are completed to schedule to ensure training system is effective.</td>
</tr>
<tr>
<td>A system is in place to ensure employees have necessary skills and knowledge to effectively do their job.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Management of change</strong></td>
<td>• number of approved temporary changes still in place beyond approval expiry date&lt;br&gt;• number of changes made that bypassed or shortcut the MOC process&lt;br&gt;• audit or quality review of change documentation, sign off and approval process are completed to schedule.</td>
<td>• number of incidents related to MOC process inadequacy&lt;br&gt;• actions from audits and incident investigations are completed to schedule to ensure MOC process is effective.</td>
</tr>
<tr>
<td>A system is in place for the management of temporary and permanent changes.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.4. How is improvement achieved?

There are two key points associated with the results of performance measurement for the SMS.

The first is that the performance measures are intended to demonstrate whether the SMS elements are functioning well and meeting their performance standards. So if the performance measurements are not indicating that the SMS is functioning well and/or the SMS is not meeting its performance standards, then corrective actions should be taken. The form of these corrective actions should be clearly defined within the SMS (e.g., action tracking to closeout, assigned responsible person). The second is that if the measurements are indicating good performance but the SMS (or components) is being identified as a cause of incidents/near misses then the performance measures are not monitoring the right thing and should be improved.

Improvement in the SMS is achieved through:

- representative measures that really reflect the status, implementation and functionality of the SMS
- timely implementation of corrective actions to remedy problems or potential problems

- clear reporting of performance to the relevant people in the organisation (e.g., people with the ability to correct problems, assign resources or provide funding).

5. OUTPUTS

The format of performance measurement information can take many forms including reports and databases. The information used and reported on-site may be used in the Safety Case or a different format may be used. The work required by the different uses of the performance measurement results should be considered when the reporting format is established (e.g., there may be separate reports generated by a database).

As mentioned in other MHF guidance, for ease of future revision, many Safety Cases are written with the methodology for various safety duties (such as hazard identification) and high-level results in the body of the Safety Case with detailed results in appendices. It would therefore make sense for operators to explain the methodology for measuring adequacy of control measures and the SMS in the body of the Safety Case and include results or examples of the performance measurement in an appendix.

<table>
<thead>
<tr>
<th>System expectation (Standard)</th>
<th>Performance measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emergency preparedness or response</strong></td>
<td><strong>Process measures</strong></td>
</tr>
<tr>
<td>A system is in place for responding to emergency situations including development of plan, its implementation and post-emergency clean-up and recovery.</td>
<td>Emergency exercises completed to schedule</td>
</tr>
<tr>
<td></td>
<td>required training (including refresher training) for specific roles in emergency completed to schedule</td>
</tr>
<tr>
<td></td>
<td>emergency equipment tested to schedule.</td>
</tr>
<tr>
<td><strong>Audits and performance monitoring</strong></td>
<td><strong>Process measures</strong></td>
</tr>
<tr>
<td>A system is in place to monitor the effectiveness of the SMS and to implement improvement actions.</td>
<td>audits/reviews are completed to schedule.</td>
</tr>
<tr>
<td></td>
<td>required training (including refresher training) for audit/review roles to schedule</td>
</tr>
<tr>
<td></td>
<td>audits/reviews address process and implementation</td>
</tr>
</tbody>
</table>
Performance monitoring results can also have an important role in demonstrating the effectiveness of control measures and SMS elements, especially for licence renewal applications. Depending on the amount of performance monitoring data available, this data can be presented in the Safety Case and thus can form an important part of satisfying the demonstration requirements (refer to guidance note – Requirements for demonstration). Alternatively for a large quantity of data, a summary of the monitoring and/or auditing process and a summary of results and conclusions could be presented in the body of the Safety Case, and detailed results in an appendix.

6. REVIEW AND REVISION

There are no specific review and revision requirements related to performance measures and their monitoring. However, the measurement of effectiveness for both the SMS and control measures may be fed into the review and revision process related to updating a Safety Case and relicensing/renewal of an MHF licence.

Any information related to the effectiveness of a control measure, including its failure, may be useful in determining whether all hazards and potential major incidents have been identified, that the risk has been reduced so far as is reasonably practicable during the Safety Assessment or if additional controls may be required. If performance monitoring results provide a new state of knowledge, then the operator should reconsider the effectiveness of a control measure or some aspect of safety management, and any adequacy assessment relating to the adopted control measures should be reviewed and revised.

Information related to the effectiveness of the SMS should be used to continually improve all aspects of the SMS. Monitoring information may therefore be useful in making improvements to the SMS to ensure that it is comprehensive and integrated and used as the primary means of ensuring safe operation. This monitoring information will also be of assistance when preparing the demonstrations required by reg 5.2.15(2).

7. COMPLIANCE CHECKLIST

Table 7.1 contains information on the MHF regulations as they relate to control measures.

Table 7.1 – MHF regulations relating to performance measures

<table>
<thead>
<tr>
<th>Section</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reg 5.2.5</td>
<td>The operator must establish and implement an SMS that provides a comprehensive and integrated management system for all aspects of adopted control measures. The operator must use the SMS as the primary means of ensuring the safe operation of the MHF.</td>
</tr>
<tr>
<td>Reg 5.2.7</td>
<td>The operator must conduct a comprehensive and systematic Safety Assessment in relation to all potential major incidents and all major incident hazards. The operator must document the Safety Assessment and the documentation must contain, in relation to the range of risk control measures considered, statements as to their viability and effectiveness and reasons for selecting certain risk control measures and rejecting others.</td>
</tr>
<tr>
<td>Reg 5.2.12</td>
<td>The operator must review and revise the hazard identification, Safety Assessment and adoption of control measures, to ensure continuing compliance with the requirement to eliminate or reduce risk so far as is reasonably practicable. Such reviews are necessary …when a deficiency is indicated in a control measure …and at least every five years.</td>
</tr>
<tr>
<td>Reg 5.2.15(2)</td>
<td>The Safety Case must demonstrate that the adopted control measures are adequate and that the SMS is comprehensive and integrated for all aspects of them.</td>
</tr>
<tr>
<td>Schedule 10, clause 7 (performance monitoring)</td>
<td>The SMS must include: Performance standards for measuring the effectiveness of the SMS which – (a) Relate to all aspects of the SMS (b) Are sufficiently detailed to ensure that the ability of the operator to ensure the effectiveness of all aspects of the SMS is apparent from the documentation (c) Include steps to be taken to continually improve all aspects of the SMS. A description of the way in which these performance standards are to be met. Performance indicators for the effectiveness of risk control measures adopted, including – (a) tests of the effectiveness of the risk control measures,</td>
</tr>
</tbody>
</table>
### Section 8. FURTHER READING


### Further Information

Contact the WorkSafe Victoria Advisory Service on 1800 136 089 or go to worksafe.vic.gov.au

**Related WorkSafe publications**

- Guidance note – Hazard identification
- Guidance note – Safety Assessment
- Guidance note – Control measures
- Guidance note – Requirements for demonstration
- Guidance note – Safety management system
- Guidance note – Renewal of an MHF licence

**Note:** This guidance material has been prepared using the best information available to the Victorian WorkCover Authority and should be used for general use only. Any information about legislative obligations or responsibilities included in this material is only applicable to the circumstances described in the material. You should always check the legislation referred to in this material and make your own judgement about what action you may need to take to ensure you have complied with the law. Accordingly, the Victorian WorkCover Authority cannot be held responsible and extends no warranties as to the suitability of the information for your specific circumstances; or actions taken by third parties as a result of information contained in the guidance material.

On 18 June 2017, the Occupational Health and Safety Regulations 2017 (OHS Regulations 2017) replaced the Occupational Health and Safety Regulations 2007 (OHS Regulations 2007), which expired on this date. **This publication has not yet been updated to reflect the changes introduced by the OHS Regulations 2017 and should not be relied upon as a substitute for legal advice.**