# Guide for major amusement parks:

## Preparing a safety case

Workplace Health and Safety Queensland
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# 4 Foreword

The purpose of this guide is to assist the operator of a major amusement park (MAP) to prepare an amusement device safety case (safety case). A safety case is a written persuasive argument or presentation of the technical, management and operational information about the hazards and risks that may lead to an amusement device incident (ADI). It must inform the reader on the amusement device hazards (ADH), ADIs and how these are minimised by the physical and management system controls. It is the case you make to the regulator that demonstrates amusement device safety is adequately managed at your MAP. There are three objectives to focus on when preparing the safety case:

- The MAP safety management system will, once implemented, so far as is reasonably practicable (SFAIRP), control the risks arising from amusement device hazards (ADHs)[1] that may lead to ADIs.
- The safety case demonstrates the adequacy of the control measures implemented by the operator to control risks associated with the occurrence of ADIs.[2]
- The safety case meets the requirements of the Work Health and Safety Regulation 2011 (WHS Regulation).[3]

This guide is the second guide for operators of MAP's and follows from the guide Developing a safety case outline available at WorkSafe.qld.gov.au.

**Scope and application**

This guide is intended to be read by a person conducting a business or undertaking (PCBU) who is the operator of a MAP. It provides practical guidance to the operator on how to develop and create a safety case.

A summary of the regulator's licence application and safety case assessment process is included in this guide for your information.

**How to use this guide**

This document is meant as a guide only. It is not a substitute for legal advice. Nor does it alter the meaning of any provision of the WHS Regulation. This guide is provided to assist operators of MAPs to develop a safety case. It is not to be relied upon, divorced from the actual content of the law. Any perceived inconsistencies between this guide and the actual text of the WHS Regulation, should be resolved in favour of that statutory text. The WHS Regulation places many duties on the operators of MAPs in relation to the health and safety of their patrons and workers. The WHS Regulation imposes a number of criminal sanctions should the operators of a MAP not comply with the provisions of the *Work Health and Safety Act 2011* (WHS Act). Compliance with this guide does not relieve operators of MAPs of their compliance with the criminal law.

[1] S.608R (4)(a) of the WHS Regulation

[2] S.608R (4)(b) of the WHS Regulation

[3] S.608R (2) of the WHS Regulation

# 5 Acronyms and abbreviations

| Acronym/ Abbreviation | Meaning |
|---|---|
| ABN | Australian Business Number |
| ACN | Australian Company Number |
| ADH | Amusement device hazard |
| ADI | Amusement device incident |
| e.g. | Exempli gratia (for example) |
| etc. | Et cetera or 'the rest' |
| FARSI | Functionality, availability, reliability, survivability and interdependency |
| FMEA | Failure mode and effects analysis |
| HAZOP | HAZard and OPerability study |
| HSR | Health and safety representative |
| i.e. | Id est (that is) |
| LAAA | Licence application administrative assessment |
| LOPA | Layer of protection analysis |
| MAP | Major amusement park |
| MOC | Management of change |
| QAS | Queensland Ambulance Service |
| QFES | Queensland Fire and Emergency Service |
| QPS | Queensland Police Service |
| s. | section (usually references to legislative sections) |
| Safety case | Amusement device safety case |
| SFAIRP | So far as is reasonably practicable |
| SIL | Safety integrity level |
| SMS | Safety management system |
| WHS Act | *Work Health and Safety Act 2011* |
| WHS Regulation | Work Health and Safety Regulation 2011 |

# 6 Introduction

All types of work involve some level of interaction with hazards. For many workplaces, the identification of hazards and the management of those hazards can be relatively easy. However, as the number, complexity, and consequences of the hazards grow, so do the organisational structures and safety systems that support the safe operation used to manage safety. These management concepts create a complex working environment.

Major amusement parks (MAPs) operate in a complex environment of equipment, workers, and patrons. The systems used to manage the associated risks need to be suitable and robust to ensure that risk to all people at the MAP is always minimised. The safety case process is one way to capture the hazards, understand the risks and for the operator to put in place controls and risk management systems that actively manage risk SFAIRP.

The safety case was developed in response to many large incidents which occurred throughout the mid-late part of the 20th century such as Piper Alpha[4] and Seveso.[5] The term 'safety case' comes from the legal origin of the idea.[6] In an inquiry into occupational safety and health in the UK, it was said that compliance with regulations was not sufficient to ensure safety:

> "*it was necessary for the operator to 'make a case' that the system was safe to operate*"[7]

Lord Robens in considering the existing laws and regulations noted that there was simply too much law. This resulted in people thinking that safety at work was predominantly about compliance to the law rather than the responsibility lying with those who create the risks and those who work with them.

Operating in a complex environment is challenging. The hazards posed by the operation must be matched to the controls. A way of managing safety using frameworks, processes and principles will need to be developed into a safety management system (SMS)[8]. The SMS must be designed to cater to those hazards, controls and risks and be agile in response to changing risk. Workers, management, and boards need to understand risk changes and react to minimise the potential harm to people. But this cannot be achieved if the operator does not fundamentally understand the hazards and risks which must be managed and provide clear decision-making processes.

This guide is designed to assist 'you', the MAP operator (the operator) in preparing a safety case for a licence application to operate a MAP. It will assist you in demonstrating how your systems work to minimise the risk of an amusement device incident (ADI) occurring.

For the purposes of this guide, the term 'operator' means the operator of the major amusement park. The term 'ride' will be used as an antecedent to 'operator' to differentiate the meaning where the guide is focused on the 'ride operator'.

# 7 Amusement device safety case: concepts

The primary duty of care for eliminating the risk of an ADI, or if elimination is not reasonably practicable, minimising the risk from an ADI SFAIRP, is the responsibility of the operator.[9]

In meeting these duties, the operator must prepare an amusement device safety case. The safety case assures the operator, workers, and the regulator that the potential for ADIs at the MAP have

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[4] hse.gov.uk/offshore/piper-alpha-disaster-public-inquiry.htm Accessed 10/08/2020

[5] en.wikipedia.org/wiki/Seveso_disaster Accessed 10/08/2020

[6] Zotov, D., 2007 *Safety Cases*, ASASI. asasi.org/papers/2007/Moving_From_SMS_to_Safety_Case_Dmitri_Zotov.pdf, accessed 23 July 2020

[7] UK House of Commons Committee on safety and health at work, 1972 'Safety and Health at Work', Lord Robens, 1970–72. mineaccidents.com.au/uploads/robens-report-original.pdf, accessed 23 July 2020

[8] casa.gov.au/safety-management/safety-management-systems/what-safety-management-and-safety-management-systems, Accessed 25/09/2020

[9] s.17 and s.19 of the WHS Act

been systematically assessed, effectively and appropriately controlled and that SMSs are in place to reduce the risk SFAIRP.[10]

The elements that make up the SMS are the primary means of managing the risks. The operator must ensure that adequate and documented systems are in place to prevent ADIs occurring that expose or potentially expose a person to a serious risk to health and safety.[11] The operator must also be prepared for when an ADI does occur. It is the operator's responsibility for minimising the effects from the ADI that might arise to workers, patrons, and emergency responders.[12] The safety case must capture all these elements in the form of a summary.

All material contained within the safety case is considered material particulars[13] by the regulator because it is used to inform the regulator in their decision to grant a licence. You should then consider what information is contained within the safety case. For example, if procedures are provided in the safety case, then any changes to those procedures would require you to update the safety case.

The emphasis then is on having the required summaries[14] containing enough detail to satisfy the demonstration requirements[15] while minimising the number of alterations required to the safety case in response to normal operational changes which do not change the nature of the safety case.

## 7.1 Amusement device safety case

MAPs operate in a complex environment and the operators must have a means of understanding the risk environment and the control measures protecting both workers and patrons from serious harm. The amusement device safety case is not necessarily a complete picture of all hazards and risks at the MAP. The safety case focus is on the amusement devices and how they can interact with people and other activities.

In creating the safety case, a fundamental understanding of how an ADH can lead to an ADI must be developed. It is not enough to accept information from vendors or manufacturers alone. Your process should delve deeply into and substantiate where practicable, that the amusement device controls are capable of minimising harm. The operator's duties are to verify and understand all assumptions providing assurance the amusement device is safe and fit for purpose. This includes manufacturers' and third-party information. This takes considerable effort to achieve but it is the purpose of the safety case process to develop a SMS to manage ADIs.

It is also important to distinguish between the safety case and the SMS. The safety case is descriptive of how 'you', the operator, manages the risks of ADIs. The SMS is the documentation of policy, procedures, operational management tools and governance over systems that you use to manage the risks. The SMS reduces risk SFAIRP.

Figure 1 depicts the differences between the information required in the safety case and information required to manage safety across all aspects the MAP. The operator has many duties under the WHS Act, WHS Regulation, *Electrical Safety Act 2002* and Electrical Safety Regulation 2013 regarding hazards and risks. The requirements under Chapter 9A of the WHS Regulation are just one element of those duties.

Learnings from the development of the safety case can and should be used to manage all risks at a MAP. In doing so, this benefits the business as a whole.

[10] s.608M of the WHS Regulation

[11] s.608B (1) of the WHS Regulation

[12] s.608R (5)(c)(iii) of the WHS Regulation

[13] s.608ZP of the WHS Regulation

[14] s.608R (2) of the WHS Regulation

[15] s.608R (4) of the WHS Regulation

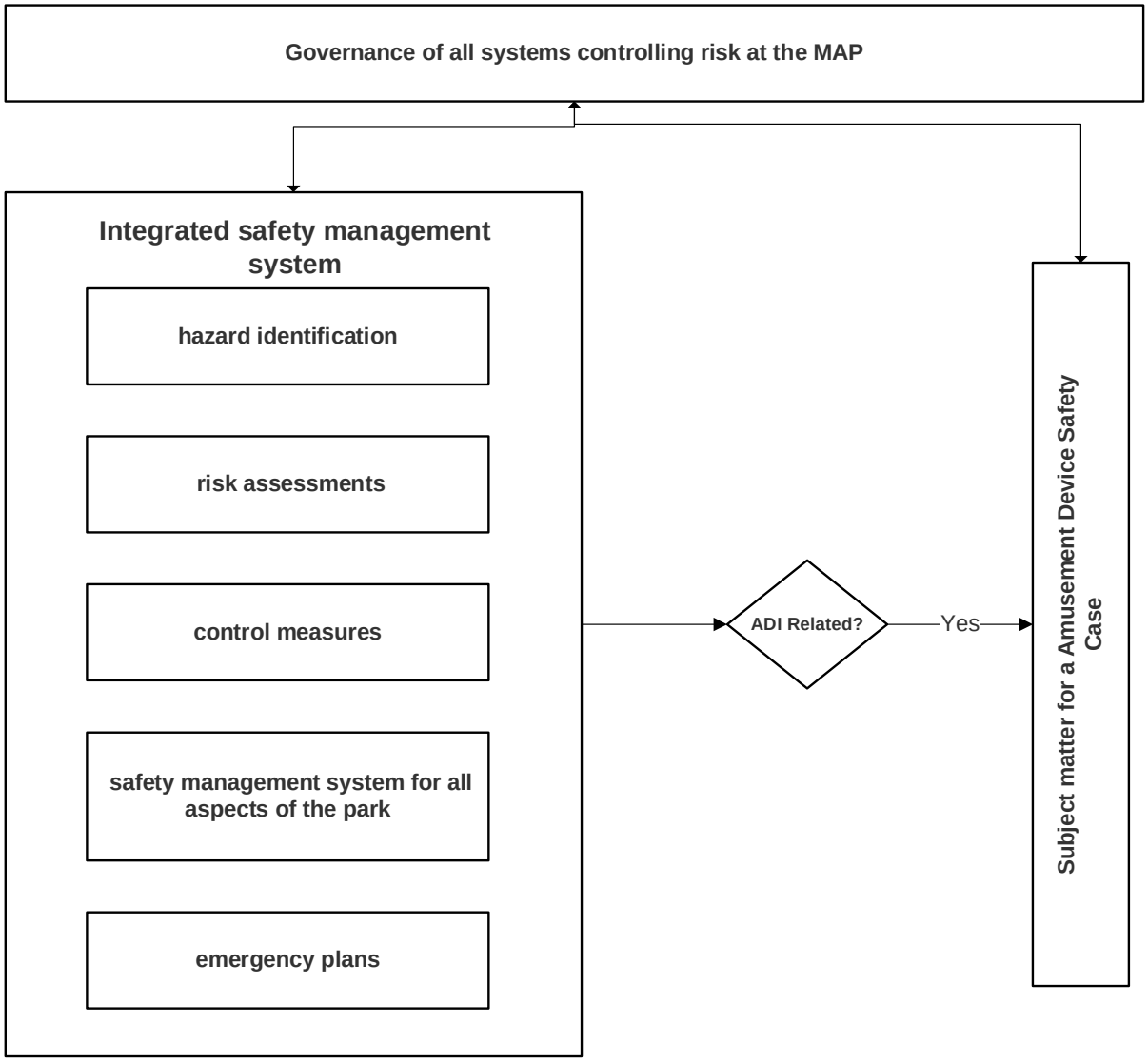


**Figure 1 Subject material for an amusement device safety case.**

*The safety case must include all aspects of managing the risks of ADHs, leading to ADIs, but not all hazards and risks that must be managed at the MAP.*

The safety case should highlight where risk control strategies are not at the desired level and communicate how safety will be improved. In addition, the safety case should provide an understanding of how your governance and oversight processes ensure safety is at the forefront of all processes at the MAP.

## 7.2 The role of the safety case outline

The safety case should be prepared in accordance with the safety case outline that was submitted by the MAP operator or altered by request of the regulator. If required, the regulator will consider the safety case outline during the assessment of the licence application.

## 7.3 What is demonstration in the safety case?

Demonstration is[16] defined in the Macquarie dictionary as:

- the proving of anything conclusively, as by arguments, reasoning, evidence, etc.
- proof, or anything serving as a proof
- a description or explanation, as of a process, given with the help of specimens or by experiment.

Demonstration, put more simply, is a practical explanation of how something works.[17] For the purposes of the safety case, demonstration is about describing the equipment, processes, tools, and other elements in the form of a summary. A summary is a brief yet adequate presentation of facts or statements.[16] It is a concise description that provides enough clarity to convey understanding to the reader.

Demonstration via a summary is more than evidence of existence of a system. For example, a statement that simply refers to the management of change (MOC) system as follows:

> *"we manage all changes at the major amusement park by a change management system as described in the MOC procedure document number 124.02"*

would not be enough. It conveys no verifiable evidence that the statement is in fact correct. There is no understanding for the reader as to how the MOC system works or is implemented. It just states that there is a system.

In contrast, you could provide a description of the MOC system which starts with 'what is a change', includes the stages and approvals processes, and links the performance standard and monitoring elements into the summary. In this way a clear view of the system is provided.

Demonstration via a summary should convey to the reader key information about the element's function (e.g. how and what a control/system does and why it is effective in minimising a particular ADH and stopping an ADI).

Demonstration can include examples or photographs of processes, completed forms or other evidence which shows that the system is implemented. One method of demonstration is to use a single ADI as an example throughout the safety case. In this way, you can link the various stages of the safety assessment through to the summaries of the SMS. However, sometimes this is not practicable and other approaches can be used where appropriate.

## 7.4 What is an amusement device?

An amusement device is defined as:

> *"plant that is operated for hire or reward that provides entertainment, sightseeing or amusement through movement of the equipment, or part of the equipment, or when passengers or other users travel or move on, around or along the equipment..."*[18]

In preparing your safety assessment description it is useful to define the scope of each amusement device. Concepts to consider include:

- Where is the boundary for each amusement device that aligns with the definition of an 'amusement device'?
- What is included that involves workers' and patrons' pathways, entries and exits when thinking about users travelling, or moving, on or around the equipment?

The scope of the amusement device boundary will affect the number of ADHs, their location and ADIs that are identified. Defining the amusement device boundary in the safety case assists the assessor in determining the nature of the ADHs might be present within that scope. Hazards which can enter or exit the boundary and cause an ADI must be considered in the safety assessment. For

[16] The Macquarie Dictionary Online accessed 10/07/2020

[17] Cambridge Dictionary © Cambridge University Press 2020

[18] See Schedule 19 of the WHS Regulation for the full definition including exclusions

example, you may wish to consider whether the perimeter fencing or surrounding access paths form part of the amusement device.

The safety case should contain your interpretation of the definition of an amusement device and how you set the boundary/scope. For each amusement device, the scope may be different, and this should be included in your safety assessment summary and individual amusement device assessments.

## 7.5 Amusement device incidents and serious risk

In the safety case, the regulator will seek out how you have defined an ADI in order to understand your hazard identification and risk process.[19] An ADI is defined as an occurrence that:

> ***"(1)(a) involves an amusement device at the park and***
> ***(1)(b) exposes or potentially exposes, a person to a serious risk to health or safety emanating from an exposure, or potential exposure, to the occurrence***."[20]

In the safety assessment and safety case, it is not enough to paraphrase the regulation in isolation. You must define how you have interpreted the concept of serious risk with respect to your risk management tools. The purpose of risk estimation is to determine the highest risk arising from each hazardous situation.[21]

In order to examine what might set the threshold of serious risk to a person's health and safety (or the gravity of an injury which could interfere with quality of life), one approach is to firstly consider that serious (risk) is identified by the potential consequence to the person(s) who could be injured, regardless of the likelihood. In this document, this is referred to as the unmitigated risk.

It is also sometimes difficult to estimate the potential consequence of a hazard because the worst thing that can happen is a fatality. Yet every incident involving the same hazard may not lead to a fatality. You will need to develop your judgement during this process.[22] When carrying out a risk assessment consider:

- the risk from the **most likely severity of the harm** that is likely to occur from each identified hazard shall be considered, but the **highest foreseeable severity** shall also be taken into account, even if the probability of such an occurrence is not high.[23]

Table 1 is a list of examples to consider[24] when looking at how to describe a consequence, which then sets the range of serious risk.

[19] s.608K (3)(b) identification of ADIs and ADHs of the WHS Regulation

[20] s.608B (1) of the WHS Regulation

[21] AS/NZS 4024.1303, Clause 5.4.1

[22] AS/NZS 4024.1303, Clause 5.4.2

[23] AS/NZS 4024.1201, Clause 5.5.2.2

[24] AS/NZS 4024.1303:2014 – clause 6.2.2.3 estimation of severity and 6.2.3 example of a risk graph tool or method.

**Table 1 Examples of consequences which could be considered serious or minor**

| Consequences which could be considered serious | Consequences which could be considered minor |
|---|---|
| Catastrophic (death, permanent debilitating injury, unable to return to work) | No injury or slight injuries |
| Severe debilitation (able to return to work at some time in the future)<br>More than two days incapable of performing the same task | Scratch, minor laceration, bruise, light wound, first aid injury |
| Broken or torn-out or crushed limb(s) | Little or no lost work time |
| Fracture (complex) | Not more than two days incapable of performing the same task |
| Injury requiring medical treatment | |
| Severe musculoskeletal trauma | |
| Grievous bodily harm | |

If you are using a qualitative matrix to conduct your safety assessment, then you could choose to identify the consequence range where you believe a serious injury occurs, as indicated below in **Figure 2**. By defining it for the regulator, it allows your safety assessment to be followed.

By combining your definition of an amusement device with the concept that you have developed for serious risk, you can provide in the safety case your definition of an ADI.

**Range(s) of consequence which might be considered in defining serious risk**

| Consequence | | | | | |
|---|---|---|---|---|---|
| **Likelihood** | **Insignificant 1** | **Minor 2** | **Moderate 3** | **Major 4** | **Catastrophic 5** |
| **A (Almost certain)** | **H** | **H** | **E** | **E** | **E** |
| **B (Likely)** | **M** | **H** | **H** | **E** | **E** |
| **C (Possible)** | **L** | **M** | **H** | **E** | **E** |
| **D (Unlikely)** | **L** | **L** | **M** | **H** | **E** |
| **E (Rare)** | **L** | **L** | **M** | **H** | **H** |

**Ratings**
**E** = Extreme risk: Immediate action required
**H** = High risk: senior management attention needed
**M** = Moderate risk: management responsibility must be specified
**L** = Low risk: manage by routine procedures

Consequence categories

| Level | Descriptor | Examples |
|---|---|---|
| 1 | Insignificant | First aid treatment, minor injury, no time off work |
| 2 | Minor | Single occurrence of medical treatment, minor injury, no time off work |
| 3 | Moderate | Medical treatment, non-permanent injury, not more than two days off work |
| 4 | Major | Extensive injuries, in hospital treatment serious permanent injury/illness, more than two days off work |
| 5 | Catastrophic | Severe injury or illness requiring life support, fatality, or multiple fatalities |

**Figure 2 Example risk matrix**

*Example risk matrix showing how serious risk could be identified on a qualitative risk matrix.*

## 7.6 Describing management of risk

The WHS Regulation[25] sets out the core duties the operator must undertake to manage the risks of ADIs at the MAP. The way these duties are managed must be summarised in the safety case.[26]

A large amount of data and information is generated identifying ADH and ADIs including the information in the safety assessment. The regulator will be looking to understand your process. In preparing the summaries, consider the following information:

**Describe the process:** the process for hazard identification and safety assessment should be summarised at a level that allows the reader to understand the stages and the steps used in identification of ADHs and ADIs. The criteria for including an incident as an ADI should also be described. Examples can be used to highlight how decisions were made.

**Comprehensive:** consider how your safety case will demonstrate the assessment is comprehensive.

**Clarity of information:** In preparing the summary of the hazard identification and safety assessment, consider how the information will answer the following questions:

- Can the identified hazard be linked to a specific control?
- Does the control directly, partially, or barely contribute to stopping the hazard from being realised?[27]
- How will the risks be monitored, and the performance of the controls maintained?
- Does the assessment provide a linkage (an identifier) from the safety assessment into the SMS elements (e.g. into the maintenance system via equipment tag numbers)?
- Has risk reduction SFAIRP been considered for all scenarios?
- If an ADI were to occur, are the control measures, which are intended to be used to limit the severity of the health and safety consequences, always available at the MAP? (e.g. a rescue at heights scenario requires a crane and box to rescue patrons).
- Does the information presented in the safety assessment determine an overall risk profile for the MAP and does the information in the safety case show where further work is required to make safety improvements?

Further details on management of risk are provided in Section 9 of this guide.

## 7.7 Amusement device safety case endorsement

The operator of the MAP must include the statements below in the safety case, or a letter attached to the safety case for the licence application[28] to be properly made. Through signing, the operator endorses the safety case as representing how the MAP operates with respect to safety. Electronic signatures are acceptable.

If the operator is a body corporate, then the safety case is required to be endorsed by the most senior executive officer of the body corporate.

The operator must include in the safety case a signed statement that:

(a) the information contained in the amusement device safety case is accurate and up to date
(b) as a consequence of conducting the safety assessment, the operator has a detailed understanding of all aspects of risk to health and safety associated with ADIs that may occur
(c) the control measures to be implemented by the operator:
    i. will eliminate the risk of an ADI occurring, SFAIRP
    ii. if it is not reasonably practicable to eliminate the risk of an ADI occurring—will minimise the risk SFAIRP

[25] Part 9A.3 Division 3 Management of risk

[26] s.608R of the WHS Regulation

[27] NOPSEMA, 2020, *Control measures and performance standards guidance note*

[28] s.608R (5) and 608ZE (g) of the WHS Regulation

iii. if an ADI occurs—will minimise its magnitude and the severity of its health and safety consequences SFAIRP

(d) all persons to be involved in the implementation of the SMS have the knowledge and skills necessary to enable each person to carry out their role safely and competently.

Visit WorkSafe.qld.gov.au for a licence application form and guidance for further information.

# 7.8 Good practice

## 7.8.1 Depicting the risk profile

While all the steps described in the legislation are discrete processes, a safety assessment is often integrated. Your summary in the safety case should be presented as it was done.

An overall picture (table or graph representing each amusement device/incident type) of the unmitigated risk and controlled risk could be presented in the summary, demonstrating that the assessment was comprehensive. It provides an opportunity to link to safety improvements which have been identified for future implementation to reduce risk further.

The level of detail in the safety case should be enough to demonstrate that you have a detailed understanding of all aspects of risks, to patrons and workers, related to health and safety associated with ADIs.

A brief description is provided in the following sections on some of the ways (but not all) this could be presented in the safety case in line with the regulatory requirements.

## 7.8.2 Providing an improvement plan

The process of developing a comprehensive risk profile for the MAP and maturing a SMS is a significant piece of work. For existing MAPs transitioning into the safety case system, not all will be completed prior to the submission of a licence application. Providing an improvement plan within the safety case demonstrates that you understand what improvements are required and how to address them.

The improvement plan could include information such as:

- a description of the improvement element
- links back to the safety assessment where the improvement was proposed
- the time frame to complete the improvement
- who (position rather than name) is responsible for the implementation of the improvement.

This information could be presented in the safety case in the form of a table or other format that provides an understanding of why the improvement is necessary.

## 7.8.3 Providing a compliance matrix

The preparation of a safety case is a complex task. It is conducted over at least two years from the first application. In this time it is easy to believe the requirements are met.

Conducting a check prior to submission will prevent any delays in processing the licence application. It is useful for you to develop a regulatory compliance matrix demonstrating how you have met the relevant requirements of Chapter 9A of the WHS Regulation within the safety case. The desired presentation for this should include the regulatory section reference and where in the safety case the relevant information can be found.

This is an essential tool for the preparation of a compliant safety case. Including it in the safety case demonstrates you have checked your safety case is compliant. It also assists the regulator in finding information where differences in terminology exist between the regulator's experience and the MAP's usage.

# 7.9 Regulatory assessment framework

The application for a licence is a legislated process which requires considerable effort by the operator to develop. The success of the application depends upon the content of the safety case

and the operation of the SMS. It also depends on how the operator has argued that the processes undertaken to develop a SMS will, once implemented, SFAIRP, control the risks arising from ADHs and ADIs.

The operation of the MAP is dependent upon a licence being granted. The process for assessing the licence application and safety case are provided below. The assessment process by the regulator enables a fair, measured, and transparent decision. Information about your rights for review of decisions under the WHS Act and Regulation is included.

### 7.9.1 Assessment processes

The assessment process is staged to ensure the application is correctly made, enough information is provided, and the processes described in the safety case will, when implemented, control the risk at the MAP SFAIRP.

The regulator will allocate a member of Engineering Services to manage the assessment of the licensing application. The lead assessor will draw upon a range of skill sets within Workplace Health and Safety Queensland to conduct the assessment. The assessor will arrange for a series of assessments to be conducted on the application. The staged approach consists of the steps outlined in Figure 3 and is conducted over the six-month period allowed.[29]

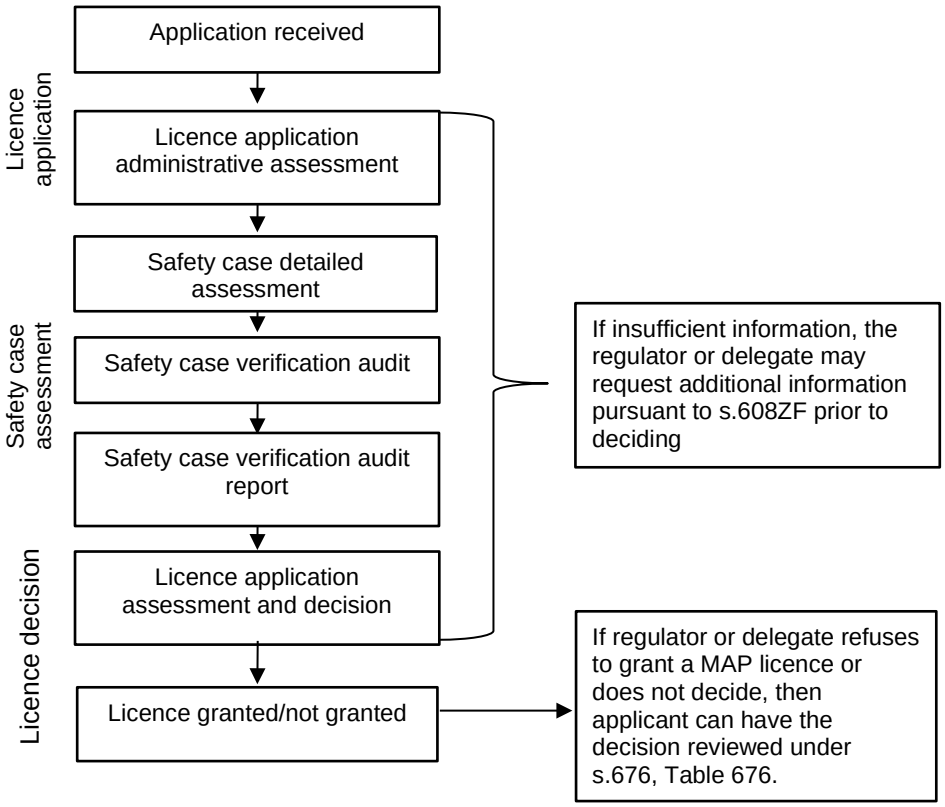


**Figure 3 Licence application assessment stages**

At each stage of the assessment, the assessor will communicate with the MAP's contact person advising them on progress. If there are minor discrepancies detected which can be resolved quickly, the assessor will seek clarification and additional information may be sought on an informal basis.

If major discrepancies are detected, then the assessor will contact you to discuss the matter. If the issue is complex, a request for additional information[30] may be considered.

[29] s.608ZI of the WHS Regulation

[30] s.608ZF of the WHS Regulation

This type of request for additional information has the following effects:

- for new licence applications it extends the exemption period until the information is provided and a further six months for the regulator to assess it[31]
- for licence renewals, the licence will continue in force until the regulator makes a decision on granting the licence.[32]

The operator can continue to operate the MAP during the period specified to provide the additional information and for at least an additional six-month period while the information is considered by the regulator.

For each of the assessment stages, the regulator conducts an internal peer review consisting of a regulatory panel to ensure that due process has been followed. Other subject matter experts not directly involved in the assessment may be asked to participate from time to time where additional information or input to the process is required.

### 7.9.2 Licence application administrative assessment

The licence application administrative assessment (LAAA) checks the licence application and safety case complies with the legislative requirements.[33] This process takes around three to four weeks.

The LAAA also briefly examines the contents of the safety case, ensuring that sufficient information is provided to undertake a detailed assessment. The LAAA can be made available to the operator on completion of this stage.

Typically, the assessor will contact you during the process to advise you of progress.

### 7.9.3 Safety case detailed assessment

Following the LAAA, the assessor undertakes a detailed review of the contents of the safety case. In this process, each section of the safety case and any additional information requested is examined in detail.

Assessors will be seeking an understanding of how you have:

- identified ADHs and ADIs
- conducted the safety assessment
- linked your SMS and emergency plans to the ADIs in order to manage the risk.

The assessor may contact you during this process to discuss elements of the safety case. This process takes around six to eight weeks depending upon the complexity of the MAP.

The regulator's objective is to determine if the information provided demonstrates that:

- the MAP SMS will, once implemented, SFAIRP, control risks arising from ADIs; and ADHs
- the safety case demonstrates the adequacy of the measures to be implemented by the operator to control risks associated with the occurrence of ADIs.

The findings of the detailed review will be recorded on the assessment document. Recommendations may be made to improve aspects of the safety case and systems described.

### 7.9.4 Safety case verification audit

The findings from the detailed review of the safety case form the basis of the safety case verification audit. The assessor will provide to the operator an audit plan including the subjects and program. Audits may be conducted over several days depending upon the complexity of the safety case and issues identified. The audit plan is approved by the regulator prior to proceeding. Other regulators such as emergency services may also attend.

The safety case verification audit examines if the information provided in the safety case reflects the operation of the SMS at the MAP. Assessors will challenge the effectiveness of the safety

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[31] s.608ZG (7) Decision on application— WHS Regulation

[32] s.608ZY Licence continues in force until application is decided—WHS Regulation

[33] s.608ZE of the WHS Regulation

assessment, SMS and emergency plan. If gaps are found in the written safety case through the detailed assessment, the assessor will seek further information to inform the regulator of the extent of the issue in practice. All or selected aspects of the safety case may be examined.

A report will be provided to the operator, typically within five to six weeks of the audit.

### 7.9.5 Licence application assessment and decision

The licence application assessment consolidates the previous stages into a single document for the licence decision maker. It includes the MAP's compliance history with respect to enforcement activities and notices from Workplace Health and Safety Queensland inspectors. The assessor makes a recommendation to the regulator regarding the licence decision, suggests a case management strategy and a licence duration.

The regulator, on the merit of the safety case, verification audit and pursuant to s.608ZG (2) of the WHS Regulation, will decide on granting a licence. If a licence is granted, the regulator will set the licence duration and any conditions. In granting a licence duration of less than five years or conditions, the regulator consults with the operator prior to making the decision.

If the regulator is not satisfied pursuant to s.608ZG and is considering refusing to grant a licence then prior to deciding, the regulator will consult with the operator following the required legislative processes.[34]

If the regulator refuses to grant a licence, or grants a licence with conditions, this decision is reviewable.[35]

# 8 Information about the MAP in the safety case

The safety case is required to provide a range of information describing the MAP. The following contains information you may consider including in your description to provide an overview of the MAP and who operates it.

## 8.1 Identification of the MAP and the MAP operator

The safety case must clearly identify the MAP to which it applies. The opening sections of the safety case should as a minimum, include the following:

- the operator's name(s)
- the MAP name (business name)
- an Australian Business Number (ABN) and/or the Australian Company Number (ACN).
- the facility address–the physical address of the facility (i.e. street number, lot and plan number(s), street name, suburb, and postcode)
- the postal address
- for renewals, the licence number that is assigned by the regulator
- contact name and details.

## 8.2 Description of the MAP

This section should describe the MAP, including its location, the nature of the activities and an overview of the amusement devices at the MAP. The content of this section provides the overall context of the MAP and allows the regulator to establish how an ADI could impact the MAP, patrons, workers, surrounding businesses and land users.

[34] s.608ZJ of the WHS Regulation

[35] s.676 of the WHS Regulation

Enough information needs to be supplied allowing the regulator to understand and evaluate the identification of ADHs and ADIs[36] and the safety assessment.[37] The following information should be included as a minimum:

- a brief description of the nature of the MAP and its operation, including a description of the main activities at the MAP, particularly those activities associated with amusement devices.
- a list of the amusement devices which meet the criteria in the definition of a 'major amusement park'.[38] This could be presented in conjunction with requirements under section 8.3 of this guide.
- a scaled plan of the general layout of the MAP, containing the location of the:
  - amusement devices
  - patron circulation areas–food courts, walkways, carparks, and other activities
  - worker areas–maintenance, depots, laydown, worker carparks, etc.
  - vehicle access points and paths including emergency response entry locations and suitable pathways for emergency vehicles
  - control rooms and offices
  - plant rooms for amusement devices, motor control rooms, electrical switch rooms, electricity supply to the MAP and substations and high voltage distribution with the MAP
  - emergency plant and equipment (e.g. fire water ring main/other fixed firefighting equipment, emergency control centre)
  - escape routes within and from the MAP
  - emergency assembly area(s). (More than one assembly area may be needed where an incident could cause the release of toxic gases or smoke, or another event may cut off access to the main assembly area.)
  - the location and quantities of dangerous goods
  - the location and name of depots or storage areas including any hazardous chemicals
- scale plans of the surrounding areas including:
  - the location of the MAP within the surrounding area
  - surrounding land zonings (e.g. residential, industrial, special interest, airports, aerodromes). One source of this data is QLD Globe available at https://qldglobe.information.qld.gov.au/
  - the location of any identified external workplaces or activities including other facilities, such as dangerous goods storage, which could affect the safety of workers or patrons in the event of an emergency incident at those locations.[39] For example:
    - industrial or commercial activities
    - retail sales
    - sporting fields
    - parkland or forest where a bush fire could occur
    - where chemical processing or storage activities occur
  - areas surrounding the MAP where the safety assessment has found that an ADI may cause harm to people outside of the MAP boundary.
- Other information which may be a consideration to the safety of a MAP could be included here, for example:
  - earthquake potential/probability
  - tidal or inundation area considerations
  - cyclone and storm impact information
  - bushfire information.

[36] s.608K of the WHS Regulation

[37] s.608L of the WHS Regulation

[38] s.608A of the WHS Regulation

[39] s.608K (3)(c) the operator must document any external conditions under which an ADH might give risk to an ADI

## 8.3 Description of amusement devices

The following relevant information about each amusement device at the MAP[40] must be included in the safety case:

- the current name of the amusement device
- the manufacturer of the amusement device
- the class of the amusement device under section 2.1 of AS 3533.1-2009 Amusement Rides and Devices – Design and Construction
- the plant design registration number of the device (if any) issued by the regulator
- if known, the year the amusement device was manufactured and/or first commissioned.

In addition to the required information, the following should also be provided to ensure the clarity of information as the MAP may have changed the amusement device name, description, or design since installing the device(s):

- The previous name(s) of the amusement device
- A brief modification history of the amusement device including:
    - changes made to the amusement device that required notification to the regulator, including:
        - any design registration number change that may have occurred
        - whether any major components are older than the ride's stated manufacturing/commissioning date (e.g. a structural tower may be older than the ride attached to it.

## 8.4 Amusement device incident history

As part of demonstrating that the safety assessment is comprehensive, you could include in your safety case the following:

- a history of all ADIs which have occurred at the MAP
- a history, relevant to your MAP, of national and international ADIs. (Relevant sources could include the ride manufacturer or court rulings.)
- safety notices released by the device manufacturer.

For each identified incident that occurred at the MAP, a short description of the incident could be provided along with a summary of the implemented controls/learning(s).

For national and international events, a similar short description of the event and learnings could be included. Information to include is any investigation findings that have been provided through your contacts or industry associations and any actions that you have taken to ensure the risk of a similar accident has been reduced SFAIRP at your MAP.

Knowing the incidents that have occurred nationally and internationally demonstrates to the regulator that the MAP is taking a broad approach to understanding and minimising the potential harm that could occur from an amusement device. This information also contributes to demonstrating risk reduction SFAIRP.

# 9 Management of risk

The safety case must include a summary of all steps taken to manage risk at the MAP.[41] The risk assessments required under the WHS Regulation are like many risk assessment guides or tools.

For example, Australian Standard AS ISO 31000:2018 Risk Management Guidelines. In that standard, Part 6 sections 6.3 Setting the scope, 6.4 Risk assessment and 6.5 Risk treatment are similar. There are several elements specific to the development of the safety assessment and safety case which are worth highlighting here.

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[40] s.608R of the WHS Regulation

[41] Part 9A.3, Division 3 Management of risk of the WHS Regulation

1. **The unmitigated risk should be determined.**
   As discussed in section 7.5, the unmitigated risk involves the worst-case consequence for any accident pathway, and it should be considered first. The worst-case consequence informs you of the strength of the control required to prevent that ADH from becoming an ADI.
2. **Identify the specific controls relevant to the ADI and pathway**
   The identified controls must intersect the incident pathway in order to prevent the consequence from occurring. The action the control must take should be identified in enough detail so it can be understood by those who use the information to implement the control and to ensure it remains effective. This, as a minimum, includes the MAP staff, relevant contractors, and in the safety case, the regulator.
3. **The mitigated risk should be determined**
   The risk with the current controls in place should be determined. If during the assessment, there are inadequate controls identified for a hazard, you must take steps to ensure that the risk is managed. This may involve stopping the activity or implementing interim controls until a permanent solution is implemented. If an interim control is identified, then it should be described as such in the safety assessment and the risk associated with the control established.
4. **Risk reduction so far as is reasonably practicable**
   The range of control measures considered as possible controls must be documented, including the rationale for including or excluding each one. The risk reduction benefit (risk estimated after any new controls are implemented) must be considered along with a rationale for including or excluding the new controls. For example, it may be that a potential control is prohibitively expensive and cannot be implemented but those controls must be included in the assessment to demonstrate you have considered all possibilities.

There are multiple mechanisms to conduct these studies, display the results and draw out the risk reduction plan and draw out a management plan for existing controls.

You should present in your summary how the risk management process was completed. You are encouraged to illustrate and demonstrate via tables or references how the process reflects the requirements of the legislation. Additional information can be found in the following Australian Standards: AS/NZS 4024.1201 Safety of Machinery General principles for Design - Risk Assessment and Risk Reduction and AS/NZS 4024.1303 Safety of Machinery Risk Assessment - Practical Guidance and Examples of Methods.

Further detail is provided in the sections below.

# 9.1 Amusement device incidents and hazards

## 9.1.1 Amusement device hazards

An ADH is defined as:

***"a hazard that could cause, or contribute to causing, an amusement device incident".***[42]

A broad range of hazards should be considered in preparing the safety assessment so that the assessment is comprehensive. However, the list of hazards discovered may be significantly longer than those hazards considered as ADHs triggering an ADI. Hazard identification is the most important step in any risk assessment[43] and according to AS/NZS 4024.1303[44] the choice of a specific risk estimation tool is less important than the process itself.

There are many ways to identify hazards. Examples include the energy method, HAZard and OPerability Studies (HAZOP) (AS IEC 61882), Failure Mode and Effects Analysis (FMEA) (AS/NZS IEC 60812), fault tree analysis (FTA) (AS IEC61025), workflow analysis, job hazard analysis, proprietary risk information from amusement device manufacturer. Any one or combination of hazard identification processes should be considered in developing the hazard list. A list of further references is provided in Appendix B–Further information.

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[42] Schedule 19 definitions—WHS Regulation

[43] AS/NZS 4024.1303, Clause 5.3.1

[44] AS/NZS 4024.1303, Clause 6.1

A critical examination of the MAP's layout should be included in the hazard identification process. It could be that an incident at one amusement device could knock-on to another amusement device or area of the MAP. Considering the layout may reveal other ADHs.

There may also be a wealth of hazard information contained within studies covering the full life cycle of the device. It may reveal additional hazards which should be included in the hazard identification processes.

Information sources that could assist in developing the hazard list for an amusement device may include:

- design (e.g. concept, detailed design, technical standards used)
- design verification for design registration purposes
- design considerations for the location of the amusement device in the MAP (including environmental and operational limitations)
- contract to purchase (to include provision by manufacturer of detailed technical and safety specifications for ongoing safe operation including, but not limited to, functional descriptions and manufacturer's risk assessment)
- processes of manufacture, delivery, and installation
- commissioning
- validation tests of control system(s) to ensure the amusement device has been installed, tested, and is functioning as designed
- preparing to operate (e.g. the development of maintenance schedules, operation procedure/s, and operator and maintenance personnel training which is based upon the specifications)
- any emergency procedure(s) provided by the original equipment manufacturer
- critical component spare parts storage and their storage requirements/history
- collection and collation of critical technical information (e.g. electrical circuit diagrams, bills of materials, mechanical and structural drawings and process and instrumentation drawings) in an information system to facilitate easy access for operation
- inspection, maintenance, and repair history
- previous incidents involving the specific ride and other similar rides worldwide
- manufacturer safety bulletins and alerts
- alteration of design
- annual and major inspections by competent person(s) (in most cases a registered professional engineer(s))
- storage history
- de-commissioning and demolishing.

The scope of the hazard identification must also be broad and include how people move within the amusement device entry/exit and during emergency situations. In this way the assessment will be considered comprehensive.

All identified hazards must be managed SFAIRP but not all hazards will lead to an ADI. The information provided in the safety case must include those hazards that lead to an ADI. Hazards which are not required to be included may optionally be included but in any case must not be forgotten. If any hazards have inadequate/no control measures identified, they should be addressed by your SMS to ensure the hazard(s) are captured and appropriate controls are put in place.[45, 46]

### 9.1.2 Amusement device incidents

The safety case must include a summary of the identification of ADIs[47] conducted. The summary should include the criteria, based upon your definition of the potential exposure of a person to a serious risk to health or safety emanating from the occurrence.

[45] s.34 Duty to identify hazards of the WHS Regulation

[46] s.35 Management of risk of the WHS Regulation

[47] s.608R(2)(a) of the WHS Regulation

The safety case summary should demonstrate that appropriate steps have been taken to identify comprehensively all potential ADIs for the complete range of normal and abnormal operating modes and maintenance i.e.:

- start-up (including after breakdowns, incidents, and extended periods of inactivity)
- shut down
- construction (as required)
- commissioning (as required)
- automatic or manual operating
- all maintenance changes to plant, structures, or gating systems
- de-commissioning, removal, and site restoration (as required).

During the hazard and incident identification process, workers must be consulted.[48] The summary should include a description of how they were included in all steps. For each amusement device the safety assessment should at least document who was consulted and their relevant experience.

A broad range of events will have been identified during the hazard and incident identification process. Each ADI that may occur during operation of the MAP should be described in sufficient detail to convey to the regulator that you understand:

- the nature of each ADH and ADI[52]
- the circumstances that link the ADH to the ADI.

Note that even if a hazard does not lead to an ADI, that hazard still exists and should still be controlled by the SMS (see Figure 1).

### 9.1.3 Summary of amusement device incidents and hazards

The safety case must include a summary of the process for identifying ADHs and ADIs and a list of all ADHs and ADIs.[49] The summary should demonstrate that you have comprehensively examined all aspects of the amusement devices for their respective hazards and linking incidents.

A large amount of information will be generated in the assessment process for each amusement device. This can make it difficult to present in the summary. It is suggested that examples are used to illustrate the salient points throughout the summary. Appendices can be used to contain the specific device assessments.

### 9.1.4 Emergency services recommendations

In conducting the assessment of ADIs and ADHs you must consult with emergency services or any department with a regulatory role and have regard to any advice and recommendations made.[50] This will include OIR.

It is not necessary to document all aspects of consultation with OIR due to the extensive nature of consultation conducted during the development phases of the safety case.

Where responses were obtained from other regulatory bodies, the actions and outcomes should be provided in the safety case as part of the summary. See Section 12.3 Consultation with emergency services of this guide.

## 9.2 Safety assessment

The safety case must include a summary of the safety assessment.[51] In this section the summary should contain the methodology[52] used in the safety assessment.

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[48] s.608ZA and s.608ZB of the WHS Regulation

[49] s.608K or s.608U s.608R(2)(a) of the WHS Regulation

[50] s.608K (2) of the WHS Regulation

[51] s.608L or s.608V s.608R(2)(b) of the WHS Regulation

[52] s.608L (3) Safety assessment or s.608V Safety assessment of the WHS Regulation

You should reflect the process provided in the safety case outline and you could include any learnings or improvements made to the process as the safety assessments progressed.

The likelihood of an ADH causing an ADI must be assessed. As part of your approach you may choose to use different types of data to establish the likelihood of a hazard leading to an ADI. Two examples are to take a qualitative, or semi-quantitative approach. Engineering studies may also inform you of the potential likelihood of an incident occurring (quantitative data). Where using third party documents or internal documents, you should provide the source of the data so the regulator can examine its validity.

In the safety case, you should summarise how you made decisions about the likelihood of an incident occurring. Examples can be used to illustrate the process.

## 9.2.1 Estimating unmitigated and mitigated risks

The safety assessment process requires that you assess the unmitigated risk (the risk without the controls in place)[53] to identify the highest-level consequence which could occur if the controls were impaired or not functional. This is sometimes difficult to relate to because some controls are simply part of the design. Therefore, it might be hard to separate unmitigated risk from mitigated risk. In this case, to identify the unmitigated risk, it can be helpful to ask yourself why that control measure was essential in the design.

It is also sometimes difficult to estimate the consequence of an incident because the worst thing that can happen is a fatality, yet every incident stemming from the same hazard may not lead to a fatality.

You will need to develop your judgement during this process to identify the consequence(s) of an ADH causing an ADI.

The mitigated risk should be estimated based upon the hazard and likelihood of the event occurring. To assess the mitigated risk, with the current controls, you could examine the effectiveness of the controls and estimate how much risk reduction those controls impart. In considering how much risk reduction, you should consider the hierarchy of controls and be able to demonstrate why those controls are effective either in stopping the initiating event or minimising the consequence if the initiating event does occur. Assessing controls is discussed below in Section 9.2.2 Control measures.

## 9.2.2 Control measures

In describing your safety assessment, you will need to include an understanding of the amusement device controls and how those controls impart hazard reduction and/or mitigation to reduce risk.[54]

There are many ways to define a control. Your summary should identify your interpretation of a control and the method used to measure its effectiveness. The key feature of any control is that it must impart, or cause, a response which reduces the frequency of the incident. Some controls may also reduce the consequence.

When claiming consequence reduction carefully examine any assumptions about the control. An example is a fire water system that limits the size of a fire. If the fire pump works, then it will limit the fire. However, if it doesn't, what will happen? The consequence reduction is based upon the control operating. If it does not (and in this example it might not), then you cannot claim a consequence reduction. Ultimately, for all the ADIs you have identified, you will need to demonstrate that:

- controls are suitable and effective in minimising the risk
- arising from the use of the control or group of controls, the risk is reduced SFAIRP.

### 9.2.2.1 Control effectiveness

There are many ways to control risk. Some control measures are more effective than others. You must consider various control options and choose the control(s) that most effectively eliminates the hazard or minimises the risk. This may involve a single control measure or a combination of different

[53] s.608L (2)(c) Safety assessment or s.608V Safety assessment of the WHS Regulation

[54] s.608M (1) Control of risk of the WHS Regulation

controls that, together, provide the highest level of protection that is reasonably practicable to achieve.

Single control measures are not desirable when the outcome of a failure is a fatality. It is more desirable to have a range of controls working together in layers to minimise the risk. Yet not all controls are equal.

At a MAP, an example of a control could be the redundant rider restraint cylinders on a ride vehicle that are automatically checked for closure and locking. The lock, rider restraint and seat hold the person in place and prevent them from being ejected. This control imparts its risk reduction directly on the person who could be exposed to the hazard. It is very effective when operating as designed. It is an engineering control.

There are administrative controls that are part of your SMS. For example, the check an operator does by pulling on the restraint prior to launch is an administrative control. The operator may not subject the restraint to the same level of test each time (the amount they pull on the restraint) or if distracted may not test every vehicle. It is considered only partially effective. It is an administrative control.

Administrative controls typically are not as effective because the operator may detect a gross failure of the control, but with a nominal human failure rate of about 10 per cent[55], the test is not always effective. An automated check of the restraint for closure and locking is an engineering control that would be better.

Both controls form barriers preventing an ADI and reducing risk, but their effectiveness is quite different. The hierarchy of control[56] must be one mechanism you use in assessing the effectiveness of a control.

If there are one or more controls for one hazard that could lead to an ADI and that fit into hierarchy level 3, which is administration or personal protective equipment (refer to Figure 4 below), then you should consider other controls further up the hierarchy in order to improve the reliability and effectiveness of the controls.[57]

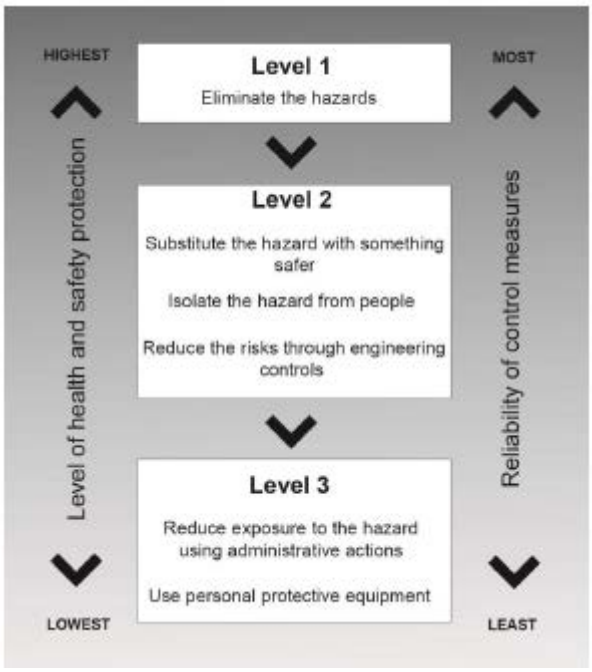


**Figure 4 Hierarchy of controls**

*When assessing controls, the hierarchy of controls must be considered in determining the risk reduction from the control.*[57]

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[55] CCPS, *2001*, *Layer of Protection Analysis: Simplified Process Risk Assessment*, American Institute of Chemical Engineers

[56] S.36 of the WHS Regulation

[57] worksafe.qld.gov.au/__data/assets/pdf_file/0003/58170/Manage-WHS-risks-COP-2011.pdf

While the hierarchy of controls is a statutory requirement under the WHS Regulation, it does not provide differentiation across a range of controls similar in function or within the same level of the hierarchy, nor differentiate how the controls, once implemented, might respond effectively or ineffectively to the circumstances of a particular incident.[27, 58] For example, a fire deluge system, meant to mitigate the impact of a fire, cannot be effective if its fire water pump is destroyed by the incident.

To determine if controls are effective and to differentiate between controls similar in function or in the same level of the hierarchy, it may be practical to use tools which come from the machine safety and process safety industries. These assessment tools are also useful in establishing the performance criteria and indicators required by Schedule 18C s7.3 of the WHS Regulation as you are characterising the control. Therefore, it is easier to link an indicator to the control.

The most effective controls are ones which are independent of the event and of each other. They are also robust and will either fail-to-safe or provide early information on their failure. Two methods are suggested below which may help you define the effectiveness of a control to protect against the hazard. One method is simplistic and offers a quick route to assess a variety of controls including human/control system interfaces. The other provides a detailed analysis and is more suited for engineering controls.

A quick assessment tool to establish if your control might be effective can be drawn from the criteria for an independent protective layer arising from the layer of protection analysis (LOPA) process (refer Table 2). This tool is qualitative and fits with a qualitative risk analysis process, but because it is simple it can be used in the field when assessing a control. It may be that further analysis is required to establish the full nature of the control, but this test is a simple first assessment.

**Table 2 Tests for an effective control**

| Control assessment element | Question | Test phrases | Examples |
|---|---|---|---|
| Effective | Is the control effective in preventing the consequence when it functions as designed? | • Can the control detect the condition requiring it to act?<br>• Can the control detect the condition in time to act? | Effective: SIL rated safety trip which stops the launch of a roller coaster vehicle via zone control detection and stops collision.<br>Less effective: operator observes first vehicle stoppage and doesn't start the launch of the second vehicle. |
| Independent | Is the control independent of the hazard? (initiating event) | • Is the control independent of other controls already identified? (i.e. is it susceptible to common cause failure where a single event can disable several controls)? | Independent: SIL rated safety trip which stops the launch of a roller coaster vehicle via two independent zone control detection loops that use different type sensors and stops the collision.<br>Not independent: the two zone detectors are the same and are used for the safety trip. |

[58] CCPS, *2001*, *Layer of Protection Analysis: Simplified Process Risk Assessment*, American Institute of Chemical Engineers

| Control assessment element | Question | Test phrases | Examples |
|---|---|---|---|
| Auditable | What is the evidence the control remains effective and what is routine validation of the control? | • Can the control be tested by audit and validated as performing the function for which it is designed? | Auditable: full loop and components of the SIL rated safety trip can be tested. The test program is in the maintenance system along with periodic validation tests. The information is retained. All tests are conducted to schedule. This information can be audited.<br>Not auditable: Maintenance performed by a third-party contractor; no records are provided to the operator. Periodic check sheet does not exist or does not require sign off by the person conducting test or observations are not recorded. |

If your control fits all the criteria, then it could be considered an independent and effective control. If not, then the control is only partially effective, and you should look for additional controls to give defences in depth or a range of controls that when used together fit all the criteria and limit the potential for an ADI to occur.

Another tool which can also provide a way to characterise the effectiveness of a control considers functionality, availability, reliability, survivability and interdependency.[27, 59] This is often shortened to the acronym FARSI. This tool is more quantitative and machine safety orientated and provides more detail on the control. An example of using the criteria to measure a control's effectiveness is given in Table 3.

**Table 3 Example of the use of FARSI for assessing a control's effectiveness**

| Control assessment element | Description | Example(s) |
|---|---|---|
| Functionality | What the control is required to do with respect to ADI management | The vehicle brakes must stop the device in the unloading zone.<br>The fire water system must deliver x amount of water per square metre.<br>The ride operator must respond to an alarm and press a button to stop the occurrence. |
| Availability | The proportion of time that the control is required to be capable of performing its function on demand. | The vehicle brakes must always be available when ride is operational. The required availability is 100%.<br>The fire water system must be available and operate till the fire is quenched. The required availability is 100%.<br>The ride operator has 10 safety (10 second duration) tasks to perform in the same two minutes and respond to alarm. Actual availability 16%. |
| Reliability | Probability that at any point in time it will operate correctly. (usually mean time before failure). | The vehicle brakes are permanent magnets with a probability of failure of 0.0001.<br>The fire system on each test has a significant maintenance task and doesn't always function as required. Estimated probability of failure is 0.5.<br>The ride operator can be fatigued or distracted and is in a noisy environment. Estimated probability of failure is 0.1. |

[59] Energy Institute, *Guidelines for management of safety critical elements (SCEs),* third edition January 2020, Energy Institute, London. Management-of-safety-critical-elements, accessed 30/07/2020

| Control assessment element | Description | Example(s) |
|---|---|---|
| Survivability | Whether the control measure can survive the potentially damaging event. | The vehicle brakes will not be affected by the failure to stop - high survivability.<br>The fire system pump and water/foam supply are removed from the hydraulics room and will survive a fire and minor explosion—high survivability.<br>The ride operator can see the accident occurring and may go into shock and not respond quickly—low survivability. |
| Interdependency | Degree of reliance on other systems to perform its intended function. | The vehicle brakes will not be affected by any other system due to design—no dependency.<br>The fire system is automatic and because it has a fusible link that drops system pressure to trigger operation—no dependency on other systems.<br>The ride operator relies upon a detector which triggers a light and alarm for response—high dependency on the operator to notice alarm and light. |

The examples show that using the ride operator as a control measure to minimise risk has a number of failure points and is less desirable. The fire water system has maintenance issues and could be significantly improved. The independent braking system is likely to be the most effective control in the example group. Using this tool can assist you in developing a fundamental understanding of the control, its function and operability. In developing the summaries in the safety case, you should consider providing information on how you have validated the effectiveness of your controls.

All controls should be critically assessed including those identified by the device manufacturer. Simply stating that a lap sash belt stops patrons from being ejected, because it was supplied by the manufacturer, may not be good enough. You will need to assess and demonstrate why it is good enough. The whole objective of the safety assessment process is to embed the knowledge of when and why the device is safe to operate into the operations team, maintenance team and management.

The advantage in critically assessing a control is that you will be able to derive the key elements which form the basis of a good control. This will tell you what you must monitor to keep it in a good state of operational readiness.

By demonstrating that you have assessed the effectiveness of your controls and summarizing your methodology in the safety case, you are demonstrating that you are working toward reducing risk SFAIRP. Actions to improve controls should come out of the analysis. These should be prioritised, can form an improvement plan and should be included in your safety case.

### 9.2.2.2 Linking controls to an amusement device incident

The ADHs should be specifically described and you will need to demonstrate a logical link from the hazard to the control in your safety assessment and summary in the safety case. Generic descriptions of a control or the hazard may not show the regulator that you understand the control or the hazard, refer **Table 4**.

**Table 4 Linking ADHs with ADIs and specific controls**

| ADH | ADI | Example control(s) | Sufficient/not sufficient | Comment |
|---|---|---|---|---|
| Corrosion | Gondola collision with ground | Corrosion inspection | × | What is the specific mechanism of corrosion and what does it affect that will lead to the gondola hitting the ground? How |

| | | | | |
|---|---|---|---|---|
| | | | | is it measured and what is the pass/fail criteria? |
| Moisture ingress leading to internal spar corrosion | Gondola collision with ground | Ultrasonic thickness assessment of spar (12 monthly) | ✓ | The hazard, moisture ingress, is clearly linked to the ADI. The control is specific and can detect a change to the thickness over time allowing reassessment of the hazard prior to an ADI occurring. |

Demonstration of your safety assessment technique linking hazards and controls can be achieved in any way that demonstrates a logical connection between them, for example by using selected examples from your chosen method/format of safety assessment or using spreadsheets or presenting it visually with bow ties. In your safety case you will need to include enough detail so that the assessor will be able to follow how you have conducted the assessment.

#### 9.2.2.3 The range of control measures considered

In conducting the safety assessment, there are requirements under the WHS Regulation[60] for operators to identify what range of controls was given consideration to manage risk. The Swiss cheese model of accident causation[61] likens complex systems to multiple slices of Swiss cheese stacked sideways. The theory is that, by using multiple layers of controls, lapses, and weaknesses in one defence (or control) are protected by the other layers thus preventing a single point of failure.

Where a single control is identified in your safety assessment you will need to consider further controls depending on the circumstances. The aim is to have effective control measures, as high on the hierarchy as possible, and as simple as possible while achieving effective control. Therefore, in considering the effectiveness of a set of controls, where there are multiple administrative controls, you should look to move up the control hierarchy to find more effective controls if they exist.

When considering your controls or potential controls, the operation of a control may lead to additional hazards which will need to be assessed. For example, an inert fire gas suppression system reduces oxygen in a room on detection of fire. However, it also impedes the capacity of a person to escape the room due to the oxygen reduction. The hazard of hypoxia is a new hazard which must be considered in the risk assessment

Every layer of protection makes an incremental improvement in safety, provided that the additional complexity does not decrease safety. As many layers as are practicable need to be implemented. Thus, a range must be considered. It is not enough only to consider one or two control measures. Range means an array of choice, variety, and assortment. You are encouraged by the WHS Act[62] to examine multiple possible options for control and mitigation–it is not enough simply to adopt the same solution that was employed the last time around; you will need to review what is most appropriate under current circumstances and seek if possible new more reliable and effective controls. Where controls are identified and rejected, a rationale will need to be included in the safety assessment and the safety case to demonstrate that you have considered risk SFAIRP.[65]

### 9.2.3 Demonstration of control adequacy

The analysis of controls should be provided as part of the summary of the safety assessment. Examples could be used to illustrate and provide the required level of demonstration. You need to provide:

- the links between ADHs and ADIs and the control measures and how the control measures will adequately control the risks that could lead to an ADI
- that in selecting control measures, the hierarchy of controls has been followed

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[60] s.608L (2)(d) 'the range of controls considered' of the WHS Regulation

[61] Reason, J., *The contribution of latent human failures to the breakdown of complex systems*, Phi. Trans. R. Soc. Lond. B. 1990, V327, p475–484 https://royalsocietypublishing.org/doi/10.1098/rstb.1990.0090 accessed 30/07/2020

[62] s18 of the WHS Act

- that a range of control measures has been considered
- that there is an understanding of how each of the control measures (actual and proposed) will affect the risk
- reasons for the selection or rejection of control measures, in the context of the principle of reducing risk SFAIRP
- the user of the control. A patron/rider control needs to be robust as patrons receive little or no information about what can go wrong. Therefore, the effectiveness of the control must be higher or the design better, to minimise harm to a patron when compared to a worker who is trained and familiar with the hazards.

However, a control measure is not just a reference to a standard or manufacturer's maintenance program. A control is that part of the device or SMS that operates to prevent a hazard's consequence from being realised. For example:

- The implementation of elements of a standard, such as the act of inspecting a part. An inspection is a control, albeit an administrative one.
- The instruction in a procedure to pull on the strap of the rider restraint is a control. However, the prestart ride procedure is not a good definition of a control because it covers multiple items and does not convey what is important about that process.

It is important to remember that a control must be something you have at the MAP and is something you have operational control over.

For example, identifying that Queensland Fire and Emergency Services (QFES) is a control and will mitigate a specific occurrence (e.g. a fire) is not something which your MAP controls because you cannot guarantee QFES will arrive in time to impart the desired hazard reduction. QFES remain a mitigation control, but they are not immediately effective. You should be seeking mitigation controls that the MAP can implement commensurate to the risk the hazard presents.

## 9.3 Control of risk and SFAIRP

The MAP operator must control the risk associated with the use of an amusement device.[63] There are two components to this requirement. Firstly, the risk should be eliminated SFAIRP. Secondly, where the risk cannot be eliminated, it should be minimised SFAIRP.[64]

To eliminate the risk completely is difficult as amusement devices operate at speeds, at heights and are structural, mechanical and electrical in nature. So unless the amusement device is removed, the hazards due to failures are almost always present. Controls reduce the frequency of occurrence and may limit the consequence, but the predominant risks associated with the amusement device will continue, so long as the amusement device is in use.

So, you must identify and implement controls which reduce risk SFAIRP. There will be limits where no new controls can be identified. There will be controls that could be implemented, but the cost of those controls would not be proportionate to the risk reduction they would impart.[65] In between these two extremes, there will be a range of controls which you may be able to implement, or you can implement as the cost is not disproportionate. Where a control can be implemented, it should be as soon as practicable.

In each instance you should include a rationale for this in the documentation. In the safety case, you could present more detailed examples of new or rejected controls and a rationale to support those decisions.

Not all proposed controls will be implemented by the time the safety case is due for submission. You should provide a list of the new controls arising from the safety assessment and the improvement plan for those controls. It should include dates of when the improvements will be started and completed even if this is an estimate at the time of writing the safety case.

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[63] s.608M of the WHS Regulation

[64] s.17 of the WHS Act

[65] s18 of the WHS Act

Demonstration of risk control should also include improvements to the SMS. The SMS contains control measures. It is useful in the safety case to include a summary of the changes in the last five years that demonstrates the operator has been seeking to reduce risk and has implemented changes to the SMS in response to signals.

The changes could include:

- Information Technology (IT) based systems
- alterations to elements of the SMS
- system changes in response to incidents
- overview of improvements to amusement device controls.

You should present all elements that have reduced risk in your safety case. By doing so, it demonstrates the active management of the site's ADHs and ADIs and that the operator is responsive to hazards.

## 9.4 Demonstrating the safety assessment

The safety assessment process takes all the identified ADHs and ADIs and assesses the risk of each event based upon the control effectiveness. The process identifies where controls are missing, are flimsy (unreliable or not effective for the particular hazard), are thin (lack a range) or present and effective. The analysis examines the preventative/mitigative controls and identifies if further controls may be required. The risk reduction effect of the proposed controls must also be provided.

The safety assessment should for all ADIs include the unmitigated risk (the worst-case consequence that could occur), the existing risk with current controls and finally the risk with proposed additional controls in place. The format for presenting this process is open however, you need to ensure that:

- the identified controls impart control over the hazard and mitigate the consequence
- the degree of analysis is proportional to the level of complexity of the amusement devices, the nature of the hazards and the possible consequences
- all possible risk control measures are considered including those currently installed and those that are being evaluated for installation
- critical (safety) controls are identified
- appropriate criteria were used to select or reject control measures
- there is a traceable link between identified hazards, incident scenarios and control/mitigation measures
- an estimation of the unmitigated consequence if the ADI were to occur
- the likelihood of each ADH causing an ADI is estimated
- in the event of an ADI occurring, its potential magnitude and the severity of its potential health and safety consequences
- described any interlinking events which could cause greater harm arising from the incident occurring (commonly known as knock-on).

Demonstration of the risk assessment can be achieved by including specific examples of how the process was implemented in the safety case. The full safety assessment must be presented in the safety case in some form.

# 10 Safety management system description

The SMS is the key system by which the operator manages safety at the MAP. The elements of the SMS which must be described in the safety case are a subset of the overall SMS..

There is likely to be more SMS elements than those statutory items listed in Schedule 18C of the WHS Regulation.

The SMS system must be comprehensive and integrated for managing all aspects of risk control in relation to the occurrence of ADIs at the MAP. Where practicable, systems should be aligned across all aspects of managing safety at the MAP.

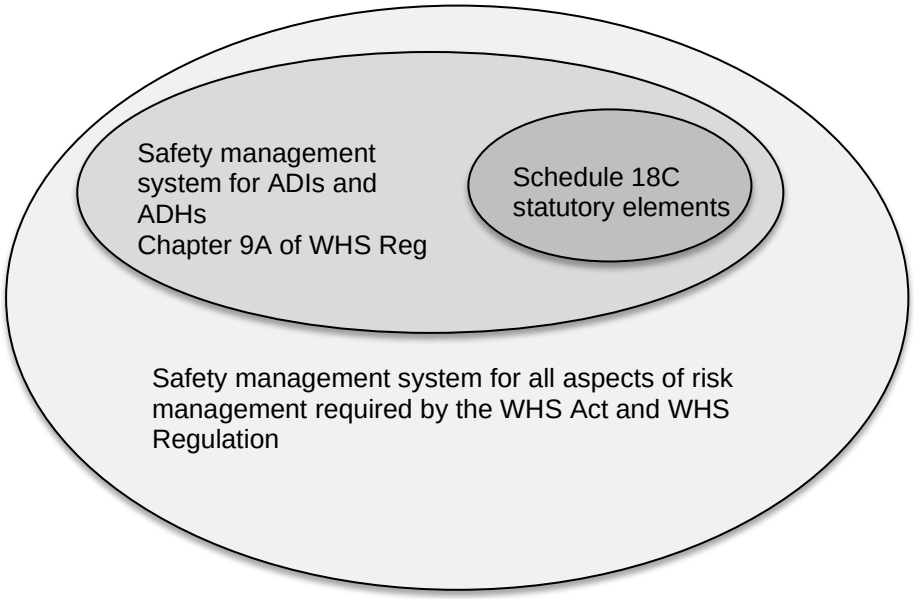


**Figure 5 The safety management system**

*The SMS as described in the safety case is a subset of the overall SMS for managing all risks across the MAP.*

## 10.1 Integrating the requirements for Schedule 18C–amusement device safety management systems

The WHS Regulation identifies statutory requirements which must be included into the SMS of a MAP. In summarising your SMS, consider integrating the Schedule 18C elements across your system descriptions as they fit into the SMS for the MAP. The summaries in the safety case should reflect how your systems work to reduce risk SFAIRP and address the criteria in Schedule 18C[66].

## 10.2 Policy and leadership

The operator of a MAP must summarise in the safety case its safety policy that ensures commitment to its SMS.[67] While often generic, the safety policy and the organisational commitment to achieving it sets out the framework for the SMS and how it will be followed at the MAP.

The policy and leadership summary should link to your summary of the due diligence processes used to inform the operator of safety matters at the MAP.[68]

### 10.2.1 The safety policy

The safety case should contain your safety policy as endorsed by the Chief Executive Officer (CEO) or other high-level management. A health and safety policy that sets out a high-level statement detailing the operator's broad aims for the safe operation of the MAP should be created if it is not already in existence.

Policy statements are usually expressed in general terms but reflect your objectives for the safety of operations at the MAP. The policy is intended to inform all stakeholders, including workers and management, that safety is an important part of all operations. Your policy statement should be reinforced through periodic review and involvement of management and board.

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

[66] Schedule 18C of the WHS Regulation

[67] Schedule 18C of the WHS Regulation–Safety policy and safety objectives s1.1

[68] Division 4, s27 of the WHS Act–Duty of officers

the safety policy(ies) section of the safety case, the required description of the operator's duties required in the amusement device SMS.[69]

### 10.2.2 Communication of the policy

The safety case must summarise how your policy is communicated to workers and the mechanisms used[70] to prevent ADIs from occurring. It may be useful to provide an overview of how you communicate the policy and feedback to workers to meet the requirements of this part of Schedule 18C.

### 10.2.3 Commitment

An operator's success at fulfilling its safety policy and achieving its safety objectives is usually proportional to the organisation's commitment to achieving those goals amid all the other goals competing for its attention. A clear commitment to those safety objectives starting at senior management level is important.

Regular reviews of safety performance and performance against the safety objectives at management level reinforces the importance of safety to the organisation's success. While management is required to demonstrate commitment through its actions and involvement, all workers need to be involved for the system to be fully functional and integrated. Everyone at the MAP should be aware of the influence that their action or inaction may have on the effectiveness of the safety system. Further advice on governance and reviews of performance is provided in section 10.12.

A short summary of how the MAP operator shows its commitment to management and workers should be included in the safety case in order to meet the requirements of this part of Schedule 18C[69].

### 10.2.4 Duties of operators

The WHS Act sets out the principles that apply to health and safety duties of the operator (a person in control of a business or undertaking).[68] For a MAP the WHS Regulation specifically requires the operator to describe how they will comply with the WHS Act and WHS Regulation.[69] This duty is often addressed by the operator's policy documents. Operators may integrate these requirements into an existing policy statement. Others choose to have a separate policy document to address Chapter 9A. However you choose to address this aspect of the regulations, it is recommended that the policy statements of the operator are attached to, or at a minimum, summarised in the safety case.

Among the matters to be included in the SMS, the WHS Regulation requires [71] that:

"*each part of the documented amusement device safety management system that describes the means of compliance with a provision of Chapter 9A, Part 9A.7 an annotation or cross-reference identifying the specific provision being complied with*".

This section of the WHS Regulation identifies that the operator must understand how its SMS complies with the requirements. This can be done in several ways. One way is to provide a table in the SMS which identifies the sections forming the compliance requirements (see Section 7.8. Good practice.)

It is also very useful to include this table indexed to the safety case so that the reader can cross reference and find how you have complied with the requirements. A table linking your safety case to your SMS and the regulations bridges terminology and language barriers improving communication aspects of the safety case.

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[69] Schedule 18C of the WHS Regulation–4.1 Duties of operators

[70] Schedule 18C of the WHS Regulation–Safety policy and safety objectives 1.2

[71] Schedule 18C 4.2 of the WHS Regulation

## 10.3 Organisation and personnel

The WHS Regulation[72] requires the identification of the persons who will implement the SMS, a description of the command structure and the specific tasks and responsibility allocated to them. A summary of this information should be contained within the safety case providing context to the summary of the SMS. The structure of the organisation also provides information about safety management at the MAP.

Typically, the summary in the safety case in this section could include as a minimum the organisational chart (command structure) for the MAP, the company or operator and the following:

- role statements for all positions of responsibility in operating the SMS
- considerations for minimum staffing numbers to operate the MAP and amusement devices safely
- fatigue management policies and shift work
- management of staff turnover
- management of workloads
- communications to workers and management of safety issues
- communication methods to workers
- availability of the safety case to workers
- statements around the role for workers
- HSRs, and participation in the hazard identification, safety assessment and ongoing safety management (how do workers contact management).

The SMS must also contain 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 to discharge their allocated responsibilities, and that they retain such knowledge.[73] The training and competency framework will normally address these requirements and a summary is required in the safety case. See section 10.8 Training and competency.

## 10.4 Operational controls—safe work methods

The SMS must contain a range of instructions and procedures to operate the MAP safely for both patrons and workers.[74] In the safety case, a summary of the systems that use procedures must be included.

There are various ways this could be presented in the safety case. Where practicable, a summary of the relevant parts of the procedure(s) could be included within the description of the SMS. Where there are multiple processes and procedures, you could utilise any internal grouping of procedures to convey the range and extent of the procedures that are relevant to the operation of the MAP.

The WHS Regulation[74] specifically calls up the following systems as they are integral to safety on site and must be in the SMS for the MAP:

- start up and operation of amusement devices (daily and other safety checks)
- shut down of amusement devices (including securing to prevent unauthorised operation)
- safe access, egress, placement, management, and security of patrons riding or using the amusement device
- communication processes between workers and other persons who check, or operate, or supervise the check or operation of, amusement devices
- isolation of the amusement device or any plant or structure connected to the device in the event of an emergency
- access for inspection, service and maintenance of the amusement device or any plant or structure connected to the amusement device. This includes:

[72] Schedule 18C of the WHS Regulation—Organisation and personnel s.2.1

[73] Schedule 18C of the WHS Regulation—Organisation and personnel s.2.2

[74] Schedule 18C of the WHS Regulation—Operational controls s.3

    - control of work via work authorisation or permit to work systems (planning permit work, developing permits, range of permit types, permit acceptance, work execution, return and termination of a permit or authorisation)
    - isolation standards for electrical, mechanical and fluids containing equipment
- interfaces (control panels, gate systems and security, are examples)
- alarm systems (local alarms, amusement device alarms and emergency alarms are examples).

In the description of the SMS, specific attention should be given to describing and demonstrating safety aspects of these system elements. Specific examples can be included to show how the system has been implemented at the site.

Other operational controls that need to be present in a MAP's SMS are the processes and procedures for managing work in the way required by the WHS Regulation in Chapter 5. These include how it is ensured:

- the only persons who operate an amusement device are those who have been provided instruction and training in the proper operation of the device, including responding safely to abnormal operation
- only competent persons operate an amusement device
- all necessary checks are done before operation
- all log book entries are made as required
- operators of amusement devices are clearly identifiable as the operator.

How the MAP meets its further obligations in the remainder of WHS Regulation Chapter 5 should also be included. These include requirements for:

- ensuring safe storage (that amusement devices are stored without risk to health and safety and only by, or under the supervision of, a competent person)
- maintenance, inspection and testing of amusement devices
- annual inspections
- major inspections
- log books and manuals.

In addressing the items above, the MAP will need to demonstrate processes and procedures that:

- control abnormal conditions and safely handle alarms
- identify, handle, and reduce or eliminate human error, particularly in procedural checks
- are fault-tolerant procedures, and demonstrate processes for improving compliance with reporting procedural errors.

The safety assessment should have identified a range of procedures which have controls within them. Where applicable, if a procedure contains a control, or part of a sequence of controls, to prevent an ADI, then it should be described in the safety case as part of the safety assessment.

It is important to remember that the safety case should not contain the procedures. Rather it should contain, a summary, or the key parts of those procedures, that are related to risk control. Where practicable, you should be specific about what controls the risk in your procedure. You should be able to link the control in the procedure back to the safety assessment.

The WHS Regulation[75] requires that there is adequate means of isolation of the amusement device or plant or structure connected to the amusement device in the event of an emergency. Arising from the safety assessment, mitigation controls will have been identified. These controls, such as the location of water, power and mechanical isolation points should be included as part of your emergency plan procedures rather than in this summary of the SMS. See Section 12 for further details.

## 10.5 Change management

A significant contributor to incidents occurring at any workplace is change. 'Minor' (e.g. a change to the colour of a sign on an amusement device), major (e.g. a replacement of a roller coaster

[75] Schedule 18C of the WHS Regulation – Operational controls s.3.2

subframe), or partially completed modifications can lead to unexpected incidents. Managing change well demonstrates to the regulator active engagement in minimising risk SFAIRP is always present during MAP operations. The concept of change is not just limited to deliberate changes. Inadvertent change also must be managed along with the discovery of new ADHs.

A MAP operator must implement control measures that either eliminate the risk or minimise the risk SFAIRP of an ADI occurring. The WHS Regulation[76] also sets out specifically the types of changes that must trigger a risk management review and potentially an update of the safety case. Your MOC system(s) must cover all these elements. Furthermore, the regulation[77] requires the MAP to have procedures for installing an amusement device and planning modifications to amusement devices.

In the safety case, the regulator will be looking for a summary, inclusive of all aspects of change, for planning and managing modifications linked to an ADI. You should also consider conducting an analysis of all types of change across the MAP and capture in the procedures all change types that could impact an amusement device or create a new ADI.

To assist you in providing your understanding of change in the safety case it is useful to define change and the scope of the MOC systems(s). Alternatively, you could provide a list of what is not a 'change' and any other alteration would then have a change process applied to it.

When considering the scope of the change management processes, the WHS Regulation requires control measures that minimise the risk SFAIRP of ADIs occurring. Consequently, the scope will need to include all systems and procedures such as operational changes, organisational changes, equipment changes, computer software and hardware changes, data recording system changes, security changes etc. that could cause the introduction or modification of an ADH. While the systems may not be managed by the same process (e.g. document changes are normally managed by a document system) you will have to include any change type linked to ADI.

It may be useful to include examples in the safety case of changes which have been completed using your MOC process(es). These can assist to illustrate the steps and checks, applied during changes, ensuring that risk is always managed SFAIRP.

Key characteristics of a MOC system are listed below (this is not a comprehensive list and you should describe your processes):

- define the type of change to which the management applies. For many MAPs, the system(s) apply to anything other than 'like for like' replacement
- change proposals are reviewed for all health and safety implications by people sufficiently knowledgeable to make informed judgements in their areas of expertise, such as operations and maintenance
- there are triggers in the change system for consultation with all workers, or their representatives, likely to be affected by the change
- there is a 'gate keeper' process to ensure that the change proposal is reviewed and approved before it is implemented
- where modifications/revisions to the approved change are discovered to be needed during implementation, those modifications are also managed with proper review, approval and recording
- there are monitoring tools (performance indicators) to ensure the change is implemented and does not stall
- change completion activities are closed out within reasonable time frames. This could include updating drawings, equipment registers, procedures, training modules, etc.

## 10.6 Contractor management

Contractors are generally used throughout workplaces to perform tasks and work for which the operator or PCBU does not have the skills within the business. Contractors can work on simple things, like fixing a patch of concrete on a walkway, through to complex control system electronics of

[76] s.608P or s.608Z (1) and (2) of the WHS Regulation

[77] Schedule 18C of the WHS Regulation – section 5

a fully automated amusement device. Contractors may also work at heights or perform confined space entry work. These are high hazard jobs which can lead to an ADI.

The WHS Regulation[78] requires the operator's SMS to provide a comprehensive and integrated system for managing all aspects of risk control in relation to the occurrence of ADIs at the MAP and this includes how a contractor's safety and competency is managed.

Some contractors will have well developed SMSs which can be assessed prior to their appointment to conduct work. Where the work is not complex, contractors may not have a well-developed SMS reflective of their work type. Consider, for example, the plumber who fixes the garden taps compared with those who will carry out modifications to an amusement device. Your management of contractors should reflect the risk associated with the work being undertaken.

The risk introduced by contractors will also be reflected in the maturity of the systems of safe work they use. The safe systems of work will differ considerably amongst contractors. However, where the contractor is involved in maintaining or modifying an amusement device, the consequence of a contractor failure can affect the operator and the patrons. The incident costs to the operator can be significant, as borne out by the Buncefield incident in the UK. The operator always carries the duty for health and safety of the entire operation including that duty in common with a contractor.[79]

Operators will have different systems for managing contractors. Some will hand over the entire job and area to the contractor. The contractor manages access, egress and safe work processes using their systems. Other businesses will require the contractor to integrate with the safety systems at the MAP. In most businesses, both systems will be used in different circumstances, depending on the size and scope of the contracted work. In your summary you will need to describe how your system works across the range of contractors who work on amusement devices.

In your safety case summary consider how you manage the following elements related to contractors. This is not a comprehensive list and you should describe your processes such as:

- contractor selection/competency assessment
- safety system assessment/validation
- contractor on-boarding (e.g. induction, isolations, work authorisation and emergency response training)
- contractor performance assessments
- dismissal processes of contractor due to poor safety or technical performance.

## 10.7 Incident management, investigation, reporting and improvement

Incidents occur at all workplaces and collecting the information from those events and understanding the impact and effectiveness of your SMS is critical to improving your MAP operations. All incidents require some level of management once they have been detected regardless of the consequence(s), i.e. a low consequence incident which does not cause harm may not require detailed analysis. On the other hand, incidents, which are of a peculiar nature, have a high potential consequence or cause a serious risk to a person's wellbeing, should be thoroughly investigated to understand the root cause of the event, its potential for future harm and seek system improvement.

In the safety case, your system for incident management, investigation and reporting (internally and externally) should be summarised in the safety case. To ensure the summary is complete, you should also include how learning from incidents is taken and imbedded into your SMS.

The regulator will be seeking information on your decision-making framework for assessing incident reports and the specific actions taken to investigate. The actions taken should be balanced and proportionate to the risk.

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[78] s.608O (3)(a) of the WHS Regulation

[79] Buncefield: Why did it happen? The underlying causes of the explosion and fire at the Buncefield oil storage depot, Hemel Hempstead, Hertfordshire on 11 December 2005, Appendix 1 + 2 hse.gov.uk/comah/buncefield/buncefield-report.pdf accessed 30/07/2020

For example, consider that an event occurs which could have caused (but did not actually cause) serious harm to a person and is reported by a worker. Upon entering the information into the system, the supervisor discovers that the control which failed is one which prevents an ADI. As a result, the supervisor or manager changes the investigation type from a simple “5 whys” assessment to a more suitable investigation technique. As the incident involves the partial or complete failure of a control for an ADI, the root cause should be determined. Therefore, a potential ADI receives the level of investigation commensurate with the harm the event could have caused. Your summary should include all levels of investigation applied to incidents and the decision-making process.

In preparing your summary for the safety case, consider at least the following aspects of your incident management system and how you can demonstrate that your system works. It is often useful to include completed incident examples within your summary. This is not a comprehensive list and you should describe your processes:

- Process for workers and patrons to notify of an incident or potential incident.
- Assessment, incident classification and types of investigation method for different consequence events.
- Triggers within your system to highlight higher risk events.
- Time for completion of incident investigations.
- Time for completion of incident investigation actions.
- The process for monitoring incident investigation progress.
- Incident investigation action tracking.
- Assessment of the effectiveness of the actions taken as a result of the incident.
- The process ensuring notifiable incidents (ADIs, dangerous incidents, serious injury or illness of a person or the death of a person) are reported to the regulator.
- Authorisation processes for extending investigation timeframes, approving actions, and closing incident investigations.

The WHS Regulation requires you to notify[80] if an ADI occurs at your MAP. ADIs are defined as including actual and potential exposure to a serious risk to health or safety. Therefore, if an incident relates to an amusement device and involves a serious risk to health or safety, regardless of whether a person is injured or not, it is an ADI and required to be notified. All ADIs need to be investigated regardless of the actual consequence to people and patrons. The incident will also trigger a review of the safety assessment and SMS as required in the WHS Regulation and discussed in section 10.12.

An incident management system is not the same as the emergency planning system, but there are often overlaps. Describe your systems as best as you can within those relevant sections of the safety case.

## 10.8 Training and competency

Training and competency systems provide a formalised way for workers to learn how the MAP operates with respect to its safety systems, conducting work on the site and responding to incidents and emergency situations including ADIs.

Schedule 18C s.2.1, Organisation and personnel, of the WHS Regulation requires the SMS to provide a means of ensuring persons have the knowledge and skills necessary to enable them to undertake their allocated tasks and discharge their allocated responsibilities. This section requires you to provide a means of ensuring workers retain such knowledge and skills. Other sections of the WHS Regulation[81, 82] also require you to ensure workers are trained in the nature of the work, the risks associated with the work and the control measures implemented.

In your SMS, you should integrate the requirements for Schedule 18C s.2.1 into your overall training and competency framework.

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[80] s.608N (7) Amusement device emergency plan of the WHS Regulation

[81] s.39 Provision of information, training and instruction of the WHS Regulation

[82] s.238 (3) Operation of amusement devices, instruction and training of the WHS Regulation

Most workplaces have a training system which covers:

- the skills necessary for all positions (e.g. skills matrix)
- training modules supporting the skills required
- records that track progress against the required skills
- competency assessments against those skills
- identifies refresher training and upgrades/changes to operations.

The summary of your training and competency system in the safety case should reflect how you assess the entry level skills of a worker for a role, assess the skills gap between the role and the person, execute training, and control the work performed, so that at all times the worker is supervised/supported until competency is obtained.

Your summary in the safety case should focus on the training of workers who interact with amusement devices, for both operators and technical services. For operators, it must include the required compliance with s.238 of the WHS Regulation. The summary should include information about training of ride operators, supervisors, senior team members, maintenance staff, contractors and security. It should also identify the method by which those persons who maintain, inspect or test an amusement device are evaluated to be competent by the MAP operator. Examples are often useful to illustrate the way training is managed at the MAP.

Managers and senior management across all roles at the MAP must also be fully aware of the potential ADHs and ADIs. These members of the workforce make decisions about task prioritisation every day and it is good practice to ensure they are fully informed of the risk impacts arising from the ADHs and ADIs. It is strongly encouraged that you develop suitable training for this group of workers.

Officers of the company also make decisions which can have an impact on potential ADIs and ADHs. Officers often have a broad range of skills and previous experiences, which may not be directly related to the specific hazards and risks at the MAP. It is strongly recommended that information about these hazards and risks be provided to them to inform their decision-making.

The officers of the operator have duties or obligations under the WHS Act[83] including due diligence requirements. As such, company officers must have the capacity to understand the nature of the operations and generally the hazards and risks. They must be informed in order to ensure that appropriate resources and processes are made available to eliminate or minimise risk to health and safety from work carried out at the MAP. This may not be in the form of ‘training’ however it is a duty under the WHS Act that this information is acquired by this group in the organisation. The training system maybe a suitable location to retain when and what information is passed through to the company officers initially.

The regulator will seek to understand how your training and competency system is effective in managing the risk from ADHs and ADIs SFAIRP. Below is a list of elements you should consider when developing your summary of the training system.

This is not a comprehensive list and you should describe your processes and subject matter content including:

- role and responsibility summaries
- organisational structures, responsibilities and reporting lines
- training needs analysis (gap between skills and those required for a role)
- training processes (online/practical/buddy systems etc.)
- competency assessment and validation processes (trainer and training assessment)
- the inclusion of information pertaining to ADHs and ADIs.
- controls used to minimise the occurrence of ADIs
- the operation of the SMS
- emergency planning for ride operators and all other staff (this could be written into your summary of the emergency planning)
- ADI history(s)
- incident reporting processes

[83] s.27 Duty of officers WHS Act

- information to officers and board about the potential ADIs and ADHs
- management of on-going (refresher) training
- review and revision of training needs and information in line with changes or new ADHs and ADIs
- management of the trainer's competency and validation of their assessment processes.

## 10.9 Asset integrity–maintenance, reliability, inspection and testing

Arising from the safety assessment for each amusement device, you will have identified a range of mechanical, electrical, and structural design features which form incident control measures. These must be maintained to ensure that the risk of an ADI occurring is always minimised SFAIRP. In the safety case, you will need to provide a summary of the systems that ensure your physical controls are always managed throughout the lifecycle of the amusement device.

Proactive or preventative maintenance is often the first aspect of maintenance that is considered, but arrangements for reactive or breakdown maintenance are also important to summarise in the safety case. From time to time any control can fail or become partially impaired as they all have an associated probability of failure. The likelihood of the failure will depend upon many factors in the design and maintenance of that control. However, the urgency of a repair should reflect its importance to the safety of the amusement device. In the safety case, the regulator/assessor will be seeking demonstration of your decision making around impaired controls, interim risk strategies and the continued operation or not of an amusement device. The assessor will also be looking to understand the authorisation process for returning a ride to service after maintenance.

A safety-critical defect in a ride is expected to lead to the shutdown of that ride until repairs are made. However, there may be occasions where a ride is operational while non-safety-critical elements of it are not at their desired state. In this case, you should be seeking interim controls which can provide assurance that the level of safety is not eroded.

For example, consider that advanced corrosion is found on signage brackets within the ride envelope, but not on the ride. The corrosion is not sufficient to stop the ride because your assessment shows that only under specific conditions (such as being struck by a large vehicle) the signage could fall and potentially cause harm. Routine inspection of the signage corrosion is undertaken on a schedule until such time as the sign's frame is replaced. On any changes to the corrosion, then the ride use would be halted. The routine inspection of the sign could be considered an interim control. As an additional interim control, vehicles are not allowed into the area. How you manage the use of an interim control is also important. Interim controls should not automatically transition into permanent control measures.

The maintenance system of a MAP is a large source of data which should be routinely analysed because equipment that is reliably operating is normally safer to operate, avoids sub-optimal work-around solutions and gives the ride operator confidence that the equipment will operate as expected. From the data, you should be seeking information about safety control measure failures and breakdown information to target reliability improvements.

In conjunction with the SMS's incident response component, the safety case should demonstrate when faults occur, or controls fail, how the safety assessment as the foundation of the ride's risk management will be consulted, will be updated and will be used for revising the maintenance regime. As described in s10.8, a failure of a control measure associated with an ADI should be thoroughly investigated. Additionally, repeated minor failures of control measures should be scrutinised and highlighted in your reliability/maintenance system reports. Managers and officers of the company and the board should be informed of problems if they are not able to be effectively fixed to maintain the equipment reliability and safety at the MAP.

In describing how your reliability and maintenance systems operate, consider including information about:

- planning (e.g. daily, weekly and monthly engineering and reliability meetings and maintenance planning processes) as well as the other types of reliability/maintenance assessments you perform

- supply chain and inventory control in conjunction with change management, particularly for safety-critical component (e.g. to demonstrate that replacement of a critical component with an unsuitable or inferior component will not occur)
- maintenance by all relevant trades or engineering disciplines
- how maintenance is managed for planned and unplanned maintenance (process for work order creation, execution and closeout)
- for existing rides, how the safety assessment, manufacturer guidance and competent persons' recommendations are incorporated
- for new rides, when a hazard identification process and safety assessment is first undertaken and how it is subsequently managed.

The regulator will look to verify controls from the safety assessment to the equivalent items in the reliability/maintenance systems . In your safety case you should concisely describe how your controls have a supporting maintenance/reliability process and include examples in your summary.

The regulator will seek to understand your maintenance and reliability strategy for the whole MAP but the focus in the safety case should be on how you manage your amusement device controls and equipment.

Your inspection regime for annual and major inspections needs to be integrated into your SMS so that any potential triggers for an ADI identified during the inspections can be readily understood and mitigated. You should include a summary of these elements in the safety case in line with the requirements of the WHS Regulation.[40, 84] In your description of annual, major, and daily inspections you could include information on the processes and an example of a completed process demonstrating implementation.

### 10.9.1 Major inspections

A summary of arrangements in relation to major inspection of amusement devices at the MAP must be included in the safety case.

The safety case should include a complete schedule for major inspections of every amusement device at the MAP. The schedule should demonstrate that any legislated timeframes will be met.

Additional information can be found on major inspections in the amusement device major inspection interim guidance document.[85] The safety case should summarise what process the major amusement park will use to ensure that the considerations in the guidance are met.

### 10.9.2 Annual inspections

A summary of arrangements for a competent person to conduct annual inspections of amusement devices at the MAP must be included in the safety case.

As part of this, the MAP should identify how they will manage annual inspections. The MAP should also submit a list of annual inspection due dates (or date of last annual inspection). The MAP should expect the regulator to audit inspection completion against this list.

### 10.9.3 Logbooks

The safety case is required to include a summary of arrangements for logbooks kept for amusement devices at the MAP. At a minimum, logbooks must comply with the requirements under the WHS Regulation. The summary should detail not only how the operator intends to comply with these requirements, but also how the operator will review and use the information in the logbook to improve safety.

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[84] Part5.2 Division 4, subdivision 2 of the WHS Regulation—Control measures for amusement devices

[85] Amusement device major inspection interim guidance

## 10.10 MAP security

In developing the safety assessment for the MAP, you will have identified potential mechanisms which could trigger an ADI that is linked to security. The events and the controls used to minimise the risk should be summarised in the safety case as required by the WHS Regulation.[86]

The regulator will be looking to see that you manage and assure the physical security of the MAP. The summary may be generalised and include the systems you use such as cameras, security guards, fences, entry control etc.

These systems should protect not only the MAP boundary from breaches, but also boundaries inside the MAP, such as ride envelopes and back-of-house. It is important to protect workers and ride patrons.

A brief summary should be provided around what the physical security systems are and how these physical security systems are monitored and assured.

A summary of how you protect your systems from the threat of cyber-attack is also warranted in the safety case. The focus of the summary should be on how any cyber-attack could create an ADI and the controls that are used to prevent those attacks. Cyber-attack security includes how you protect your corporate systems and records which form the SMS. The loss of these records would compromise your ability to provide records demonstrating logbooks, reliability, maintenance, inspection data and design changes and other key functions pertaining to the safe operation of the MAP.

The summary should convey an overall approach with limited specific details so as not to compromise the key features of your physical, cyber, or other security elements that you have identified. For example, the times when security will do rounds of the MAP, where keys are stored, and the type of cyber security system used, should not be included in the safety case.

## 10.11 Worker safety role and consultation

One object of the WHS Act is to secure the health and safety of workers and workplaces by protecting workers and other persons against harm to their health, safety and welfare through the elimination or minimisation of risk arising from work or from particular types of substances or plant.[87]

Workers and management both have a wide range of experiences which may be relevant to your MAP. This knowledge base should be drawn upon to capture all aspects of ADIs, ADHs, controls and SMS knowledge that can contribute to minimising the risk SFAIRP.

To give effect to this knowledge base the WHS Regulation[88] requires MAP operators to implement a safety role for workers to contribute to the management of risk processes. The safety role for workers must also include their participation in review/development of the MAP's safety assessments, emergency plans and SMS.

Similarly, the WHS Regulation[89] requires MAP operators to consult with workers in relation to a similar range of matters, including the preparation and review of the safety case. The duty to consult with workers is in s48 Nature of consultation of the WHS Act. Further information on worker consultation is available from the Work health and safety consultation, co-operation and co-ordination Code of Practice on the WorkSafe website.

In the safety case, you should summarise how you have implemented a safety role for workers and implemented worker consultation.

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[86] s.608R(2)(l) of the WHS Regulation— Security of the park

[87] s.3 Object of the WHS Act

[88] s.608ZA of the WHS Regulation

[89] s.608ZB of the WHS Regulation

The summary in the safety case could include the following elements, but this is not a comprehensive list and you should describe your processes:

- implementation of the safety role for workers
- keeping records of workers attendance at risk management workshops and other aspects of developing the SMS
- recording dates of consultation meetings
- recording summaries of issues raised, discussed and outcomes or actions from consultation and any unresolved issues.

Examples of implementation could be included in your summary/appendices to support demonstration.

## 10.12 Triggers for review of risk management and safety case

Safety assessments for amusement devices must be reviewed and revised as necessary to ensure the adequacy of the control measures to be implemented by the operator.

When a specific change occurs to operations at the MAP, you must trigger a review of the associated safety assessments, emergency plan and SMS if the change is likely to give rise to a new risk, or a variation of an existing risk to health or safety.

It is sometimes difficult to understand how a particular change could lead to an event like an ADI. History[90, 91, 92] tells us that changes to systems or people (intended change or those due to system compliance slippage) have brought about incidents that have had serious consequences to people and to business. The WHS Regulation focuses on managing changes related to:

- an amusement device
- plant or structure associated with an amusement device
- a change to the operation, or nature of operation
- the workers' safety role at the MAP
- training for the operation of amusement devices
- maintenance and inspection
- annual inspections and major inspections
- organisational change

The WHS Regulation also focuses on managing circumstances related to:

- a control measure not controlling the risk
- a new ADH being identified
- consultation with workers indicating a review is necessary
- the regulator requesting a review.

The way that you manage these types of changes should be integrated within your change management tools. The regulator will seek to understand how you have implemented these aspects and monitor the success of the changes that you make.

In your safety case, you should include in your change management system description how you meet these compliance aspects of Chapter 9A of the WHS Regulation. Include, in your summary, the changes that will lead to, or cause, an update of a safety assessment, emergency plan, SMS and/or the safety case. This is often a forgotten aspect in the SMS and descriptions in a safety case. You will need to recognise the event(s) and complete the required updates.

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[90] "The contribution of management of change to process safety accidents in the chemical process industry" Chemical engineering transactions, Vol 56, 2017, p1363–1368. The Italian Association of Chemical Engineering Online at aidic.it/cet

[91] "Safely managing changes to process: A case study of onshore gas plant in Bangladesh", Chowdhury Mohammad Touhid Amin, Krish Energy Bangladesh Limited. Conference paper Fifth International conference on chemical engineering 2017

[92] "What went wrong" Trevor Kletz and Paul Amyotte, Part VI Design and modifications, 6th Ed, 2019 Elsevier Inc.

# 11 Governance, performance indicators and audit

Governance encompasses the system by which an organisation is controlled and operates, and the mechanism by which it, and its people, are held to account. Ethics, risk management, compliance and administration are all elements of governance.[93]

For the purpose of managing safety at a MAP, the governance processes should describe the structure through which the company's:

- safety objectives are set
- the ways the company intends to achieve those goals
- the monitoring of performance toward meeting those goals.

It is too late after an incident has occurred to recognise that things were out of control.[94] Governance through performance indicators and auditing allows you to recognise the "out of control" signals early. Management can exert influence to avert the systems and operations from exceeding an acceptable safety zone.

Schedule 18C of the WHS Regulation sets out the overall aspects of governance through Schedule 18C (1) Safety policy and safety objectives, 18C (2) Organisation and personnel, 18C (7) Performance monitoring and 18C (8) Audit.

While other elements of the Schedule 18 requirements will have already been described in the safety case, it is desirable to bring together a description of how the systems are integrated and work together forming a governance process over the safety systems at the MAP. The description should be inclusive of the following two sections,11.1 Standards and performance indicators and 11.2 Auditing (performance monitoring).

In your safety case summary of the governance systems, you could include excerpts from reports prepared for the board and examples of current performance indicators. These demonstrate the implementation and the performance of your SMS.

## 11.1 Standards and performance indicators

The WHS Regulation[95] sets out requirements for measuring the effectiveness of the amusement device SMS. The objective of this section is to ensure that you set expectations (standards) for the performance of your systems and controls. Then you monitor those standards of performance via your system's performance indicators or metrics.

The intention of the standards and indicators is to actively monitor the parts of the SMS linked to ADIs as these are critical to the safety of workers and patrons. The indicators are there to trigger a response from management when 'normal' operations are not meeting the expected standard.

In order to meet the prescriptive element of Schedule 18C (7.1), performance standards should be set across all elements of the SMS that are involved in or control the potential for an ADI to occur.

For example, a performance standard for MOC might be 'all amusement device changes will be managed by the change management system'. You will then need to have performances measures/indicators to monitor and assess how you are operating against this standard to meet the prescriptive element of the regulation. The indicator could arise from audit programs which seek to identify that all changes have been managed appropriately. If detected, this indicator could trigger further training with workers to keep change management on track.

An additional performance indicator within the MOC system could be linked to hold points (or gates). The indicators inform you of how many changes are open and at what stage in the process the changes are. If changes are stalling, it gives you a chance to find out why that system is not operating as it should.

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[93] The Governance Institute of Australia at: governanceinstitute.com.au/resources/what-is-governance/.

[94] OCED Environment, Health and Safety Chemical Accidents Programme, June 2012, Corporate governance for process safety–Guidance for senior leaders in high hazard industry.

[95] Schedule 18C (7) of the WHS Regulation–Performance monitoring.

Setting up performance standards and indicators is not a straightforward task. Initially it is helpful to set out a basic suite of standards and indicators that you believe will work and review them after a trial period. It is not unusual then to change the standards and indicators as you learn about how effective, or otherwise, they are in assisting you to monitor the performance of your safety systems.

The WHS Regulation[96] also requires that performance indicators are to be set against control measures to manage their effectiveness. You may also need to trial several different measures to ensure the indicators will actively respond to the performance of the system.

There are two basic styles of performance indicators which could assist management oversight of operations. They are known as leading and lagging indicators. Both metrics should be considered in building your performance indicators.

Leading indicators are predictive and designed to detect and indicate that a system or control is eroding away from its expected performance standard. They identify trends that give you the opportunity to take corrective action early. For example, the rate of breakdown maintenance work is often a useful leading indicator. Increasing breakdown activities on one amusement device might suggest that perhaps insufficient or ineffective maintenance is being done. Equally, it can point to equipment that is reaching end of life and allow you to plan for replacements. Leading indicators are often hard to put in place but allow for early influence and control by management to address the associated safety risks.

Lagging indicators are a record of what has already happened and are useful to chart your progress against expected performance. However lagging indicators don't necessarily give warning of imminent failure. For example, recording the number of successful tests of a rider restraint locking system on your roller coaster gives you confidence that the system works. However, this indicator lags any potential failure event (i.e. it can only identify if the restraint has already failed). It will not give you an early indication that a failure is imminent or that the system's performance has fallen to a level which could lead to an ADI occurring. Lagging indicators are easy to put in place but are not active enough to provide an early indication of a latent failure.

To make your performance indicators effective, it can be useful to try to measure the rate of change as part of the measure. Where performance indicators are constantly reading zero, there is a tendency to lose attention or focus. Trends are usually easier to take in and process visually.

In the safety case, a summary of the performance standards and performance indicators should be provided. There are several approaches that can be used, for example for each element of the SMS you could include examples of performance monitoring to demonstrate implementation. The advantage is the information is included with the section and tells the reader in context the system's current performance.

Alternatively, performance standards and indicators could be presented grouped as a section of the safety case. This is often the approach so that an overall picture of system performance is provided.

In either case, this section should provide information on where your monitoring system is in its development and how the business responds to changes in any of the indicators. This demonstrates management monitoring over all elements of the SMS and controls.

## 11.2 Auditing (performance monitoring)

The safety case must include information about auditing, including the methods, frequency and results of the audit process.[97] Auditing ensures the MAP operator is checking that the SMS is operating as expected. Auditing highlights system deficiency or departure from process. It is a key tool for the performance monitoring of systems and controls. The outcomes from audits should drive improvements in amusement device safety across the MAP. Where you operate more than one MAP, learnings from SMS audits at each MAP should be transferred across your collective parks to assist with "all of business" safety system improvements.

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[96] Schedule 18C (7.3) of the WHS Regulation

[97] Schedule 18C 8 of the WHS Regulation—Audit

In the safety case, a summary of the auditing system should be provided. The summary could contain the following information (this is not a comprehensive list) but ensure you describe your system as it is at the time of writing the safety case:

- A summary of all your auditing/observation methods (safe work observations, ISO 45001 Occupational Health and Safety, walk and talk meetings etc.) should be given.
- An audit plan and assessment criteria that covers all aspects of the SMS that are linked to the management of ADIs.
- The range of external audits that are conducted on the MAP, for example corporate audits, regulator audits and insurance audits that are associated with system elements linked to the management of ADIs.
- Audit recommendations and audit action tracking to ensure recommendations are driven to completion.
- How auditors from within the organisation are selected.

The auditing system itself is an element of the SMS and you should consider including a standard of performance for the audit system. Indicators of implementation should also be considered so that management and the corporate board understand the audit program is progressing as intended.

It should be noted that the terms of reference for an audit are critical to understanding what types of issues the audit will find. If an audit's terms are only to check compliance to an element of the SMS, then it will not question whether that element adequately manages the risk that element was intended to mitigate. To be effective, two questions need to be asked. That is, audit terms need to be broad enough to ask not only whether a process is being properly followed, but also whether the proper process is good enough to manage the risk it was intended to mitigate.

# 12 Emergency plans

Arising from the safety assessment process, you will have identified a range of ADIs for each amusement device and a range of incidents which could affect the entire MAP. The WHS Regulation[98] requires the operator to prepare an amusement device emergency plan for the MAP that addresses all health and safety consequences of an ADI occurring. This includes all matters stated in Schedule 18B and provides for testing of emergency procedures. In your safety case, you will need to include linkages from your ADIs to the corresponding amusement device emergency plans.

In order to meet this requirement, you will need to develop suitable emergency plans for all ADIs identified from your safety assessments. The emergency plans for ADIs should be integrated into the broader emergency plan and response framework for the MAP as required under this and other sections of the WHS Act or WHS Regulation to form one emergency plan. In this guide, the amusement device emergency plan is considered to be part of a larger integrated emergency plan for the MAP. The term emergency plan applies to the overall site emergency plan. The term amusement device emergency plan refers to the legislative requirements under Schedule 18B[98].

When preparing your emergency plans for individual ADIs, there may be similarities that will allow you to combine specific emergency response actions for similar ADIs. In this case, it is effective to combine those plans. However, it is important to recognise where specific plans are required, they should be maintained as such.

When combining response plans, the regulator will seek to understand how they have been combined. This could be demonstrated by a table which links the emergency plans back to the ADIs.

You must provide a summary of the amusement device emergency plan in the safety case. The summary should broadly cover the following elements:

- How your emergency plan for each ADI was derived from your safety assessment(s) and integrated into your existing emergency plans mitigating the consequences of any ADI
- The triggers that cause your emergency plan to be enacted

[98] s.608N Amusement device emergency plan—WHS Regulation

- How your emergency plan will be implemented including the roles and persons involved in the implementation
- Notification triggers to emergency services and the regulator
- Scalability of the plan for small incidents up to ADIs and other site wide emergencies
- Closing incidents and recovery plans
- The emergency plan tests conducted and how you learn from those exercises and how the learnings are assessed and implemented
- The emergency exercises/drills planned for the MAP over the next 12–18 months
- Consultation undertaken with relevant emergency services (QFES, Queensland Police (QPS) and Queensland Ambulance Service (QAS) and other relevant emergency service)
- Address the contents of Schedule 18B[99]

It is likely that the regulator will ask for a full copy of the MAP's emergency plan and response procedures following your licence application. The summaries are often not detailed enough to gain a full understanding of how your plan works but this is subject to a case by case decision by the regulator.

## 12.1 Emergency planning and response plan documentation

Emergency plans can become complex and sometimes they are large documents. Often the emergency plan will contain information on planning for emergencies, training, equipment and maintenance and the actual response plans.

It is useful to consider how you will use the documentation in the event of an incident. Some operators will choose to separate the planning elements from the operational response plans. This means the operational portion is smaller and easier to use in an emergency.

When preparing your response plan, consider the following items (this is not an exhaustive list):

- The emergency response teams' roles and how they are trigged when/if the response is required.
- How is the team structured so that control and command is maintained during the incident (Do workers have dual roles? How much information is processed by each individual and is that effective?)
- How will information be transferred across roles, what communication methods are available and how might they be impacted during an emergency (e.g. are any parts of the communication system (e.g. repeaters) reliant on electricity to operate)
- Does the information need to be transmitted securely and can others interfere with the communication system (e.g. interference on open radio channels)?
- The language used in communications to ensure that it is specific and understandable to responders.
- Are the team identified daily to ensure that all members are present during operational hours?
- How will/does the emergency plan work after hours? Are there enough staff?
- Equipment required to respond to a specific event is tested for suitability to perform the task?
- Is the equipment required for rescue available on site or does it need to be brought to site? If the equipment is brought in, what is the longest time period to arrival? Will that minimise the consequence of the incident?
- Suitability and availability of equipment:
  - How is rescue equipment managed?
  - Is rescue equipment common between amusement devices or specific, is it appropriate for the peculiarities of each relevant device and incident scenario (e.g. size and manoeuvrability of elevated work platform)
- How will you keep the plan simple enough to use by all workers on site?
- How will patrons be evacuated?
- Where will patrons and workers go?
- How will the patrons be informed/inform the MAP if persons are missing?
- Where will the patrons go to raise a concern during the incident?

[99] Schedule 18B - WHS Regulation

- Do workers and/or patrons need to be retained as witnesses?
- How often will you train workers in the plan?
- What type of training will you undertake and how will learning from that training be incorporated into the emergency planning and response documentation?

The terminology used throughout the documentation is vitally important. Equipment names, locations and other specific terms need to be consistently used. Where the operator controls more than one MAP, it can be critical to the plan's success that all responders are using the same terms with the same meaning. Where plans and training are shared across the operator's MAPs for common amusement devices (or types of amusement devices), the consistency of terms becomes more important as workers need to be trained so that ambiguity is minimised. This can be difficult to achieve, but it leads to better outcomes when the plan is enacted.

There are likely to be differences between the extent of incidents which can occur at your MAP. These will require different emergency responses. You could structure your emergency response plan so that there are different levels of response depending upon the size and extent of the incident. This strategy is helpful in resource planning and responding because it allows the plan to scale up or down in the event the incident changes.

The emergency plans should also consider the operator's corporate response. A corporate emergency plan is useful in prolonged incidents where only the top-level management can authorise funds and equipment that might be needed. Additionally, if patrons are involved in the incident, then other resources may be needed which are not located at the MAP. For large scale ADIs it is well worth considering how your corporate emergency plan will be used in the response.

Questions to consider when thinking about your corporate emergency plan include:

- What ADIs can be addressed by the MAP without corporate assistance?
- What ADIs trigger the corporate response plan?
- Have the appropriate people been identified in the corporate response plan and how are they always available?
- In considering emergency exercises, has a corporate emergency response exercise been included?
- How does the MAP recover from an ADI and resume normal operations?

The emergency plan and emergency response structure should include how the operator will trigger a corporate emergency response when an incident occurs or escalates. The plan should also identify how additional resources or financial assistance is obtained where the incident requires a longer-term response.

## 12.2 Integration of emergency plans with emergency services

The Queensland Police Service (QPS) and emergency response organisations (QFES and QAS) use an established emergency management structure for larger events. This is known as the Australasian Inter-Service Incident Management System (AIIMS). This system is used when the scale of the incident is large and variable.

Given the large number of patrons and workers at a MAP, it may be useful to consider building your emergency plans and the emergency action response documents used during the emergency response in a similar way to aid integration[100] with QFES/QAS/QPS.

In this way, you can maintain similar terminology to the responding emergency services. Training in AIIMS is available through the Australasian Fire and Emergency Services Authorities Council at various levels of detail. Prior to undertaking any training, you should consult with your local QFES response team to ensure the relevance to your situation.

[100] qfes.qld.gov.au/planning/Documents/QFES-Emergency-Planning-Guidance.pdf - page 3, note this reference is for illustrative purposes and relates to chemical safety, but refers to AIIMS as a preferred system.

## 12.3 Consultation with emergency services

When preparing the emergency plan, you must consult with the emergency service organisations with responsibility for the MAP locality.[101]

If the emergency service organisation(s) makes recommendations, note this in your emergency plan summary in the safety case and provide information on how those recommendations were incorporated into the plan. This can be achieved by a table or other means in the safety case.

When the emergency plan is finalised, the WHS Regulation[102] requires you to send a copy of the plan to all emergency service organisations either consulted or relevant to a site incident. This could include QFES, QPS and QAS.

In some cases, you may not have received feedback information prior to submission of the licence application and safety case. In this event, provide evidence in the safety case that the information has been forwarded to the relevant emergency service organisation demonstrating that the consultation approach has been made.

Regardless of any feedback received you must, prior to applying for a licence, have tested your emergency plan.[103] The exercise should be more than an evacuation exercise. It should involve one of the potential ADI(s) that have been identified at the MAP. A scenario test is a stronger demonstration of the plan's effectiveness, but other examples can be included such as desktop exercises for scenarios impractical to test.

## 12.4 Schedule 18B–Amusement device emergency plans

In the WHS Regulation, a MAP is regarded as having one amusement device emergency plan. A summary of it is required to be presented in the safety case. The summary of the plan should focus on demonstrating the planned response is appropriate for events associated with amusement device incidents.

While it could be easier to provide the emergency plan in the safety case, as with procedures this would make the emergency plan a material particular to the licence. In that case, if you were to update or change the emergency plan, you would also have to provide the regulator a revised copy. This means that any minor modification to the plan would require you to send a copy to the regulator. This is impracticable, so a summary is the best way forward.

The following should be considered when developing your emergency plan summary for the safety case. This list does not include all aspects of your summary.

- To identify the maximum numbers of persons, including workers, likely to be present at the MAP on a normal working day,[104] include the variations in staff and patrons during the 'busy' season(s) and other times if these occur. Include any variation in the emergency response team numbers that might reflect the higher intensity season(s).
- There is a requirement[105] to have in place a workplace warning system and workplace communication systems at the MAP. Your summary should include how you implement these warning and communications systems. One of the challenges for a MAP emergency is managing the number of people per exit safely and effectively. There may be areas in the MAP where a public address emergency warning system may not be heard or not heard well. The regulator will be interested in how you manage the effectiveness of your warning systems and supporting communication systems.

Section 4.1 of Schedule 18B identifies that your emergency plan must provide information on workplace emergency resources, including emergency equipment and personnel.

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[101] s.608N (2) of the WHS Regulation

[102] s.608N (4) of the WHS Regulation

[103] s.608N (5) of the WHS Regulation—Amusement device emergency plan

[104] Schedule 18B 1.3 of the WHS Regulation

[105] Schedule 18B 3.2 and 3.4 of the WHS Regulation

In considering what is relevant information pertaining to emergency equipment, this includes both generalised equipment types and identifying specialised equipment. For example, the equipment for firefighting includes general systems, such as automatic extinguisher systems for spaces operating hydraulic equipment and fire suppression, if any, in electrical substations. The specific equipment, such as booster points and hydrants, should be identified and so should their compatibility with QFES equipment.

It is also important to identify specialised equipment that you may call upon for specific incidents at the MAP. For example, if a specific piece of equipment is needed for a rescue at heights, or similar, these should be identified in this section.

A general overview of the equipment maintenance process associated with emergency equipment is useful to be given in this part of the safety case. Often, equipment maintenance is split across the emergency response team and maintenance department. For example, the maintenance might look after fire hydrants and ring mains. However, the emergency response team might look after any emergency 'turn out' equipment. Providing information on this is useful to understand how you manage the equipment and, in turn, that the reliability and availability of the emergency response equipment is upheld.

To demonstrate the adequacy of the emergency response equipment, the summary could note the principles or standards on which particular items among the response equipment have been designed. E.g. the codes and standards used to determine provision of fire water, hydrants and deluge systems.

Your emergency plan must contain the procedures for safe evacuation, and how you will account for all people at the workplace. It also must contain the procedures and control points relevant to utilities including gas, water, and electricity.[106] Your summary must provide an overview of these elements demonstrating that you have considered all of your emergency planning requirements.

[106] Schedule 18B 5 of the WHS Regulation—Procedures

# 13 Appendices

## 13.1 Appendix A–Example safety assessment checks

The following provides a list of checks which can be used to critique a safety assessment.

**Safety assessment system development**

| | |
|---|---|
| **Set the scene** | • Define the scope of system–amusement devices, other work areas?<br>• Gather amusement device existing information.<br>• Conduct research on approaches to managing risk, assessing controls, safety management.<br>• Consult standards and specialists.<br>• Gather a multidisciplinary team for the assessment. |
| **Develop policies, procedures and systems** | • Define policies, risk tolerance, ADI criteria, etc.<br>• Establish procedures, hazard identification, risk assessment, control assessment.<br>• Select and build necessary systems. |

**Unmitigated risk assessment**

| | |
|---|---|
| **Undertake hazard identification** | • Identify hazards present.<br>• Utilise specialist advice (manufacturers, maintenance, reliability etc.).<br>• Clearly and specifically define hazards and sources.<br>• Scan the hazard list and check for completeness. |
| **Assess risk** | • Examine the potential consequences of the hazards found.<br>• Identify amusement devices incidents. |

**Mitigated risk assessment**

| | |
|---|---|
| **Identify and assess current controls** | • Identify current controls.<br>• Assess current controls according to procedures (e.g. FARSI, LOPA). |
| **Assess risk** | • Assess the current risk against company criteria.<br>• Take immediate action if necessary.<br>• Repeat current risk assessment for interim controls and actions (Check the rationale for interim controls and decide how long you will allow them to be in place).<br>• Determine if further action is needed. |

| | SFAIRP assessment |
|---|---|
| **Identify all available controls** | • Research what other controls are available to mitigate risk (consider controls that previously might have been rejected or those that could be high cost).<br>• Assess those controls against hierarchy/effectiveness/risk reduction capacity.<br>• Estimate implementation costs. |
| **Assess practicability** | • Assess whether the cost of implementation is grossly disproportionate to the reduction in risk.<br>• Decide and rationalise controls that will be implemented/not implemented. |
| **Determine residual risk** | • Examine future risk.<br>• Does the risk level meet company tolerance?<br>• Who knows about the residual risk levels and accepts them? |
| **Reflect** | • Has the safety assessment delivered a fundamental understanding of the risks for each ride and how they are controlled? |
| **Further action** | • Improvement plans.<br>• Monitoring and review.<br>• Governance. |

## 13.2 Appendix B–Further information

The following references may assist you in preparing your safety assessment and safety case:

**Australian and New Zealand Standards**

- AS 3533 series—Amusement rides and devices
- AS/NZS 4024 series—Safeguarding of machinery
- AS/NZS IEC 60812 Failure modes and effects analysis
- AS IEC 61025 Fault tree analysis
- AS IEC 61882 Hazard and Operability Studies (HAZOP Studies)—application Guide
- AS 61508 series Functional safety of electrical /electronic/programmable electronic safety related systems
- AS 60204 series—Safety of machinery—Electrical equipment of machines general requirements
- AS 62061—Safety of machinery Functional safety of safety -related electrical, electronic and programmable electronic control systems
- AS ISO 31000 series—Risk management—guidelines
- ISO 45001 Occupational Health and Safety

Visit standards.org.au/

**FARSI**–*Functionality, Availability, Reliability, Survivability, Interdependency* for control measures

- '**Performance standards in the management of risk of major accident events**'; Presentation slides by Michael Coppen (OHS Inspector), 3rd September, 2014, NOPSEMA
  Visit: nopsema.gov.au
- **NOPSEMA Guidance Note GN0271 – 'Control Measures and Performance Standards' Rev 4** Visit: nopsema.gov.au/safety/safety-case/safety-case-guidance-notes/

**Queensland codes of practice**

- How to manage work health and safety risks Code of Practice 2011
- Managing risks of plant in the workplace Code of Practice 2013
- Work health and safety consultation, cooperation and coordination Code of Practice 2011

**Queensland guides**

- Guide for major amusement parks: Developing a safety case outline
- Amusement device major inspections: Interim guidance

**UK guidance**

- **Fairgrounds and Amusement Parks: Guidance on Safe Practice**
- UK Health and Safety Executive–HSG175 (Third edition, published 2017)
- ISBN 978 0 7176 6663 8

Visit: hse.gov.uk/pubns/books/hsg175.htm

**Safe Work Australia guides**

A range of guides covering all aspects of preparing safety cases for major hazard facility compliance with the model Australian Work Health and Safety laws are available at:

- safeworkaustralia.gov.au/industry_business/major-hazard-facilities#work-health-and-safety-duties