



Government of **Western Australia**
Department of **Mines and Petroleum**
Resources Safety

Dangerous Goods Safety Guidance Note M01/09

Generating the supporting documentation for an MHF safety report

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Introduction

All dangerous goods sites are required to prepare a risk assessment identifying the hazards and risks from dangerous goods, and setting out the risk control measures and the reasons for their selection.

Sites classified as major hazard facilities must also submit a safety report that deals specifically with those risks that may involve major incidents. The purpose of the safety report is to demonstrate that:

- these more significant risks have been identified; and
- the systems in place at the facility eliminate or reduce those risks to as low as is reasonably practicable.

The preferred form of the safety report is a succinct document that provides transparent validation and linkages between assessments, consultation and verifications in order to assure the Chief Officer that systems, methods and processes at the site will prevent a major incident from occurring, and public and employee safety will not be compromised.

This guidance note assists operators in determining what material to consider when collating the information required to prepare the safety report. This information should be progressively submitted to the Resources Safety MHF safety assessors for appraisal and comment prior to preparation and submission of the safety report.

Documentation related to assessments, consultation and verifications must be retained by the operator.

Note: Resources Safety's online MHF guideline provides detailed information on determining if a dangerous goods site is an MHF and, if so, how to prepare and submit a safety report in accordance with the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007.

Facility description

Introduction

This section provides guidance on information to be considered when preparing the facility description.

The facility description should include a detailed written description of the facility's activities, equipment, operation and its interaction with surroundings and other facilities. This enables assessment to ensure the design and operating philosophy are consistent with the assumptions and outputs of the formal safety management and controls in the safety management system.

Generic information to be considered includes:

- site information
- design philosophy and criteria for technology selection
- process overview.

Site information

Site location

- Location of the site
- Site history
- Aerial map of the site location indicating the co-ordinates of the site boundaries.
- Distance of the site from nearest population centres

Surrounding land use

- Map showing the zoning of the locality
- Topography of the land
- Marked separation distances from the boundary to surrounding facilities, such as distances from neighbouring industries, facilities, public access roads, pipeline corridors, sensitive users (e.g. houses, schools, child care, aged care centre, ranger's residence, walkways, nature reserves, recreational facilities, prisons, shops), critical production infrastructure (e.g. gas main lines, ports, communication towers, public access roads hospitals, fire stations)

Note: The intent is to indicate the separation distances from hazards that could potentially impact on people, property or environment.

Site and area occupancy

- On-site population during and after hours operation of the facility
- Typical on-site population distributions
- Off-site population during and after the hours of operation
- Consultation zone

On-site population should take into account the indicative number of visitors, contractors, maintenance workers and employees on any typical day. Population peaks due to maintenance and turnarounds need to be accounted for.

Off-site population should be indicative of the population surrounding the facility, i.e. people that would be living working or participating in recreational activities in the vicinity.

A consultation zone is the area where the population needs to be consulted on matters such as potential major incidents, emergency preparedness and public safety. The extent of the consultation zone is determined by consequence modelling of major incidents.

Design philosophy and criteria for technology selection

- Basis for arriving at current plant designs (e.g. reasoning for selecting key plant equipment and technology)
- List of codes of practice, standards and guidelines used in process and safety systems design
- Safety critical items (e.g. containment, leak detection, safety instrumented functions, alarm systems, emergency systems)
- Use of latest technology
- Operating experience

Process overview

Description of operations

A flow chart and descriptions of various unit operations and the interactions between those unit operations including:

- Processing units
- Storage and dispatch
- Pipelines
- Utilities
- Road, rail and ship loading facilities

Process description

- A basic stage by stage description of the technology used or proposed to be used
- Process flow diagrams (PFDs)

Site plan

- Process units, occupied buildings and utilities
- Areas of storage and handling of dangerous goods
- Pipelines and access roads
- Import or export operations through rail, road, air, waterways or pipelines

Storage and handling details

- Dangerous goods inventory, including the sizes and types of storage facilities

Formal safety assessment

Process for undertaking a formal safety assessment

A formal safety assessment involves the identification of hazards that have the potential to result in a major incident. Likelihood of occurrence and consequence estimations for each major incident are documented, taking into account the plant design and operational safety features.

The adequacy of control measures should be determined and confirmed by various verification and validation checks. The residual risk is then compared against the proponent's internal risk acceptance criteria.

During the phases of the facility lifecycle, hazard controls are effectively managed through the safety management system and a process of risk reduction and continual improvement. The safety management system should incorporate a program for periodic monitoring, review and verification of continued adequacy of controls and risk mitigation measures.

The identification of hazards, likelihood analysis and the consequence estimations for potential major incidents are generally carried out by a team whose members have a range of technical and professional knowledge gained from within the facility or similar facilities. Documentation should include the composition of the team, assessment methodologies, document references, assumptions and discarded scenarios.

Proponents are encouraged to communicate regularly with Resources Safety during the development processes on aspects such as hazard identification, consequence modelling assumptions, safety integrity level (SIL) verification and fire safety studies.

The overall safety assessment process (Fig. 1) comprises:

- hazard identification
- risk analysis
- risk controls
- risk reduction.

Hazard identification

Definitions

"Hazard" means any activity, procedure, plant, process, substance, situation or other circumstance that could be a source of harm to people, property or the environment (e.g. emission, loss of containment, fire, explosion, release of energy). Examples are given in Figure 2.

"Harm" means injury to, or harm to the health of, an individual; or damage or harm to property or the environment.

"Major incident" means an incident, including an emission of a Schedule 1 substance; or a loss of containment of a Schedule 1 substance; a fire; an explosion; or a release of energy that causes serious harm to people, property or the environment.

Regulatory requirements

For each hazard relating to dangerous goods, assess:

- the probability of the hazard causing a major incident (likelihood), and
- the nature of harm to people, property and the environment that would result from the occurrence of that incident (consequence).

Hazard identification process

Table 1 lists some matters to consider for the hazard identification process.

Hazards are diverse and vary with the type of industry being considered. Hazards in complex chemical operations will be different from those identified for storage operations. More than one hazard identification methodology may be required to ensure that all hazards are identified.

The hazards need to be identified in a systematic manner. It is also important that current information is used. Some of the commonly used methods for hazard identification at different stages of the project lifecycle are listed in Table 2. It is not expected that most or all of the methods would be applied — only use those most relevant and best suited to your site.

Risk analysis

Likelihood analysis and consequence estimation

Likelihood analysis and consequence estimations are generally considered at the same time as the hazard identification for developing controls against the hazard leading to a major incident.

In the process of conducting likelihood analysis, reliability data can be derived through numerous sources. Typical reliability data sources and matters to consider while carrying out likelihood analysis are listed in Table 3.

Equipment needs (hardware, software and human factors) are determined for control purposes, and the "fit for purpose" determination is made at the likelihood analysis stage. Numerous major incident scenarios are modelled or pilot tested, and consequences with and without control measures are determined for acceptable risk levels.

The level of consequence arising from an incident needs to be assessed for all populations exposed to that incident (both near and far field populations). Consequence estimation can be qualitative, semi-quantitative or quantitative. Qualitative and semi-quantitative consequence estimations involve a high degree of subjectivity as they are based on operator experiences and other relatively less rigorous approaches. For potential major incidents, the general accepted practice is to quantify the consequence, as shown in Table 4.

Risk estimation and ranking

The outcomes of the likelihood analysis and consequence estimates are commonly represented by risk estimation and ranking methods.

Estimation of risk can involve:

- quantitative risk assessments – all risks are quantified through the use of recognised data and are numerically expressed
- semi-quantitative risk assessments – risks associated with an incident are generally quantified through the use of industry specific or site data
- qualitative risk assessments – assessment of risk from subjective, considered opinion based on operating expense.

In many major hazard facilities, quantitative or semi-quantitative risk assessments have been adopted. The risk to individuals and workgroups from both individual and collective events (total risk) needs to be considered for all populations exposed to or affected by those events (near and far field).

A risk matrix can be used to represent the relative consequence and likelihood of an incident. Figure 3 shows a typical risk matrix.

The level of risk acceptable to the organisation should be determined in conjunction with the workforce and other key stakeholders.

Risk controls – prevention and mitigation

Minimising hazards to acceptable levels of risk involves the appropriate use of control measures (Table 5). The control measures can include hardware, software, human intervention or, in many cases, a combination of these. Figure 4 summarises the process for determining controls.

There should be a clear demonstration that the level of residual risk meets the organisation's acceptable risk criteria.

Figure 1 Overview of the safety assessment process

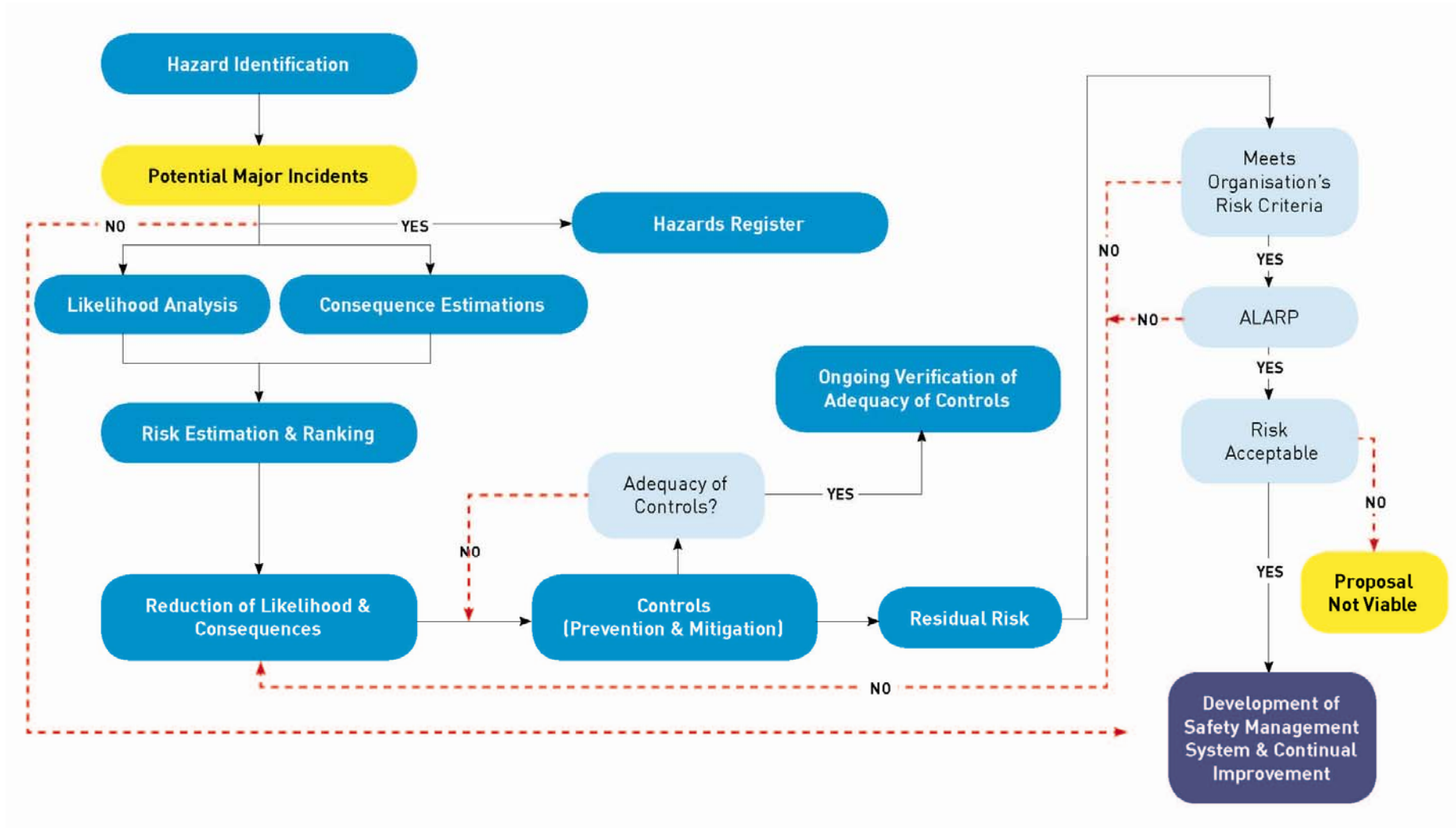


Figure 2 Potential hazard sources during the facility lifecycle

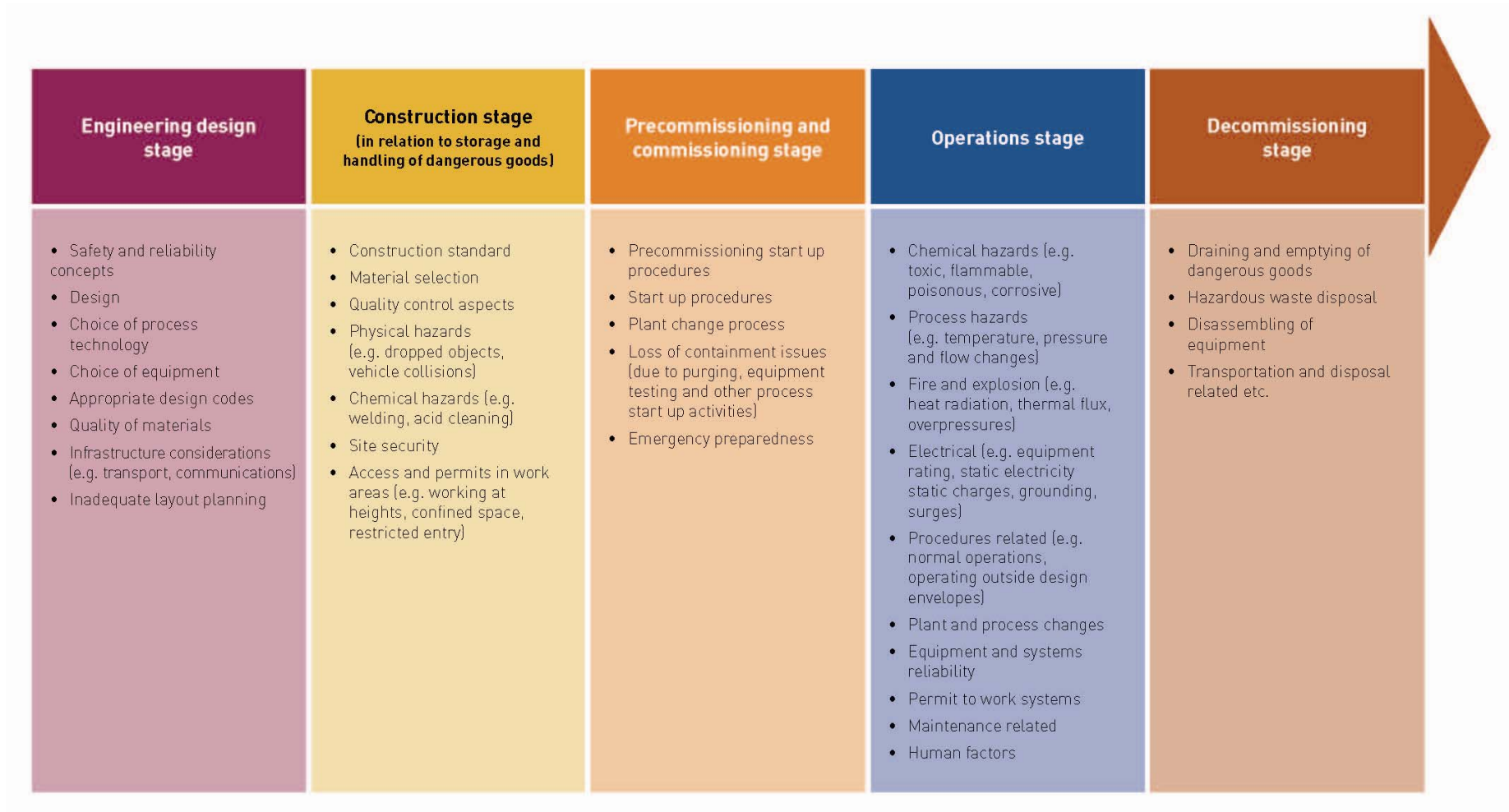


Table 1 Hazard identification process

Hazard identification process	Matters to consider
Facility description	<ul style="list-style-type: none"> • Linkages between the facility description and hazard identification
Hazard identification considerations	<ul style="list-style-type: none"> • Were the hazard identification boundaries clearly defined?
Hazard identification technique	<ul style="list-style-type: none"> • Appropriateness of hazard identification technique for intended purposes
Hazard identification team and competency	<ul style="list-style-type: none"> • Composition of the hazard identification team, workforce participation • Competence and expertise of the hazard identification team • Independence of the facilitator
Hazard identification timing	<ul style="list-style-type: none"> • Appropriateness of hazard identification timing • Sufficient time allocation for hazard identification process
Conduct of hazard identification process	<ul style="list-style-type: none"> • Competency and independence of facilitator, presentation tools, layout of the workshop, and other ambience factors
Hazard identification documentation	<ul style="list-style-type: none"> • Capturing of all hazard identification actions • Justification and documentation of discarded hazard identification scenarios • Documentation and recording process of the sessions (for audit purposes)
Communication	<ul style="list-style-type: none"> • Audit of communication aspects (e.g. procedures, processes)
Hazard register	<ul style="list-style-type: none"> • Compilation of hazard identification findings into a major incident register also referred into as hazard register

Table 2 Hazard identification techniques and their application

Hazard identification technique	Facility siting or front end engineering design (FEED)	Engineering design stage for new plants	Operational stage (new and existing facilities)	Modification to existing facilities
Historic records of incident	✓	x	x	✓✓
What if analysis	✓✓	✓	✓	✓✓
Task analysis	x	x	✓	
Hazard and operability (HAZOP)	✓	✓✓	✓✓	✓✓
Failure modes and effects analysis (FMEA)	x	✓	✓✓	✓
Failure modes, effects and criticality analysis	x	✓	✓✓	✓✓
Fault tree analysis (FTA)	x	✓✓	✓✓	✓✓
Event tree analysis (ETA)	x	✓✓	✓✓	✓✓
Process hazard analysis	✓✓	✓	x	✓
Job safety analysis (JSA)	x	x	✓	✓
Human reliability analysis (HRA)	x	✓✓	✓✓	✓✓
Checklists	✓	✓	✓	✓
Scenario based hazard identification	✓✓	x	✓✓	✓✓
Chemical reactivity hazard matrix	✓✓	✓		✓
Concept hazard analysis	✓		✓	

✓ = Could be used ✓✓ = Best suited x = Least suited

Table 3 Typical considerations during likelihood analysis

Likelihood analysis – data sources	Matters to consider
Historic incidents, accidents, near misses	<ul style="list-style-type: none"> Reliability and relevance of data References for the data Statistical significance based on population sample size
Manufacturer's or technology provider's database	<ul style="list-style-type: none"> Failure frequencies based on manufacturer or provider's experience, adjusted for local environmental conditions
Fault tree, event tree, cause consequence diagrams	<ul style="list-style-type: none"> Estimation of failure frequencies
Standard databases and literature	<ul style="list-style-type: none"> Suitability of data for the given conditions Referencing the source of data (e.g. generally used sources for obtaining information on standard failure frequency rates are OREDA, Chlorine Institute literature, "Lees Loss Prevention in the Process Industries") Statistical relevance of the data source in the literature
Safety alerts / bulletins	<ul style="list-style-type: none"> Alerts from various regulatory agencies and institutes (e.g. Chemical Safety Board, Chlorine Institute, American Petroleum Institute, Centre for Chemical Process Safety)
Operator experiences and other sources	<ul style="list-style-type: none"> Based on the experience and expertise of the personnel involved in the likelihood analysis process Failure frequency database or incident database maintained by the industry or operator

Table 4 Typical considerations during consequence estimation

Consequence estimation process	Matters to consider
Modelling software selection and validation	<ul style="list-style-type: none"> Industry recognised model Appropriateness of modelling software Validity of software Independent validation of consequence modelling Selection of appropriate "probit" equations
Modelling assumptions and considerations	<ul style="list-style-type: none"> Parts count – documentation of omissions or exclusion of parts (referenced to up-to-date "P&IDs") Storage, pipelines and process inventory Modelling scenarios Weather data Topography People distribution and exposure times
Alternative assessment process	<ul style="list-style-type: none"> Use of appropriate qualitative or semi-quantitative measures relevant to situation

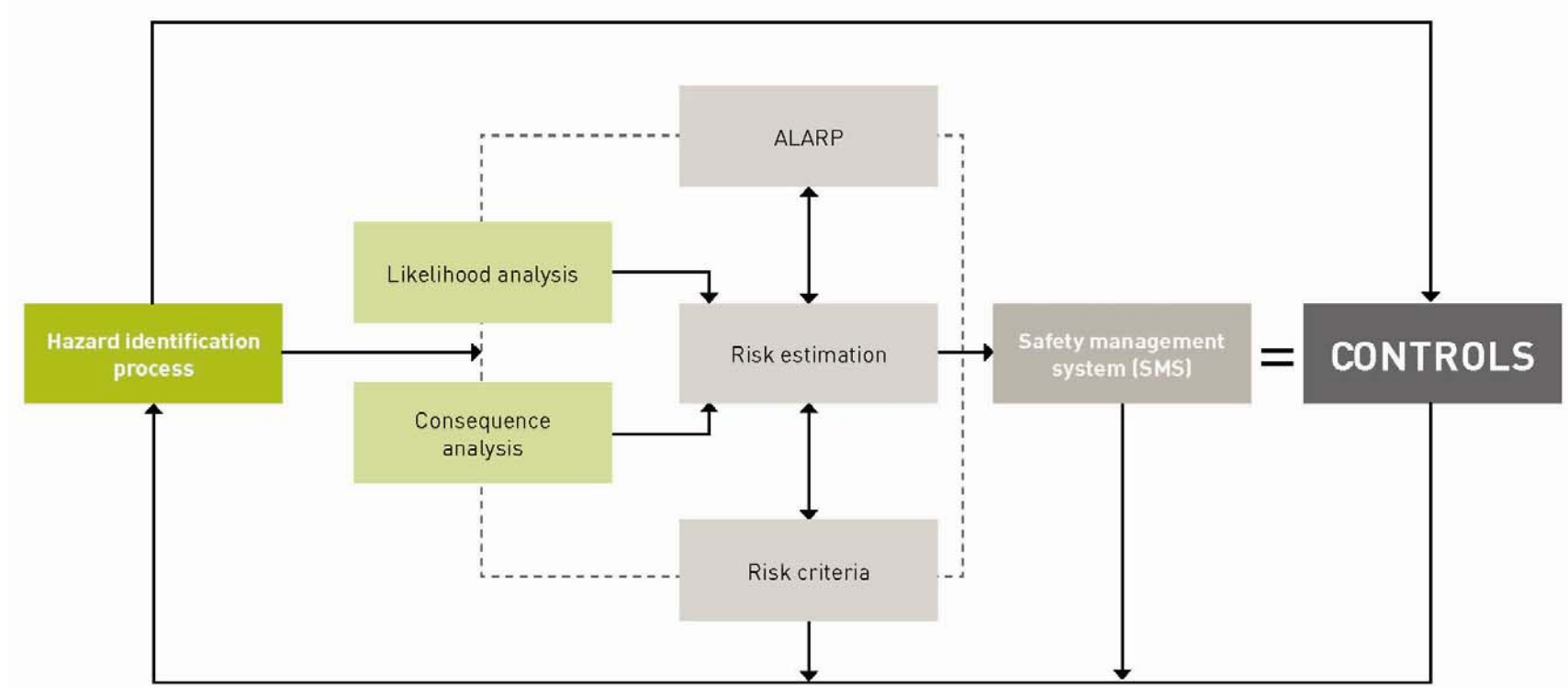
Figure 3 Typical risk matrix for an MHF

Risk Matrix		CONSEQUENCES				
		INSIGNIFICANT 1	MINOR 2	MODERATE 3	MAJOR 4	CATASTROPHIC 5
HEALTH AND SAFETY VALUES		A near miss, first aid injury (FAI), one or more medical treatment injuries (MTIs)	One or more lost time injuries (LTIs)	One or more significant lost time injuries (LTIs)	One or more fatalities	Significant number of fatalities
ENVIRONMENTAL VALUES		No impact	No or low impact	Medium impact. Release within facility boundary	Medium impact outside the facility boundary	Major impact event
FINANCIAL LOSS EXPOSURES		Loss below \$5,000	Loss from \$5,000 to \$50,000	Loss from \$50,000 to \$1,000,000	Loss from \$1,000,000 to \$10,000,000	Loss above \$10,000,000
LIKELIHOOD	A Possibility of repeated events (1×10^{-1} per year)	Significant	Significant	High risk	High risk	High risk
	B Possibility of isolated incidents (1×10^{-2} per year)	Moderate risk	Significant	Significant	High risk	High risk
	C Possibility of occurring sometimes (1×10^{-3} per year)	Low risk	Moderate	Significant	High risk	High risk
	D Not likely to occur (1×10^{-4} per year)	Low risk	Low risk	Moderate	Significant	High risk
	E Rare occurrence (1×10^{-5} per year)	Low risk	Low risk	Moderate	Significant	Significant

Table 5 Typical risk control measures

Consideration	Typical controls
1. Elimination	<ul style="list-style-type: none"> • Facility siting • Plant layout • Physical barriers between non-compatible materials • Optimum inventory level • Removal of hazardous materials • Containment systems
2. Substitution	<ul style="list-style-type: none"> • Alternative processes • Alternative technology • Substitution by less hazardous materials
3. Engineering	<ul style="list-style-type: none"> • Selection of equipment for hazardous areas • Reliability of utilities • Relief or vent systems • Flow controls • Purging systems • Quench systems • Manual isolation or by-pass systems • Flare systems • Alarm and trip systems • Leak or gas detection • Fire and heat detectors • Emergency shut-down (ESD) • Distributed and supervisory control systems (DCS/SCADA) and related safety instrumented functions (SIFs)
4. Safety management system	<ul style="list-style-type: none"> • Permit to work • Management of change • Risk assessments (e.g. JSA, PHA) • Maintenance • Engineering procurement • Engineering document control • Audits • Human factors assessment and training • Induction and competency-based training • Personal protective equipment • Emergency preparedness • Administrative (e.g. signage, site security, traffic control, warning signs)

Figure 4 Process overview for determining controls



Periodic review, assessment, validation and demonstration of adequacy due to surrounding land use changes, ageing plant, changing technology and other factors related to safety

- In determining adequate control measures against hazards, emphasis is placed on "judgement", which can be drawn from various processes shown in the block diagram above
- The justification for the "judgement" on the control measures needs to be clearly presented in the safety report submitted for approval. The linkages must be verifiable and auditable.

Table 6 Typical considerations for demonstration of adequacy

Technology selection <ul style="list-style-type: none">• Benchmarking technologies and justification in selecting or retaining current technology
Equipment selection <ul style="list-style-type: none">• Inherent safe designs• Reliability• Serviceability and maintenance considerations• Integrity
Design standards <ul style="list-style-type: none">• Application of codes of practice and design standards• Design review and acceptance or registration• Design validation
Site selection and separation distances <ul style="list-style-type: none">• Infrastructure considerations (e.g. transport risk and other infrastructure limitations)• Preliminary risk assessments for determining site layout• Inventory considerations• Potential for future risks(e.g. current future zoning, population intensification)
Key stakeholder engagement <ul style="list-style-type: none">• Involve key identified stakeholders

Demonstration of adequacy of controls

Demonstration of adequacy forms an important aspect of the safety report. There are several methods that can be used for the presentation of this information, ranging from a simple benchmarking exercise involving comparison of various engineering standards, to complex presentations such as the “bow tie” methodology (Fig. 5), layers of protection analysis (LOPA; Fig. 6) and safety integrity level (SIL) analysis for safety instrumented functions, or a combination of such techniques. Table 6 lists some typical considerations.

The information to be presented should take into account the complexity of the operations and risk control measures being addressed.

The intent is to clearly identify the hazards and indicate the preventative and mitigative controls in place to manage the hazards effectively. These are linked to appropriate performance standards for ongoing verification of adequacy of controls. Also identified are the post-incident controls such as emergency preparedness and response.

Having identified a critical control, the frequency and means of ongoing verification are also identified as part of the ongoing verification of adequacy of controls program.

Ongoing verification of adequacy of controls

Control failures or inadequate controls can lead to major incidents with undesirable consequences. These controls must be effectively monitored.

The ongoing verification of the adequacy of controls is paramount to ensuring ongoing safety integrity at the facility. The verification to ensure their ongoing adequacy and fitness for purpose also promotes a systematic review of plant performance and allows prioritisation of safety matters pertaining to potential major incidents.

Proponents are required to produce a program for the regular verification of the continual adequacy of controls.

Figure 5 Typical “bow tie” representation of adequacy of controls

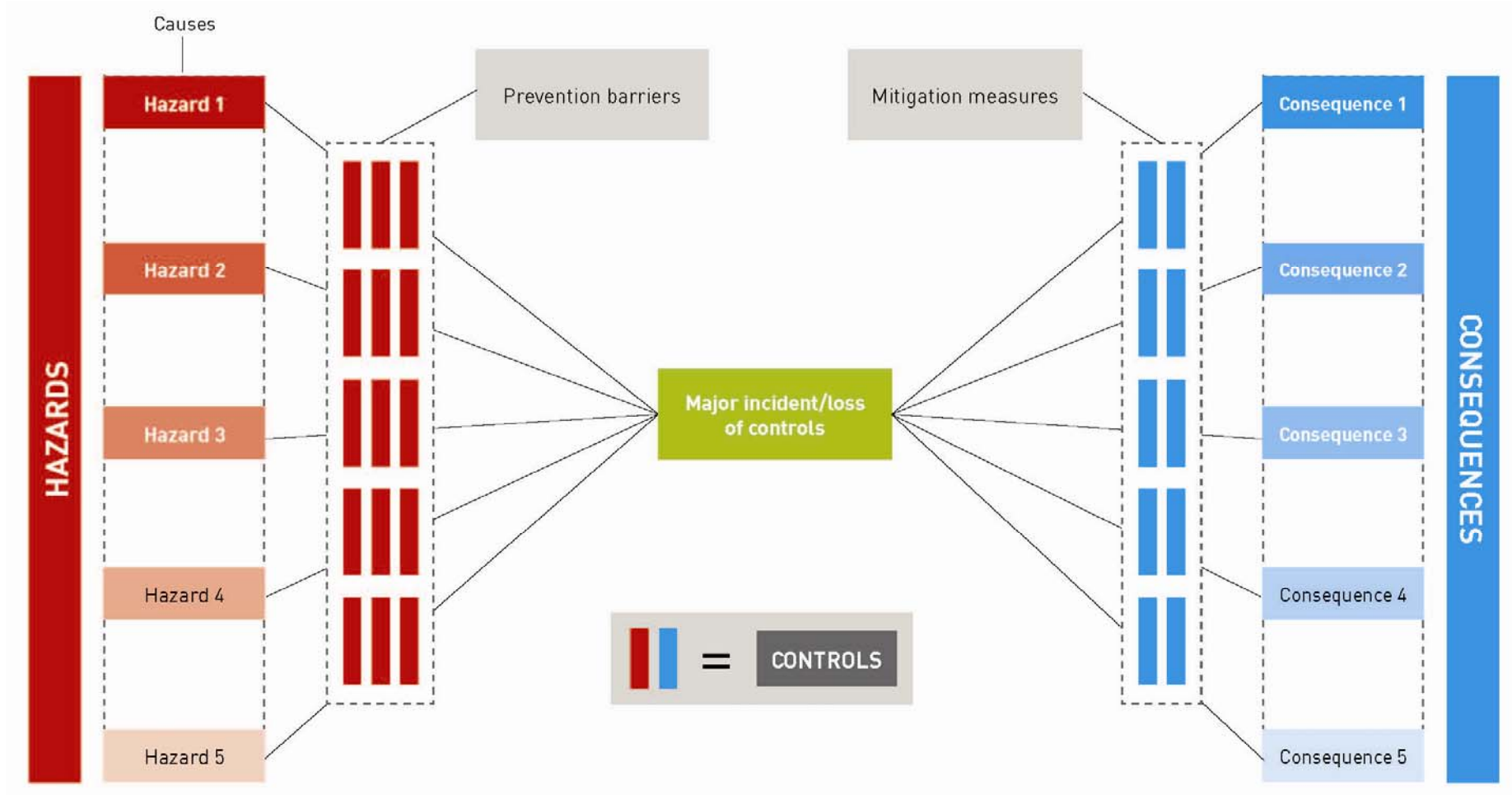
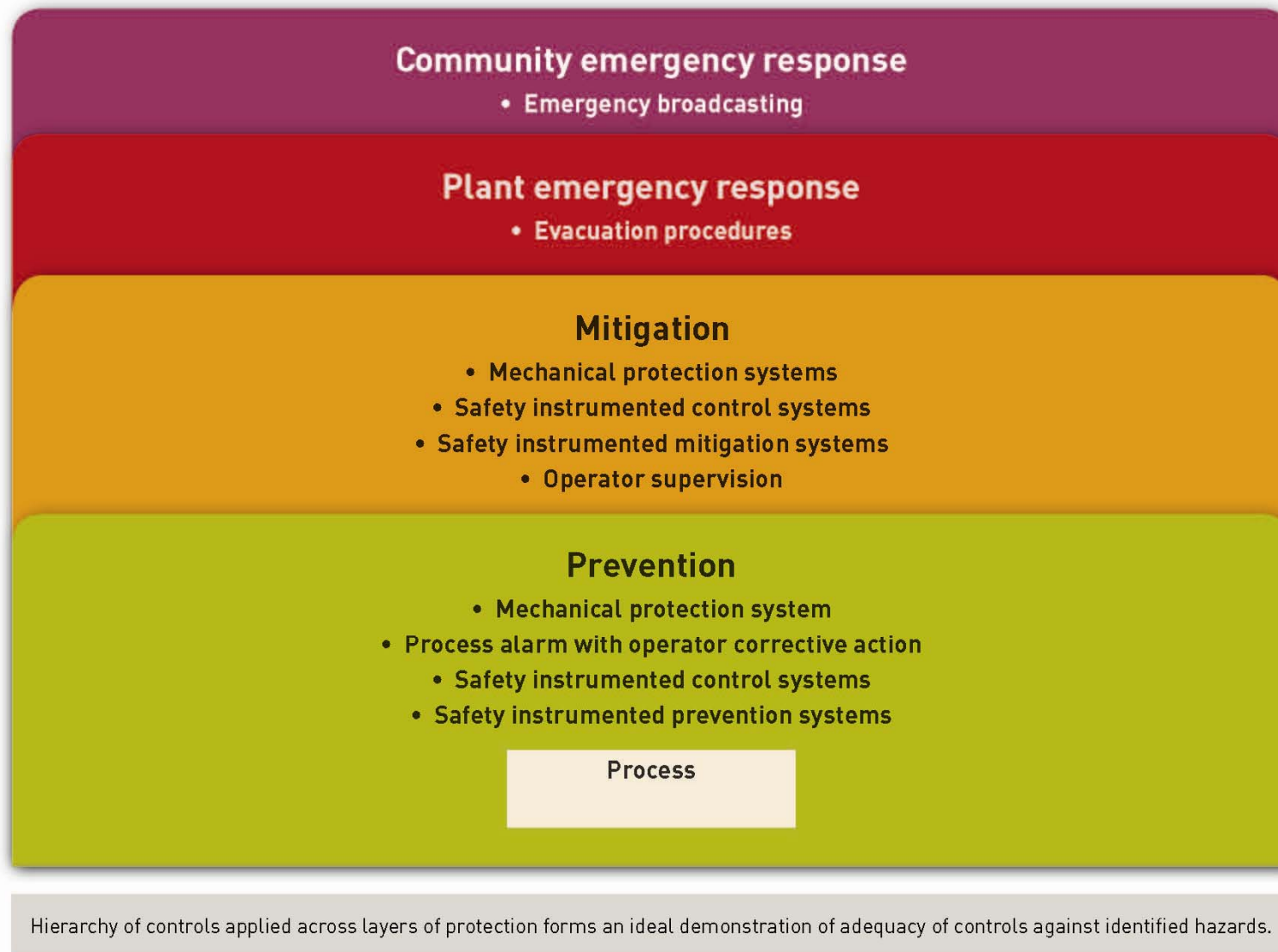


Figure 6 LOPA methodology for demonstrating adequacy of controls



Risk reduction and continual improvement

Demonstration that the risk is “as low as reasonably practicable”

As low as reasonably practicable (ALARP), as defined in the regulations, is in the context of minimisation of risk to people, property and the environment.

In demonstrating ALARP, consideration is given to the risk reduction that can be achieved and the practicality of introducing the control measures to achieve that reduction.

Proponents should re-examine their risk assessments to identify areas where additional controls could further reduce the risk presented by their operations.

Such controls can be introduced either promptly or progressively over a period of time (continual improvement). Continual improvement can be achieved through changes in work practices, process improvements, adopting new technologies, and changes to materials of construction.

Although a facility might consider that it is demonstrating ALARP, the risk presented may still be unacceptable (Fig. 7). Should this occur then the following may be considered.

- For a new facility – further actions that could be put in place to achieve an acceptable risk.
- For an existing facility – the facility may need to formulate and implement a time-based risk reduction program, to reduce the risk to ALARP levels.

An essential aspect of the safety report regime is continual improvement aimed at risk minimization (Figure 8). The general strategies that could be considered are:

- process optimisation
- internal audit program
- development of lead safety performance indicators (with clearly defined and measurable events that can be reviewed in a timely manner).

Figure 7 Illustration of ALARP approach

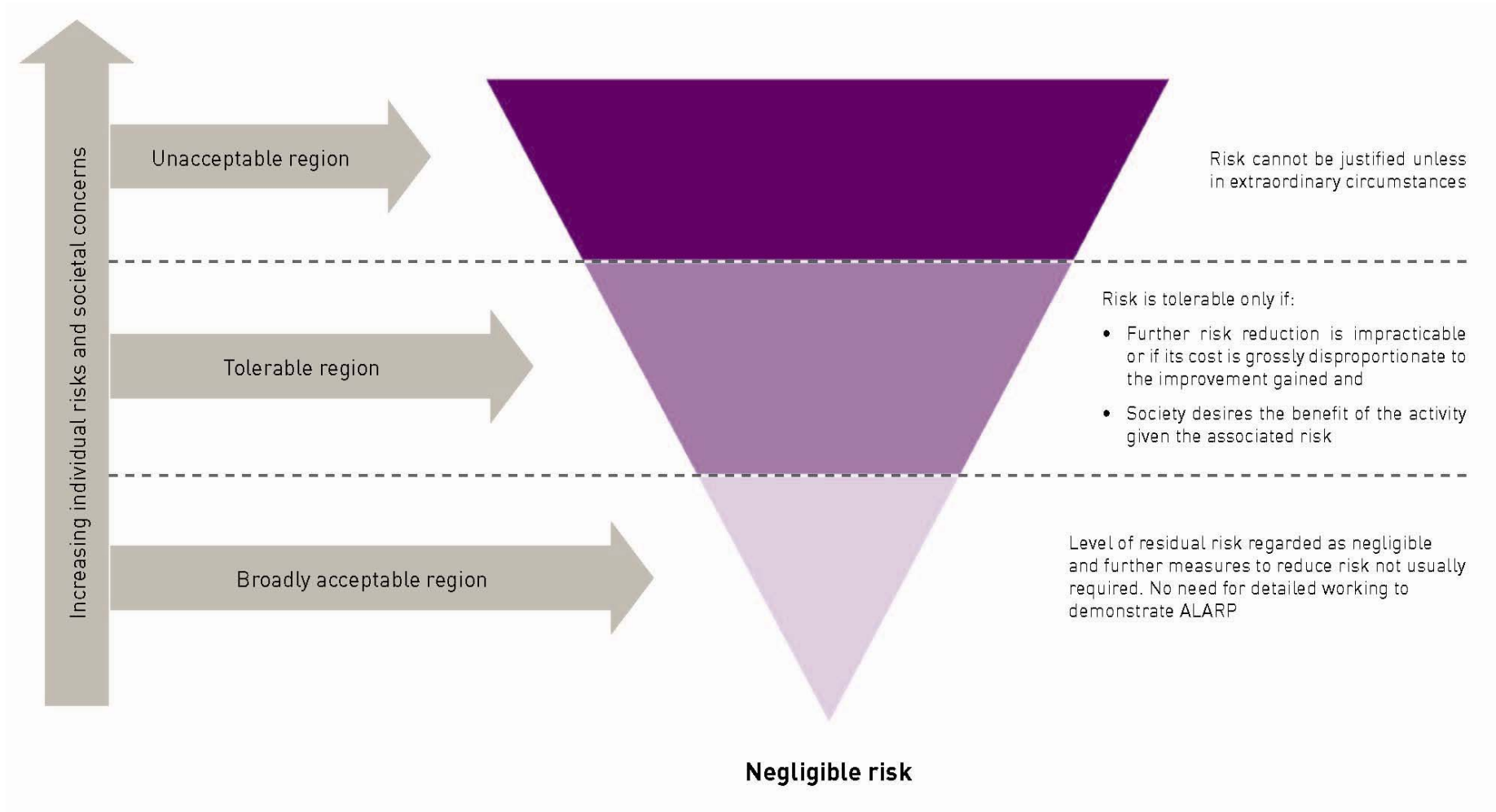
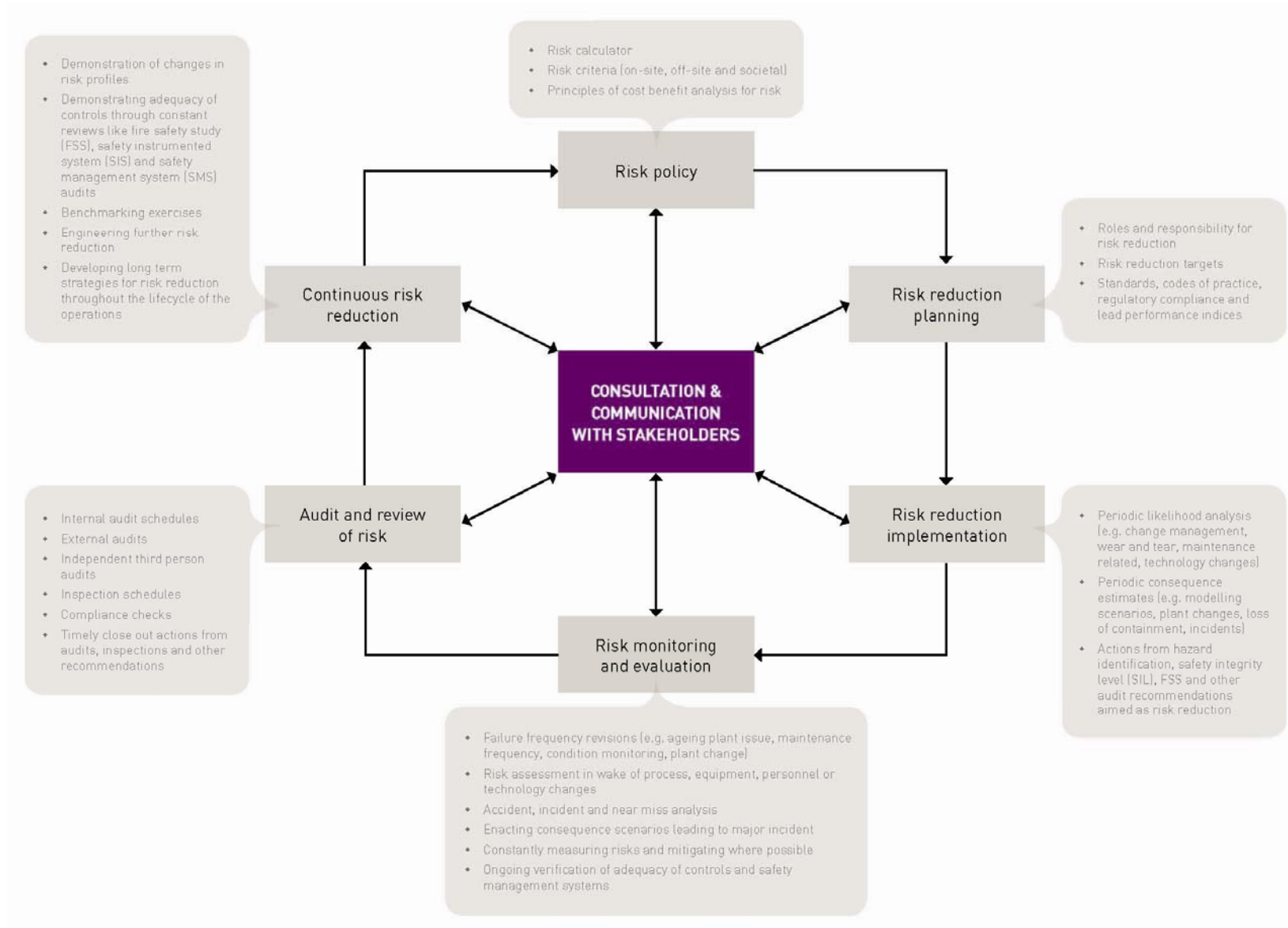


Figure 8 Example of continual improvement process



Safety management system

Typical elements

The safety management system (SMS) addresses the management framework for ensuring safe operations, and is specific to the facility and its hazards. Key features are shown in Figure 9.

Leadership and commitment

- Corporate policy on safety, health and environment
- Consultation and communication on strategic or corporate directions and policies
- Corporate risk acceptability criteria (defining the limits of risk to workforce and other stakeholders)
- Risk reduction targets
- Organisation structure
 - organisational chart of similar identifying positions, roles and responsibilities with an emphasis on identifying safety responsibilities
- Safety critical roles and responsibilities (task matrix for implementation and maintenance of safety management system elements)
- Continual improvement commitments

Hazard and risk management

- Due diligence on commitments made during safety report development
- Maintenance of a hazards register
- Regular review of:
 - risk assessments
 - hazard reporting
 - condition of plant (hardware and software)
 - process conditions
 - personnel numbers and skills
 - surrounding land use
 - dangerous goods inventory
 - applicability of procedures (operating, maintenance, administrative controls)

Standard operating procedures

- Start-up
- Normal operations
- Shut down (planned and unplanned)
- Key operating procedures
- Process upsets and abnormal conditions
- System bypass
- Cryogenic equipment cool-down or start-up procedures
- Management of change
- Utilities and back up systems
- Emergency shut-down (ESD) procedures

- Commissioning procedures

Process safety information

- Plant layout, plot plans and general arrangements
- References to operations and maintenance manuals supplied by technology or service provider
- Process design conditions
- Critical operating parameters
- Safe operation envelopes or conditions for critical operating parameters
- Chemical storage conditions
- Process flow diagrams (PFDs) and material balances
- Piping and instrumentation diagrams (P&IDs) engineering line diagrams
- Material safety data sheets (MSDSs)
- Correlation charts and other critical data such as steam tables and flow calibrations
- Cause-and-effects chart for alarms and interlocks.
- Major incident scenarios register

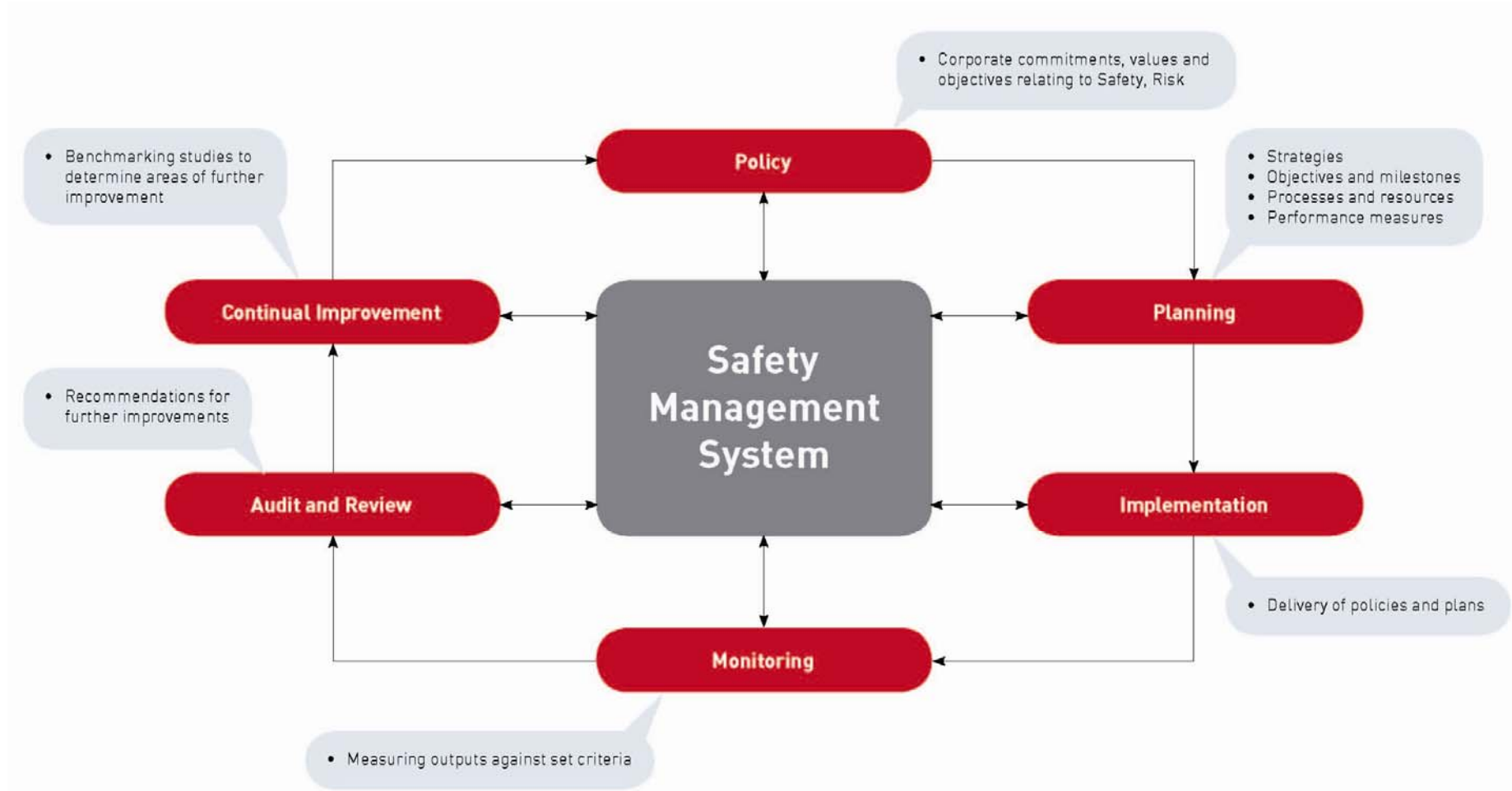
Management of change

- Triggers for change management procedure (e.g. significant process, hardware, software, procedural, personnel and organisational changes)
- Change management procedures, including timing of change management, training and related documentation
- HAZOP or risk assessment
- Track aspects of the change management process (e.g. documents, P&ID, procedures, drawings, training records)

Permit systems

- Crane access and heavy lifting
- Rendering plant safe for maintenance
- Contractor access during plant turnarounds
- Hot work
- Confined space
- Working at heights
- Lock-out and tag out
- Access to restricted areas
- Electrical
- Excavation
- Plant isolations

Figure 9 Key features of a safety management system



Asset integrity management

- Inspection and maintenance program
- Safety critical equipment register
- Condition monitoring
- Risk-based inspection (RBI)
- Frequency of maintenance of safety critical equipment
- Fire fighting and emergency preparedness equipment
- Utilities and backup systems

Emergency preparedness

- Emergency information
 - Emergency access, muster points, escape routes and safe refuges on and off site
 - Fire and gas detection systems (where applicable)
 - Emergency shut-down systems
 - Fire fighting capabilities (e.g. firewater storage, pumps and distribution system, fixed and portable fire suppression systems)
 - Storage locations of critical personal protection equipment and emergency response equipment
 - Boundary alarms and detectors
 - Wind socks and monitors
 - Exclusion zones and hazardous areas
- Notification and escalation procedures and protocols
 - On-site (employees or personnel, visitors and contractors)
 - Off-site (immediate neighbours, community and areas that could be affected by emergency identified in the consultation zone)
- Shut-down procedures
- Roles and responsibilities
- Emergency response training and competencies
- Plan for major incident scenarios
- Emergency drills and testing procedures
- Warning systems, evacuation systems and escape routes
- Safe refuges
- Spill containment
- Fire fighting and deluge systems
- Liaison with emergency services, government agencies, media, etc.
- Special risk plans

Note: As a minimum, the information identified in Section 9 of the National Standard for the Control of Major Hazard Facilities NOHSC [1014: (2002)] and National Code of Practice [NOHSC: 2016 (1996)] should be addressed.

Facilities are to develop emergency response plans by actively engaging government authorities such as Fire and Emergency Services (FESA). The emergency response plans should be endorsed by FESA.

For further information on emergency planning, refer to Resources Safety's *Dangerous Goods Site – Emergency Planning Code*.

Facilities should conduct emergency drills enacting likely emergency scenarios for ensure adequacy of emergency preparedness. For new facilities, the emergency drills will be at the pre-commissioning stage. For existing facilities, this should be carried out at least annually. The emergency drills should involve personnel from FESA and Resources Safety.

Accident, incident and near-miss reporting and investigations

- Accident and incident investigation procedures
- Reportable incidents (developed in consultation with Resources Safety)
- Notification timings of accidents, incidents and near-misses
- Accident, incident and near-miss reporting process and procedures
- Securing the place for incident investigation
- Criteria for selecting investigation team
- Accident, incident and near-miss reporting database
- Root cause analysis and implementation of corrective actions or recommendations

For further information on formal reporting of incidents, refer to Resources Safety's *Dangerous Goods Incident Reporting Guideline*.

Note: Certain situations may require reporting to multiple government agencies.

Training and competency

- Position and skills
- Assurance on maintaining competency and skills
- Emergency preparedness
- On going job training (competency based)
- Professional development program
- Training gap analysis
- Visitor and contractor induction and training
- Training records management
- Human factors and human error minimisation
- Man-machine interface issues

Audit, review and continual improvement

- Verification program for risk control
- Internal audit program (frequency and scope of internal auditing program)
- External audits
 - Internal corporate audits
 - Independent third party audits

Note: Third-party independent audits may be required of proponents. The scope of works, frequency of audit and the appropriateness of auditors must be agreed with Resources Safety.

Security

- Asset protection
- Site security
- Product security
- Distributed control system or safety instrumented system (DCS/SIS) security levels

- Document and data security

Consultation and communication

- Consultation process, including identification of issues and stakeholders, methods used, outcomes and demonstration of adequacy of consultation
- Consultation with the workforce on development of the safety report
- Consultation with neighbours and emergency services in development of the facility's emergency response plan
- Communication with the community on the risk presented by the facility, the facility's preventative and mitigative control measures
- Communication with the community on the facility's emergency response plan and the actions members of the community should take if a dangerous situation develops or major incident occurs

Engineering procurement

- Inventory management (availability of spares or standby arrangements for safety critical items)
- Engineering specifications (e.g. material of construction, operating parameters, P&ID, reliability, SIL rating)
- Approved vendor or supplier list for critical equipment

Contractor management

- Selection of contractors
- Knowledge in relevant field
- Site induction
- Appropriate equipment usage
- Access levels and areas
- Training and competency
- Emergency preparedness

Notification of change

Change management is an integral part of the safety management system for a major hazard facility. The management of change is a risk-based decision-making process.

In certain cases, Resources Safety must be notified if a significant change involving any plant, process, substance or dangerous goods inventory used in a place is proposed (Figure 10).

Such cases could:

- introduce a new potential major incident scenario
- affect the probability, consequence or both of existing identified major incidents
- modify critical controls identified in risk assessments or other technical studies.

The implementation of such changes may require a review of the facility's safety report. Any amendment of the safety report needs to be approved by the Chief Officer prior to implementation of the change.

Note: Resources Safety's online MHF guideline contains information on the notification procedure.

Some typical documents required in support of a proposed change are:

- Modified safety procedure(s) (e.g. highlight the changes between the referenced procedure in the safety report versus the proposed amendment)

- Changes in standards, code of practice, and/or technical design need to be accompanied by justification, risk assessment process undertaken (e.g. hazard considerations, HAZOP) and demonstration of adequacy of controls
- Detailed engineering drawings, P&IDs and other technical modelling and risk assessment studies (e.g. SIL reassessment, fire safety study review, flare systems, alarm rationalisation, human factors)
- Testing and maintenance records supporting the need for change

Process changes

- Raw materials changes
- Changes in the inventory levels of dangerous goods
- Process set point change resulting in significant temperature, pressure or volume changes, or an increase or decrease in throughput. The focus here is on the potential to cause a major incident while operating outside the normal operational envelope.

Plant changes

- Civil construction and temporary structures
- Changes to pipelines, conveyor belts, temporary storages involving dangerous goods (e.g. additional storages, bypass systems, addition of process equipment)
- Changes to safety critical alarms, safety relief valves, emergency shut-down systems and safety instrumented functions

Hardware and software changes

- Physical changes to layout of equipment
- Alternate usage of plant equipment
- Changes relating to material of construction of plant and equipment
- Changes to instrumented protective systems

Procedural changes

- Safety critical procedures listed in the safety report
- Standards, codes of practice and other design references as listed in safety report
- Emergency response plans
- Pre-commissioning, start-up and shut-down safety critical procedures
- Maintenance frequency changes, risk based inspection changes and safety critical equipment maintenance related procedures

Intensification of population distribution

- Significant changes in on-site and off-site population

Figure 10 Overview of process for managing change

