

1. PURPOSE

To describe the formal method of hazard identification, risk assessment, risk control and documentation to effectively manage hazards that may occur.

2. SCOPE

This procedure applies to all Redox sites.

Hazard identification, assessment and control are an on-going process. It must be undertaken at various times, including:

- a. Starting a new business or process, or purchasing an existing business.
- b. Changing work practices, procedures, processes or the work environment.
- c. Changing organisational structure or jobs.
- d. Introducing new workers or returning workers to the workplace.
- e. Purchasing new or used equipment or using new substances.
- f. Working with a new supplier or new commissioner of your services.
- g. Planning to improve productivity or reduce costs.
- h. New information about workplace risks becomes available.
- i. Responding to workplace incidents.
- j. Responding to concerns raised by workers, health and safety representatives, or others at the workplace
- k. When a hazard has been identified
- l. Required by the WHS regulations for specific hazards.
- m. Prior to completing any hazardous work covered under Safe Work Permits

3. REFERENCES

- a. Standards, Acts, Legislation
 - i. Work Health and Safety Act and Regulations (NSW, QLD)
 - ii. Work Health and Safety Act and Regulations 2012 (SA)
 - iii. Work Health & Safety Act 2020 (WA)
 - iv. Occupational Health and Safety Act and Regulations (VIC)
 - v. How to Manage Work Health and Safety Risks Code of Practice – Safe Work South Australia March 2019
 - vi. How to Determine What is Reasonably Practicable to Meet a Health and Safety Duty – Safe Work Australia – May 2013.
 - vii. Managing Risks of Hazardous Chemicals in the Workplace Code of Practice – Safe Work Australia 2011
 - viii. Control of Major Hazard Facilities - National Standard [NOHSC:1014(2002)] & National Code of Practice [NOHSC:2016(1996)]
 - ix. New Zealand Health and Safety Act 1992
 - x. PACIA Responsible Care Codes of Practice
- b. Procedures

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- i. [Corrective & Preventive Action \(3011\)](#)
- ii. [Internal & External Management System Audits \(3017\)](#)
- iii. [Process & Change Control Management \(3026\)](#)
- iv. [Safe Work Permit System \(3112\)](#)
- v. [Work Health & Safety Consultation \(3119\)](#)
- vi. [Safety Management System \(3140\)](#)
- vii. [Safe Work Permit Procedure \(Adelaide MHF\) \(3804\)](#)
- viii. [Process & Change Control Dry Creek MHF Site \(3815\)](#)
- ix. [Safety Management System - MHF \(3881\)](#)
- x. [Threshold Quantities \(3890\)](#)

4. DEFINITIONS

- a. Consequence - The specific result of an event occurring.
- b. Control Measure – An action taken to eliminate or minimise health and safety risks so far as is reasonably practicable. A hierarchy of control measures is set out in the WHS regulations to assist duty holders to select the highest control measures reasonably practicable. (Note: Often referred to as ‘Risk Control Measure’ or ‘Risk Control’)
- c. Hazard - a situation or thing that has the potential to harm a person. Hazards at work may include but not limited to noisy machinery, a moving forklift, chemicals, electricity, working at heights, a repetitive job, bullying and violence at the workplace.
- d. Health – Health includes both physical and psychological health
- e. Health and Safety Committee – A consultative body established under the ACT. The committee’s functions include facilitating cooperation between workers and the person conducting the business or undertaking to ensure workers’ health and safety at work, and assisting to develop work health and safety standards, rules and procedures for the workplace.
- f. Health and Safety Representative (HSR) – A worker who has been elected by their work group under the WHS Act to represent them on health and safety matters.
- g. Likelihood - The chance of the consequences of an event occurring.
- h. Major Hazard Facility (MHF) - Sites where large quantities of hazardous materials are stored, handled or processed. These sites are required to have a specific accreditation. Currently only the Dry Creek (Adelaide) site has MHF accreditation.
- i. Major Incident (MI) - Results from an uncontrolled event at the major hazard facility involving, or potentially involving, Schedule 15 chemicals (WHS Regulations) and exposes a person to a serious risk to health or safety emanating from an immediate or imminent exposure to the occurrence
- j. Management – Redox Board of Directors
- k. Reasonably Practicable - that which is, or was at a particular time, reasonably able to be done to ensure health and safety, taking into account and weighing up all relevant matters including: likelihood of the hazard or the risk concerned occurring, the degree of harm that might result from the hazard or the risk, what the person concerned knows, or ought reasonably to know, about the hazard or risk, and about the ways of eliminating or minimising the risk, the availability and suitability of ways to eliminate or minimise the risk and after assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.
- l. Risk – The possibility harm (death, injury or illness) might occur when exposed to a hazard.
- m. Unacceptable Risk - A risk rated as ‘High’ or ‘Extreme’ according to Table 3 - Redox Risk Matrix.

- n. Worker - A person who carries out work in any capacity for Redox including work as an: Employee, Contractor or Sub-Contractor, Employee of a labour hire company who has been assigned to work at Redox, Outworker, Apprentice or Trainee, Student gaining work experience or Volunteer.

5. PROCEDURE

5.1. RESPONSIBILITIES AND AUTHORITY

Management is responsible for understanding the nature of the operations of the business and generally of the hazards and risks associated with those operations, ensuring hazards are identified and risks are identified, assessed and controlled (where reasonably practicable) and that the health and safety of workers is not put at excessive/undue risk from work carried out as part of the conduct of the business.

The Branch/Department Manager is responsible and has the authority to ensure that staff at or within their branch or department comply with this procedure.

Redox workers (including all external workers) have a duty to take reasonable care for their own health and safety and that of other persons. Workers are responsible for acting in accordance with this procedure.

The Internal Auditor is responsible and authorised to review and audit this Procedure as per Procedure 3017 - Internal Audits.

The Branch/Department Manager or Risk Team, for each Redox site is responsible for carrying out the tasks described in this procedure. Where reasonably practicable, the tasks will be completed in consultation with all Redox employees within the site.

The Risk Team at each site will consist of the Branch Manager, Warehouse/Plant Manager, Health and Safety Representative and/or WHS Representatives (where appropriate).

5.2. IDENTIFY THE HAZARDS

Identifying hazards in the workplace involves finding things and situations that could potentially cause harm to people. Hazards generally arise from the following aspects of work and their interaction:

- a. Physical work environment;
- b. Equipment, materials and substances used.
- c. Work tasks and how they are performed and.
- d. Work design and management.

5.2.2. COMMON WORKPLACE HAZARDS

Below is a list of some common types of workplace hazards. Some hazards are part of the work process, others are a result from machine or equipment failures and misuse, chemical spills and structural failures, or where work demands exceed a worker's ability to cope.

- a. **Manual Tasks** – Tasks involving sustained or awkward postures, high or sudden force, repetitive movements or vibration which could lead to harm such as muscular skeletal disorders such as damage to joints, ligaments and muscles.
- b. **Gravity** – Falling objects, falls, slips and trips of people which could lead to harm such as fractures, bruises, lacerations, dislocations, concussion, permanent injuries or death.
- c. **Psychosocial** – Excessive time pressure, bullying, violence and work-related fatigue which could result in harm such as psychological or physical injury or illness.
- d. **Electricity** – Exposure to live electrical wires resulting in harm such as shock, burns, damage to organs and nerves leading to permanent injury or death.
- e. **Machinery or Equipment** – Being hit by moving vehicles or being caught in moving parts of machinery resulting in harm such as fractures, bruises, lacerations, dislocations, concussion, permanent injuries or death.

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- f. **Hazardous Chemicals** – Acids, hydrocarbons, heavy metals, asbestos and silica resulting in harm such as respiratory illnesses, cancers and dermatitis.
- g. **Extreme Temperatures** – Heat and Cold resulting in harm such as burns, heat stroke, illness due to fatigue, hypothermia or frost bite.
- h. **Noise** – Exposure to loud noise resulting in harm such as permanent hearing damage.
- i. **Radiation** – Ultraviolet, welding arc flashes, microwaves and lasers resulting in harm such as burns, cancer or blindness.
- j. **Biological** – Micro-organisms resulting in harm such as hepatitis, legionnaires' disease, Q fever, HIV/Aids or allergies.

5.2.3. METHODS

Numerous methods and sources of information can be used to identify Hazards associated with Redox operations:

- a. Site Inspections;
 - i. General Workaround and observation;
 - ii. Formal inspections of site;
- b. Consultation
 - i. Interviewing workers;
 - ii. Worker surveys;
 - iii. Information from contractors;
 - iv. Information from suppliers and customers e.g., SDS.
- c. Review Information
 - i. Reports published by Regulatory Bodies and Education Institutes;
 - ii. Information from Chemistry Australia (previously known as PACIA) or other industry bodies;
 - iii. Manufacturer specifications and user guides;
 - iv. Australian/New Zealand Standards;
 - v. Codes of Practices published by regulatory bodies (such as Managing Hazardous Chemicals in the workplace);
 - vi. Previous safety incidents or near misses;
 - vii. Incident and near miss reports;

All workers are responsible for reporting any hazard identified to their HSR, Supervisor or Manager. The Procedure: 'WH&S Incident Identification Report' (21096) can be used but for ease of use and to promote reporting, workers can also report this through handwritten notes and/or e-mails or other means. The Supervisor or Manager may then report the hazard using Procedure: 'WH&S Incident Identification Report' (21096) to notify the National WH&S manager, the Branch Manager and/or member of the Risk Team for review via a quality problem.

5.3. ASSESSING THE RISK

The Branch, Department Manager and Risk Team shall assess the risks that are likely to affect Redox objectives and activities. A risk assessment can help to determine:

- a. How severe a risk is;
- b. Whether any existing control measures are effective;
- c. What action you should take to control the risk, and;
- d. How urgent the action needs to be taken;

A risk assessment should be done when:

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- e. There is uncertainty about how a hazard may result in injury or illness.
- f. The work activity involves several different hazards and there is a lack of understanding about how the hazards may interact with each other to produce new or greater risks, or
- g. Changes at the workplace occur that may impact on the effectiveness of control measures.

Utilising Form: 'Hazard Inspection Form' (21190), Redox will begin to record the assessment process. As per section 5.2 Identify the Hazards a short and concise description will be added to the form. Redox staff must then begin to understand the Consequence and Likelihood.

5.3.2. HARM/CONSEQUENCE/IMPACT

For each hazard identified, the Branch, Department Manager and Risk Team shall determine the consequence of each Hazard or hazardous event. When determining consequence, the following needs to be taken into consideration:

- a. How many people are exposed?
- b. Nature of product/chemical (corrosive, flammable, toxic, etc.)
- c. Nature of task (manual handling, lifting, etc.)
- d. The likely dose to which the person is exposed
- e. Method of exposure (skin, mouth, eyes, etc.)
- f. What is the worst thing that could happen if the hazard occurs?
- g. Any legislative or recommended exposure levels required by statutory authorities.

To estimate the severity of harm that could result from each hazard the risk assessment team will consider what category and rating of the consequence using the following table:

Table 1 – Consequence Rating Reference Table

Level	Consequence Category	Description
1	Negligible	<ul style="list-style-type: none"> • Adverse event leading to minor injury not requiring first aid • No impairment psychosocial functioning
2	Minor	<ul style="list-style-type: none"> • Minor injury or illness, first aid treatment required • Less than 3 days absence • Less than 3 days extended hospital stay • Impaired psychosocial functioning greater than 3 days, less than month
3	Moderate	<ul style="list-style-type: none"> • Significant injury requiring medical treatment e.g., Fracture and/or counselling • More than 3 days absence • 3 to 8 days extended hospital stay • Impaired psychosocial functioning greater than 1 month less than 6 months
4	Major	<ul style="list-style-type: none"> • Major injuries/long term incapacity or disability (loss of limb) requiring medical treatment and/or counselling • Impaired psychosocial functioning greater than 6 months

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5	Extreme	<ul style="list-style-type: none"> • Incident leading to death or major permanent incapacity. • Event which impacts on large number of patients or members of public • Permanent psychosocial functioning incapacity
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The above criteria are only injury and illness related and ignores business related effects. The above criteria are also a guideline, and not all points need to be satisfied to consider an incident a specific heading. All incidents considered extreme or major and some moderate must be reported by Branch Manager/HR/Directors to the regulator.

5.3.3. LIKELIHOOD/FREQUENCY

For each hazard identified, the Branch, Department Manager and Risk Team shall determine the likelihood of each Hazard or hazardous event. When determining likelihood, the following needs to be taken into consideration:

- a. Whether there are any other risk factors that increase the likelihood of exposure or consequence?
- b. How often the person is exposed (frequency)?
- c. For how long is the person exposed (duration)?
- d. How many people are exposed?
- e. Nature of product (corrosive, flammable, toxic, etc.)
- f. Nature of task (manual handling, lifting, etc.)
- g. The likely dose to which the person is exposed.
- h. Method of exposure (skin, mouth, eyes, etc.)
- i. What is the worst thing that could happen if the hazard occurs?
- j. Any legislative or recommended exposure levels required by statutory authorities.

It is very important that we estimate the Likelihood that someone will be harmed, considering the following:

- k. How often is the task done? Does this make the harm more or less likely?
- l. How often are people near the hazard? How close do people get to it?
- m. Has it ever happened before, either in your workplace or somewhere else? How often?

The below table is used to rate the likelihood:

Table 2 - Likelihood Rating Reference Table

Level	Category	Examples	
		Qualitative	Quantitative
1	Rare	May occur in exceptional circumstances	Once in 10+ years
2	Unlikely	Could happen at some time	Once in 5 years
3	Possible	May occur occasionally	Annually
4	Likely	Will probably occur in most circumstances	Monthly to Six Monthly
5	Almost Certain	Expected to occur in most circumstances	Daily to Weekly

In aid of determining Likelihood, it may be useful to consider the following:

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- n. How often are people exposed to the hazards?
 - i. The more often a hazard is present, the greater the likelihood
- o. How long might people be exposed to the hazard?
 - i. The longer someone is exposed to a hazard, the greater the likelihood that harm may result.
- p. Could any changes in your organisation increase the Likelihood?
 - i. The demand for goods and services throughout the year may be seasonal.
- q. Could the way people act and behave affect the likelihood of the hazard?
 - i. People may make mistakes, misuse items, become distracted or panic in particular situations.
- r. Do the differences between individuals in the workplace make it more likely for harm to occur?
 - i. People with disabilities, people's individual response to stress, new and/or young workers, people who do not normally work at the workplace.

5.3.4. RISK EVALUATION

Following the assessment of the risk and determining the likelihood and consequence and recording using Form: 'Hazard Inspection Form' (21190), the hazard is given a risk rating by using Table 3 - Redox Risk Matrix and this rating is matched against Table 4 - Redox Risk Calculation Table.

Table 3 - Redox Risk Matrix

	5 – Extreme	4 – Major	3 – Moderate	2 – Minor	1 – Negligible
5 – Almost Certain	Extreme	Extreme	High	High	High
4 – Likely	Extreme	High	High	Moderate	Moderate
3 – Possible	High	High	Moderate	Moderate	Low
2 – Unlikely	High	Moderate	Moderate	Low	Low
1 – Rare	Moderate	Moderate	Low	Low	Low

Table 4 - Redox Risk Calculation Table

Risk Calculation	Controls needed
Extreme (Unacceptable Risk)	further controls need to be found and operation ceased
High (Unacceptable Risk)	further controls need to be found or continued operation questioned
Moderate	further risk reduction controls to be investigated seriously
Low	further risk reduction is probably impracticable

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5.4. RISK CONTROLS

The primary objective of the Hazard identification and risk assessment is to eliminate or reduce the risk associated with the hazards so far as it is 'reasonably practicable'. This means all relevant matters must be considered and weighed up and a balance achieved that will provide the highest level of protection that is both possible and reasonable in the circumstances.

When implementing Corrective actions/controls, the Branch/Department Manager and/or Risk Team must follow Figure 1 - Hierarchy of Control Measures. The methods of controlling risks are ranked from the highest level of protection and most reliable to the lowest level.

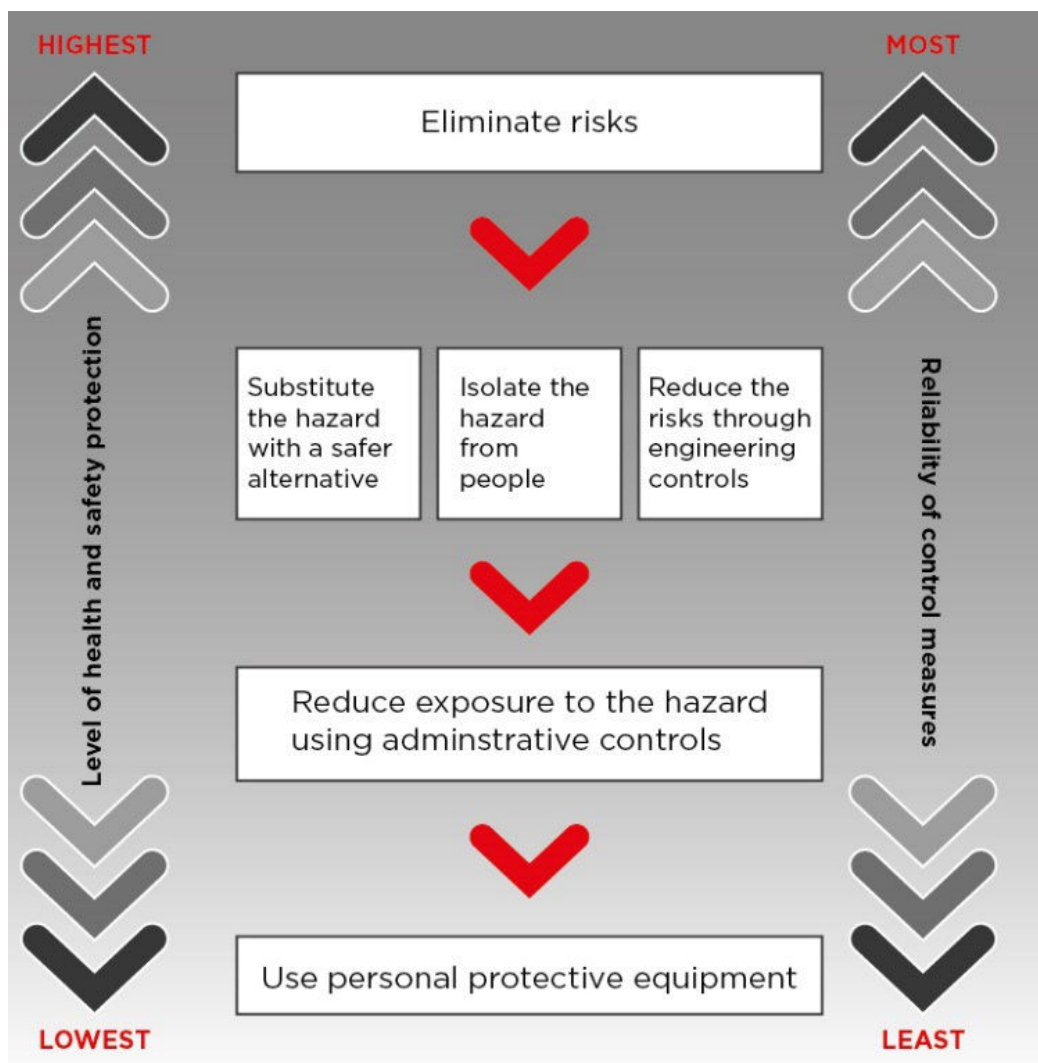
The Branch/Department Manager and Risk Team must attempt to implement corrective actions/controls at the highest level (elimination of the hazard); if the highest level of control is not practicable, they must work their way down the hierarchy.

Where the hazard or risk has the potential to cause death, serious injury or illness, more emphasis should be given to those controls that eliminate or reduce the level of harm, than those that reduce the likelihood of harm occurring.

It is very important that your chosen solution does not introduce new hazards. If this is not possible and new hazards or risks introduced will also need to be managed.

The cost of controlling risk measures may be considered in determining what is reasonably practicable but cannot be used as a reason for doing nothing. In fact, the greater the level of harm imposed by a hazard, the less weight should be given to the cost of controlling the hazard. Costs should not be used as a reason for adopting controls that rely exclusively on changing people's behaviour when there are more effective controls available that can change the risk through substitution, engineering or isolation.

Figure 1 - Hierarchy of Control Measures



A QP will be raised in Redebiz for all hazards that have been identified and require corrective Risk control measures to be implemented. The QP will be owned by the Human Resources Manager, Branch Manager or member of the Risk Team.

5.4.1. ELIMINATION

The most effective control measure involves eliminating the hazard and associated risk. The best way to do this is to firstly consider not introducing the hazard into the workplace. For example, you can eliminate the risk of a fall from height by doing the work at ground level. Or perhaps in considering a chemical related hazard, the chemical cannot be sold or removed from site.

So, in utilising Form: 'Hazard Inspection Form' (21190) we must consider, is it practicable to eliminate this hazard? Yes, or No?

5.4.2. SUBSTITUTION

Substitute the hazard for something safer, by considering the replacement of machinery, chemicals, processes etc. Consideration must be given to a safer process or material for the one identified, and it must be in a form that decreases the risk rating for the hazard.

5.4.3. ISOLATION

This involves physically separating the source of harm from people by distance or using barriers. For instance, installing guardrails around exposed edges and holes in the floor. Use of remote-control systems to operate machinery. Placement of barriers between workers or customers.

5.4.4. ENGINEERING

An engineering control is a control measure that is physical in nature, including a mechanical device or process. For instance, use mechanical devices such as trolleys or hoists to move heavy material. Place handrails around existing machinery, install residual current devices, install sound dampening measures.

5.4.5. ADMINISTRATIVE

If risks remain, they must be minimised by implementing administrative controls. Administrative controls include work methods or procedures that are designed to minimise exposure to a hazard as well as the information, training and instruction needed to ensure workers can work safely. For instance, develop procedures on how to operate machinery, introduce forms and audits to ensure safety is adhered to.

5.4.6. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Any remaining risk must be minimised with suitable PPE. Examples of PPE include earmuffs, respirators, face masks, hard hats, gloves, aprons and protective eyewear.

5.5. IMPLEMENTING CONTROLS

The control measures you put into operation will usually require changes to the way work is carried out, for example, working with new or modified equipment or processes, new or different chemicals or new PPE. In these situations, it is important to support control measures with the following:

- a. Work Procedures
- b. Training, Instruction and Information
- c. Supervision
- d. Maintenance

An important part of controlling risk is ensuring that your chosen control measures are maintained after their initial implementation. The following actions may help in monitoring the control measures and ensure they remain effective:

- e. Accountability for Health and Safety
- f. Maintenance of Plant and Equipment

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- g. Up-to-date Training and Competency
- h. Up-to-date Hazard Information
- i. Regular Review and Consultation

5.6. MONITOR AND REVIEW

Any controls implemented must be reviewed at regular intervals by the Manager of the branch or department where the hazard is present. A review is required:

- a. When the control measure is not effective in controlling the risk
- b. Before a change at the workplace that is likely to give rise to a new or different health and safety risk that the control measure may not effectively control
- c. If a new hazard or risk is identified
- d. If the results of consultation indicate that a review is necessary, or
- e. If a health and safety representative request a review.

The review may be conducted using Form: 'Hazard Inspection Form' (21190), and it is recommended workers and health and safety representatives are consulted and the following questions are considered:

- f. Are the control measures working effectively in both their design and operation?
- g. Have the control measures introduced new problems?
- h. Have all hazards been identified?
- i. Have new work methods, new equipment or chemicals made the job safer?
- j. Are safety procedures being followed?
- k. Have the instruction and training provided to workers on how to work safely been successful?
- l. Are workers actively involved in identifying hazards and possible control measures? Are they openly raising health and safety concerns and reporting problems promptly?
- m. Are the frequency and severity of health and safety incidents reducing over time?
- n. If new legislation or new information becomes available, does it indicate current controls may no longer be the most effective?

If corrective action/control measures are not implemented, deemed unsatisfactory or unsuccessful; the Human Resources Manager will review the situation and either:

- o. Reassess the Risk;
- p. Look at other control measures;
- q. Refer to the Board of Directors for review;

Internal auditing of all the hazard identification assessments and controls shall be undertaken at planned intervals in accordance with Procedure 3017 - Internal Audits.

5.7. CONSULTATION

The Branch Manager, Human Resources Manager, WHS Representatives and/or HSRs shall ensure that workers are consulted through the processes described in this procedure (from identification to assessment and control). Consultation must take place in accordance with Procedure 3119 – Work Health and Safety Consultation.

5.8. MAJOR HAZARD FACILITIES (MHF)

Sites with Major Hazard Facility (MHF) accreditation will conduct an additional hazard analysis and risk assessment in accordance relevant chapters of WHS Regulations. The aim of this hazard analysis and risk assessment is to identify, assess and control 'major incidents' which could occur at the site.

5.8.1. MHF TEAM

When a Redox site is proceeding with MHF accreditation, a MHF team must be established who will identify major incident and incident hazards and develop a Safety Case.

The MHF team will consist of: Branch Manager, Warehouse Manager and other specialist staff who can assist such as MHF Support Officer, HSR, Chemist, Regulatory Affairs Coordinator, Logistics Manager, Quality Assurance Manager and Internal Auditor.

Selection of staff for the MHF team will be based on: Product and process knowledge, Work Health and Safety knowledge and experience, Chemistry training and experience and Site knowledge. External consultants with specialist knowledge may also be selected for the team (such as chemical engineers).

5.8.2. WHAT IS A MAJOR INCIDENT

A Major Incident is an occurrence that:

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

5.8.3. MAJOR INCIDENT IDENTIFICATION

In addition to the items outlined in sections 5.2 - 5.7. The MHF team must identify:

- a. All major incidents that could occur during the operation of the major hazard facility (The focus is on high consequence/low frequency incidents).
- b. All major incident hazards for the major hazard facility, including major incident hazards relating to the security of the major hazard facility.

In order to identify major incidents and major incident hazards applicable to an MHF site, the MHF team must undertake the following steps.

5.8.3.2. IDENTIFY AND SELECT ALL SCHEDULE 15 CHEMICALS (BOWTIEXP TERM: HAZARD)

Refer to schedule 15 of WHS Regulations and determine which chemicals are stored on site and in what quantities (this information can be obtained from Redebiz).

A list will be created with an estimated aggregate quantity for:

- a. Total known market to Redox (In Relevant State)
- b. Relevant financial year sales.
- c. Relevant year stock holding.

5.8.3.3. GATHER INFORMATION ON SCHEDULE 15 CHEMICALS

- a. Understand the chemical properties and how the schedule 15 chemicals stored on site could cause harm: This information can be obtained from SDSs, product specifications, Australian Standards, Suppliers, Industry publications and results of testing. It is important that the chemical properties can be interpreted and understood, therefore it is strongly advised that someone (internally or externally) with chemistry training and experience is on the MHF team, as they will probably have a better understanding of this information.

- b. Research previous major incidents and near misses: This information can be obtained from site and industry history, organisation near miss and incident reports, industry publications and Safe Work Australia.
- c. Identify the Major Incident and Major Incident Pathways: Identification of the major incident hazards and the potential major incidents they may require some creativity, technical expertise, and familiarity with the plant and equipment. It is important that the MHF team consider the following: what constitutes a major incident, the properties of schedule 15 chemicals, how the chemicals are used, plant and industry incident history and feedback from Emergency Service Organisations and Government departments.

5.8.3.4. IDENTIFY UNCONTROLLED EVENTS (BOWTIEXP TERM: TOP EVENT)

For each major incident identified, the team will need to determine the 'uncontrolled' event(s) that could occur as a result of the major incident. This includes events such as package leaks, spills or fire.

An uncontrolled event is a deviation from the desired state or activity, it happens before major damage has occurred (time remains to recover). Redox will use wording such as "Loss of Containment", "Rapid Decomposition" or "Build-Up of Gas" to name a few. The team must consider the potential uncontrolled events from the failure of a control (or multiple controls).

5.8.3.5. IDENTIFY CAUSES (BOWTIEXP TERM: CAUSE/THREAT)

The potential cause of each major incident needs to be identified. The cause must be a credible cause for the uncontrolled event, should not be a control failure, should lead directly to the event and should be able to lead independently to the top event. It is important that more than one event or situation could cause a major incident and that these causes aren't always apparent. Consultation with staff will help identifying potential causes of major incidents.

Redox will use terms such as "Mechanical Impact", "Racking Failure", "Corrosive Properties" or "Fallen Package". The team must consider all possible causes, on site,

5.8.3.6. DEFINE CONSEQUENCES (BOWTIEXP TERM: CONSEQUENCE/OUTCOME)

The potential onsite and offsite consequence of each major incident must be identified. The consequences are the unwanted events arising from the uncontrolled event and must describe the consequential event and the specific injury, loss or damage. Redox will use terms such as "Potential for Combustion Leading to Fire", "Potential for Exposure of Chemical to Personnel", "Ignition of flammable gases resulting in explosion or large-scale fire".

is important that the team challenge assumptions and existing norms and design of operation; think beyond the immediate experience of the facility and look only at the potential and ignore any consideration of likelihood or existing controls (at this stage). Recognise that existing controls and procedures cannot always be guaranteed to work as expected and learn lessons from similar organisations and businesses. Further detail on how to identify hazards is located under Section 5.2.

5.8.4. REFINE THE MAJOR INCIDENT LIST

All identified major incident hazards with a scientifically credible mechanism linking it to a major incident should be included. If the mechanism cannot be established, then the incident can safely be removed from further consideration. This is not the same as establishing a very low likelihood.

Once a list of Major incidents has been developed, they should be submitted to the local Emergency Services Organisation (i.e., fire brigade or police) and local government office and/or Environmental Protection Agency (EPA) for review and comment.

5.8.5. SAFETY ASSESSMENT

5.8.5.1. CONSEQUENCE ANALYSIS (INHERENT CONSEQUENCE)

Initially the MHF team must identify the worst consequence of all major incidents without controls in place. When determining the consequence of a major incident the following needs to be considered:

- a. Magnitude: The size scale of the effect zone created by the incident, within which several injuries or fatalities or extent of property damage could arise.
- b. Severity: The actual level of injury that could occur or damage caused.

An Assessment of the possible outcomes needs to include consideration of what may go wrong if measures to eliminate or prevent incidents are not present, are wrongly implemented or fail to function. The team need to also consider potential for one event to potentially trigger another event or major incident. Consequences of major incidents can be determined/estimated by referring all or some of the below:

- c. Previous internal incident and investigation reports and Lost Time due to injury (LTI) data.
- d. Incident and investigation reports on major incidents published by regulatory bodies.
- e. Safety Data Sheets.
- f. Studies on potential incidents released by industry bodies, educational facilities and regulatory bodies.
- g. Consequence modelling (with and without controls): i.e., Pool Fire Assessments and Explosion, fire and smoke modelling.
- h. Sensitivity Analysis – Analysis which provides guidance on factors which are important and how the consequence severity varies with variation in those factors.

The inherent consequence will be rated using Table 1 – Consequence Rating Reference Table, Table 3 - Redox Risk Matrix and Table 4 - Redox Risk Calculation Table, with the result recorded.

5.8.5.2. LIKELIHOOD ANALYSIS (INHERENT LIKELIHOOD)

The likelihood of each major incident occurring without controls in place must be analysed by the MHF team. The likelihood of a major incident occurring depends on the likelihood of the initiating event and effectiveness of controls. Effectiveness is a measure of how well the control measure performs or is likely to perform if required. An assessment of effectiveness may include:

- a. Functionality: ability of control to address a particular hazard;
- b. Reliability: whether control will be functional when/if required;
- c. Independence: control is not dependent on other controls functioning;
- d. Maintenance: whether control functionality can be maintained (e.g., availability of parts, access, training and knowledge);
- e. Monitoring: whether it is possible to monitor that the control is fully functional or impaired, and how this could be done.

The inherent Likelihood will be rated using Table 2 - Likelihood Rating Reference Table, Table 3 - Redox Risk Matrix and Table 4 - Redox Risk Calculation Table, with the result recorded.

5.8.5.3. RISK CONTROL

The MHF team must identify and implement controls in accordance with the 'Hierarchy of Controls' (refer to Figure 1 - Hierarchy of Control Measures). The aim of risk control is to eliminate the risk of a major incident occurring, its magnitude and the severity of its consequences to persons both on-site and off-site (as far as it is reasonably practicable). If it is not reasonably practicable to eliminate that risk, the team must follow the hierarchy of controls until adequate controls can be found.

When determining controls, the team must demonstrate that the identified controls are adequate.

The MHF team will identify existing controls which are used to eliminate or reduce the risk associated with a major incident (as far as reasonably practicable). Existing controls are identified by reviewing current Redox Policies, Procedures and Processes, consulting with staff and observing processes being conducted.

All controls implemented must be able to demonstrate adequacy. To do this, controls must show the following:

- a. The control measures in place can reduce the risk posed by each hazard so far as is reasonably practicable.
- b. It is not reasonably practicable to use more or better control measures to reduce risk further (i.e., the hierarchy of controls has been followed).
- c. The control measures in place perform their intended function effectively and reliably;

- d. Shows layers of protection commensurate with the inherent level of risk posed by the major incident;
- e. An SMS is in place that works to ensure that all control measures will continue to perform effectively whenever needed.

Demonstrations of control adequacy are to be detailed in the Safety Case.

5.8.5.4. RISK RE-EVALUATION (RESIDUAL RISK)

A re-evaluation of risk after controls are applied must be conducted as per Sections 5.8.5.1 and 5.8.5.2. The MHF Team, using Figure 1 - Hierarchy of Control Measures will evaluate the residual risk by deducting Likelihood rating points as per the following system:

- a. Substitution: 1 Rating Point
- b. Isolation: 1 Rating Point
- c. Engineering: 1 Rating Point
- d. Administrative: 0.5 Rating Point
- e. Personal Protective Equipment: 0.25 Rating Point.

The MHF team must remember that the consequence originally decided upon is still a plausible event and therefore the consequence rating will rarely be reduced, however the addition of both preventative and mitigative controls will reduce the likelihood of the event's consequences.

5.8.5.5. CONSIDER POTENTIAL ADDITIONAL CONTROLS

Depending on the outcomes of the adequacy review and Risk re-evaluation, additional controls may need to be implemented. Any additional controls will need to demonstrate adequacy. In order to determine what additional controls will need to be implemented, the team should refer to the following resources:

- a. Performance Standards;
- b. Manufacturing and supplier standards and guides;
- c. Australian and International Standards;
- d. Industry experience and processes;
- e. Regulatory and educational publications;
- f. Incident Investigation reports;
- g. Consult with staff.

5.8.5.6. BOW-TIE DIAGRAMS (MHF SITES ONLY)

For each major incident identified by the MHF team, a bow tie diagram and risk register need to be created detailing:

- a. Hazard which could cause major incident (E.g., dropped container).
- b. Current controls in place to eliminate and/or reduce risk;
- c. Major incident event (e.g., Uncontrolled event involving Xanthates).
- d. Consequence of major incident event (e.g., Potential for spontaneous combustion leading to fire).
- e. Mitigation control (controls used mitigate effect of major incident);

5.8.6. CRITICAL CONTROLS

Critical controls are those systems and components (e.g., hardware, software, procedures etc.) that are designed to prevent, control, mitigate or respond to a major incident that could lead to injury or death. To decide on these elements Redox Dry Creek the following questions to determine if a control is critical:

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- a. Is the control crucial to preventing the event or minimising the consequences of the event?
- b. Is it the only control, or is it backed up by another control in the event the first fails?
- c. Would its absence or failure significantly increase the risk despite the existence of the other controls?
- d. Does it address multiple causes or mitigate multiple consequences of the Major Incident? (In other words, if it appears in several places on the bowtie or on a number of bowties, this may indicate that it is critical.)

5.8.7. REVIEW OF RISK MANAGEMENT

The MHF Risk Assessment including the following documents:

- a. Safety Assessment: Once every two years;
- b. Emergency Plan: Once a year;
- c. Safety Management System: Once a year;

Will be reviewed when:

- d. A modification to the facility is proposed;
- e. A control measure implemented does not minimise the relevant risk so far as reasonably practicable;
- f. A new major hazard is identified;
- g. Results of consultation indicate that a review is necessary;
- h. The regulator requires a review to be conducted;
- i. A health and Safety Representative requests a review.

6. DOCUMENTATION

- a. Forms
 - i. [WH&S Incident Identification Report \(21096\)](#)
 - ii. [Hazard Inspection Form \(21190\)](#)
 - iii. [Food Safety Risk Assessment \(2208\)](#)

7. PROCEDURE RESPONSIBILITY

- a. Refer Review/Approval status.

8. SUMMARY OF CHANGES

1. 29-Aug-05 Initial issue.
2. 09-Dec-05 Amended address in 4.3a from Wetherill Park to Minto.
3. 20-Dec-06 Various amendments throughout the procedure.
4. 30-Jan-08 Added SA and WA to 5.2.1 and added SA to 5.4.1.
5. 26-Mar-10 Added reference to Procedure 0402 to section 4.3. Removed reference to Forms 21141 & 21142 and added Form 21110. Replaced reference to Quality Assurance Manager with Quality Assurance Coordinator in Section 5.1 and Amended in Section 5.7
6. 15-Dec-11 Changes to all sections after major upgrade to system processes
7. 04-Jun-13 Changed References to WHS rather than OHS, defined 5.6 Risk Matrix and added 5.1.4 v) Queensland.

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8. 19-Aug-13 Added 5.1.1 and 5.8 re Corrective Action and Controls.
9. 03-Jun-14 Amendments made to sections 2.0, 5.1 and 5.2. Amended definitions of some words. Implemented section of Hierarchy of controls.
10. 02-Oct-15 Major amendments throughout procedure; amended date format in Section 8.
11. 15-May-17 Removed Form 21093 from 6.1 as it has been revoked (replaced by 21121 or 21261 where applicable).
12. 06-Sep-18 Removed references to Form 21128, Procedure 3026 and inserted correct Risk Assessment Calculation in 5.10.5.4
13. 18-Jul-22 Amended Scope; Updated Redebiz Procedure Template format.