Management and storage of combustible recyclable and waste materials – guideline

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EPA VICTORIA | Environment Protection Authority Victoria

VICTORIA State Government

MFB

CFA

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Chapter 1: About this guide

1.1. Introduction

This guideline is designed to support the management and storage of combustible recyclable and waste materials (CRWM) in a manner that minimises the risk of harm to human health and the environment from fire. The guideline will help to support compliance with the Waste Management Policy (Combustible Recyclable and Waste Materials) (WMP CRWM).

This guideline is designed to help:

- occupiers of waste and resource recovery facilities (WRRF) who are looking to comply with the WMP CRWM
- any business wishing to implement best practice in the management of CRWM.

The WMP CRWM applies to all WRRF in Victoria regardless of size, other than licensed waste tyre storage premises and licensed landfills.

The objective of the WMP CRWM is to ensure that CRWM at WRRF is managed and stored in a manner that minimises risks of harm to human health and the environment from fire. You should refer to the WMP CRWM to understand your regulatory obligations.

In summary, the WMP CRWM requires occupiers of WRRFs to:

- Manage risks of harm to human health and the environment from fire.
- Take all reasonable steps to manage and store CRWM at the WRRF in a manner that minimises risks of harm to human health and the environment from fire, either in accordance with this guideline or in a manner that minimises the risks to a level at least equivalent to this guideline; and
- Prepare an emergency management plan.

1.2. Purpose

Major CRWM fires at WRRFs can take days to control and have resulted in evacuations of local communities, first aid and hospital treatments. They can also cause short and long-term environmental harm (figure 1).

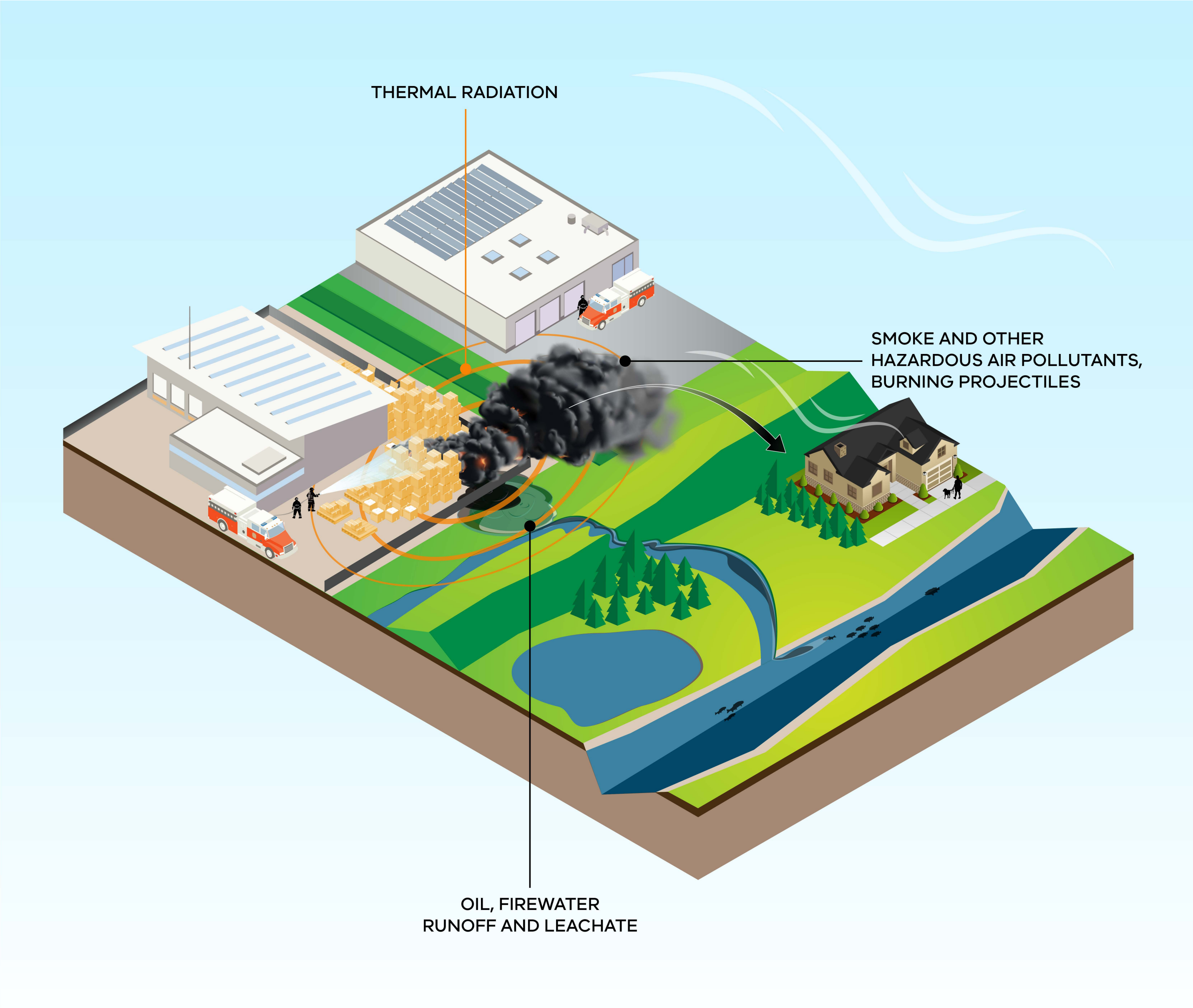


Figure 1: impacts on communities, environment, and firefighting authorities from fires at WRRF.

To support compliance with the WMP CRWM, or as a guide to implementing best practice, this guideline provides advice for:

- how to design and meet performance outcomes for managing and storing CRWM at WRRFs
- selecting a site and designing a new WRRF
- improving management of CRWM at an existing WRRF.

Specifically, it:

- outlines a process for fire risk assessment
- identifies controls to prevent and mitigate fires at WRRFs
- sets out CRWM storage guidance
- outlines emergency management plan requirements for fires at WRRFs.

Occupiers should apply the performance outcomes outlined throughout this guideline when:

- selecting a site and designing a new facility
- improving management of CRWM at an existing facility.

1.3. Guideline development

This guideline has been prepared by EPA in conjunction with the Country Fire Authority (CFA), Metropolitan Fire Brigade (MFB), Emergency Management Victoria (EMV), WorkSafe Victoria and the Department of Environment, Land, Water and Planning (DELWP). Additional technical advice was provided by Fire Protection Association Australia.

The first version of this guideline was developed to support the interim Waste Management Policy (Resource Recovery Facilities) which commenced in August 2017. The Waste Management Policy (Combustible Recyclable and Waste Materials) replaced the interim policy when it expired on 28 August 2018.

This version of the guideline has been updated to better support compliance with the new WMP CRWM, after consultation with community, industry members, local government, and waste and resource recovery groups.

	Waste Management Policy (Combustible Recyclable and Waste Materials)	**www.gazette.vic.gov.au/gazette/Gazettes2018/GG2018S397.pdf**

1.4. Using this guideline

Symbols used in this guideline:

Performance outcomes and how to meet them.

Key message.

External links and further reading.

Focus on additional definitions, explanations and examples.

This guideline has been developed in a workbook format to assist WRRF occupiers, and those responsible for WRRF, to implement systems and processes that will enable compliance with the WMP CRWM. It contains:

- performance outcomes which establish the outcomes expected to be achieved in order to comply with the WMP CRWM. These outcomes appear throughout the document
- process flows which walk the reader through a thought or assessment process
- key messages, summaries of the main information
- links to additional external information which further support site specific compliance with the WMP CRWM
- additional definitions and examples.

A checklist has been developed to support occupiers in the implementation of the guideline (appendix 1). It is recommended that occupiers complete the checklist as part of a gap analysis of existing systems and processes prior to commencing any implementation activities.

Technical information regarding burn temperatures, ignition points and the nature of fires in CRWM storage has been provided within this guideline to support discussion of the content. When applying the principles outlined within this guideline it is recommended that WRRF seek independent information that will be relevant to their site, specific to waste types, setting and activities.

1.5. Abbreviations and definitions

Combustible recyclable and waste materials (CRWM): is defined by the WMP CRWM as recyclable and waste materials that could create a fire hazard. They include but are not limited to:

- paper and cardboard
- wood
- plastic
- rubber, tyres, and tyre-derived waste
- textiles
- organic material
- refuse-derived fuel (RDF)
- specified electronic waste (e-waste)
- metal and other materials with combustible contaminants
- combustible by-products of metal processing activities.

CRWM may include industrial or municipal waste.

Firefighting authorities: members of the Country Fire Authority or Metropolitan Fire Brigade.

Fire safety engineers: fire safety engineers play a key role in identifying fire hazards and developing fire protection designs and treatments to deliver the standard of fire safety expected by this guideline. They develop systems to save life, protect property and preserve the environment from destructive fire, through design, fire protection and fire prevention strategies.
Fire safety engineers must have:

- evidence of an appropriate university degree and relevant experience, or
- a certificate of registration with the National Professional Engineers Register (NPER) maintained by Engineers Australia, or
- be registered by the Victorian Building Authority in the category of Fire Safety Engineer; or
- hold a qualification that the EPA considers is, either alone or together with any further certificate, authority, experience or examination equivalent to a prescribed qualification.

Occupier: is defined by the *Environment Protection Act 1970* (EP Act) as a person who is in occupation or control of the premises whether or not that person is the owner of the premises.

Owner: an owner is usually the person who is listed as the registered proprietor on the certificate of title.

Premises: a house or building, together with its land and outbuildings, occupied by a business or considered in an official context.

Sensitive uses: Land that is considered having a sensitive use due to either the environmental values or human activities that need protection from the effects of pollution and waste. They include, but are not limited to:

- ecosystem protection
- human health and wellbeing
- buildings and structures e.g. accommodation, childcare centres, education centres
- local amenity e.g. outdoor recreation sites
- aesthetic enjoyment
- production of food, flora and fibre

Site: Any place within the perimeter of a WRRF premises including those occupied by buildings.

Specified electronic waste: is defined by the Environment Protection (Scheduled Premises) Regulations 2017 as rechargeable batteries, cathode ray tube monitors and televisions, flat panel monitors and televisions, information technology and telecommunications equipment, lighting and photovoltaic panels.

Waste: is defined by the EP Act as any matter, whether solid, liquid, gaseous or radioactive, which is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration of the environment.

Waste and resource recovery facility (WRRF): is defined by the WMP CRWM as premises that receive waste intended for recycling, reprocessing, recovery, purification or sale, including but not limited to:

- transfer stations
- materials recycling facilities

- resource recovery centres
- reprocessors (e.g. paper, cardboard, plastic, e-waste)
- recyclers (e.g. metals, tyres stored in numbers less than 5000)
- energy from waste facilities.

Table 1: list of abbreviations used throughout this guideline.

CFA	Country Fire Authority.	**EP Act**	*Environment Protection Act 1970.*
CRWM	combustible recyclable and waste materials.	**MFB**	Metropolitan Fire Brigade.
EIB	Emergency Information Book.	**WMP CRWM**	Waste Management Policy (Combustible Recyclable and Waste Materials).
EIC	Emergency Information Container.	**WRRF**	waste and resource recovery facility.
EPA	Environment Protection Authority Victoria.	**WRRG**	waste and resource recovery group.

Chapter 2: Occupiers responsibilities

2.1. Role of the occupier

Who is the ‘occupier’?

The WMP CRWM refers to occupiers of WRRF. As per the EP Act, an occupier is a person who occupies or has control of the premises, whether or not that person is the owner of the premises. If you are a landowner with tenants who manage CRWM on your property, you should seek to proactively engage with them and ensure they are aware of their obligations as occupiers.

For a WRRF where different parts are managed by different persons (e.g. contractors, councils), occupiers are the respective persons in occupation or control of each part.

Obligations of licensed operators	Occupiers of EPA licensed landfills, or EPA licensed waste tyre storage premises operating within the boundary of a WRRF, do not have to comply with the WMP (CRWM). However, they should still ensure that their workplace, and means of entering and leaving, are safe and without risks of harm to human health and the environment.

Responsibilities of occupiers in managing risks from fire

Occupiers are responsible for minimising harm to human health and the environment from fire at their sites, irrespective of how the fire starts. Fires can start elsewhere, such as in a neighbouring yard or a bushfire, and could spread to your facility.

The WMP CRWM states under Clause 7 that if you occupy or control a WRRF you must take all reasonable steps to manage and store CRWM in a manner that minimises risks to human health and the environment from fire. One way to demonstrate compliance with Clause 7 of the WMP CRWM is to follow the advice and specifications in this guideline. Alternatively, you can manage and store CRWM in a different manner, but you should show that you are minimising risks from fire to a level at least equivalent to this guideline (figure 2).

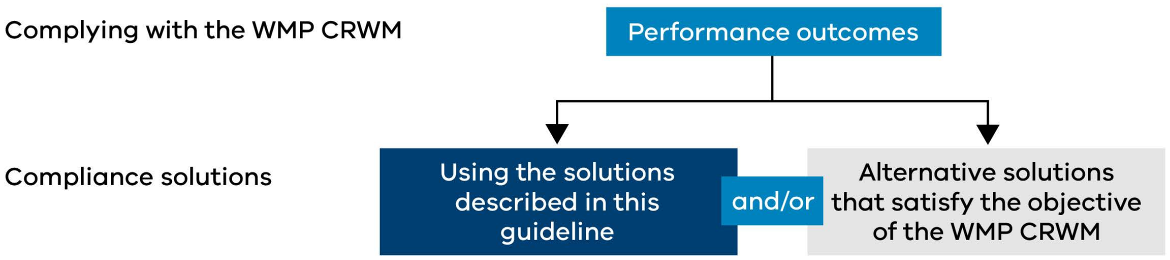


Figure 2: how occupiers can demonstrate compliance with the WMP CRWM.

It is important for occupiers who are operating within a leased premise to clearly identify who owns the controls used to manage fire risk (for example firewater systems). For controls that are the responsibility of the owner, occupiers should ensure arrangements are in place to check, verify and maintain these controls.

Table 2 outlines the basic responsibilities of occupiers to ensure they are minimising the risk from fire at their sites, including responsibilities to their staff, authorities and the public.

Table 2: responsibilities of occupiers of WRRFs to minimise the risks to human health and the environment from fire.	
Responsibilities to authorities	• Comply with the WMP CRWM to store and manage CRWM in a manner that minimises risks to human health and the environment from fire. • Ensure new buildings and significant refurbishments (i.e. for indoor CRWM storage) meet requirements of local planning and building authorities. • Sign off on essential safety measures for buildings. • Display safety measures, routine service records, and emergency plans onsite and provide these to relevant authorities on request. • Ensure fire protection service providers are recognised as competent individuals for the tasks they undertake • Respond to fire prevention notices, pollution abatement notices and WorkSafe Victoria improvement notices to improve fire safety onsite and reduce risks to human health and the environment from fire. • Comply with relevant Victorian occupational health and safety (OHS) legislation, including by providing a safe working environment and ensuring that the means of entering and leaving the workplace are safe and without risks to health.
Responsibilities to employees and other people on site (contractors, visitors, public)	• Actively involve employees in site safety, for example risk assessments and site walks. • Ensure there are adequate emergency exits from indoor storage facilities and that access to these is maintained. • Ensure that non-employees (e.g. members of the public, contractors and nearby communities) are not exposed to risks to their health and safety. • Provide adequate training and equipment for staff to respond to fire hazards, for example training employees on the emergency management plan and how to safely use fire extinguishers.
Responsibilities in an emergency (fire in CRWM storage)	• Manage emergencies according to the site's emergency management plan. • Ensure appropriate access to/within site for emergency services and staff implementing the emergency management plan. • Ensure that the resources described in the site emergency management plan exist, are functional and available.

Staff training

If you are an employer, under the *Occupational Health and Safety Act 2004* (OHS Act) you are required to provide appropriate information, instruction, training and supervision to employees to enable them to perform their work safely and without risks to health. You are also required to consult with employees about matters related to health or safety, including site fire safety. This includes involving them in fire hazard identification and risk assessment, making decisions about measures to control risks and proposing changes that may affect the health or safety of employees.

Summary of employer duties to staff	**www.worksafe.vic.gov.au**

It is important that staff are involved in the development of the WRRF's emergency management plan and understand their roles in applying it. The emergency management plan may include options for staff to initially respond to fire or to evacuate the facility. Whether or not staff actively respond to fires (using fire extinguishers, fire hose reels or other means) depends on the specific circumstances of the fire and the threat it poses.

If staff are assigned roles to respond to fire it is crucial that appropriate training is provided. It is important that they are aware that their first obligation is to their own safety, and trained staff are under no obligation to respond to fires if they deem it not safe do so.

In the event of fire dial 000 as soon as possible, regardless of any initial response from onsite staff.

Useful staff training resources	**www.cfa.vic.gov.au/plan-prepare/training-services** **www.fes.com.au/www/emergency-training**

Explanation of regulatory powers

In addition to the WMP CRWM, the following Acts are relevant to occupiers for managing risk from fire at WRRF:

- *Environment Protection Act 1970* – minimising harm to people and the environment from fire and firefighting activities (e.g. firewater run-off).
- *Country Fire Authority Act 1958* and *Metropolitan Fire Brigades Act 1958* – defines powers and duties of CFA and MFB respectively.
- *Occupational Health and Safety Act 2004* – duties of employers and managers of WRRFs to provide safe workplaces (e.g. through minimising risk from fire).
- *Building Act 1993* – minimising risk from fire in indoor storage through infrastructure and planning.
- *Planning and Environment Act 1987* – requirements for use of land to operate a WRRF.
- *Australian Dangerous Goods Code, Edition 7.6* and *Dangerous Goods Act 1985 and regulations* – understanding what dangerous goods are, including flammable liquids and solids that may pose a fire hazard and the requirements for managing them.

Other Acts and regulations may also be used by authorities to enforce fire safety at WRRFs, and it is the responsibility of the occupier to ensure they are compliant with all relevant laws and policies.

2.2. Who to contact for advice

Questions with regards to the implementation of this guideline can be directed to EPA Victoria. Occupiers of WRRF can also seek assistance with fire safety from:

- other authorities and agencies
    - Country Fire Authority (CFA)
    - Metropolitan Fire Brigade (MFB)
    - Victorian Building Authority (VBA)
    - WorkSafe Victoria
    - Sustainability Victoria
- industry associations
    - Victorian Waste Management Association (VWMA)
    - Local Waste and Resource Recovery Groups (WRRGs)
- specialised experts
    - fire safety engineers
    - insurers

Chapter 3: Hazard identification and assessing the risk from fire

3.1. Performance outcomes for assessing the risk from fire

A well-developed fire risk assessment includes:

- ☑ Identifying all possible fire hazards and their potential causes at your site.
- ☑ Assessing the risks to human health and the environment from identified hazards.

Meeting these outcomes involves:

- ☑ Ensuring that your documented hazard list is comprehensive and new hazards are added as they are identified.
- ☑ Understanding why the fire risks exists.
- ☑ Assessing the fire risks with consideration of the consequence and likelihood of the identified fire hazards.

3.2. Introduction to a fire risk management framework

Well-developed and well-communicated fire risk management ensures all stakeholders (including staff) at WRRF are aware of the fire hazards, the associated risk and controls implemented to reduce the risk of harm to human health and the environment from fire.

There are three important elements to understand to implement this fire risk management framework:

1. **Hazard** is something that has the potential to cause harm or detriment to people or the environment.
2. **Risk** is the possibility of harm that could happen as a result of an event. The level of risk is influenced by two factors, consequence and likelihood:
    - Consequence is an outcome or impact of an event.
    - Likelihood is the probability of that outcome occurring.
3. A **control** is something which eliminates or reduces a hazard or risk. This includes equipment, work processes or monitoring systems.

One option for undertaking risk management is outlined in figure 3. This is a continuous and circular framework that can facilitate effective risk management.

You may wish to incorporate this risk assessment process into your existing OHS framework or use the risk register template provided in this guideline.

Risk management for businesses

There are many documents that can support development of general risk management for businesses. These can include Australian/New Zealand or International Standards, such as ISO 31000, *Risk Management,* which address risk across all business activities. Others have been developed to address specific aspects of a business's activities e.g. EPA publication 1695 *Assessing and controlling risk: a guide for business*:

www.epa.vic.gov.au/our-work/publications/publication/2018/may/1695

Step	Action	Description
1	***Identify fire hazards***	What fire hazards are present that might cause harm to human health and the environment.
2	***Assess risks from fire***	What your understanding of the level or severity of a fire risk is, based on consequence and likelihood, and your understanding of why the risks exists.
3	***Implement controls***	What measures can be put in place to eliminate or reduce a risk (e.g. engineering, equipment, work processes or monitoring systems).
4	***Check controls***	Review controls to ensure they are effective. Independently check that monitoring activities are being conducted properly and verify that the activities are suitable (i.e. actively manage the risk).

Figure 3: steps in controlling hazards and risks.

Robust fire risk management requires a regular review of the hazard identification, risk assessment and the controls that have been implemented at the facility.

3.3. Identifying fire hazards

When looking to identify hazards which could start a fire, a number of different approaches can be taken.

For example, consideration could be given to the three elements required for a fire to start; oxygen, heat and fuel (figure 4). Without all three of these elements, a fire cannot start. Identify potential sources of these elements and implement controls to isolate them.

Figure 4: the fire triangle

When identifying hazards (table 3), you may ask the following questions:

- Where are the potential fuel sources onsite and where are they relative to other flammable items?
- What happens to those fuel sources which could create a hazard? Are they managed in a way that creates a hazard?
- What activities are occurring around these fuel sources that might ignite the fuel?

Table 3: examples of fire hazards at waste and resource recovery facilities.

Examples of components for a fire to start

Ignition (heat) sources	Fuel sources	Oxygen sources
Lit cigarettes/butts, matches, lighters. Improperly stored batteries. Bushfire. Self-heating piles. Hot loads/contaminated waste. Hot work operations. Arson. Lightning. Fires from neighbouring activities. Faulty electrical wires. Poorly maintained equipment. Naked flame.	Flammable liquids, gases and solids. Combustible goods and waste materials (e.g. CRWM). Contamination in CRWM storage. Poorly managed, high volumes of CRWM. Dry and unmanaged vegetation.	Oxidising chemicals such as oxy-acetylene sets, bleach, hydrogen peroxide, nitrates. Physical introduction of oxygen through unbaling or turning loose piles.

How to identify hazards

Identifying hazards is a very important first step in risk management. If a hazard is not identified, the risk cannot be managed. It is therefore important to ensure that your hazard list is comprehensive and that new hazards are added as they are identified. You should look to a number of sources and activities to identify your hazards (figure 5).

Figure 5: potential resources and activities for hazard identification.

The risk management steps to identify hazards require consultation with the workforce and periodic review. This ensures there is a collective understanding of the hazards and that newly identified hazards are communicated.

3.4. Assess fire risks

Once fire hazards are identified they should be assessed. Assessing identified hazards inform decisions on the implementation of the most appropriate control strategies and methods. Establishing consequence and likelihood provides WRRF operators with a framework in which to develop, select and apply controls.

Understanding consequences

When considering consequence, look at how your organisation operates. Figure 6 provides concepts which may be of use.

Figure 6: concepts in understanding consequences of fire.

Once you have considered various consequences of fire, table 4 lists some questions which might help you work out:

- the harm each identified fire hazard could cause
- the potential severity of the harm to human health and the environment.

Table 4: typical question types which could be asked to identify consequences.

Question types	Question examples
What environmental harm could occur when a major fire breaks out?	Could the hazard cause a major fire that would impact the community or environment?
What circumstances could influence the severity of harm?	Are there adequate distances between storage piles? Is there adequate access to/around the site for firefighting authorities? Have the minimum site access requirements stipulated by the firefighting authorities been adapted onsite?
What is the potential for people at your site to be harmed?	Are there enough exits to allow everyone to escape safely? Does the business keep a register of people onsite?
What is the potential impact to the surrounding communities if a fire occurred?	Are there sensitive community members (e.g. young children and the elderly) nearby that could be harmed?
What are the potential impacts of any firefighting activities?	How could firewater runoff enter the environment? How far away is the nearest waterway?
Are there circumstances that could increase the severity of a fire?	If a fire plan depends on using an excavator to separate burning material, and this excavator can't be used, what affect would this have on the outcome?

Understanding likelihood

If an event occurs (e.g. a fire), likelihood is the probability that a consequence (e.g. that fire causing property damage) of the event occurring. The question you would ask to assess likelihood in this case is 'what is the probability of a fire causing property damage when a fire breaks out?'

Table 5 sets out general questions and examples that can help with the process of assessing likelihood.

Table 5: typical questions to ask to assess likelihood.

Key concepts	Questions	Explanation
Previous occurrence	Has a fire occurred in your industry in the past, and if so, what were the consequences? Have there been any near misses at your site?	Assessing incidents or *near misses* provides an understanding of the context in which the incident occurs. This provides a good indication of how to prevent it in the future. It is important not to just consider your site but think about occurrences across the CRWM industry. *For example, if you have had a fire at your facility, it is important to ask what are the circumstances that led to the fire and what are the lessons learnt?*
Frequency	How often does the outcome of a fire have the potential to cause harm to human health and the environment?	A negative consequence of fire may exist all the time or only sometimes. If not managed effectively, the more often the fire risk is present, the greater the likelihood that it will cause harm. *For example, the likelihood of a fire spreading through CRWM storage is more likely at a site that frequently exceeds their operational capacity.*
Changes in operational conditions	How could variations in operating conditions increase the risk?	Operating conditions change over time and vary throughout the year, these changes can influence the likelihood of a negative outcome if an event occurs. *For example, a site located close to a school may receive lots of material in a short period of time creating a large volume of CRWM – increasing the likelihood of the school being evacuated when the material burns.*
Changes in environmental conditions	Can environmental conditions influence fire risk? How would external factors (such as bush fire) increase the risk?	The probability of a fire having a greater impact can increase in summer when conditions are hot and dry. *For example, if you store materials that have a high risk of self-combustion in warm conditions (e.g. organic waste), do you have any measures in place to cool or otherwise manage these materials during hot and dry conditions?*
Behaviour	Could the way people act and behave affect the likelihood of a hazard causing harm?	People may make mistakes, misuse items, act spontaneously or panic during a fire. Review staff emergency management training to ensure that staff receive adequate and updated training. *For example, staff that have received adequate training will have experience in implementing the emergency management plan and will be able to notify relevant emergency services as soon as reasonably possible.*

3.5 Building your risk register: identifying hazards and assessing risks

To ensure the ongoing management of risks, it is important to document all identified fire hazards or risks and their controls. One method to achieve this is through a risk register. Table 6 provides an example of how to record hazards, identify their potential causes, and consider the consequence and likelihood of an uncontrolled event.

Identifying hazards and assessing risk is an ongoing exercise. Risk assessment involves developing an appreciation of the scale of potential consequences and the relative likelihood of those consequences should an event occur. Understanding the consequence and likelihood of a hazard leading to an event can support and inform the selection, development and application of controls.

Table 6: initial steps of the risk register.

Hazard	Potential causes	Initial risk	
		Consequence	Likelihood
Fire in drop-off area skip bin.	▪ Arson ▪ Illegal dumping ▪ Self-combustion.	Fire spreading to processing area/CRWM storage/adjacent bushland, causing loss and damage to property, harm to staff, damage to environment, wildlife and nearby community.	Small fires have happened several times within the last year and threatened boundary vegetation. Once vegetation is on fire, could easily spread into surrounding buildings and bushland.

Alternatives to the risk register

There are other tools for capturing and effectively managing risks which may be more appropriate for your organisation than a risk register. For example, SA/SNZ HB 89 *Risk management - guidelines on risk assessment techniques* provides alternative risk management tools for consideration if you choose not to follow the risk register method.

www.standards.org.au/standards-catalogue/sa-snz/publicsafety/qr-005/sa--snz--hb--89-2013

Chapter 4: Controlling your fire hazards and risks

4.1. Performance outcomes for controlling your fire hazards and risk

When controlling your fire hazards and risks, ensure that you:

- ☑ Identify appropriate controls to minimise the risk of harm from fire.
- ☑ Describe how the controls will be implemented and continuously improved.
- ☑ Describe how controls will be checked for their effectiveness, any actions to improve your site's risk management and how this process will be verified.

Meeting these outcomes involves:

- ☑ Choosing and implementing controls based on their effectiveness in managing hazards and risks, practicality and feasibility.
- ☑ Assessing and documenting effectiveness of your selected controls.
- ☑ Re-evaluating the consequence and likelihood of the identified fire hazards, with consideration of how the implementation of controls are reducing the initial risk and what the remaining residual risk would be.
- ☑ Documenting your implemented controls, measures of effectiveness and how these will be checked.

4.2. Choosing and implementing controls

Fire in CRWM storage is a principal hazard to human health and the environment. Effective risk management requires that all reasonable steps are taken to eliminate fire hazards at your site, and where fire does occur, to mitigate the consequences of these fires by reducing their burn time, intensity and ability to spread. This is achieved by applying effective controls.

Controls for specific hazards or risks may be prescribed as part of statutory or regulatory requirements, for example: dangerous goods storage and handling. Controls may also be outlined in other guidance documents, for example: WorkSafe publications, operating manuals, or safety data sheets. Where there is no mandatory control to manage a risk or hazard, a methodical approach should be used to identify options.

The **hierarchy of controls (HOC)** can be used to support the identification and selection of controls by providing a prioritisation framework (figure 7).

Figure 7: hierarchy of controlling hazards and risks.

When choosing a control for an identified risk or hazard, the HOC can be used to review control effectiveness and therefore support control selection. However, this analysis should also include an assessment of the practicality and feasibility of each control option, where the primary consideration for applying controls should always be the practicality of implementation. In the example given in table 7, the risk of 'ignition from equipment' can be eliminated by the 'removal of the equipment'. However this may not be possible if no alternative approach or equipment exists; or if it is not practical or feasible as the equipment is required for essential operational activities.

The same can be said for your CRWM storage - it is not possible to eliminate the fire hazard that stored CRWM poses, but you can implement other controls to reduce the likelihood of fires starting (prevention controls) or reduce their consequence (mitigation controls).

Table 7: examples of controls across the HOC for addressing a single risk.

Risk	Elimination	Substitution	Engineering	Administrative	PPE
Ignition of CRWM from equipment.	Remove the equipment.	Substitute the equipment with a safer alternative.	Scheduled maintenance of the equipment.	Procedures to support the schedule and specific activities of maintenance.	N/A

The following principles should be considered when assessing risk controls:

- does it provide the highest level of protection for human health and the environment as well as being the most reliable (e.g. does it sit at the highest possible level of the HOC given your site conditions?).
- is it readily available or can it be manufactured to suit?
- is it suitable for the specific situation/task/application and is it suitable for the intended work environment?
- does it introduce significant new hazards?

Risk controls should be adopted in line with a cautious approach, that considers the site's capacity, inventory, location and proximity to sensitive land uses. Adopting a cautious approach means to implement all practical and feasible controls to ensure that the risk is managed so far as is reasonably practicable.

Using a cautious approach to select adequate controls	An example of a feasible and practical control all sites could use is to implement a no-smoking policy, which is low-cost and requires minimal effort to maintain.

4.3. Key controls to be used at a WRRF to manage fire risk

Controls are implemented to reduce the occurrence of fire (prevention) and detect as well as suppress the fire (mitigation).

Many of the fire protection system and equipment controls listed in the tables below may have applicable Australian Standards (AS), these should be referred to, to ensure compliance (appendix 2). Please note that although compliance with AS for fire protection systems and equipment should be adhered to, especially when referenced by applicable legislation, there may be instances where it would be appropriate to use performance solutions or alternative systems. Such alternative systems may be identified in International Standards or developed using appropriate guidelines.

Developing alternative fire protection solutions	The International Fire Engineering Guidelines (IFEG), Part 1, published by the Australian Building Codes Board, is a useful resource for the development of alternative solutions associated with fire protection. **www.abcb.gov.au/Resources/Publications/Education-Training/International-Fire-Engineering-Guidelines**

Some types of systems and equipment may not be considered in AS but could still provide an appropriate level of fire protection. These might include thermal detection camera systems, video imaging detection camera systems, static and portable fire water monitors, and water spray systems.

Fire prevention

Controls to consider for preventing fires at your site can include (but not limited to) the following types of engineering and administrative controls.

Effective storage management (engineering controls) – see chapter 5 for more detail

Examples to consider	Purpose
Separation of activities e.g. separate drop off, processing and storage areas by distance, containment walls etc.	Prevent risk of contamination and hot loads in drop-offs and other parts of the operation being introduced to CRWM storage.
Good layout of site (including storage dimensions) to prevent the occurrence of fire.	Reduce the risk of fires starting through self-heating in oversized and/or hard to manage piles.

Monitoring hazards (engineering controls)

Examples to consider	Purpose
Security systems such as CCTV to monitor sites for illegal dumping, vandalism, other potential sources of ignition.	Identify and respond to fires that occur when sites are unmanned/fire starts without anyone noticing.
Early detection devices such as thermal probes to monitor temperature of CRWM storage; and external thermal detection, video smoke detection and flame detection to detect fire in the early stages.	Alert staff to a potential fire or when a fire has started but has not yet been spotted. Crucial for organic storage or for long term storage of other self-heating materials.

Site arrangement (engineering controls)

Examples to consider	Purpose
Separation of combustible non-waste materials from CRWM storage through removing gas cylinders, dangerous goods, electrical devices etc. from areas where CRWM is stored.	Avoid introducing an ignition source to combustible materials stored onsite.
Quarantine areas for hazardous waste and hot loads through separating combustible hazardous wastes from where CRWM is stored, and having designated areas for depositing and controlling hot loads.	Avoid introducing an ignition source to combustible materials stored onsite.
Adequate and maintained security fencing to restrict unauthorised access.	To prevent arson, illegal dumping, or harm to public onsite when site is unmanned.

Policies and procedures (administrative controls)

Examples to consider	Purpose
Good housekeeping through a regular cleaning program and records.	Reduce dust, litter and other combustible materials building up around the premises.
Permits and policies e.g. hot works in place and utilised (including exclusion zones).	Avoid sparks/molten metal from hot works igniting any combustible materials.
Site walks conducted regularly including inspections of equipment/vehicles.	Identify new or changing hazards, ignition sources etc. and respond to them before they cause problems.
Record keeping of staff training, staff roles, and maintenance of vehicles and routine service of fire protection equipment and systems.	Maintain essential equipment to an adequate standard and track issues to satisfactory completion.
Routine service of fire protection equipment is carried out to the latest edition of AS 1851 by individuals considered competent by VBA recognised qualifications or industry accreditation schemes such as Fire Protection Accreditation Scheme. Critical defects are to be rectified within 30 days.	Ensure essential fire safety measures remain in effective working order
Review and make updates to safety documents in a timely manner/when introducing new equipment or tasks to the site/in the event of a fire.	Ensure risk assessments are accurate, realistic and up to date.
Develop and enforce a smoking policy that prevents smoking on site or includes no-smoking zones near combustible materials.	Avoid introducing an ignition source to combustible materials stored onsite.

Fire mitigation

Fires may occur in CRWM despite taking all reasonably practical steps to prevent them. It is therefore also important to identify management controls that detect and suppress the fire, thereby reducing the impact to human health and the environment. Mitigating controls to consider at your site include but are not limited to the following types.

Effective storage management (engineering controls) – see chapter 5 for more detail

Examples to consider	Purpose
Good layout of site (including separation distances) to prevent the spread of fire and facilitate an emergency response. Refer to figures 13, 21.	Reduce the risk of fire spreading to other areas.

Fire protection systems (engineering controls)

Examples to consider	Purpose
Fire protection systems (e.g. hydrants, fire water monitors, fire sprinklers) provided to respond to hazards on the site (compliant with applicable standards and appropriate to the potential fire hazard).	To ensure adequate coverage of site and performance of the system for fire authorities to fight fires.
Water supply (reticulated or tanks) provided onsite. Where a reticulated supply is not available or cannot meet the requirements of AS 2419.1, or the worst credible fire scenario, it is important to provide a static water supply that is fit for purpose. Water for fire systems should be potable or Class A recycled water and salt-free.	To ensure adequate water supply
Fire warning systems (e.g. bells, alarms, alarm signalling equipment) that can be automatically or manually triggered by the fire detection and protection systems, providing both local alarms and automatic notification to the CFA or MFB of the fire.	To alert staff/public/firefighting authorities and instigate fire response/evacuation
First aid firefighting equipment (e.g. fire extinguishers, fire hose reels) that is both accessible and in effective working order.	To allow trained staff to suppress or douse small fires when they occur, if safe to do so.
Firefighting support equipment (e.g. excavators) that is stored on site and fitted with AS 5062-compliant vehicle fire suppression systems to separate burning materials or build containment ponds.	To manage fires in larger piles and prevent the spread of fire throughout the site.
Automatic fire deluge systems in bunkered storage within the site.	To ensure piles are doused in the event of fire.

Selecting appropriate fire protection systems for your WRRF

Fire protection systems for a WRRF should be fit-for-purpose. It is important for occupiers to take all reasonably practicable measures to ensure that there is adequate infrastructure, water supply and water pressure to combat all credible, high-risk fire scenarios identified in a risk assessment.

Large volumes of water are often necessary to extinguish fires in CRWM storage. An adequate water supply is crucial to maintaining effective controls. For example, if you install a hydrant system it should be sufficient to deliver flowrates and pressure to feed the minimum number of hydrants needed to deal with the worst credible fire hazard, regardless of design requirements specified by AS 2419.1.

Fire water containment (engineering controls)

Examples to consider	Purpose
Liquid run-off management including bunding, drainage basins/catchment pits, contingency plans to divert from storm drains to sewers, use of booms, extinguishing fires with sand instead of foam/water, eductor pumps to pump firewater off site for disposal, and/or monitoring of waterways.	To prevent firewater that has been contaminated by waste and burnt residues from entering the environment (e.g. nearby waterways).

Policies and procedure (administrative controls)

Examples to consider	Purpose
Pre-approval with relevant authorities for collection/disposal of fire water prior to an incident occurring.	To prevent firewater that has been contaminated by waste and burnt residues from entering the environment (e.g. nearby waterways).
Maintenance of firefighting equipment, including a regular inspection and maintenance program.	To ensure firefighting equipment is fit for purpose and working when a fire occurs.
Routine service of firefighting equipment, in compliance with the latest edition of AS 1851 by individuals considered competent by VBA-recognised qualifications or industry accreditation schemes such as FPAS. Critical defects are to be rectified within 30 days.	To ensure firefighting equipment is fit for purpose and working when a fire occurs.
Arrangements to access offsite firefighting equipment prior to an incident occurring if you expect to use equipment from a neighbouring operation (e.g. council depot) during a fire.	To ensure that specialised plant/other firefighting equipment to control and suppress burning waste materials will be available in the event of a fire.
Staff training, including awareness of procedures in the event of a fire (as per the site's Emergency Management Plan) and awareness of the procedures for ongoing maintenance of firefighting equipment, including inspections by accredited persons.	To ensure staff are competent to fight fires/follow emergency procedures including alerting authorities and emergency evacuation.
Readily available records of risk assessments, staff training, emergency management plan, maintenance etc.	To ensure staff are up to date on relevant training; equipment is maintained; that staff/visitors are aware of potential fire hazards and controls.
Keeping an Emergency Information Book (EIB) stored in a red Emergency Information Container (EIC) somewhere readily accessible by fire authorities.	To allow fire authorities to quickly assess the threat from fire when they arrive on site, enabling them to fight the fire with greater efficiency.
PPE such as self-contained breathing apparatus kept onsite, and easily accessible by staff who have the training and (where necessary) accreditation to use them.	To reduce the risk of harm (e.g. through smoke inhalation, extreme heat) to staff who are engaging in firefighting activities.

Effective fire risk management requires implementing preventative and mitigating controls to provide layers of protection; the effectiveness of these individual barriers combined determines the degree of protection.

4.4. Are my controls adequate?

Following the risk assessment of fire (step 2) and the identification of control measures (step 3) the next step is to go through an assessment to determine whether the controls you've selected are adequate in reducing the different fire risk scenarios. To complete this assessment for a control you should determine:

- how effective your selected control can be
- what circumstances could contribute to its failure (i.e. 'failure modes')
- what contingencies you have in place if the control fails.

If fire safety relies upon a control, assess that control to identify ways it could fail. This enables the establishment of practices to prevent failure such as inspection, testing and maintenance; or contingencies to address that failure.

Figure 8 outlines a decision diagram that is aimed at helping you think through the process of identifying the effectiveness of your selected controls.

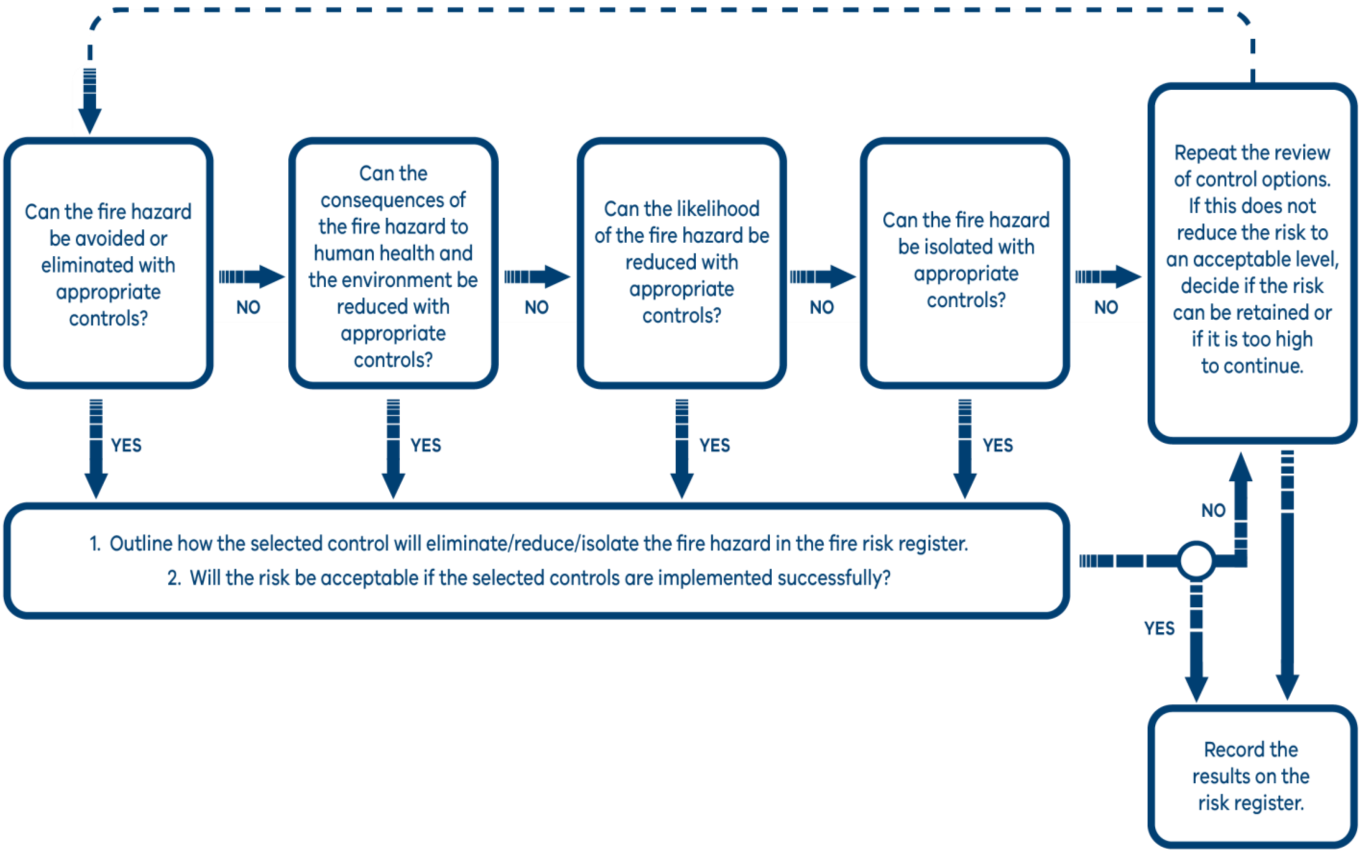


Figure 8: determining if your controls are adequately managing fire hazards.

Checking the adequacy of controls

If you rely on a piece of machinery to process materials and keep your storage volume to a minimum, what happens if it breaks down? Do you have infrastructure in place to deal with higher pile volumes such as deluge systems or other firefighting equipment, or alternative arrangements to move materials offsite?

Reporting and recording incidents and near-misses allows you to identify failures in your controls and identify ways to improve these controls to prevent future incidents occurring.

4.5. Building your risk register: capturing controls and residual risk

Once you have identified the appropriate controls to implement, update the risk register. Repeat the process of identifying the consequence and likelihood of the fire hazards as you did in step 2 (table 8), but with consideration of how the implementation of controls is reducing the **initial risk** and what the remaining risk will be**.** This re-evaluation of risk is capturing **residual risk**. The purpose for re-evaluating risk is to assess the effectiveness of your controls and to determine the need for any further actions (e.g. any infrastructure upgrades you will need), which is discussed in the next section.

Table 8: adding controls and re-evaluating risks in the register.

Hazard	Potential causes	Initial risk		Controls implemented	Residual risk	
		Consequence	Likelihood		Consequence	Likelihood
Fire in drop-off area skip bin.	▪ Arson ▪ Illegal dumping ▪ Self-combustion.	Fire spreading to processing area/CRWM storage/adjacent bushland, causing loss and damage to property, harm to staff, damage to environment, wildlife and nearby community.	Small fires have happened several times within the last year and threatened boundary vegetation. Once vegetation is on fire, it could easily spread into surrounding buildings and bushland.	▪ Skip bin locked up behind gate outside operating hours ▪ Separation of bin from nearby buildings and site boundary to be maintained at all times ▪ Removal of boundary vegetation and weed control added to general site maintenance procedures.	Any fire is likely to be confined to the skip bin. The result would be minor damage to bin and surrounds, and a small risk to staff from exposure to harmful smoke.	Access is significantly limited, preventing illegal dumping, but bin may still be exposed to other ignition sources.

The implementation of controls may not always reduce the risk to an acceptable level. Further controls may be needed to adequately manage a risk.

4.6. Checking and verifying your controls

Once controls have been implemented, it's important to monitor them to ensure they stay effective. Checking the effectiveness of controls may involve physical inspections, routine maintenance, consultations and recording incidents/near-misses. You may also want to test your administrative controls by conducting fire drills and other scenarios to see whether staff are following procedures. This will allow you to address and prevent controls from failing and closes the loop in the risk assessment process.

All processes to check the effectiveness of controls should have a follow-on verification step. This verification step is generally the responsibility of senior or site management and confirms that the loop in the risk assessment process has been closed. For example, if handheld fire extinguishers are installed throughout a site, control effectiveness would be maintained by ensuring that the extinguishers are unobstructed and checking the service date during the weekly site walk (with routine testing and service to be carried out by an accredited person). The verification would be, senior management signing off in a register that the weekly site walk had been completed.

Checking the effectiveness of controls

Design effectiveness

Design effectiveness is a measure of the extent to which a control is designed to reduce the likelihood and/or the impact of the underlying risk. The control must be designed to operate reliably and/or sufficiently frequently to reduce the risk as intended. Design includes a requirement that ensures that the persons operating the control are adequately informed and trained, and that the effectiveness of the control is overseen by management and independently validated.

Operating effectiveness

Operating effectiveness is established when a control can be demonstrated to have operated as designed, without interruption or failure throughout the period it was relied upon to achieve its objective.

Designed effectively + Operating effectively = Effective control

A site self-audit can help identify issues with your current controls and form the basis of a review of your current fire risk management framework. You should consider conducting self-audits on a regular basis for the level of fire risk associated with your site, once every 12 months or more frequently such as in the event of an incident, or when there are changes to processes/storage activities etc.

Figure 9 outlines some of the steps you can take to check the effectiveness of your controls.

Figure 9: checking, maintaining and verifying your controls to meet performance outcomes for managing risk from fire.

Table 9 provides an example of how to check and verify a common control for managing hazards in CRWM storage. For any control, how and what checks you decide to implement together with verification will depend on the risks identified at your site.

Table 9: example of checking recommendations for a common fire prevention control.

Example of a control	Type of control	How this control will be checked and verified
Standard operating procedures for storing CRWM.	Fire prevention-administrative control.	Checks • Record inventory of combustible non-waste materials and storage locations (could use photographs/videos to support this). • Ensure Standard Operating Procedure (SOP) reflect requirements for separation in CRWM storage. • Conduct site walks and self-audits to determine if SOPs are being followed. Verification • Review of CRWM inventory by senior management (i.e. capture of volumes within weekly report to management). • Ensuring that all SOPs are up to date and current. • Completion of site walks and self-audits signed off by management.

Including additional items on your site's housekeeping checklist(s) or including a discussion point for toolbox meetings can assist in identifying if the site procedure or process is being followed.

4.7. Building your risk register: creating and recording checks, verification and further actions

Your risk register should now contain existing controls for each hazard and the associated risk. It can also be used to identify when there is a need to introduce new controls to address residual risks (table 10).

Table 10: checking controls and completing the risk register.

How controls will be checked	Any further controls/actions required	Actions	
		Due date	Date complete
▪ Gate lock sign-off procedure to be added to daily tasks (dd/mm/yy). ▪ Review of site maintenance procedures at weekly toolbox meetings. ▪ Incident register to document nature/times of fires in drop-off area (dd/mm/yy).	Incident register indicates arson still occurring (flares being found in drop-off area, small fire dd/mm/yy). ▪ CCTV to be installed in drop-off area. ▪ Skip bin lid to be shut and locked outside operating hours.	dd/mm/yy dd/mm/yy	dd/mm/yy signed:

Finally, the register can be used to track controls and related actions. Any inspections/maintenance or issues should be identified and signed off by nominated staff members. This will allow you to track the effectiveness of your selected controls, maintain them to an adequate standard and decide on any adjustments/improvements. An example of a completed risk management process is provided in table 11.

A completed risk register for all site hazards will allow staff and other relevant personnel to understand the fire risks at your site and address these risks as part of the decision-making process. The register and any updates should be signed off by your managing director, most senior executive or other authorised senior representative of the business.

Table 11: example hazard and risk register.

Revision:		Date:		Attendees:		Signed:	

Hazard	Potential causes	Initial risk		Controls implemented	Residual risk		How controls will be checked	Any further controls/actions required	Actions	
		Consequence	Likelihood		Consequence	Likelihood			Due date	Date complete
Fire in drop-off area skip bin.	▪ Arson ▪ Illegal dumping ▪ Self-combustion.	Fire spreading to processing area/CRWM storage/adjacent bushland, causing loss and damage to property, harm to staff, damage to environment, wildlife and nearby community.	Small fires have happened several times within the last year and threatened boundary vegetation. Once vegetation is on fire, could easily spread into surrounding buildings and bushland.	▪ Skip bin locked up behind gate outside operating hours ▪ Separation of bin from nearby buildings and site boundary to be maintained at all times ▪ Removal of boundary vegetation and weed control added to general site maintenance procedures.	Any fire is likely to be contained to skip bin. Minor damage to bin and surrounds, small risk to staff from exposure to harmful smoke.	Access is significantly limited, preventing illegal dumping, but bin may still be exposed to other ignition sources.	▪ Gate lock sign-off procedure to be added to daily tasks (dd/mm/yy) ▪ Review of site maintenance procedures at weekly toolbox meetings ▪ Incident register to document nature/times of fires in drop-off area (dd/mm/yy).	Incident register indicates arson still occurring (flares being found in drop-off area, small fire dd/mm/yy) ▪ CCTV to be installed in drop-off area ▪ Skip bin lid to be shut and locked outside operating hours.	dd/mm/yy dd/mm/yy	dd/mm/yy signed:

Note: This example is reflective of a minor fire hazard. For an example of a major fire hazard, refer to appendix 4.

Chapter 5: Effective storage management

5.1. Performance outcomes for effective storage management

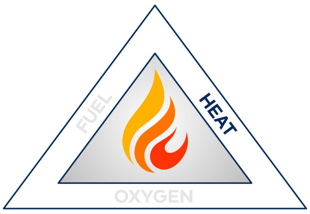
Arrange CRWM in a manner that:

- ☑ Facilitates safe and efficient evacuation of occupants.
- ☑ Allows emergency vehicle access in and around the site.
- ☑ Allows emergency responder access to fire protection systems and equipment.
- ☑ Allows effective and safe fire-fighting operations.
- ☑ Limits the potential for fire spread between piles, to buildings or surrounding premises.

Meeting these outcomes involves:

- ☑ Providing information on the site to the emergency services (e.g. inventory, location of storage).
- ☑ Ensuring site access points (including any rear access) are evident and unobstructed.
- ☑ Separation between piles, buildings, non-CRWM and surrounding premises.
- ☑ Separation between piles and other hazards onsite (e.g. hot works).
- ☑ Management of pile dimensions (heights, widths and lengths).

5.2. Understanding how fires start and burn



This section provides some background information on how fires can start and spread through CRWM storage. It is intended to help you design effective storage layouts, select adequate controls to manage the risks posed by the materials you store, and understand how these risks are influenced by the specifics (location, size, infrastructure etc.) of your site.

Combustion of stored materials

CRWM storage has the potential to be ignited by external factors (ignition sources), or by spontaneous combustion. Spontaneous combustion occurs due to internal heating, where an exothermic process (such as that which can occur during decomposition) generates heat faster than it is lost to the surroundings.

All CRWM will burn if their temperature exceeds their ignition point. Once alight, burning material can form an ignition source for other materials which have higher ignition points. These ignition points will vary with material type (table 12). Identifying ignition points of materials you store may help you effectively monitor their temperatures and reduce the risk of spontaneous-combustion, additional controls to reduce the risk of spontaneous combustion are listed in table 13.

🔍	**Ignition points and burn temperatures**	**Ignition point** refers to the temperature a material must reach before it catches fire. **Burn temperature** in this document refers to the temperature of a material when it is burning.

Table 12: ignition points (°C) for various CRWM. The ranges given may depend on the specific type of CRWM (e.g. type of wood), range of real world measurements etc. and should be treated as approximates. Adapted from T.C Forensics (www.tcforensic.com.au/docs/article10.html).

Material	Ignition point (˚C)	Material	Ignition point (˚C)
Compost	150-200	Nylon	424-532
Wood	190-260	Polyester	432-488
Paper	218-246	Polystyrene	488-496
Rubber	260-316	Acrylic plastic	560

Types of processing and storage of materials can increase the risk of combustion in long term storage (figure 10).

Unprocessed materials containing hazards such as exposed rust, as oxidisation of metals generates heat

Treated materials which have not been cooled before storage, requiring lower heat inputs (e.g. from the environment) before they reach ignition temperature

Materials that have been shredded to reduce particle size (e.g. shredded tyres)

Figure 10: type of processing of CRWM and method of storage can increase combustion risk.

The particle size of stored CRWM will influence the potential for spontaneous combustion, with smaller particle sizes having a higher risk (figure 11).

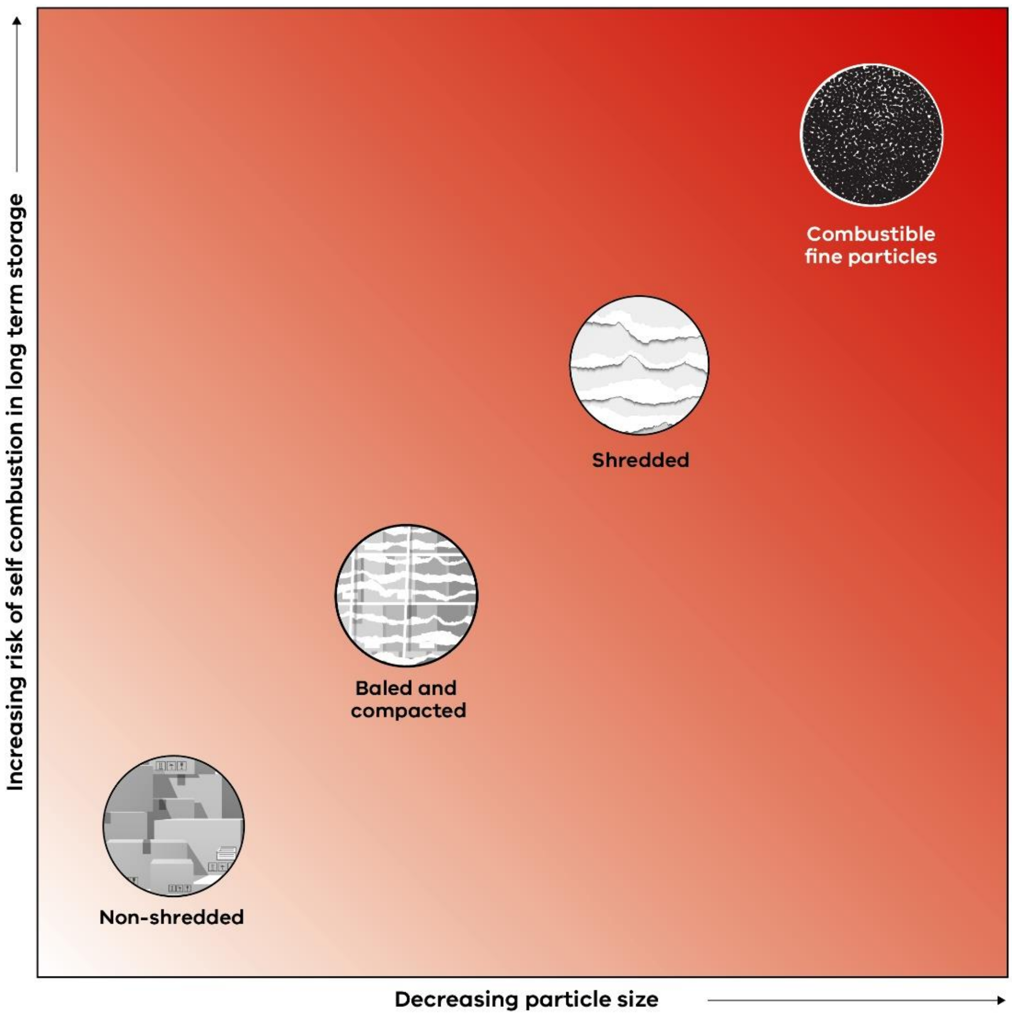


Figure 11: level of processing prior to storage can increase combustion risk.

Table 13: controls to reduce the risk of spontaneous combustion in CRWM storage.

Managing CRWM storage to reduce risk of self-combustion

Monitoring storage	Reducing temperature	Storage type and activities
Monitor internal temperatures and moisture content. Detect hot spots with thermal imaging cameras, especially when turning piles, so that hot spots can be managed.	Allow processed material to cool prior to baling/storage. Where appropriate for the materials you are storing, introduce moisture by spraying piles down during warm and dry periods/high fire risk days. Manage environmental factors (e.g. shading storage during hot weather). Routinely turn piles/break up bales in quarantined areas.	Stock rotation. Minimise pile size and split larger piles. Only store material in its largest form prior to processing. Reduce exposed metal content and other combustible hazards.

Storing organic CRWM

Food organics and garden organics (FOGO) decompose through microbial and chemical action, which can generate considerable heat. They will spontaneously combust when the heat generated is higher than that lost to the surrounding environment.

Allowing a pile to get to an internal temperature of over 90 °C can trigger rapid self-heating and eventual combustion. FOGO undergoing composting typically ignite between 150 °C and 200 °C.

Moisture content will also influence spontaneous combustion - low moisture levels will stop biological activity (stopping self-heating), and high moisture levels will allow for evaporative cooling of the pile. To reduce the risk of spontaneous combustion, organics storage (i.e. any FOGO not being otherwise actively managed) should be kept **below 70 °C** and moisture content should be maintained at either **less than 20% OR more than 45%** (Rynk, 2000)**.**

Any storage of organic material should be supported by a monitoring process.

Remember: If smouldering fires are detected in CRWM storage (organic or otherwise), the introduction of oxygen (e.g. through turning the pile) may cause flames to develop. Suitable firefighting equipment should be set up and ready for use at the scene if turning CRWM that is self-heating, or that you suspect is already smouldering. Firefighting authorities should be called in the event of an emergency.

	Further advice for managing organic CRWM	*Guide to Biological Recovery of Organics*, Sustainability Victoria (2017): **www.sustainability.vic.gov.au/About-Us/What-we-do/Strategy-and-planning/Victorian-organics-resource-recovery-strategy** *Designing, constructing and operating composting facilities*, publication 1588.1, EPA (2017): **www.epa.vic.gov.au/our-work/publications/publication/2017/june/1588-1** Rynk *Fires at composting facilities: causes and conditions*. *BioCycle*. 41. (2000); 54-58.

The risk of spontaneous combustion is influenced by the type of CRWM, processing/storage practices and particle size. Each site must identify the conditions required for spontaneous combustion within their CRWM storage and implement controls (e.g. screening practices, ongoing monitoring) to prevent or quickly mitigate potential incidents.

How fires spread in CRWM storage

The duration and intensity of a fire will largely depend on the type of CRWM and the total volume of burning material. High volumes of burning CRWM will be harder for you to manage, as the size of the pile will impact on the effectiveness of firefighting systems or equipment in controlling the fire and stopping its spread.

Fires can spread between storage piles through a number of mechanisms, including:

- collapse of burning baled stacks
- burning, molten material running along the ground
- firebrands/embers being blown into other CRWM storage
- heat output from a burning pile (the ‘emitter’) raising the temperature of a nearby pile (the ‘receptor’) to ignition point (figure 12).

Heat output from burning CRWM can be very high over a significant distance. The heat from burning plastic can blister the paint on a building 30 metres away (WISH 2017). Factors that influence the amount of heat output from a pile during a fire include:

- wind conditions
- ambient temperature
- pile structure/stacking layout
- the type of material. For example, plastics and rubber have burn temperatures over 1200 °C, while other CRWM have burn temperatures in the range of 850-950 °C.

The amount of heat output in any one direction (the amount of heat another pile can receive) will depend on the ‘burn-face’ of the pile - the side of the burning pile that is facing other combustible objects. As figure 12 shows, the overall volume of the pile may not be as important as the dimensions of the burn-face (e.g. pile length and height) in determining whether heat output will ignite nearby objects.

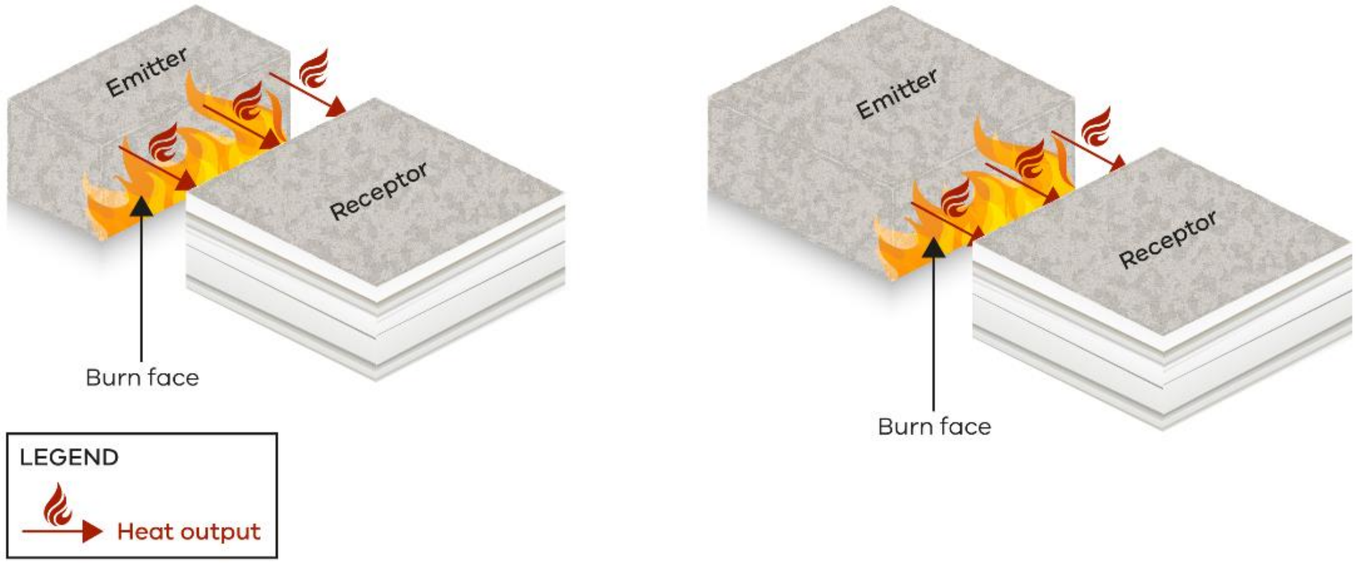


Figure 12: the burn-face of a pile of burning CRWM has a greater effect than pile volume on heat received by another pile. Adapted from *Reducing Fire Risk at Waste Management Sites* WISH (2017).

The shape of storage piles, along with environmental conditions, will influence the risk of fire spreading throughout your CRWM storage area.

Layout of storage can increase risk of harm from fire

The mixing or arrangement of different materials can increase combustion risk or facilitate the spread of fire throughout your CRWM storage. Some materials may have a low risk of spontaneous combustion when stored separately but become combustible when mixed together. Other materials may have low risk of spontaneous combustion but burn rapidly when ignited by external sources. For example, storing highly combustible materials (e.g. paper) right next to materials with a high risk of self-combustion (e.g. organics) is not recommended, as a fire in the organic storage could quickly spread to your paper storage.

If you store your CRWM separated by type, you should consider the placement of materials to reduce the risk of fire spreading from one material type to another. You may even want to consider storing non-combustible material (e.g. loose glass, non-reactive metals) between combustible materials to reduce the spread of fire (figure 13).

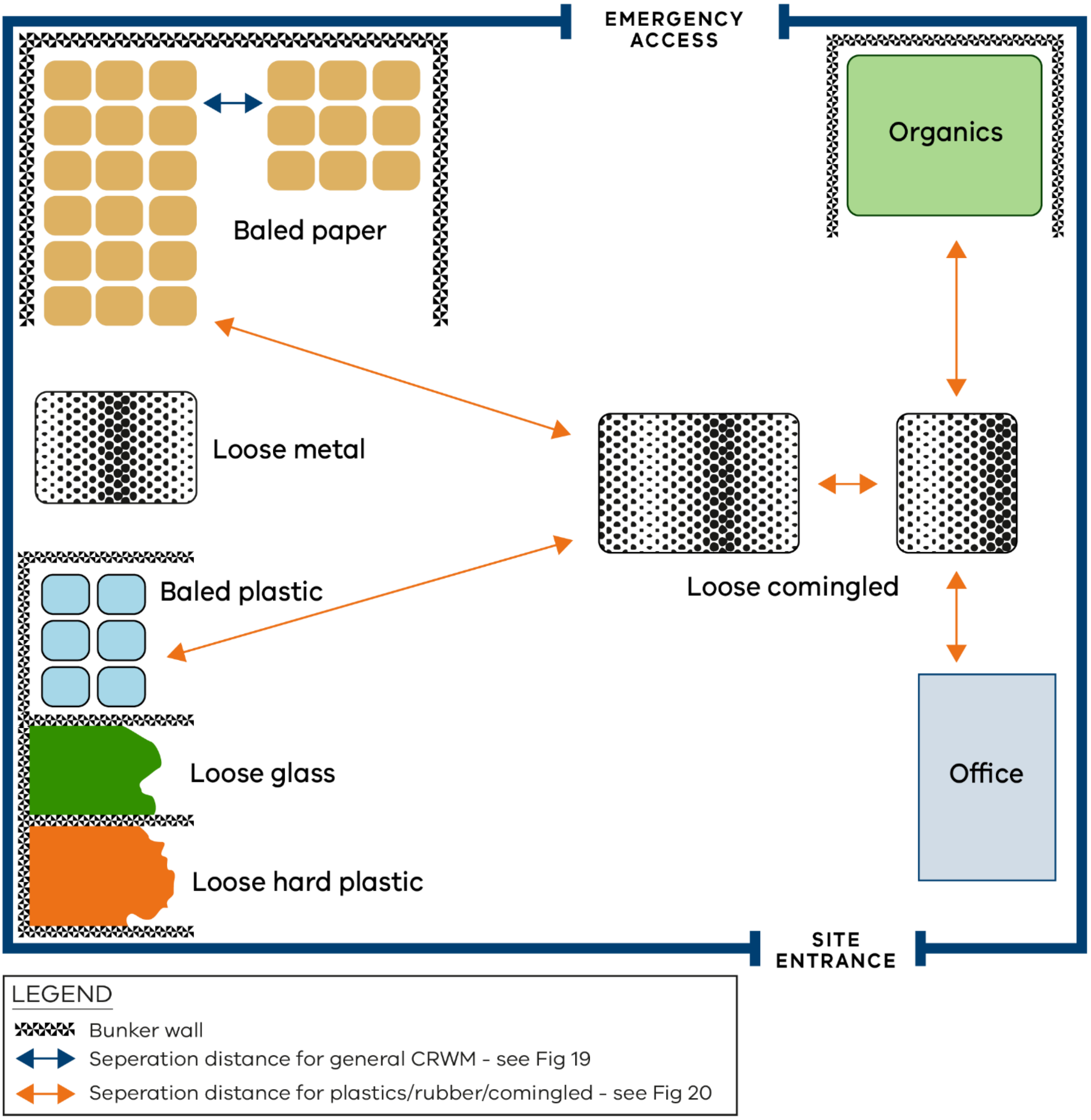
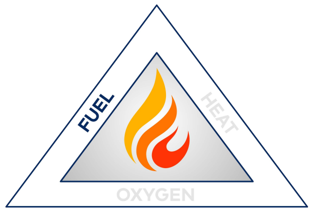


Figure 13: considerations for separation of CRWM by material type. Adapted from *Reducing fire risk at waste management sites*, WISH (2017). Distances/pile sizes are not to scale and are representative only.

In figure 13, baled paper is separated both within and between bunkers of other storage through sufficient free-air gaps and bunker walls. Loose plastic is also bunkered. Non-combustible materials such as metals and glass create an additional gap between different types of CRWM. Loose comingled CRWM storage is separated using appropriate free-air gaps from bunkered organic storage, other piles and the office building. There is access for firefighting on at least one side of the bunkered materials and on all four sides of the larger, comingled piles.

When designing CRWM storage layout, you should consider separating out materials that have a high risk of spontaneous combustion and use appropriate materials or free-air gaps to create barriers between storage piles.

5.3. Reducing the impacts of fire



Inventory

Developing and maintaining an accurate inventory or manifest of all materials held at a WRRF supports operations at the site, informs the risk management process, and provides essential information for firefighting authorities in an emergency. Inventory recommendations are outlined in table 14.

Table 14: inventory recommendations.

CRWM inventory		
Primary information (including recommended presentation)		**Additional information**
Maps or plans	**List/s**	**List/s**
☑ The types of CRWM stored and managed at the premises. ☑ The location of CRWM managed and stored at the premises. ☑ Area of operational capacity for CRWM storage, given factors such as the site's size, dimensions and activities.	☑ Current total volume of all CRWM onsite. ☑ Estimated volumes or size of CRWM piles managed and stored at the premises.	☐ Date and time that CRWM is transported into and out of the premises. ☐ Source of CRWM. ☐ Load number. ☐ Load vehicle registration. ☐ Outgoing load destination addresses.

In order to be useful in the case of an emergency, it is important for inventories to be maintained at a frequency that ensures data accuracy, as far as reasonably practicable. Sites with regular, small fluctuations in material volume a range or average may be adequate, for example listing material "x" as <100 tonnes or between 800-1000 tonnes at all times. It is important to provide a copy of the primary information recorded in the inventory within your site Emergency Information Container (chapter 6).

Selecting storage type and layout to reduce the impacts of fire

To reduce the risk of fire spreading throughout your CRWM storage:

- ☑ Set out your piles in a way that would reduce the heat being transferred from emitter to receptor (figure 14A).
- ☑ Consider the effect of pile slope on heat transfer and pile stability (figure 14B).
- ☑ Separate your piles by sufficient free-air gaps (separation distances) or physical barriers made from non-combustible materials (bunker walls).
- ☑ Arrange any baled storage in a way that restricts the growth of a fire burning within baled stacks.

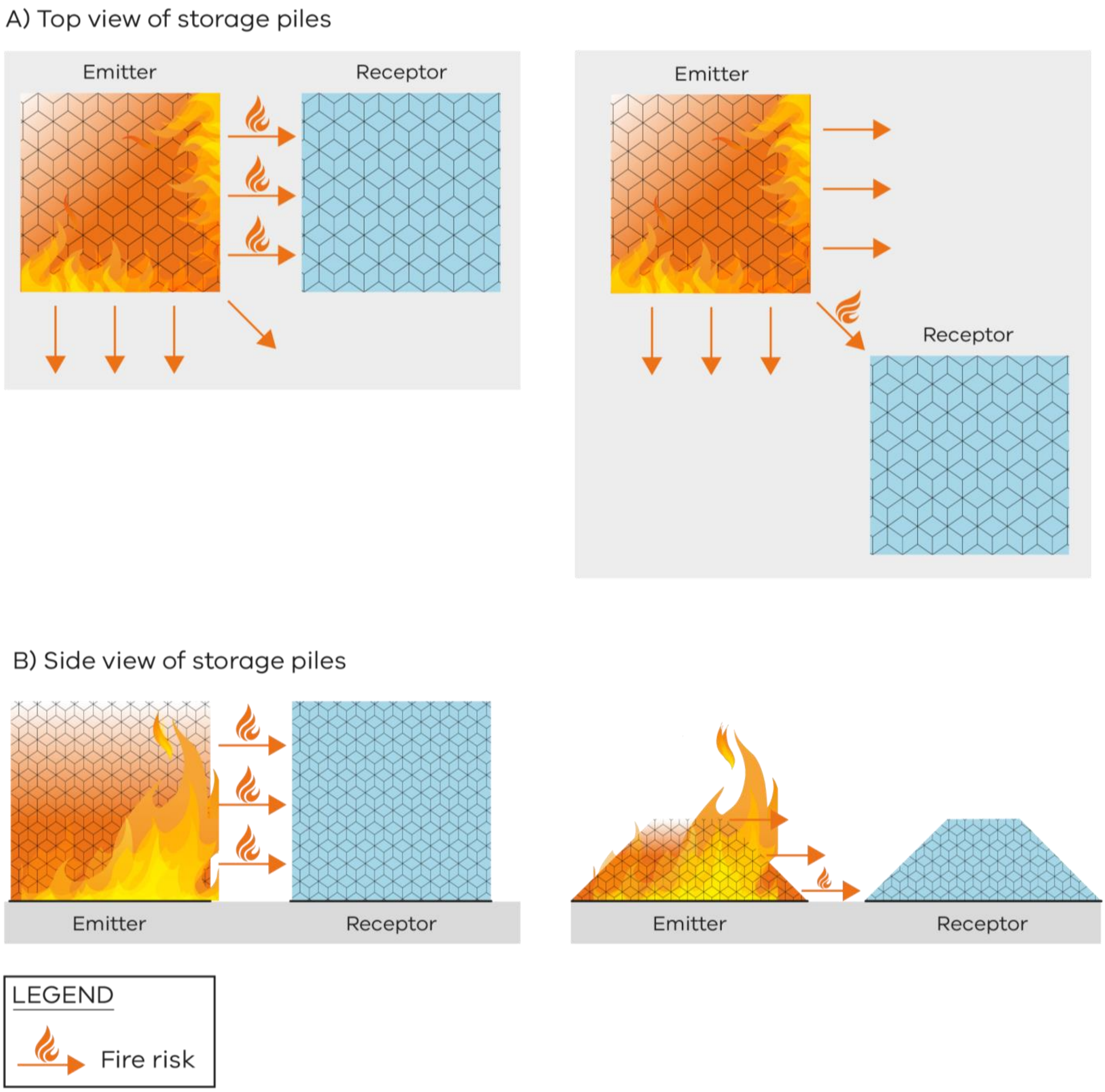


Figure 14: The effect of storage layout and shape on thermal energy transfer.

a) If piles of CRWM are parallel more of the emitted heat from the burning pile will transfer to a neighbouring pile, increasing its temperature and the likelihood that it will also ignite. If piles are set out diagonal from each other this reduces the intensity of heat being radiated from the emitter to the receptor.

b) You can also reduce the amount of heat transferred between emitter and receptor by ensuring that uncontained vertical faces of piles have shallow slopes (≤45°). This will also help to stabilise a pile and reduce the risk of collapse.

Using bunker walls to separate storage

Fire bunker walls can be used instead of free-air gaps to reduce/prevent heat emitted from burning CRWM from reaching other piles (figure 15). However, it is important that bunker walls:

- ☑ Always allow access for firefighting (e.g. have at least one open side accessible with appropriate free-air separation from other combustible materials).
- ☑ Be appropriately sized for the fire protection systems in place (e.g. no more than 10 m wide to allow for control of fire using first-response firefighting equipment, or wider if additional fire protection systems such as water deluge systems or fire water monitors have been installed).
- ☑ Allow a suitable freeboard gap (recommended ≥ 1 m) between the maximum pile height and the top of the bunker wall to account for flame height during a fire.
- ☑ Be higher than any material they are abutting against (e.g. building, boundary fence) to adequately minimise risk of fire spread/damage to nearby structures.
- ☑ Be made of an appropriate non-combustible material for the CRWM being stored, thick enough to reduce heat transfer, and inspected regularly so that cracks and other holes that would increase air flow are repaired. Concrete is recommended.

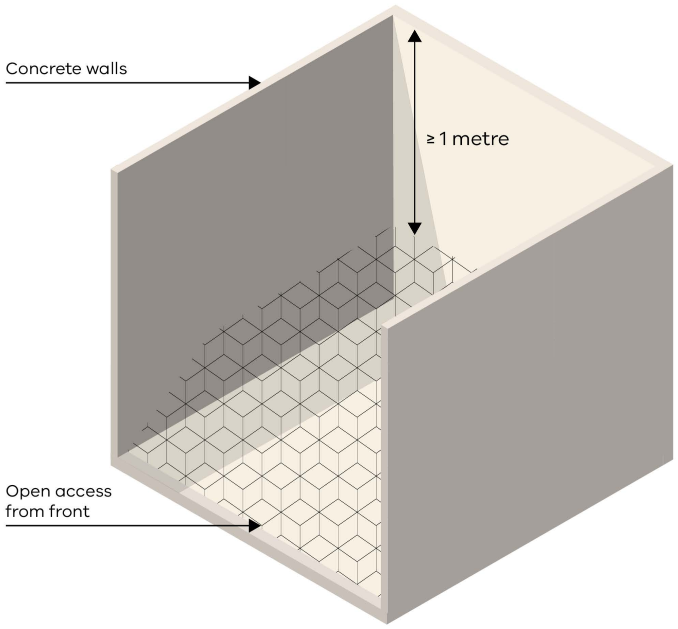


Figure 15: recommendations for separating CRWM using bunker (fire) walls

Baling wastes and fire risks

Baling CRWM may reduce the likelihood of fires starting. The material should be screened prior to baling, removing contaminants that could ignite a fire. Bales may also be harder to ignite through external sources. However, once established, fires in bales are harder to extinguish because the fuel is more concentrated.

Fire is likely to develop more rapidly in vertically stacked bales as this creates a “chimney” of high energy air flow between stacks, allowing fires to spread quickly throughout a pile (figure 16). One way to reduce this chimney effect is to interlace bales. Interlacing bales does not reduce peak burn temperatures once the fire is fully developed. However, it can double the time taken for the pile to reach peak burn temperature, making it easier to control the fire in its early stages. If you decide to bale your CRWM, you should consider interlacing stacks.

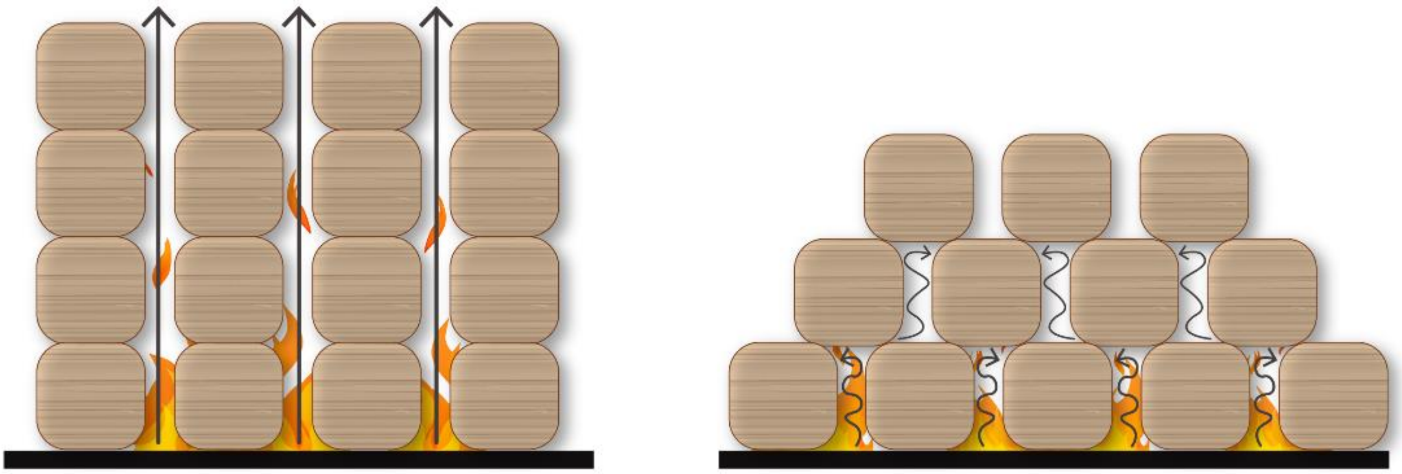


Figure 16: interlacing bales to disrupt chimney effects in a fire and make it easier to control a fire in its early stages. Interlacing may also increase stack stability. Source: *Waste fire burn trials summary report*, WISH (2017).

5.4. Managing your storage of CRWM

Regardless of size, all facilities storing CRWM outdoors or indoors are required to take all reasonable steps to manage and store CRWM in a way that minimises the risk to human health and the environment from fire. This can be achieved through the demonstration of the performance outcomes for effective storage management of CRWM (section 5.1).

Your site activities, capacity, location and infrastructure may require prescriptive storage design, as discussed below. The type and extent of requirements will depend on whether the storage activity is indoor or outdoor – for example, CRWM that you store indoors may trigger specific design requirements under the National Construction Code based on the height and volume of that storage.

Outdoor storage

To understand how to meet performance outcomes for outdoor storage management you need to consider your site capacity, throughput and activities. Figure 17 talks through the decision process to determine the approach a WRRF can take to meet the performance outcome of "*Limits the potential for fire spread between piles, to buildings or surrounding premises*"- section 5.1.

For outdoor storage, WRRFs where storage capacity is greater than 1000 tonnes or 1000 m^3 **and** where there is an annual throughput of more than 6000 tonnes can demonstrate that they meet this performance outcome by adhering to storage dimensions and distances given in figures 19 and 20.

If adhering to the storage dimensions and distances described by figures 19 and 20 is not possible at your site, you may be required to demonstrate how your alternative storage design takes all reasonable steps to minimise the risk from fire to at least an equivalent level. This includes being able to provide any modelling and analysis on alternative storage dimensions and other management controls that minimise the risk of radiant heat transfer igniting adjacent storage/buildings. A fire safety engineer may be able to assist you with this. Refer back to section 4.3 for relevant information about alternative design solutions.

Maximum storage dimensions

Pile height, length and width are key determinants of the severity, duration and intensity of fires. Adhering to the following storage dimensions (figure 18) demonstrates that a WRRF is attempting to minimise the harm from fire by limiting fire spread between piles and buildings, limiting fuel loads within piles and facilitating effective management of fires (e.g. by maintaining access for firefighting authorities and/or safe evacuation from the site). These dimensions also take into consideration pile stability as larger piles may be more prone to collapse, impeding access and spreading burning materials to other areas.

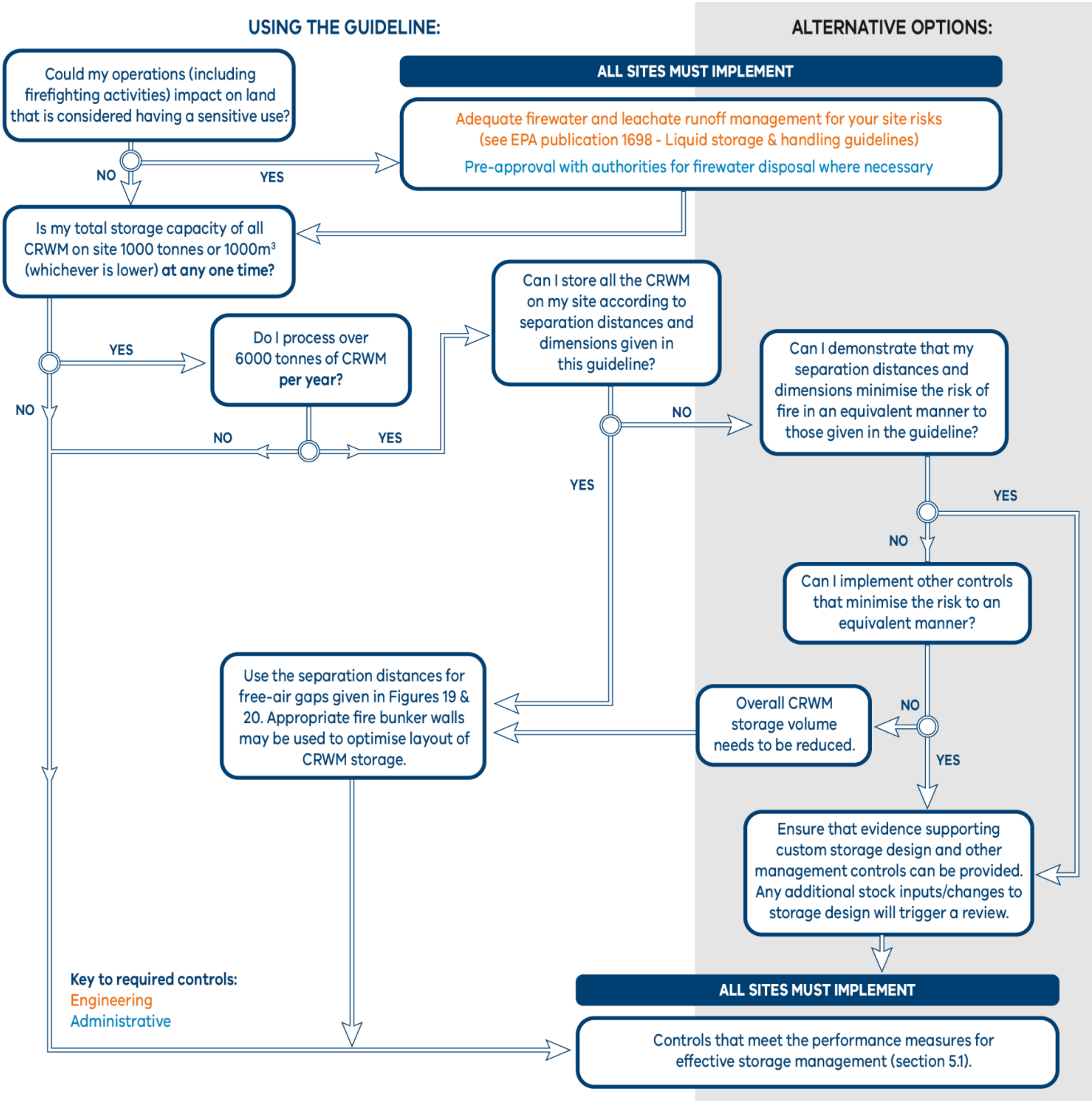
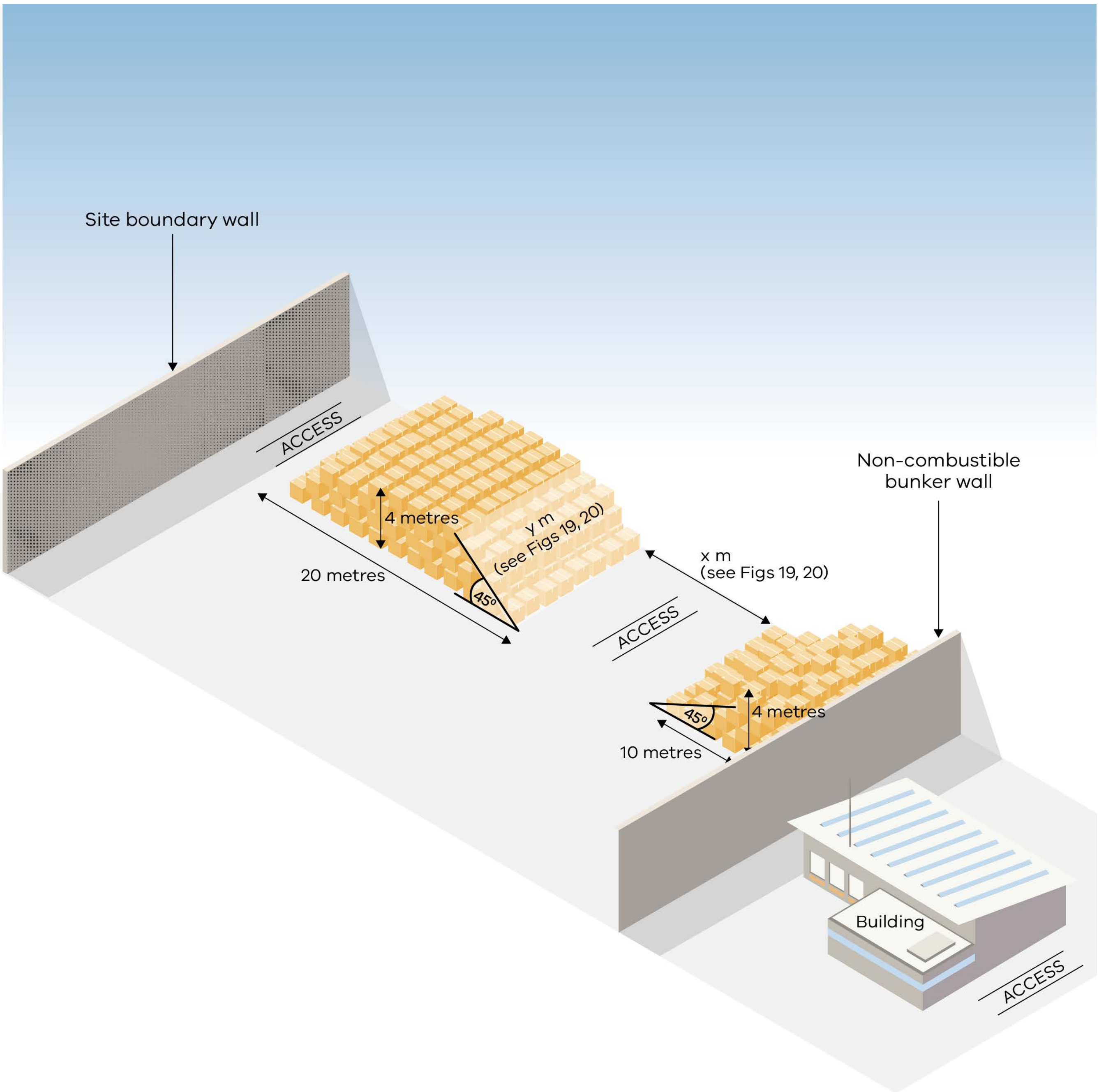


Figure 17: decision process for occupiers in meeting the performance outcome of "*Limits the potential for fire spread between piles, to buildings or surrounding premises*".



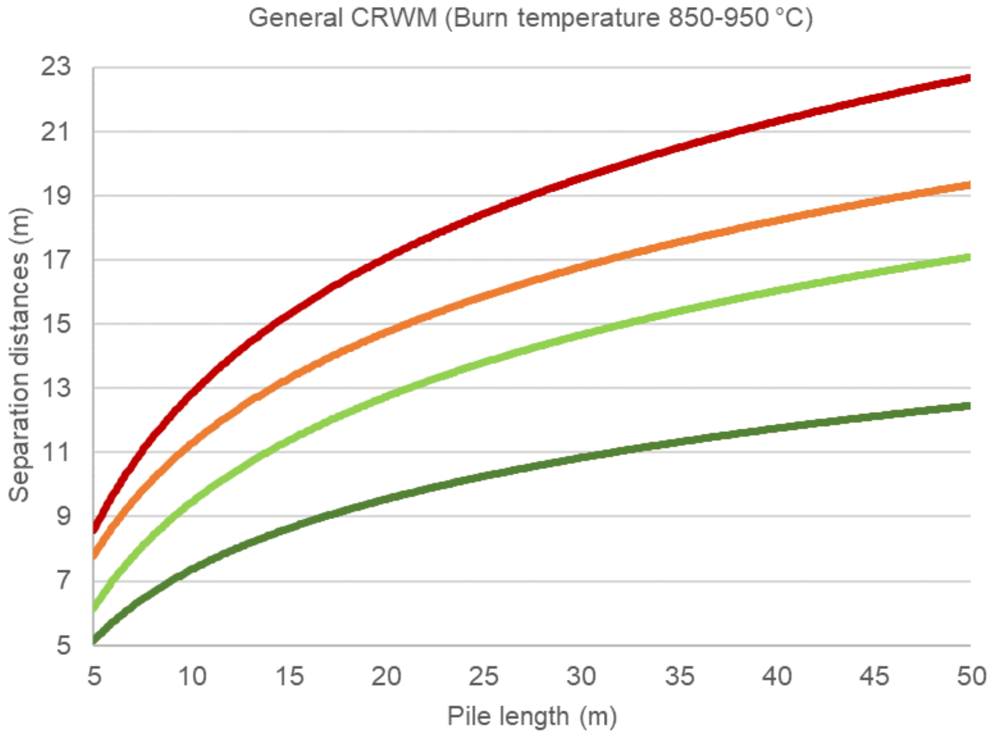
Pile dimension	Baled or loose CRWM
Maximum pile height	4 metres or 4 bales, whichever is lower
Maximum pile width (easy access to pile from both sides)	20 metres
Maximum pile width (easy access to pile from only one side)	10 metres
Pile length	Calculate using figures 19 and 20

Figure 18: limiting pile height, length and width to reduce fire risks.

Using the guideline to determine storage dimensions and distances

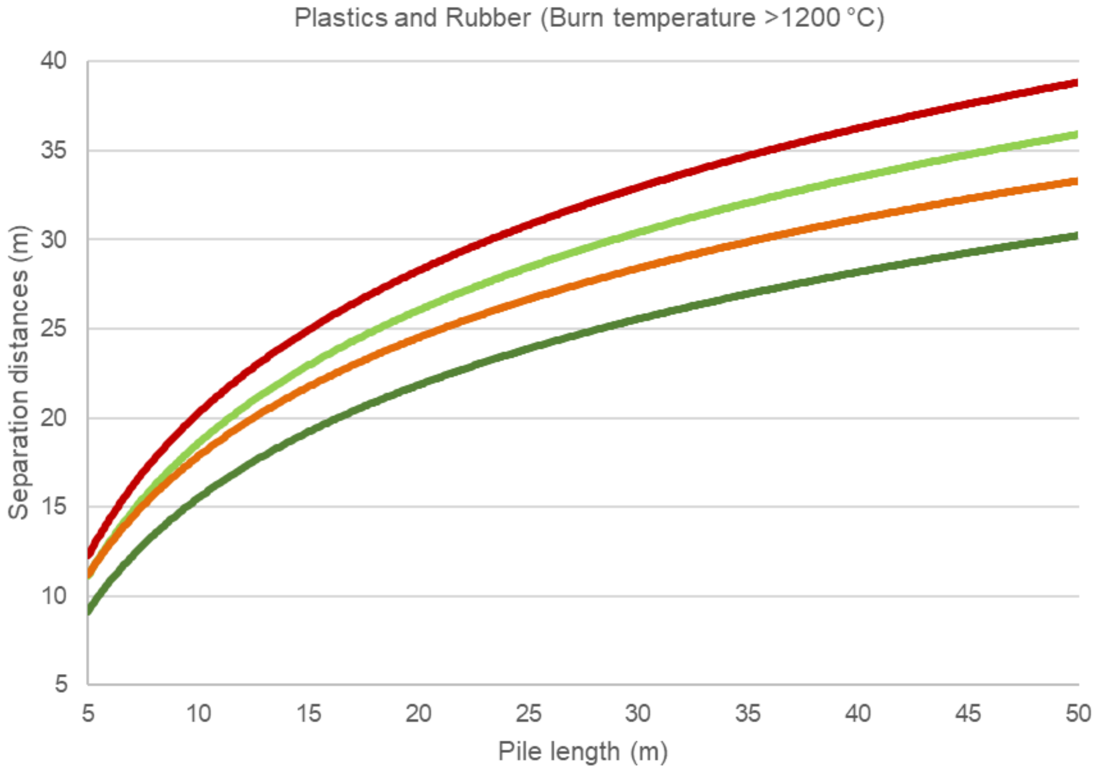
Figures 19 and 20 are adapted from the 2017 WISH report, *Reducing Fire Risk at Waste Management Sites* and were determined using data collected during waste burn trials. Additional assumptions for the curves given for standard storage dimensions can be found in appendix 3.

'General' CRWM refers to all CRWM except for plastics, rubber, e-waste or comingled storage.



	Storage type			
	Loose pile to loose pile	Loose pile to building	Baled pile to baled pile	Baled pile to building
Pile length (m)	Separation distance (m)			
5	5	7	9	8
10	7	9	13	11
15	9	11	15	13
20	10	13	17	15
30	11	15	20	17
50	12	17	23	20

Figure 19: separation distances for storage of general CRWM types (burn temperatures of 850-950 °C). Figure adapted from *Reducing Fire Risk at Waste Management Sites*, WISH (2017)



	Storage type			
	Loose pile to loose pile	Loose pile to building	Baled pile to baled pile	Baled pile to building
	Separation distance (m)			
Pile length (m)				
5	10	13	14	13
10	15	18	19	18
15	18	22	24	21
20	23	25	27	23
30	25	30	34	28
50	31	38	40	35

Figure 20: separation distances for storage of plastic and rubber CRWM (burn temperatures of > 1200 °C). Figure adapted from *Reducing Fire Risk at Waste Management Sites*, WISH (2017)

	Notes on storage separation distances and dimensions	Distances given in the tables included as part of figure 19 and 20 as determined by the storage curves are rounded up to nearest metre. Pile height is assumed to be at a maximum of 4 metres and pile width is at a maximum of 20 metres**.**

	Scenarios used to generate storage dimension graphs	To avoid overcomplicating this guideline, a limited number of scenarios have been used in figure 19 and 20. These reflect common scenarios at WRRFs. For more information about other scenarios, Refer to waste fire burn trials summary non-technical report, WISH (2017). **https://wishforum.org.uk**

The assumptions underpinning figures 19 and 20 may not reflect the conditions and circumstances of your site. This should be taken into consideration when applying the dimensions and distances given.

Be conservative when using the graphs in figures 19 and 20 to determine separation distances and consider these distances as a minimum. For example, round up separation distances to the nearest whole number. **Comingled waste containing rubber and plastics should be separated using figure 20.** Likewise, if you have a baled pile facing a loose pile, use the separation distances for baled to baled piles.

Indoor storage

If you are using a building to store CRWM, the building needs to be fit for purpose and compliant with relevant local planning and building authority requirements such as the *Building Act 1993* and Building Regulations 2018, including the National Construction Code Series Volume 1 (NCC). Additionally, you must ensure your building is designed to be safe and fit for purpose under the *OHS Act 2004*.

The regulations above outline the minimum requirements for the safety of people working in them, including their ability to safely evacuate in case of fire. They do not provide an exhaustive list of requirements or recommendations to prevent fire occurring. Your risk assessment should clearly identify all preventative and mitigating controls relied upon to manage the risks specific to the building and storage activities.

All buildings should have an Essential Safety Measures (ESM) record of the fire items installed or constructed in the building (such as sprinklers, fire doors and paths of travel to exits). This list should be referenced to ensure adequate levels of routine service are being carried out on all essential safety measures. The required Essential Safety Measures Routine Service Records for a building, as well as the Annual Essential Safety Measures Report (completed by the owner), should be kept onsite and able to be produced upon request.

	Roles and responsibilities for indoor storage facilities	The regulations around essential safety measures apply to owners of buildings that store CRWM. Occupiers who do not own their storage facilities should ensure the owner is aware of their obligations for fire safety items, maintenance, and reporting. However, it is the responsibility of the occupier to maintain exits and paths to exits such that people can leave the building in the event of a fire. This means ensuring proper housekeeping (keeping paths clear) and maintaining exits (safety doors).

Considerations for your indoor storage design

When choosing or designing indoor storage of CRWM, check that:

- ☑ The building is compliant and remains compliant with the requirements of the latest edition of the Building Regulations.
- ☑ Any changes to the use of the building comply with the requirements of the latest edition of the Building Regulations in force at the time of the change when implementing additional requirements.
- ☑ The service records and annual Essential Safety Measures Reports are current.
- ☑ Essential safety measure critical defects reported during routine service activities will be corrected within 30 days and the performance of each essential safety measure is endorsed by a qualified competent fire safety practitioner after the yearly routine service.
- ☑ There are adequate exits and pathways to exits.
- ☑ Exit signs can be seen clearly; or directional lights are installed to guide people to exits when exit signs are obscured (e.g. by storage/walls).
- ☑ Pile stability is maintained either through limiting pile height or adequate bunding/shoring, and that piles are not obstructing firefighting equipment, firefighting systems or limiting firefighting access or paths of travel to exits.
- ☑ Your overall floorspace/compartment size and volume/type of materials stored do not trigger prescriptive requirements as per the NCC.
- ☑ The height of your storage is not blocking any sprinkler systems by leaving an adequate gap (≥ 1 m) between height of a pile and sprinkler heads.
- ☑ Any sprinkler system designed to deal with fires in indoor CRWM storage is compliant with AS 2118
- ☑ There is adequate water supply for fire suppression systems and that access to hose reels, extinguishers etc. are maintained (leaving at least a one-metre clear space around them).
- ☑ Automatic alarm systems will automatically alert the fire brigade and alert building occupants of a fire in fire compartments or areas with CRWM.

Indoor fire safety resources	www.vba.vic.gov.au/consumers/essential-safety-measures

It is your responsibility to ensure that your building's specific safety measures meet your obligations under the law, and that the way you store CRWM indoors minimises the risk to human health and the environment from fire.

Chapter 6: Emergency management plan

6.1. Performance outcomes for developing your emergency management plan

When developing your emergency management plan, ensure that it:

- ☑ Contains current, concise information about the site's operation, infrastructure, hazards and emergency resources.
- ☑ Contains credible emergency scenarios and clear procedures to manage them, including notification and escalation procedures.
- ☑ Identifies specific personnel roles and/or a warden structure so that WRRF personnel are clear on the notification and escalation procedures during an emergency.
- ☑ Contains a clear emergency management communication plan to internal staff and external emergency responders.
- ☑ Contains a schedule and process for reviewing, updating and testing (exercising) the emergency management plan.

Meeting these outcomes involves:

- ☑ Performing a practical assessment of hazards associated with WRRF activities and the possible consequences of an emergency occurring as a result of those hazards.
- ☑ Providing emergency procedure training for all personnel who may be involved in evacuation and/or are required to alert colleagues, emergency response teams and emergency services.
- ☑ Providing emergency information (e.g. the Emergency Information Book (EIB)) in a clearly-identifiable container, for example the Emergency Information Container (EIC).
- ☑ Implementing a schedule and process for reviewing, updating and testing the emergency management plan.
- ☑ Conducting drills to test and improve the emergency management plan.

6.2 Developing your emergency management plan

An emergency management plan is a written set of instructions that outlines what WRRF owners, employees, contractors and visitors should do in any type of emergency.

Further advice for developing an emergency management plan	*Safe Work Australia: Emergency Plans – Fact Sheet (2012)*: **www.safeworkaustralia.gov.au/doc/emergency-plans-fact-sheet**

An effective emergency management plan address all hazards, not just fire related, where the consequence of the hazard could significantly have an impact on human health and the environment.

This chapter provides general guidance on how to develop an emergency management plan that will help WRRF occupiers and employees respond to a fire emergency.

A well-developed emergency management plan for WRRF will consider fire in relation to information provision, risk management and emergency response.

The emergency management plan should be based on a practical assessment of hazards associated with WRRF activities and the possible consequences of an emergency occurring as a result of those hazards. Refer to Chapter 3 which outlines the steps to identify, assess and document fire hazards, and Chapter 4 for how to implement controls to minimise harm to human health and the environment.

In developing the plan, consideration should be given to all relevant laws, including public health laws and state or territory disaster plans.

Factors to consider when developing your emergency management plan

A clear, concise and effective emergency management plan ensures effective and efficient management of emergencies that may arise at a WRRF. Emergency management plans are underpinned by a comprehensive risk management process that considers all hazards and risks pertaining to the facility. Emergency management plans do not have to be lengthy or complex but at a minimum, should include the following:

General facility information

- the size and location of the WRRF (e.g. rural vs. urban location, distance to sensitive land uses)
- inventory/manifest of CRWM materials (including type, tonnage accepted and processed per day)
- number of personnel expected at the premises
- if the WRRF stores dangerous goods, a manifest/inventory of the location of the dangerous goods
- plant/machinery equipment available onsite
- accessibility points for fire brigade access
- options for hardstand surfaces.

Nearby key infrastructure

Examples of nearby key infrastructure and other sensitive uses:

- airports, major roads, railways, waterways, drains
- hospitals, schools, child care and aged care facilities
- ecosystems
- powerlines.

Evacuation procedures

- raising the alarm onsite in the event of an emergency
- safe evacuation and accounting for personnel.

Fire procedures

- isolation points for essential services (e.g. gas and electricity) and isolation procedures
- actions to be taken in the event of a vehicle or plant fire, including containment (if safe to do so)
- actions to be taken in the event of stockpile smouldering, or hot spot identification
- actions to be taken in the event of a smouldering truck/delivery (hot load).

Grassfire/bushfire procedures

- details of monitoring for bushfires; triggers for limiting staff access to the facility; and evacuation of personnel from the facility, all linked to 'fire danger ratings'.

Fire water runoff/containment procedures

- details of containment systems for any liquids that if spilt are likely to cause pollution or pose an environmental hazard, including fire water runoff

Bunding guidelines	Further details that may assist you in providing a secondary containment system can be found in EPA's *Liquid storage and handling guidelines* (publication no. 1698). **www.epa.vic.gov.au/our-work/publications/publication/2018/june/1698**

- the location and capacity of fire water containment systems (e.g. drain covers, isolation valves, bunds and sumps)
- details of resources and procedures necessary for decontamination following incidents (i.e. decontamination equipment and its location onsite; procedures for decontamination of personnel, plant or equipment).

	Fire water run-off control	Further details that may assist you in controlling fire water run-off can be found in MFB's Fire Safety Guideline, *Guideline No. GI-12: Control of Fire Water Run-Off.* **www.mfb.vic.gov.au**

Emergency equipment & resources

- details of emergency resources onsite (e.g. fire protection systems and water supply, alarms, emergency shut-down systems, vehicles/equipment for dismantling stored CRWM, spill kits, fire water containment systems, warden intercommunication phone (WIP), eye wash/safety showers).
- arrangements for obtaining additional external resources, including any 'mutual aid agreements'. Mutual aid agreements are agreements between two or more emergency services to provide emergency assistance during a particular emergency event.
- deployment procedures for equipment and resources (if applicable).

Fire protection systems and equipment

- the location of fire extinguishers and fire hose reels
- the location of fire hydrants, hoses, boosters, etc
- servicing requirements and schedule for fire protection systems.

Fire water supply

- the location of any access point to reticulated water supply
- the location and capacity of fire water tanks (and pumps)
- performance specifications for water supply
- servicing requirements and schedule for water tanks and pumps.

Site layout plan

To assist emergency services, it is important that specific site information is captured as a single or series of site layout drawings (figure 21) which include the following information:

General layout

- buildings, roads and boundaries.
- site entrances and exits, including emergency gates and access points
- the name or purpose of each building and area (e.g., office, workshop, organics storage)
- the name or description of site neighbours (residential, commercial, industrial)
- adjacent street names
- the direction of north.

Fire protection systems and emergency resources

- fire protection systems and equipment (hydrants, water supply, booster connection, fire hose reels, etc.)
- emergency resources and equipment (e.g. neutralising agents, absorbents, spill kit, PPE)
- emergency evacuation assembly points
- facility emergency control centre (if applicable)
- relevant emergency information and safety information.

Dangerous goods storages

- tanks and package stores of dangerous goods.

Isolation valves and drainage systems

- electrical supply isolation
- gas supply isolation valves
- town water isolation valves
- stormwater drainage points
- site topography (including bunding and site drainage)
- open uncovered land (that may act as run-off sinks)
- sewage system outlets.

Other information

- first aid stations.

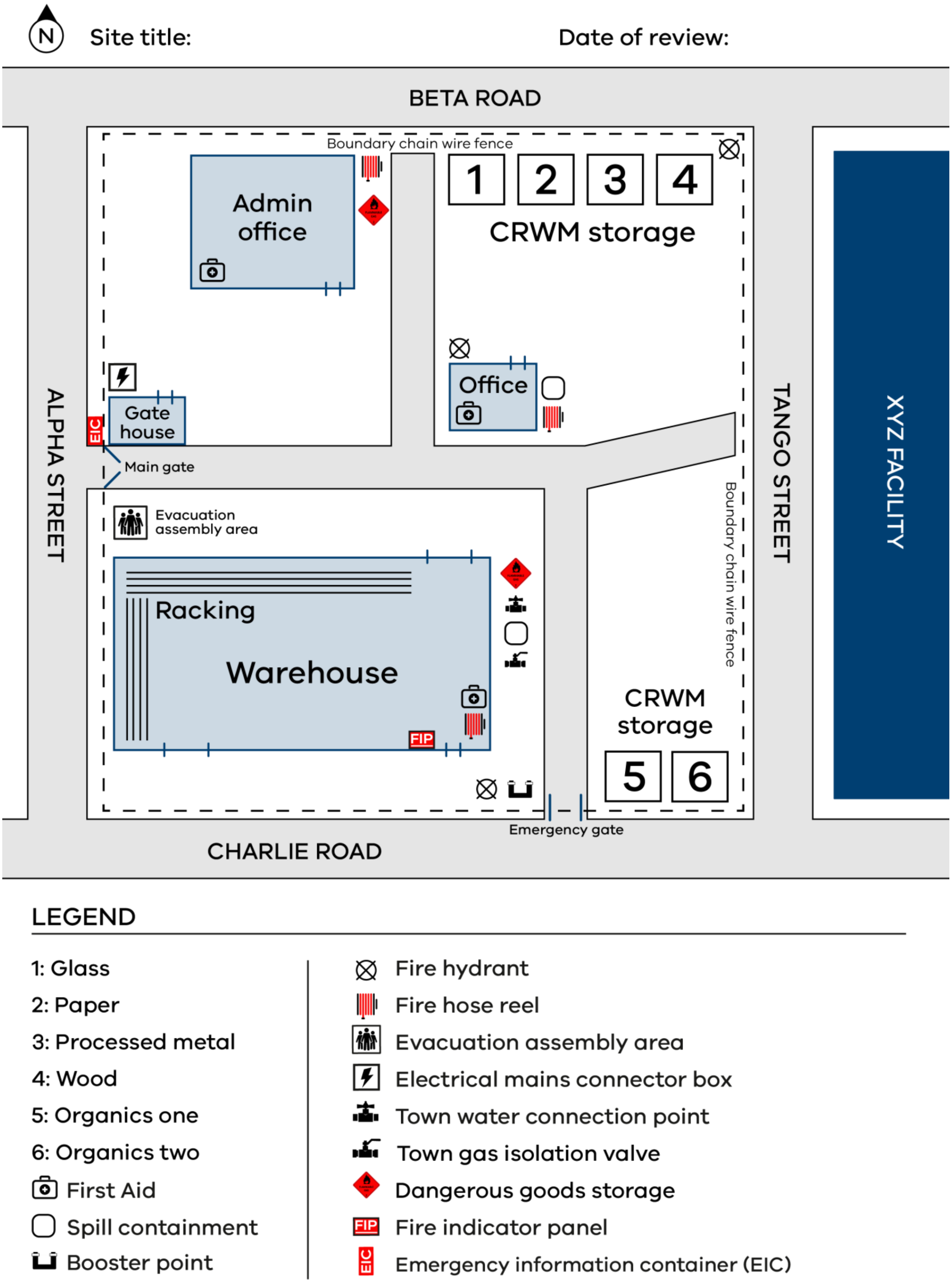


Figure 21: a simplified concept map of a site layout plan that includes key site information for internal staff and external emergency responders. Note that your site plan should contain site-specific information, such as location of any stormwater drains (where applicable).

	Developing a site facility plan for your emergency management plan including guidance for hardstand and emergency vehicular access for fire-fighting appliances	MFB has a detailed guidance *GL-13 Hardstand and Emergency Vehicular Access for Fire Fighting Appliances.* **www.mfb.vic.gov.au/Industry/Workplace/Fire-Safety-Guidelines.html**

Roles and responsibilities

The following information focuses on emergency management personnel roles and responsibilities. It outlines procedures for notifying the emergency services and the responsibilities of suitably qualified personnel for implementing the emergency management plan.

An emergency management plan should identify and communicate specific personnel roles and/or a warden structure so that WRRF personnel are clear on what should happen during an emergency.

Warden structure/personnel roles

- the contact details of key personnel in the event of an emergency, including after-hours telephone numbers.
- the roles and responsibilities of personnel for actioning the emergency management plan, that clearly identifies:
    - who notifies the emergency services during emergencies
    - activities for liaising with the emergency services, for example a dedicated emergency coordinator to meet responding emergency services at the main gate
    - personnel with specialised knowledge of the WRRF and its operations to support emergency services operations.

Emergency services notification

Circumstances for reporting incidents to the emergency services are to be included in emergency procedures. Examples of these circumstances would be fires, explosions, work place accidents/injuries and spills.

	Key concept: All emergency procedures encompassing fire (or the potential for fire) are to include a notification to the emergency services at the earliest possible stage of the incident, to allow efficient intervention and reduce the potential for escalation.

Training requirements and activities

It is important that all personnel who have emergency response roles receive appropriate training, including refresher training. This includes people who may be involved in evacuation and/or alerting colleagues, emergency response teams and emergency services.

General training for personnel may include the following:

- individual roles and responsibilities
- emergency response procedures
- evacuation, shelter and accountability procedures
- notification, warning and communications procedures
- location and use of common emergency equipment.

Documentation and a description of the training program for relevant personnel should be included in the emergency management plan.

6.3 Storage of emergency information

An Emergency Information Book (EIB) provides responding emergency services important WRFF site emergency information. To assist emergency services, ensure that your book contains information that will assist responding emergency services during the emergency response. Include:

- drawings/plans that lay out the entire site/facility (including its fire protection systems)
- an inventory of materials at the premises (e.g. types, location and volume of CRWM)
- contact details for facility personnel, emergency services, utility service providers, regulatory authorities and facility neighbours
- procedures for management of emergencies, including evacuation, fire, spills and leaks and any other risks or potential hazards for the facility.

Figure 22: the Emergency Information Container (EIC) should be located at your site as close as practical to all vehicle entrance(s).

The EIBs should be stored in an Emergency Information Container (figure 22). To assist emergency services, locate these at entrances which responding emergency services would use.

The Emergency Information Container needs to be:

- painted red and marked 'EMERGENCY INFORMATION' in white contrasting lettering not less than 25mm high
- installed at all vehicle entrances, including emergency access
- installed at a height of 1.2m – 1.5m
- accessible with a fire brigade standard '003' key
- kept clear of obstructions (including products, vehicles and vegetation).

Useful resource for developing an Emergency Information Book:	www.cfa.vic.gov.au/plan-prepare/dangerous-goods

6.4 Review and testing of emergency management plan

For emergency plans to remain accurate, current and effective, they must be reviewed and (if necessary) revised on a regular basis. For example:

- when there are changes to the workplace such as increase in the CRWM volumes or processing quantities
- when there are changes in the number or composition of staff including an increase in the use of temporary contractors
- after the emergency management plan has been tested.

Emergency management plans may be developed in conjunction with the relevant fire authority. The development of the following supports effective emergency planning:

- A schedule and process for reviewing, updating and testing the emergency management plan
- Open and transparent communication of the emergency management plan with internal staff and emergency responders.

Appendix 1: waste and resource recovery facilities – fire risk management framework checklist

This checklist has been developed to support occupiers in the implementation of the guideline by identifying gaps within their risk management framework systems and processes. The aim of the checklist is to:

- provide a 'snapshot' of the fire risk management framework and outline process requirements to ensure WRRF consistently apply and align with the waste management policy
- inform WRRF of the tasks required to be completed by them if they wish to demonstrate compliance with the WMP CRWM.

The checklist is designed to be used in conjunction with the guideline and serves as a guide to support implementation. The checklist should not be used on its own to demonstrate compliance.

This check list has been broken up into the four stages:

- assessing the risk from fire
- controlling your fire hazards and risk
- effective storage management
- emergency management plan.

Who should use the checklist?
Current or new WRRFs that store CRWM waste and want to understand the process and system requirements which need to be implemented if a site is to comply with the WMP CRWM.

When should you use/review this checklist?

- at the start of your implementation program to comply with the WMP CRWM
- to support the review of your fire risk management framework
- after the event of a fire or after significant operational change.

Assessing the risk from fire	Response	For support refer to:
1. Have you identified and documented all hazards, both onsite and offsite that pose a fire risk to your CRWM storage?	☐ Yes ☐ No	Section 3.3
2. Have you assessed the initial fire risks associated with each of your identified hazards?	☐ Yes ☐ No	Section 3.4
a. Have you documented the consequence and severity associated with each of your identified hazards causing an impact to human health, community and the environment?	☐ Yes ☐ No	Section 3.5
b. Have you documented the likelihood associated with each of your identified hazards causing an impact to human health, community and the environment?	☐ Yes ☐ No	

Controlling your fire hazards and risks	Response	For support refer to:
1. Have you identified management controls for each of your identified hazards appropriate to the documented consequence and likelihood?	☐ Yes ☐ No	Section 4.2
2. Have you implemented and documented your controls?	☐ Yes ☐ No	Section 4.5
3. Have you assessed if the controls are adequate in reducing the likelihood and consequence/severity of your identified fire hazards based on the effectiveness of the control, potential ways the control can fail and appropriate contingencies?	☐ Yes ☐ No	Section 4.6
4. Do you have a documented process in place to check the effectiveness of your implemented controls and verify that the checks are being completed?	☐ Yes ☐ No	Section 4.7

Effective storage management	Response	For support refer to:
1. Has your site implemented the performance outcomes of effective storage management?	☐ Yes ☐ No	Section 5.1
2. Have you considered how CRWM management activities influence the severity of a fire?	☐ Yes ☐ No	Section 5.2
3. If your site is storing and processing CRWM outdoors, have you determined and documented your site storage design approach?	☐ Yes ☐ No	Section 5.4
4. For indoor storage activities – is your building fit for purpose and compliant with the relevant local Planning and Building Authority requirements such as the Building Act 1993 and Building Regulations 2018, including the National Construction Code Series Volume 1 (NCCI)?	☐ Yes ☐ No	Section 5.4
a. Does your site have an Essential Safety Measure Report?	☐ Yes ☐ No	
b. Have all the actions on that report been addressed?	☐ Yes ☐ No	

Emergency management plan	Response	For support refer to:
1. Do you have an emergency management plan?	☐ Yes ☐ No	Section 6.1
2. Are your staff trained in the implementation of the emergency management plan?	☐ Yes ☐ No	Section 6.2
3. Have you set up an Emergency Information Container that contains the Emergency Information Book?	☐ Yes ☐ No	Section 6.4
4. Have you reviewed and tested your emergency management plan?	☐ Yes ☐ No	Section 6.5

Appendix 2: Australian Standards relevant to fire protection systems and equipment for WRRFs

Australian Standard	Description
AS 1851-2012	Routine service of fire protection systems and equipment.
AS/NZS 1668.1-2015	The use of ventilation and air conditioning in buildings – fire and smoke control in buildings.
AS 1670.1:2015	Fire detection, warning, control and intercom systems – system design, installation and commissioning fire.
AS 1670.3-2004	Fire detection, warning, control and intercom systems – system design, installation and commissioning fire alarm monitoring.
AS 1670.4:2015	Fire detection, warning, control and intercom systems – system design, installation and commissioning emergency warning and intercom systems.
AS 1905.1:2015	Components for the protection of openings in fire-resistant walls fire-resistant doorsets.
AS 1905.2-2005	Components for the protection of openings in fire-resistant walls fire-resistant roller shutters.
AS 2118.1:2017	Automatic fire sprinkler systems – general systems.
AS 2293.1-2005	Emergency escape lighting and exit signs for buildings – system design, installation and operation.
AS/NZS 2293.2:1995	Emergency evacuation lighting for buildings – inspection and maintenance.
AS 2293.3-2005	Emergency escape lighting and exit signs for buildings – emergency escape luminaires and exit signs.
AS 2304	Water storage tanks for fire protection systems.
AS 2419.1-2005	Fire hydrant installations – system design, installation and commissioning.
AS 2441-2005	Installation of fire hose reels.
AS 2444-2001	Portable fire extinguishers and fire blankets – selection and location.
AS 2665-2001	Smoke/heat venting systems – design, installation and commissioning.
AS 2941	Fixed fire protection installations – pumpset systems.
AS 3745-2010	Planning for emergencies in facilities.
AS 4072.1-2005	Components for the protection of openings in fire-resistant separating elements, service penetrations and control joints.
AS 5062:2016	Fire protection for mobile and transportable equipment.

Appendix 3: assumptions for the curves used in calculation standard separation distances and dimensions

- Emitters and receptors are parallel to each other.
- The slope of your pile is 45° for loose waste piles and 90° for baled stacks.
- Typical maximum burn temperature for the two broad categories of waste types noted (general wastes and plastics/rubber wastes) have been used. These reflect the typical worst-case fire scenarios observed during burn trials.
- A receptor ignition property of 10 kW/m^2 has been used for waste stacks, based on research into the ignition properties of baled refuse-derived fuel.
- A receptor ignition property of 12.6 kW/m^2 has been used for buildings. This is the value commonly used for buildings with unprotected surfaces.
- 'Adequate access to allow fire-fighting' is generally a minimum of five metres. This may be varied dependent onsite conditions, such as obstacles etc. – which would make five metres too narrow. In addition, access should be good on **all** sides of a stack, not just its length.
- All the dimensions and distances given are for standard CRWM storage – that is, an open or baled pile of material on the ground in a storage yard, in a bunker or in a building. They would not apply for specialised storage such as silos, racked storage (e.g. for end-of-life vehicle storage), or treatment systems.

Appendix 4: example of a major hazard entry for a risk register.

Revision:		**Date:**		**Attendees:**		**Signed:**	

Hazard	Potential causes	Initial risk		Controls implemented	Residual risk		How controls will be checked	Any further controls/actions required	Actions	
		Consequence	Likelihood		Consequence	Likelihood			Due date	Date complete
Ignition / combustion of baled CRWM stored externally in Yard ZZ.	▪ Malicious act (e.g. arson). ▪ Embers from offsite source (e.g. grass fire). ▪ Discarded cigarette butts. ▪ Improperly supervised Hot Work. ▪ Self-combustion.	▪ Major fire – loss of life (staff/contractors/emergency responders). (Expand on other consequences that may arise)	Major fires have happened several times within the past few years across the industry. (Expand on other likelihoods that may occur)	▪ Enforced a “non-smoking” policy onsite. ▪ Erected non-combustible bunker walls to separate storage piles and adjacent site buildings. ▪ Adhered to the storage dimensions and separation distance as outlined in EPA Victoria’s “Management and storage of combustible recyclable and waste materials – Guideline”. (Expand on other controls that may be implemented)	A fire that occurs should be contained within a specific pile and not spread to adjacent piles and site amenities. (Expand on other residual consequence that may arise)	A fire could still break out (e.g. through self-heating) but the likelihood of the fire spreading is reduced. (Expand on other residual likelihoods that may occur)	▪ Review of CRWM inventory to ensure that it is up-to-date, and that appropriate storage dimensions are being followed. ▪ Review of site maintenance procedures at weekly toolbox meetings. ▪ Site walks to check that non-smoking policy is being followed. (Expand on other ways controls can be checked)	Had a near-miss (small smouldering fire in pile XZ), fire caused by self-heating) on dd/mm/yy. ▪ Purchasing thermal probes to monitor temperature of CRWM storage.	dd/mm/yy	dd/mm/yy (signed by:)