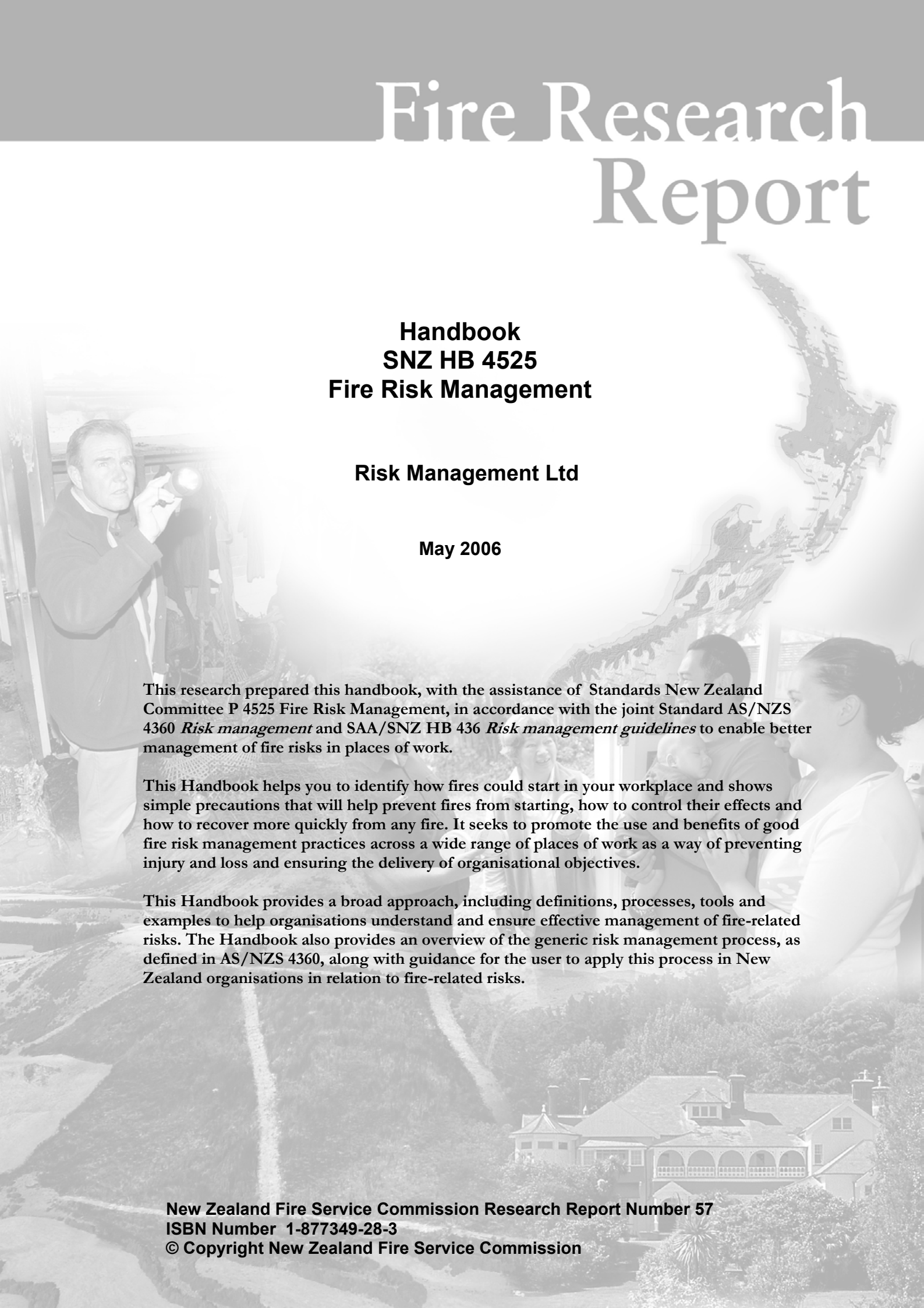
Fire Research Report

Handbook
SNZ HB 4525
Fire Risk Management

Risk Management Ltd

May 2006

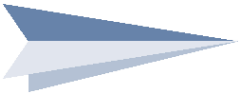


This research prepared this handbook, with the assistance of Standards New Zealand Committee P 4525 Fire Risk Management, in accordance with the joint Standard AS/NZS 4360 *Risk management* and SAA/SNZ HB 436 *Risk management guidelines* to enable better management of fire risks in places of work.

This Handbook helps you to identify how fires could start in your workplace and shows simple precautions that will help prevent fires from starting, how to control their effects and how to recover more quickly from any fire. It seeks to promote the use and benefits of good fire risk management practices across a wide range of places of work as a way of preventing injury and loss and ensuring the delivery of organisational objectives.

This Handbook provides a broad approach, including definitions, processes, tools and examples to help organisations understand and ensure effective management of fire-related risks. The Handbook also provides an overview of the generic risk management process, as defined in AS/NZS 4360, along with guidance for the user to apply this process in New Zealand organisations in relation to fire-related risks.

New Zealand Fire Service Commission Research Report Number 57
ISBN Number 1-877349-28-3
© Copyright New Zealand Fire Service Commission



Handbook on Fire Risk Management

Report to the Fire Service Commission

Report number 2006/008

Final report

Prepared by: Chris Peace

Risk Management Limited
PO Box 7430
Wellington 6242
(T) 04 389 2665
(F) 04 389 1116
(M) 0274 713 723

Email chris.peace@riskmgmt.co.nz

website www.riskmgmt.co.nz

About Risk Management Limited

Risk Management Limited is an independent risk management consultancy established in 2003 to help clients identify, analyse, assess and manage their major risks and to monitor their critical controls over those risks.

Further information about Risk Management Limited is available on our website (www.riskmgmt.co.nz).

About the author of the report

This report was prepared by Chris Peace, the managing director of Risk Management Limited who worked for NGC Holdings Ltd as their risk manager (2000-2003) and who had worked for Jardine Lloyd Thompson in New Zealand (1995-2000) and the UK (1990-1995), Marsh & McLennan in New Zealand (1985-1990) and CIGNA (NZ) Ltd (1982-1985). He holds an MSc in Risk Management and Safety Technology and other qualifications in environmental health, air pollution control and occupational safety and health. Chris is also a Chartered Fellow of the Institution of Occupational Safety and Health (UK); details are available from IOSH at http://www.iosh.co.uk.

Contents

Executive Summary

PROJECT STATUS

Our proposal was for the preparation of a handbook that would be:

- written in plain English
- published by Standards New Zealand
- a workbook that steps business owners and managers (especially in small and medium enterprises) through the fire risk assessment process and the selection of relevant fire risk controls
- aligned with SNZ AS/NZS 4360: 2004 *Risk Management.*

SNZ HB 4525:2006 *Fire Risk Management* Handbook was published by Standards New Zealand on 18 May 2006 after meeting the above criteria.

FURTHER WORK

While the Handbook does not contribute new knowledge it collates what is known in a readily usable form and format. It should therefore contribute to the Fire Service Commission's strategic objectives by enabling the Fire Service and others (eg, the insurance industry and the Department of Labour Occupational Safety and Health Service) to:

- better work in partnership with occupiers of commercial and industrial premises
- help build safer communities
- promote economic and community development.

This will require further work by the Fire Service Commission as outlined on page 4.

ACKNOWLEDGEMENTS

We acknowledge with thanks:

- the substantial financial support of the New Zealand Fire Service Commission through the Contestable Research Fund and the additional financial support of Aon New Zealand Ltd for this project
- the considerable contributions of the members of the Standards New Zealand committee P4525; without their criticisms and contributions of ideas, words and graphics the project would have been far more difficult
- the perseverance, guidance and assistance of the staff of Standards New Zealand.

HB 4525:2006 FIRE RISK MANAGEMENT

A copy of HB 4525 is included in this report as Appendix 1.

Background and methodology

REASONS FOR THE PROJECT

Access to information

There is a wealth of information available about fire prevention, detection and suppression but it can be difficult for operators and managers of businesses to find and apply the relevant information.

Recent and continuing legislative changes (eg, the building warrant of fitness regime and smokefree legislation) have resulted in better control of some of the "traditional" fire hazards but fires continue to damage and destroy commercial and industrial businesses and harm the New Zealand economy.

The project drew on previously published work, including earlier research funded by the Fire Service Commission. Significant publications were noted in the Handbook.

Contribution to Fire Service Commission objectives

The project was designed to contribute to the strategic objectives of the Fire Service Commission by improving the accessibility of easy-to-use information and increasing the options for training and education of business operators in fire safety. These will lead directly to the government goals of "building safe communities" through "working in partnerships with communities".

The Handbook is applicable to a large proportion of New Zealand small and medium enterprises (which make up the majority of employers).

METHODOLOGY

How the aims and objectives were achieved

The project included:

- a review of the economic impact of fires in commercial and industrial buildings to identify the occupations most at risk and, hence, the areas giving the greatest potential impact for the Handbook
- identification of the major causes of fires (ignition sources, materials first ignited, etc) in those occupations using the FIRS database and insurance claims statistics
- identification and description of the common fire risk controls that could prevent ignition or spread of fire or that could result in the early detection or suppression of fire
- development of a risk assessment tool, modelled on AS/NZS 4360: 2004 *Risk Management* and its associated handbook
- preparation of a draft handbook, written in plain English, to provide business owners and managers (especially in small and medium enterprises) with a workbook that steps them through the fire risk assessment process and the selection of relevant fire risk controls.

Work done

The work carried out to develop the Handbook from concept to published document was as follows. We:

- established with Standards New Zealand that the fire risk management handbook was in a project numbered P 4525 leading to a handbook to be named and numbered SNZ 4525 *Fire Risk Management Handbook*
- successfully approached the suggested members of the Standards New Zealand committee and asked for their involvement

- developed draft terms of reference for the consideration of the committee at their first meeting on 14 September 2006
- developed the first draft of DZ HB 4525 *Fire Risk Management* Handbook using precedents set by other Standards New Zealand risk management handbooks
- held the second committee meeting at the Standards New Zealand offices during which we confirmed the terms of reference in light of committee comments at the first meeting
- extensively revised the first draft of DZ 4525 to take account of comments from the committee and the formatting requirements of Standards New Zealand
- using the Standards New Zealand facilities, placed the handbook in the public domain for consultation between November and February
- received six comments on the draft, two of which commented in some detail and pointed to the need for some changes to the draft Handbook; these were considered and necessary changes made to the draft handbook
- responded to a request from the joint Standards Australia and Standards New Zealand committee OB7 (that has oversight of AS/NZS 4360 *Risk Management*) to be represented on the HB 4525 *Fire Risk Management* committee; Roger Estall subsequently represented OB7 and suggested some changes for better alignment of the Handbook with AS/NZS 4360 *Risk Management*
- carried out further field testing of the Handbook which showed the need for some further simplification and clarification
- subsequently made some structural changes to the handbook (including better indexing to help users find entries) and deleted some text while adding other text
- comment had been made earlier that two graphics in HB 4525 did not match Standards New Zealand normal style; replacements were commissioned and inserted into the final draft
- concluded that simply approving publication of the Handbook will not be sufficient to encourage changes to the management of fire-related risks; we comment further on this need later but note here that it will be necessary to actively promote the Handbook by a variety of means that Fire Service Commission communications staff may also be able to advise on
- in accordance with normal Standards New Zealand practice, the revised draft was then circulated to the committee for review and ballot
- the draft Handbook was put through external editing and sent to the Fire Service Commission by Standards New Zealand for review and approval
- the final draft was then submitted to the Council of Standards New Zealand for final approval and then published on 18 May 2006.

Next steps

We believe that HB 4525 provides a tool with which the Fire Service Commission can take advantage of opportunities to improve fire safety in commercial and industrial premises and so contribute to life safety in workplaces in New Zealand. For these opportunities to be realised we believe that the Fire Service Commission will need to consider to following options.

- Training
- Communication
- Liaison with insurers
- Legislation

TRAINING

For the Handbook to be fully applied by small and medium businesses (SMEs), training may need to be available through a variety of providers. In all cases, it may be relevant to liaise with the New Zealand Qualifications Authority on approvals for such courses. In outline, we believe that the training should cover:

- managing fire safety
- principles of fire
- causes and prevention of fire
- fire protection in buildings
- safety of people in the event of fire
- fire risk assessment.

COMMUNICATION

Communications with SMEs and other employers will need to take into account:

- cultural and social factors
- need for pre-testing communications
- frequency of communications
- variations in understanding of fire risks.

We believe that your corporate communications team will be able to help adapt your existing fire risk communications plan to include HB 4525.

LIAISON WITH INSURERS

Insurers have a strong interest in any reduction in fires in businesses. We believe they will welcome the opportunity to disseminate HB 4525 as a methodology and so persuade clients to better manage fire risks.

LEGISLATION

We believe that the current Fire Services Act and subordinate fire safety legislation needs to be amended so that it is aligned with the general duties set out in the Health and Safety in Employment Act. HB 4525 could then be applied as an approved code of practice under the amended Act and conformance with HB 4525 used as evidence of compliance with the amended Act.

This pattern has been followed in the UK where legislation has moved from a prescriptive model to standards setting model and now requires ownership of fire risks and controls to be held by business operators.

Appendix 1: HB 4525:2006 *Fire Risk Management*

SNZ HB 4525:2006

New Zealand Handbook

Fire Risk Management Handbook

SNZ HB 4525:2006

COMMITTEE REPRESENTATION

This Handbook was prepared under the supervision of the Fire Risk Management Committee (P 4525), the Standards Council established under the Standards Act 1988.

The committee consisted of representatives of the following nominating organisations:

Aon New Zealand Ltd
First Windows
Institution of Fire Engineers
New Zealand Fire Service
Risk Management Ltd
Wellington City Council

ACKNOWLEDGEMENT

Standards New Zealand gratefully acknowledges the contribution of time and expertise from all those involved in the development of this Handbook.

Special thanks to the New Zealand Fire Service Commission for its substantial funding for this project, and to Aon New Zealand Ltd who provided additional funding.

COPYRIGHT

The copyright of this document is the property of the Standards Council. No part of it may be reproduced by photocopying or by any other means without the prior written approval of the Chief Executive of Standards New Zealand unless the circumstances are covered by Part III of the Copyright Act 1994.

Standards New Zealand will vigorously defend the copyright in this Handbook. Every person who breaches Standards New Zealand's copyright may be liable to a fine not exceeding $50,000 or to imprisonment for a term not to exceed three months. If there has been a flagrant breach of copyright, Standards New Zealand may also seek additional damages from the infringing party, in addition to obtaining injunctive relief and an account of profits.

Standards New Zealand accepts that the substance of the Handbook will be made available electronically free of charge by the New Zealand Fire Service Commission through its website.

Published by Standards New Zealand, the trading arm of the Standards Council, Private Bag 2439, Wellington 6140. Telephone (04) 498 5990, Fax (04) 498 5994. Website www.standards.co.nz

AMENDMENTS

No.	*Date of issue*	*Description*	*Entered by, and date*

SNZ HB 4525:2006

New Zealand Handbook

Fire Risk Management Handbook

ISBN 1-86975-048-9

NOTES

CONTENTS

Appendix

Table

Figure

REFERENCED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARDS AND SPECIFICATIONS

NZS 3902:2004	Housing, alterations and small buildings contract
NZS 3910:2003	Conditions of contract for building and civil engineering construction
NZS 3915:2005	Conditions of contract for building and civil engineering construction (where no person is appointed to act as engineer to the contract)
NZS 4503:2005	Hand operated fire-fighting equipment
NZS 4512:2003	Fire detection and alarm systems in buildings
NZS 4515:2003	Fire sprinkler systems for residential occupancies
NZS 4541:2003	Automatic fire sprinkler systems
NZS 4781:1973	Code of practice for safety in welding and cutting
SNZ PAS 4509:2003	New Zealand Fire Service fire fighting water supplies code of practice

JOINT AUSTRALIAN/NEW ZEALAND STANDARDS AND HANDBOOKS

AS/NZS 1020:1995	The control of undesirable static electricity
AS/NZS 1221:1997	Fire hose reels
AS/NZS 1841:1997	Portable fire extinguishers (all Parts)
AS/NZS 3760:2003	In-service safety inspection and testing of electrical equipment
AS/NZS 3931:1998	Risk analysis of technological systems – Application guide
AS/NZS 4360:2004	Risk management
AS/NZS 4801:2001	Occupational health and safety management systems – Specification with guidance for use
AS/NZS ISO 9000:2000	Quality management systems series
AS/NZS ISO 14000 (Set)	Environmental management standards series
SAA/SNZ HB 221:2004	Business continuity management
SAA/SNZ HB 436:2004	Risk management guidelines

AUSTRALIAN STANDARDS AND HANDBOOKS

AS 1319:1994	Safety signs for the occupational environment
AS 1674.1-1997	Safety in welding and allied processes – Fire precautions
AS 4214:2002	Gaseous fire extinguishing systems
SAA HB 141:1999	Risk financing guidelines
SAA HB 240:2004	Guidelines for managing risk in outsourcing
SAA/SNZ HB 436:2004	Risk management guidelines

➤

BRITISH STANDARD

BS 5378:

Part 1:1980 Safety signs and colours – Specification for colour and design

OTHER PUBLICATIONS

ACC 442: 2002 *Workplace Safety Management Practices* Accident Compensation Corporation, Wellington, NZ

Collier, P. and Baker, G. (2004) *Improving the Fire Performance of Polystyrene Insulated Panel in New Zealand* Research Report 45: NZ Fire Service Commission, Wellington, NZ

Department of Labour *Hot work on drums and tanks* ISBN 0 477 03420 9 Wellington, NZ

ERMA (2001) *User Guide to the HSNO Control Regulations* ER-UG-05-1 11/01: Environmental Risk Management Authority, Wellington, NZ

Goodchild, M., Nana, G., and Sanderson, K. (2002) *An Economic Assessment of Industrial Fires in New Zealand* Research Report 28: NZ Fire Service Commission, Wellington, NZ

Rylands v Fletcher and Another Volume XIX NS Reports The Law Times p. 220 [1868]

Department of Building and Housing – New Zealand Building Code – Compliance Documents

B1 – Structure

B2 – Durability

C – Fire Safety in Buildings

D1 – Access routes

D2 – Mechanical installations for access

F1 – Hazardous agents on site

F2 – Hazardous building materials

F3 – Hazardous substances and processes

F4 – Safety from falling

F5 – Construction and demolition hazards

F6 – Lighting for emergencies

F7 – Warning systems

F8 – Signs

G12 – Water supplies

NEW ZEALAND LEGISLATION

Building Act 2004

Crimes Act 1961

Fire Safety and Evacuation of Buildings Regulations 1992

Fire Service Act 1975

Hazardous Substances and New Organisms Act 1996

Hazardous Substances Regulations 2001 – 2004

Hazardous Substances (Emergency Management) Regulations 2004

Health and Safety in Employment Act 1992

Resource Management Act 1991

New Zealand Building Code 1992

LATEST REVISIONS

The users of this Handbook should ensure that their copies of the above-mentioned New Zealand Standards are the latest revisions. Amendments to referenced New Zealand and Joint Australian/New Zealand Standards can be found on www.standards.co.nz

NOTES

Fire Risk Management Handbook

1 Scope and Interpretation

1.1 Purpose of this Handbook

The Standards New Zealand Committee P 4525 Fire Risk Management has prepared this Handbook in accordance with the joint Standard AS/NZS 4360 *Risk management* and SAA/SNZ HB 436 *Risk management guidelines* to enable better management of fire risks in places of work.

This Handbook helps you to identify how fires could start in your workplace and shows simple precautions that will help prevent fires from starting, how to control their effects and how to recover more quickly from any fire. It seeks to promote the use and benefits of good fire risk management practices across a wide range of places of work as a way of preventing injury and loss and ensuring the delivery of organisational objectives.

This Handbook provides a broad approach, including definitions, processes, tools and examples to help organisations understand and ensure effective management of fire-related risks. The Handbook also provides an overview of the generic risk management process, as defined in AS/NZS 4360, along with guidance for the user to apply this process in New Zealand organisations in relation to fire-related risks.

1.2 Scope

1.2.1 Inclusions

This Handbook includes guidelines and tools (e.g. worksheets) for assessing and managing typical fire risks in small and medium-sized businesses engaged in manufacturing, storage, commerce, community services, infrastructure and other activities.

1.2.2 Exclusions

The Handbook is not designed to apply:

(a) To industrial processes that are complex or pose special fire risks;

(b) Outside the workplace;

(c) To residential accommodation.

Sufficient information is provided about the technical characteristics of fire to allow sound decision making. Nevertheless it is possible that particular building owners or occupiers may need to obtain additional advice or assistance. The Handbook identifies some of the available sources of such support.

1.3 Who should use this Handbook?

People in New Zealand organisations range from very knowledgeable and experienced in risk management to those for whom this is a new responsibility. This Handbook has been designed for anyone managing or operating a small or medium-sized organisation in New Zealand but it could be used in any size or level of an organisation as a way of consistently assessing and managing fire-related risks in any workplace.

1.4 How to use this Handbook

This Handbook will take the user through a series of actions from identifying fire risks to reducing them to an acceptable level and monitoring and communicating them. Appendix A also gives a glossary of terms. While the Handbook contains a step-by-step set of worked examples (based on a small to medium-sized business) it is not an instant solution. It is meant to provide a simple and user-friendly framework to assist with managing the risk of fire. However, fire risk management requires ongoing thought and continuing attention from all personnel at all times.

1.5 Structure and use of this Handbook

The diversity of organisations for which this Handbook has been prepared means that some of the advice is necessarily general in nature and some readers will find they are already familiar with one or more sections.

As a general guide:

(a) Readers who have need to learn about risk management should read section 2, *Introduction;*

(b) Readers who have need to learn about fire and how fire spreads should read section 3, *Understanding fire;*

(c) All readers should work through section 4 (*A framework for managing fire risk*) and section 5 (*The risk management process and fire hazards*);

(d) All readers should use or adapt the sample worksheets in Appendix B;

(e) All readers should review the suggested risk controls and risk treatments in Appendix C and decide which will work for their organisation or location.

(f) Readers will find information on legal responsibilities in Appendix D and information on other resources in Appendix E.

1.6 Future actions

You can think about fire risk management as a pathway. At this point you may be anywhere on the pathway from just getting started to delivering model fire risk management. You might start by making a commitment to learning the core principles of risk management and thinking about them as you go about your work.

At a suitable point in the future you may decide to begin formalising your approach. Eventually you might progress to a fully documented and integrated risk management framework that incorporates management of fire risks and many of the other risks that your organisation faces.

It is generally recognised that risk is being managed e*ffectively* in an organisation if the following apply:

(a) The organisation has clear risk management goals and constantly chooses and applies its risk management techniques accordingly;

(b) The organisation has a “real time” understanding of its risks and recognises that most decisions about the organisation – whether of a strategic or operational nature – will have risk implications. It will thus routinely *anticipate* risk as part of its decision-making, rather than periodically *react* to risks that already exist;

(c) The organisation and its people have sufficient technical understanding of the various sources of risk (in this case, fire-related risk) to allow effective risk management decisions; and

(d) The processes used to manage risk are integrated into the general processes of management and are broadly consistent across all sources of risk. (This recognises that "risk" in any organisation is defined by the organisational objectives.)

Don't panic! The Handbook is not intended to be a rigid set of requirements. It is designed to help you understand the key elements of good fire risk management, but the extent to which you apply the risk management framework is up to you. The approach and the sample worksheets provided may be customised to suit your needs and available resources.

2 Introduction

2.1 What is risk management?

AS/NZS 4360 defines risk as, "the chance of something happening that will have an impact upon objectives". Risk may have a positive or negative effect, and is measured in terms of consequences and likelihood.

Risk is inherent in everything we do. In general, we take a risk in order to benefit from an opportunity. When we consider opportunities, we weigh up the risks, look at the benefits we might achieve, and make our decisions accordingly. For example, an organisation may invest in a new process or activity intending to improve services, products or profits. The investment will carry risks that could result in losses (e.g. inadequate demand for a new product) as well as the opportunity to make a profit.

The purpose of formalising risk management is to apply a process to identify risks, set an acceptable level for risk, and take steps to keep residual risk at that acceptable level.

How we decide what is an acceptable level is influenced by legal standards, our personal risk tolerances and societal views. Legal standards are established in legislation (such as the Health and Safety in Employment Act 1992) and in common law (also known as judge-made law) through lawsuits brought by people when things go wrong. An individual's risk tolerance is the level of risk that he or she is willing to take, considering the opportunity at hand.

We manage risk by developing responses to reduce the consequences of adverse incidents, their likelihood, or both. In order to do this, we need to identify risks and the hazards that give rise to risks, assess their consequences and likelihood, and design a treatment (response) plan.

2.2 Why manage risk?

2.2.1 General

We manage risk to optimise the balance between risk and opportunity. That is, we want to increase the chances that we will achieve something, and reduce the chances that anything will go wrong. These days, legal and economic imperatives also provide powerful incentives to take a systematic approach to managing risk.

By managing risk, you can improve your performance. A key way to reduce the likelihood of something untoward happening and to achieve the best possible results is to apply good practice. For example, you might apply good fire prevention to a finished goods warehouse to ensure you can deliver the goods to your customers on time. As an added benefit, you may find that you improve your financial position by reducing insurance costs.

Many New Zealanders own, manage or work in small and medium-sized businesses. Such businesses account for 98 % of places of work in New Zealand. A relatively small fire can badly damage or destroy a business and take with it the livelihood of several people. If the fire occurs in business hours, it may also endanger their safety or, occasionally, kill them.

2.2.2 Relationship between hazard and risk

A hazard is a source of potential harm whereas risk is the chance of something happening that will have an impact on objectives. Thus, a fire in a furnace may be a hazard that could escape and set fire to a building; the fire might become a risk if loss of the building could have an impact on objectives.

2.2.3 Levels of risk

There are several ways of looking at risk:

(a) Absolute risk – the inherent risk in a situation that has no controls present or the worst thing that could happen if you don't do anything about a risk. There may be inherent controls that reduce the absolute worst case such as a large separation between two buildings that prevents a fire from spreading from one to the other. The separation is an inherent control.

(b) Current risk – the level of risk when assessed with the current controls may also be called the controlled risk. Controls are actions taken by management to increase the likelihood that objectives will be achieved. A fire risk control might be the provision of enough extinguishers to attack a small fire. The difference between the absolute and current levels of a risk is due to the controls that are in place. The greater the difference, the more important are your controls and the more effort that may be needed to make sure they work as intended.

(c) Treated or target risk – the remaining level of risk after risk treatment. Treatments are actions taken to reduce the level of controlled risk to an acceptable level. A fire risk treatment might be the improvement of housekeeping on a manufacturing site.

(d) Perceived risk – an individual's subjective assessment of the risk at any time – how risky you think the situation is.

For example, poor housekeeping might result in a build-up of combustible materials near electrical equipment. The absolute risk of a fire might be high if the electrical equipment is poorly maintained. With good housekeeping and maintenance, the fire risk becomes moderate (the equipment might still malfunction and catch on fire). Because the perceived risk is that there is a low or non-existent risk of fire, it is difficult to communicate the need for risk reduction.

2.2.4 A risk management model

The above ideas are gathered together in section 5 to show how the risk management process is used to manage fire risks.

3 Understanding fire

Fire can be good or bad, useful or threatening, absolutely essential but potentially lethal. Fire can be:

(a) *Controlled* – when it is used for benefit (cooking, light, heat, industry, propulsion etc.);

(b) *Uncontrolled* – often when it is unintentionally started and grows to destroy property, lives or environment (e.g. wildfires, bush fires, house fires, conflagrations, explosions).

3.1 What is burning?

3.1.1 General

Burning occurs when a fuel combusts and gives off enough heat to keep the burning going. Nearly 21 % of the air is oxygen so there is generally enough for a fire to burn. Sometimes, other substances can act as an oxidiser. Chlorine, organic peroxides, ammonium nitrate and sodium nitrate can oxidise a fuel to produce burning. Materials that burn freely in air can burn violently in oxygen and some other oxidising substances.

When the burning is slow, without any flames, it is often called smouldering. When it is extremely fast, as when a gas leak mixes with air, we sometimes get an explosion. In between we get flaming fires.

Fuels come in many different forms. Some are gases such as those used in gas cookers, some are liquids like petrol, and some are solids like wood and coal.

Fuels that are gases burn freely because the gas and the oxygen can mix easily. For a liquid to burn, the heat from the fire must boil off some of the fuel so that it becomes a vapour and can mix with the oxygen in the air. For a solid fuel to burn, the heat from the fire has to break down the fuel into vapours that can mix with oxygen in the air.

The burning process is a continuous chemical reaction between oxygen and fuel particles, which have been heated up to their ignition temperature. This is often represented by the triangle of fire – see figure 1. Take any one component away and the fire goes out.

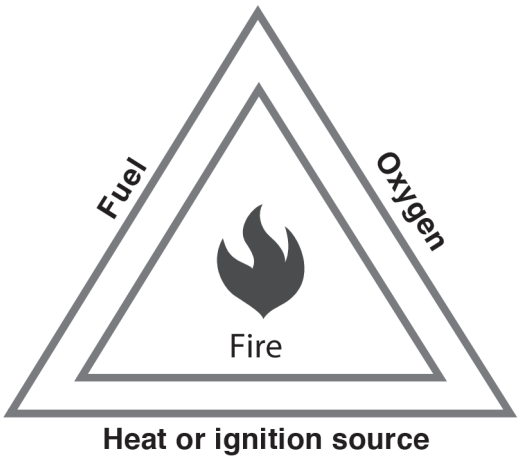


Figure 1 – Triangle of fire

3.1.2 Ignition sources

Fires start when an ignition source containing enough energy heats up a fuel to its piloted or auto-ignition temperature. Small pieces of wood or paper will need much less energy to ignite than big pieces of wood or paper that are packed together.

Table 1 summarises the main ignition sources in New Zealand and overseas.

Table 1 – Ignition sources

Ignition source	Percentage
Arson	40 %
Failure or improper use of electrical equipment or electrical wiring systems that are overloaded	15 %
Carelessly discarded lighted cigarette materials	15 %
Hot work operations (welding and cutting) and failure to follow hot work permit procedures	15 %
Other causes including: • chemical reactions • spontaneous ignition or self-heating • friction (when mechanical equipment is poorly lubricated or maintained) • external fires (sparks or radiated heat) • static electricity	15 %

3.1.3 Fuels

For a fire to start, the fuel must be in the right form. For example, it is relatively difficult to set wood on fire when it is in the form of a newly felled tree trunk. After drying and cutting into smaller pieces of wood, it is easier to set on fire. If the wood is converted into paper, it is very easy to set on fire. If the wood is reduced to particles of wood dust in air, it can burn so fast that it explodes.

Fuel can be in a solid form (e.g. wood, paper, plastic or cotton) that is easy to see and manage. It can be in liquid form (e.g. petrol or oil) that needs to be contained in a tank or smaller container. Or it can be gaseous (e.g. natural gas) and need to be delivered in a pipe or tank. Sometimes, a fuel can be in different forms: LPG is a liquid when it is very cold but as it warms up to room temperature the liquid boils and forms an invisible vapour that, being heavier than air, can flow along the ground or in drainage channels.

3.1.4 Oxygen

Oxygen is in the air we breathe. We cannot see, smell or touch it. Sometimes, oxygen is stored in cylinders so that it can be used to speed up a controlled fire (e.g. in oxy-acetylene welding). If it escapes through a leaking valve or hose, the oxygen can make it much easier for some fuels to be ignited (e.g. grease on clothing can be set on fire very easily in an oxygen-rich atmosphere).

3.1.5 Breaking the triangle of fire

If we can remove or reduce one side of the triangle when a fire has started, the fire will go out. This is how fire extinguishing systems work. For example:

(a) Water will cool a fire so there is not enough heat for it to continue burning;

(b) Foam can smother a burning liquid and so remove the fuel from oxygen or the air;

(c) Some extinguishing agents stop the chemical reaction between the fuel and oxygen in the air.

Also, if we can keep one side of the triangle away from the other sides a fire cannot start. In practical terms it is easier to prevent ignition sources from reaching fuels.

3.2 How do fires start?

All fires start with an ignition source that is either new or is no longer properly contained. For ignition to occur, all the following conditions must exist simultaneously and be continuous.

(a) Sufficient heat must be present to provide the required energy ("kinetic energy") for the chemical reaction to start. If there is insufficient energy, the molecules do not react with each other. The energy to cause ignition might be in the form of a match or a spark or a cigarette. All fuels require different amounts of heat energy to cause an ignition; some are easier to ignite than others;

(b) There has to be enough fuel vapour in the air; not too much, not too little; and

(c) There has to be sufficient oxidiser (air).

Once started, a fire is easily visualised as a self-sustaining "heat engine". A fire is the combustion of vaporised fuel, which when burnt produces heat, which in turn converts more fuel into vapour, thus continuing the combustion cycle. The speed with which a fire grows will then depend on what is available to burn and how it is arranged. Some fuels can quickly spread fires around a building while others burn locally.

Remember, if there is no ignition there is no fire. Prevention is better than a cure.

3.3 How fast do fires grow?

The rate of fire growth depends on the fuel that is burning, and how much air can get to the fire. Fires in liquids and gases can grow very fast but some solid materials also burn very easily. Thin materials like cardboard burn faster than thick materials such as wood.

Fire tests have shown that some materials stored in warehouse racking will burn very fast and can spread a fire across spaces between the racking.

A high fire load could result in a very large fire.

3.4 How does heat move around?

The good, and bad, effects of fire result from the movement of heat away from the flame and into the adjacent area.

The study of heat is a subject in itself, with the movement of heat (heat transfer) categorised into three different modes:

(a) *Convection* – the transfer of heat by moving particles or liquids or gases, like the heat that flows out of a kettle in a flow of steam;

(b) *Conduction* – the transfer of heat through a solid, like the heat we feel when we touch the outside of a hot stove; and

(c) *Radiation* – the transfer of heat by infrared electromagnetic radiation, heat we can feel without touching like the heat from the sun or from a ceiling heater in the bathroom or from a campfire.

NOTE – All these processes of heat transfer are shown in figure 2.

(1) A fire has started in some office furniture stored in a room and the hot smoke cannot escape.

(2) Heat is being transferred from the fire to the smoke by convection and the heat is rising from the fire in a plume of hot smoky gases.

(3) Heat is transferred from the smoke to the ceiling and the walls by convection.

(4) The ceiling has heated up and is radiating heat back down to the surroundings, including some office equipment.

(5) The fire is also radiating heat outwards to the rest of the room and the hot smoke is radiating heat downwards to the floor and the rest of the material in the room.

(6) Some of the heat is being conducted through a wall to heat up cardboard boxes in the next room. The boxes have become hot enough to ignite.

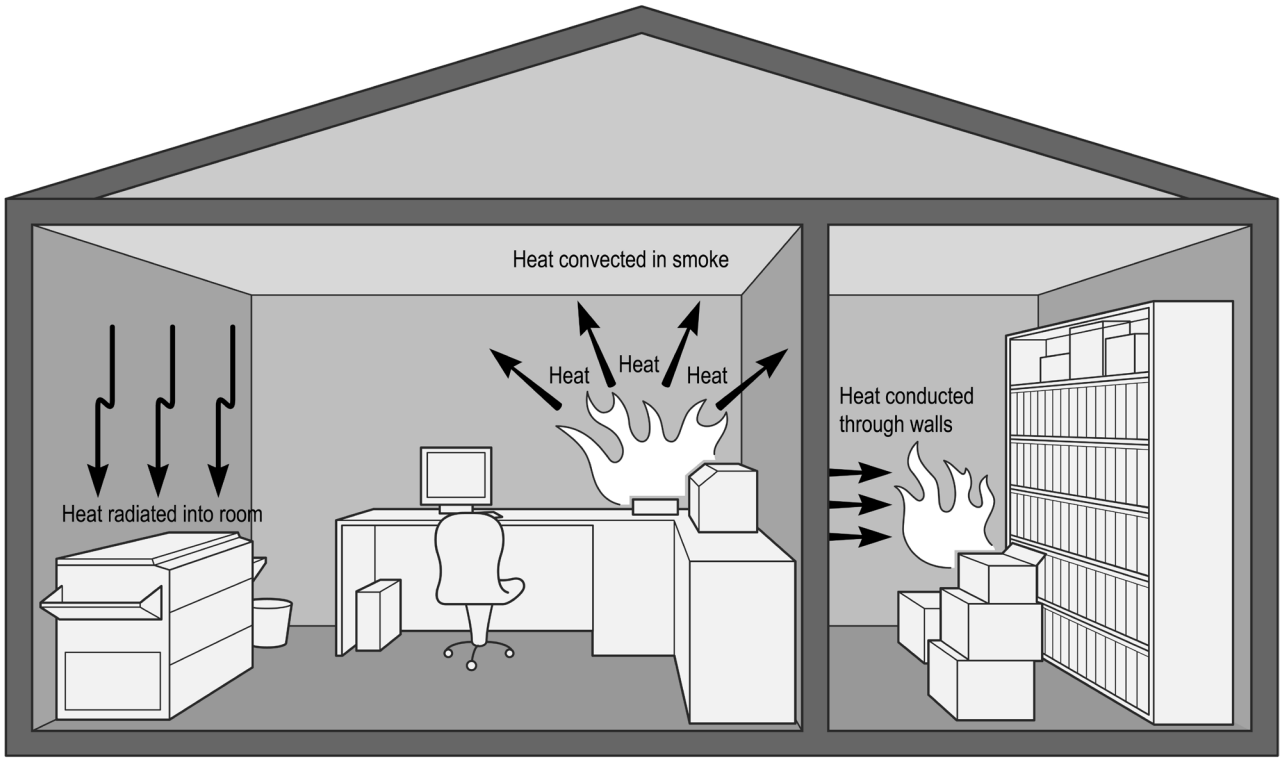


Figure 2 – How heat moves around

3.5 What is smoke?

Smoke from fires is very hot and contains the products of combustion. These almost always include water vapour and the gases carbon monoxide and carbon dioxide. Some gases produced by burning (e.g. carbon monoxide and carbon dioxide) are very poisonous and others are irritating and cause coughing or streaming eyes. Smoke also contains particles of unburned carbon that make it look black. Smoke therefore endangers people. ➤

Because smoke is usually much hotter than the surrounding air it has buoyancy and can move through openings and doors to the top of a building and gradually fill it.

In figure 3, a layer of smoke has built up inside a room and has begun to move into the corridor. The smoke will then rise to the highest point in the building unless a wall or ceiling blocks its path. The smoke will then spread across the ceiling and fill the space downwards.

All the time, heat from the smoke is warming up the building and building contents. Eventually, other parts of the building, remote from the original fire, could be set on fire by the heat from the smoke. This is especially dangerous if the smoke is spreading in a ceiling void or some other space that cannot be seen.

If you can see (or smell) smoke, treat it as harmful, because it:

(a) Makes it difficult to see;

(b) Is an indication of a nearby fire;

(c) Contains poisonous gases;

(d) Can transfer heat quickly and spread fire closer towards you;

(e) Reduces the level of visibility and light illumination; and

(f) Contains unburned flammable gases and can ignite suddenly.

When moving in smoke stay low – remember that smoke tends to rise.

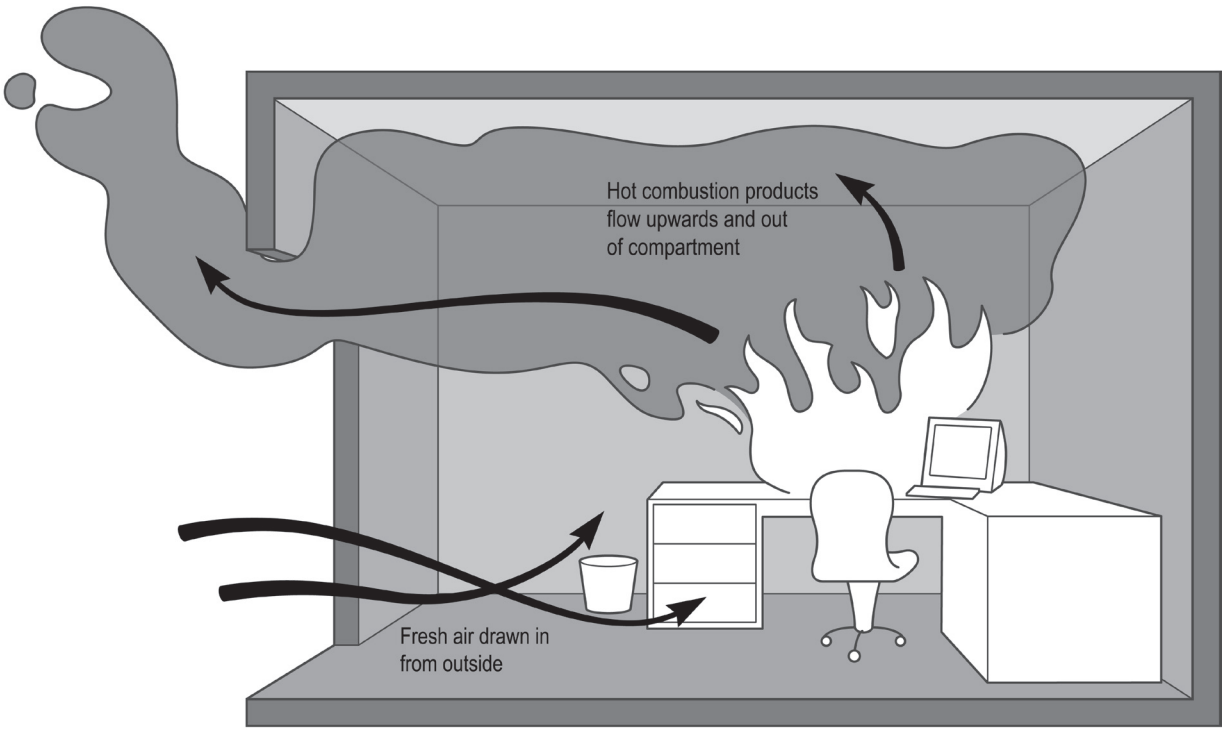


Figure 3 – How smoke spreads in a building

3.6 What happens when items in a room catch fire?

Fires can burn fast in enclosed spaces such as rooms. This is because the trapped smoke in the room radiates heat back to the contents of the room, which heat up until they are hot enough to ignite.

A fire cannot burn without air. So if all the doors and windows in a room are closed, and the windows do not break, the fire will probably go out. But if there is an open window or door, fresh air to feed the fire can flow in, and smoky gases will flow out.

Usually the hot smoky gases will form a layer in the top of the room and there will be a clearer layer of cool air near the floor. This air is drawn into or entrained in the smoke plume that rises from the fire. As the fire grows the smoky layer descends closer to the floor and becomes hotter and blacker.

At this stage conditions are very dangerous for anyone left inside the room. Also the hot smoke that is flowing out of the door is moving around the rest of the building, threatening people elsewhere.

Figure 4 shows the stages in the development of a fire.

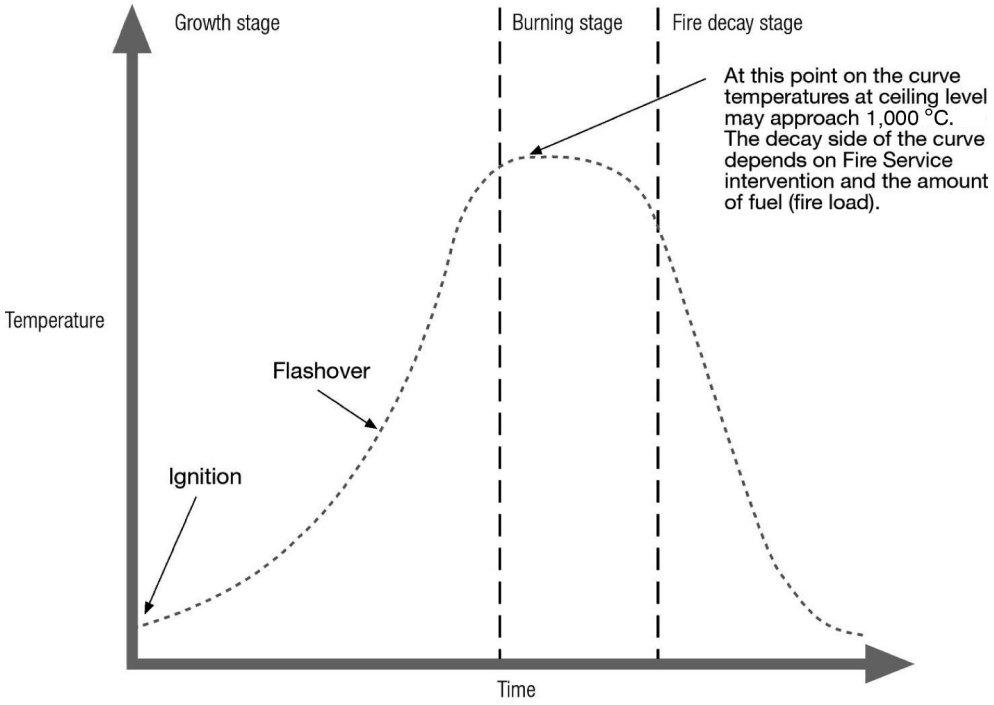


Figure 4 – Stages in a fire

3.7 What is flashover?

As the smoky gas layer in a room becomes hotter it radiates more and more heat to the rest of the contents of the room. Finally, the whole room catches fire, almost explosively. This is flashover.

After flashover the room is essentially in burning free fall mode, only limited by the availability of oxygen. Flames come out of windows and doors and it is most likely that the fire will quickly spread to other parts of the building. The fire is now very difficult to control. ➤

The temperature of the hot smoky gases at the time of flashover is about 600 ºC. This is extremely hot, nearly red hot. But after that the temperature of the room may climb to over 1000 ºC. The room will carry on burning until it has consumed all the fuel, or until fire fighters put it out.

Flashover can occur within three minutes of a fire starting.

3.8 How do we detect fires?

Since fires grow so fast and become deadly so quickly, it is important that we detect them early, preferably with an automatic system. Automatic fire alarms designed and built to NZS 4512 *Fire detection and alarm systems in buildings* can do this.

Because smoky gases rise to the top of the room, smoke-detector based fire alarms that comply with NZS 4512 will usually give the earliest detection of a growing fire while it is small. Heat-detector based fire alarms that comply with NZS 4512 give a slightly slower warning than smoke-detector based systems.

If an automatic fire alarm is connected to the Fire Service it will not only sound the evacuation alarm inside the building but will also send a signal calling the Fire Service. This is especially important if a fire starts after-hours. Some automatic fire alarms may be connected to a monitoring station. While they will sound the evacuation alarm the Fire Service may take longer to be called, resulting in more risk to people and damage to property.

However, regardless of the type of detector, an automatic fire alarm will do no more than signal the alarm and does nothing to stop the growth of a fire. Such fire alarms are therefore only a part of a planned emergency response plan. During work hours, an emergency response plan must include evacuation and may include some attack on the fire with extinguishers or fire hose reels until the Fire Service arrives. After hours, the emergency response plan will probably require a response from the Fire Service and call-out of designated staff. In either case, the Fire Service should know something of the activities in the workplace and the substances you use.

An automatic sprinkler system takes slightly longer to detect a fire than an automatic smoke-detection system but, once activated, sprinklers will spray water onto the fire while it is still small and signal the Fire Service through an automatic alarm connection. Whilst a sprinkler system may be more expensive than a heat or smoke-detector system, it not only detects the fire, but controls it while signalling the alarm and calling for Fire Service help. In many cases, sprinkler systems extinguish fires before the Fire Service arrives.

3.9 The cost of fires in places of work

3.9.1 General

Some research in New Zealand (Goodchild et al, 2002) found that the total cost of the 2719 workplace fires in one year was:

(a) 3 fatalities, 3 serious injuries and 25 non-life threatening injuries;

(b) 209 full time equivalent jobs affected;

(c) $8.5 million due to injuries and fatalities;

(d) $44 million to the businesses affected;

(e) $23 million to the Fire Service;

(f) $8.5 million indirect economic costs; and

(g) $2.1 million indirect effects of reduced consumption.

3.9.2 Occupations and activities most at risk

The same research showed that over the five years from 1996 to 2000, the 10 areas in the New Zealand economy most at risk of suffering from fires were (in descending order):

(f) Wood and paper product manufacturing;

(g) Electricity and gas supply;

(h) Food, beverage and tobacco manufacturing;

(i) Water supply, sewage and drainage services;

(j) Non-metallic mineral product manufacturing;

(k) General manufacturing;

(l) Accommodation, cafes and restaurants;

(m) Storage and wholesaling;

(n) Petroleum, coal, chemical and associated products manufacturing;

(o) Food retailing.

A few fires involved various sorts of processing equipment, but the great majority of workplace fires involve careless disposal of cigarettes, faults in electrical systems, overheating and the use of cooking equipment.

In general, records in New Zealand and overseas show that the main causes of fires are consistently:

(a) 15 % carelessly discarded lighted cigarette materials;

(b) 15 % hot work operations – failure to follow hot work permit procedures;

(c) 15 % failure, or improper use of electrical equipment and systems;

(d) 40 % arson;

(e) 15 % other causes such as chemical reactions, spontaneous ignition, etc.

Recently, arson has become a very serious cause of fires; in some parts of New Zealand it now accounts for 50 % of fires.

Looking at these ignition causes, will suggest how fire-related risks could be minimised in many workplaces.

3.10 Risks due to fires

3.10.1 Physical risks

The risk of injury or damage by fire could arise from a number of causes, for example: by burns from an out-of-control process; from a fire burning in a workplace; from an explosion involving a hazardous substance; or from fire spreading to adjacent property.

Injuries, deaths and damage to property due to fire-related risks can also give rise to other consequences such as dissatisfied customers, business disruption, prosecutions and loss of profits.

3.10.2 Business risks

Regardless of whether a business operates in the public, private or not-for-profit sector, organisations need to set goals and objectives, raise funds to develop goods or services, market themselves, sell goods or provide services and maintain their ability to operate.

A minor fire can severely disrupt these functions and have a serious impact on organisational objectives.

A large fire can totally disrupt normal business for protracted periods, resulting in loss of business and assets. After large fires, businesses can take months to restart or can even become bankrupt.

3.10.3 Legal compliance risks

Organisations and all their employees have legal duties to make sure that people who could be affected by workplace activities are not harmed by them. They risk legal action and fines and sanctions if they do not comply with these duties. Most organisations will also have in-house standards and rules. Legal compliance means doing the things that people and organisations must do to comply with their legal duties and in-house rules, irrespective of whether they directly contribute to achievement of the business objectives of the organisation.

Appendix D sets out the legal background to fire risks in places of work. Here, it is enough to note that it is a legal requirement to protect from harm people who could be affected by a fire in your place of work. This will mean taking all practicable steps to reduce the risk of fire and having emergency plans for evacuation if a fire does occur.

4 A framework for managing fire risk

4.1 Overview

A formal approach to management of fire-related risks will require top management direction and support, probably including a formal policy and written accountabilities. For some places of work, a formal management system that incorporates fire risk management will help maintain good management control of other workplace risks.

Any effective framework for managing risks needs to incorporate:

(a) A management policy;

(b) Responsibilities and accountabilities for managing risks;

(c) Processes and procedures; and

(d) Tools, information and documentation.

4.2 Policy

A fire risk management policy is important to record the organisation's commitment to managing fire risk, the principles it will apply, who will be responsible and accountable for aspects of risk management, and when key activities will be undertaken. A documented policy provides the formality to ensure that fire risk management receives the intended level of attention. This does not need to be a large or complicated document, but it should be developed with careful thought about the commitment being made and the resources available. A fire risk management policy should include top management commitment to:

(a) Achievement of business goals and objectives;

(b) Accountabilities for areas of risk management and specific activities;

(c) Compliance with relevant legislation;

(d) Prevention, detection and control of fire;

(e) Continual improvement of the management of fire-related risks; and

(f) Regular review and revision of the policy.

4.3 Responsibility and accountability

4.3.1 General

Fire risk management is everyone's business but successful implementation of a fire risk management system will require allocation of appropriate accountabilities to nominated individuals throughout the organisation. While nominated employees will have specific roles and responsibilities in the strategy, everyone in an organisation needs to be informed and aware of the fire risk management strategy. For example:

(a) *The executive* is responsible for setting out strategies, making sure the resources needed to deliver the strategies are in place and associated fire risk and compliance issues are met.

Example: There is long-term investment in a change from using flammable liquids in a process to a process that uses water as the solvent. ➤

(b) *Managers* are responsible for ensuring employees and contractors have the necessary skills, raw materials and production equipment to deliver the required services or products and knowing the organisation rules.

Example: Employees have approved containers for safely carrying flammable liquids from the dangerous goods store to the place of use.

Example: Fire prevention responsibilities are allocated to production employees while maintenance or property management employees are allocated responsibilities for maintenance of fire detection and suppression equipment.

(c) *Employees* are responsible for working responsibly to get the defined job done and minimise the likelihood of injury.

Example: Employees have been trained in and understand the safe ways of using flammable liquids.

(d) *Contractors* are responsible for understanding and carrying out the instructions given to them.

Example: Contractors know how flammable liquids are managed on site and what they are expected to do to conform to the management system.

4.3.2 Management system

The most effective, long-term way of managing fire risks is to build your fire controls into a management system. For example, developing an occupational health and safety management system (OHSMS) that incorporates fire safety can make the management of fire risks easier. Such a system also contributes to the wider management of business and legal compliance risks. The following are points to note:

(a) The most significant fire safety legislation (the Health and Safety in Employment Act 1992, the Hazardous Substances and New Organisms Act 1996, the Fire Safety and Evacuation of Buildings Regulations 1992 and the Building Act 2004) do not specifically require an OHSMS but such a system will help make compliance with that legislation easier;

(b) AS/NZS 4801 *Occupational health and safety management systems,* describes the establishment of an OHSMS;

(c) The Accident Compensation Corporation (ACC) offers premium discounts for an audited OHSMS that meets the workplace safety management practices standards (refer to ACC 442). These standards were developed from AS/NZS 4801;

(d) Insurance companies may offer reduced premiums to organisations that demonstrably manage the risk of fire.

Therefore, there can be good legal compliance and financial reasons to develop an OHSMS that conforms with AS/NZS 4801. Alternative management systems include:

(A) Quality management systems that conform with the AS/NZS ISO 9000 series;

(B) Environmental management systems that conform to the AS/NZS ISO 14000 Environmental management standards series.

4.4 Process

Section 5 explains the generic risk management process as set out in the Standard AS/NZS 4360 *Risk management*. While that Standard does not aim to promote uniformity of risk management systems, it sets out the elements of an effective risk management process.

Risk management should be part of everything you do, not a separate management process. However you approach managing your organisation, there will be opportunities to build risk management disciplines into your current processes. Whether your planning processes are formal or less structured, as you set goals you should be asking yourself, "What could go wrong?" "What could prevent me achieving these goals?" and, "What should I be doing about it?" Strategic and business planning, operational planning, and planning for projects and events should all have risk management firmly embedded within them.

As you monitor and review the organisation's performance, you should look for risk information. You might require a risk section to be included in management reports. Discussion of risk should be a standing agenda item for all meetings whether at board, management, team or project level.

Encourage people at all levels to think about risk and what they should do when they recognise a risk or a hazard as they go about their daily activities. If an individual identifies a risk that they can't handle alone, or that is significant in terms of its likelihood and potential consequences, there should be a process to bring it to the attention of their manager. If the manager is unable to deal with the issue within the scope of their responsibilities and delegation, they should take the issue further. This principle of escalation is key to enabling people at all levels to participate effectively and safely in managing risk. It also ensures that each risk is dealt with at the appropriate level.

4.5 Tools

In order to facilitate the process of managing risk, it is important to have adequate tools. Tools might include forms and methods to help with risk identification and analysis.

4.5.1 Worksheets

Worksheets or computer databases can be helpful when identifying and assessing risks and organising information. See Appendix B for examples of worksheets.

4.5.2 Risk identification and analysis tools

There are a number of resources and techniques you can use to help identify fire hazards and their causal factors that could become risks. Examples are listed below:

(a) Undertake physical inspections of the workplace and equipment – look for fire hazards;

(b) Brainstorm with a team – ask what could go wrong (sometimes, what has gone wrong);

(c) Review the organisation's management and delivery processes and look for points where things can go wrong;

(d) Commission annual audits by your insurer, insurance broker or an ACC workplace safety management practices auditor that show weaknesses in the management system;

(e) Examine records of previous plans, reviews, and incidents;

(f) Talk to other organisations (including trade bodies) about their approaches and the risks they have identified – what have their fire experiences been?

(g) Talk to stakeholders, circulate documents;

(h) Talk to the local Fire Safety Officer, your insurance broker or insurance company – what can they tell you about fires in your type of business?

(i) Observe people, activities and events;

(j) Hire a risk consultant who is a sector specialist;

(k) Consult relevant trade or professional organisations – what sorts of fire reports do they have from your sector?

(l) Conduct research using industry publications, newspapers and the internet.

Further guidance on formal risk analysis tools can be found in AS/NZS 3931 *Risk analysis of technological systems – Application guide*.

4.6 Information

The risk management process outlined in section 5 will help you gather risk information about your organisation. You may also need information to help you decide on good risk practices, on appropriate risk treatments, on the environment you operate in, and on different techniques for analysing and ranking risks. Appendix E provides some ideas for accessing further information about fire.

4.7 Documentation

Keep records of your risk management activities. Records will provide an audit trail should they be required by stakeholders or regulators. They will provide a history for reference so you won't have to start future activities from scratch. Good records will also ensure that your perception of the organisation's risk and how you communicate this to staff and stakeholders are consistent. Your risk management documentation should include:

(a) Risk management policy (see 4.2);

(b) Context statement (see 5.2);

(c) Your risk evaluation register (see 5.5);

(d) Plans to deal with or treat identified risks (see 5.6.3);

(e) Risk analysis research (this will be a file that you keep research documents in);

(f) Monitoring and reviewing information (see 5.7); and

(g) Risk communication plan (see 5.8).

4.8 Conclusion

The above provides an overview of a framework for managing fire risks. In the next section, we will show how the process works in practice using a manufacturing company as an example.

5 The Risk Management Process and Fire Hazards

5.1 Overview

The general risk management process involves five logically sequenced process stages and two ongoing activities set out below.

5.1.1 Process stages

(1) Establish the context for managing risks, including criteria for evaluating them.

(2) Identify risks and how they can arise.

(3) Analyse how often risks are likely to occur and the consequences they would have.

(4) Evaluate each risk's likelihood and potential consequences against your evaluation criteria.

(5) Treat unacceptable risks to reduce the chance that they will happen or the consequences they would have if they did.

5.1.2 Ongoing activities

Aspects of risk management should be ongoing and continuous and include the following:

(a) Monitor and review the performance of the system and changes that might affect it;

(b) Communicate and consult with internal and external stakeholders as appropriate at each stage of the risk management process and concerning the process as a whole.

5.1.3 Risk management process

These stages have been drawn together in figure 5 to show the risk management process and how it relates to managing fire-related risks. The rest of this section provides more detail.

The practical process we will go through is:

(1) First we will need to understand our business environment – our context;

(2) Then we will need to make sure the suggested criteria for measuring our fire risks are appropriate;

(3) We can then identify our fire risks and their current controls, analyse the risks and evaluate whether the risk severity is at an acceptable level;

(4) Finally, for fire risks that are at an unacceptable level, we can develop a risk treatment or reduction plan;

(5) This risk treatment plan and all our other work will need to be communicated to employees and other stakeholders and the status of our risks, controls and risk treatment/reduction plans monitored.

In this part of the Handbook, we will use an example based on a kitchen unit manufacturer that has many fire hazards commonly found in the manufacturing industry.

As we go through this section, you may want to start making notes about fire hazards that could result in risks in your place of work. It is never too early to make a start! You can always check out your notes and make good records later.

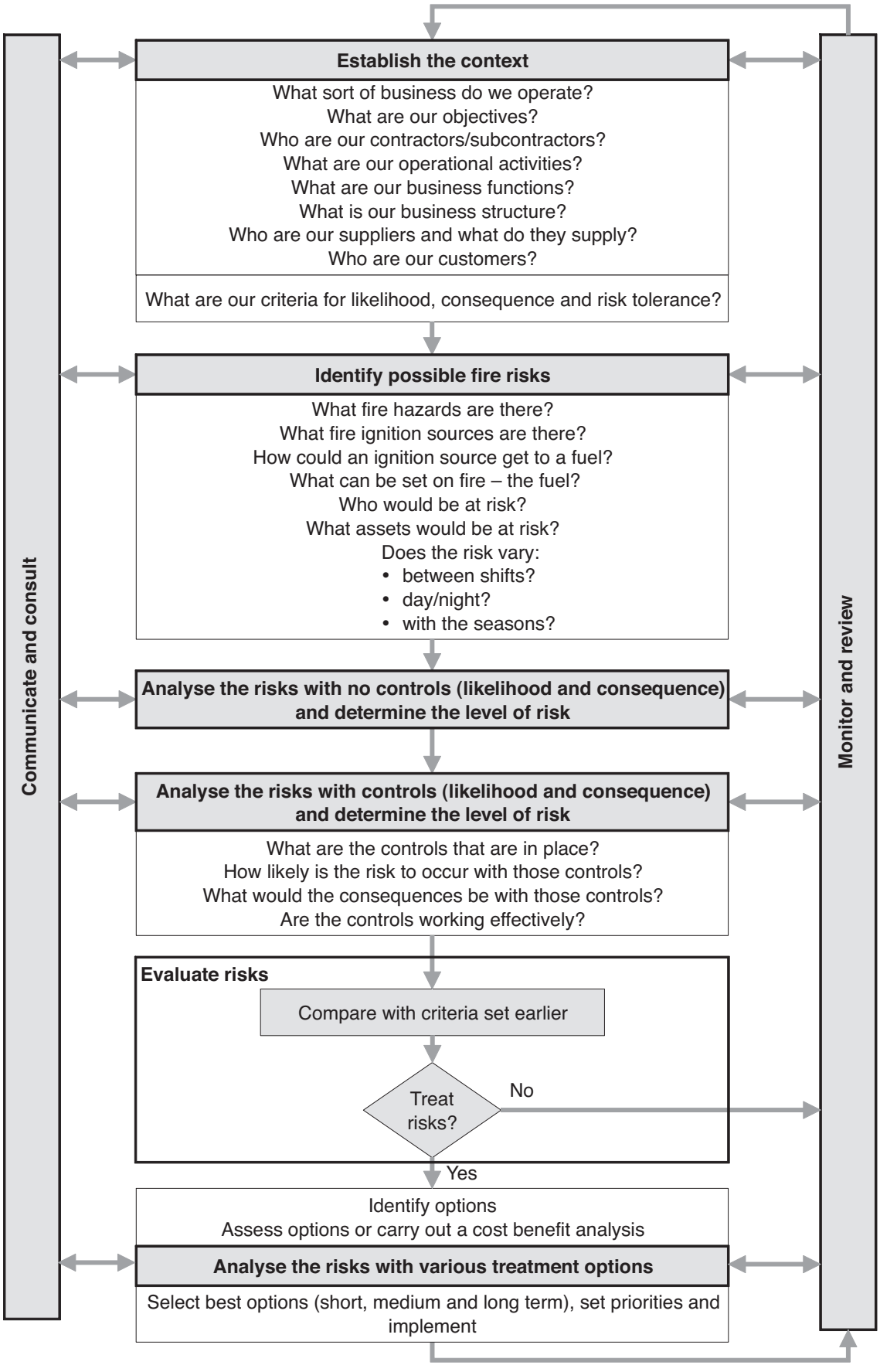


Figure 5 – The risk management process and fire

5.2 Establish your context

5.2.1 Scan the external and internal environment

To complete this step, use table 2 to ask yourself the following questions (the right-hand column provides an example of possible answers for our kitchen unit manufacturer).

Table 2 – Example of the context of an organisation

Example questions	Your answers – some examples
What sort of business do we operate?	A small kitchen unit manufacturer with growing turnover aimed at the luxury end of the market. Plans are in hand to add more production and storage space.
What are our objectives?	To supply and install high quality kitchen units on time and on budget to customers.
Who are our most important suppliers of: Raw materials? (Who are they and what do they supply?)	Company A supplies hardwoods from renewable tropical sources. Company B supplies special Italian lacquers that give us a unique selling point.
Plant and equipment? (Who are they and what do they supply?)	Company C supplies saws made in the USA. Company D supplies lacquer and paint spraying equipment from Australia.
Utilities e.g. electricity, water, gas, telephone, transport (Who are they and what they supply?)	Company E is our gas and electricity lines company and company F is the gas and electricity supplier.
Who are our most important customers?	Company G, a builder specialising in luxury houses.
Do we have contractors or subcontractors?	Yes.
If so, who are our most important contractors or subcontractors and what do they do for us?	Kitchen units are installed by company H. Plumbing and draining work is done by company I. Electrical work is done by company J.
How is our business structured?	See the example organisation chart, figure 6.
What operational activities do we operate?	See the example flow chart, figure 7.
What equipment do we use to move and process materials or stock, wrap or pack finished goods, etc?	See the example flow chart, figure 7.
What are our business functions? (Describe using a flow chart or a site layout sketch)	See the example flow chart, figure 7.

5.2.2 Internal environment – organisation

We have used the simple organisation chart in figure 6 and later will show how accountabilities may be set using the people shown.

If you own or work in a small or medium-sized organisation that has no organisation chart, drawing one, and discussing who is accountable for what, (including which parts of the site), can sometimes help towards reducing risks.

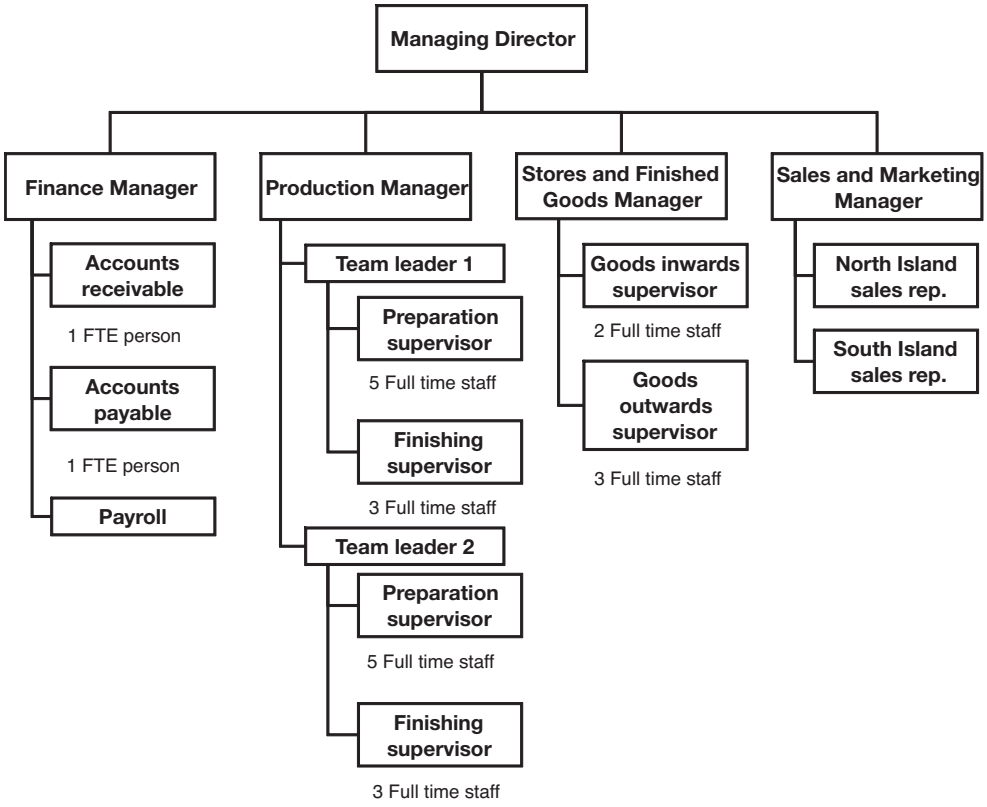


Figure 6 – Organisation chart for kitchen unit company

5.2.3 Internal environment — activities

A simple, hand-drawn flow chart can help clarify processes and (as you will see later) their associated risks. For this example, we have used the flow chart in figure 7 to show some of the business processes in our kitchen unit manufacturer. This flow chart will be used later with fire hazards added that would need to be included in a fire risk assessment.

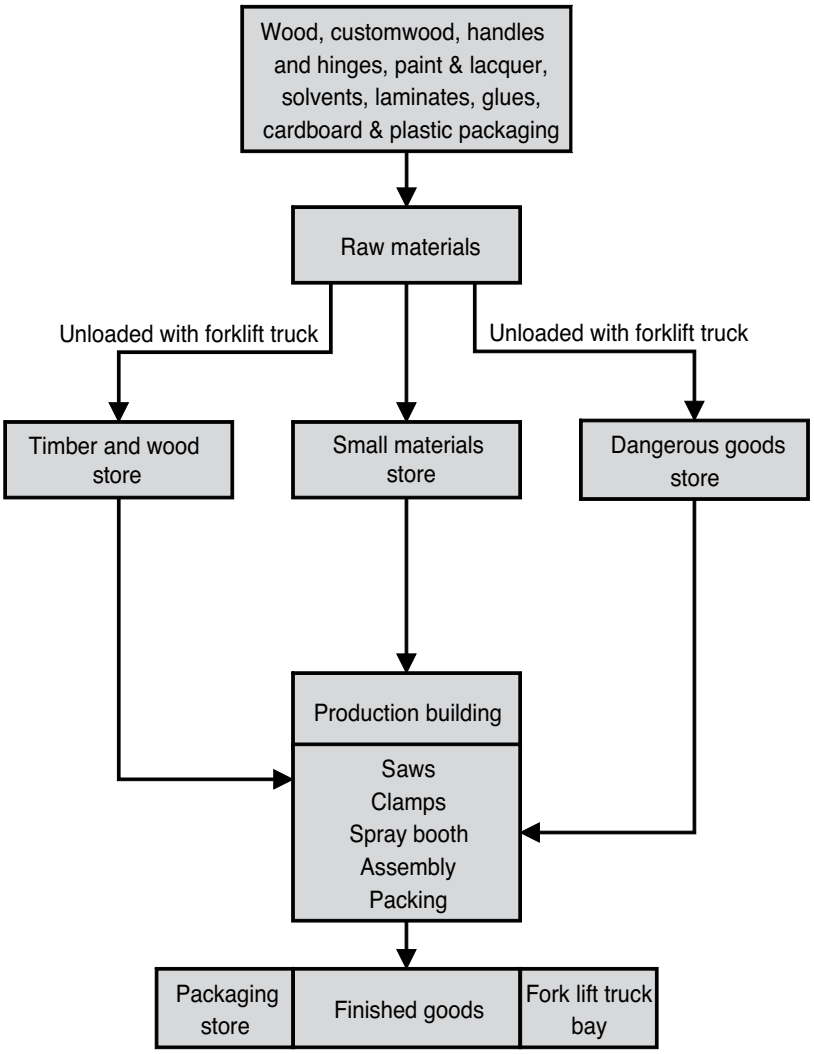


Figure 7 – Business processes in kitchen unit company

5.2.4 Documentation

Appendix B1 provides a sample worksheet to help you document your context statement.

5.2.5 Identify types of risk consequences and their likelihood, and determine how to measure these

You will need to be able to measure your fire risks. First you need to choose what the consequences of a risk might be. One set of risk consequences is shown in table 3 following. These cover the consequences of fires but if they do not seem right for you and your place of work, adapt them to suit your circumstances. SAA/SNZ HB 436 *Risk management guidelines,* gives more information about developing such risk criteria.

Table 3 – Risk consequence scales

	Negligible	Minor	Moderate	Major	Catastrophic
Injury	Bruises, scrapes, no recovery time	Contusions, sprains and/or less than 1 week recovery	Blood, broken bones, and/or 1-6 weeks recovery	Hospitalisation and/or more than 6 weeks of recovery	Death, or permanent disability
Financial	Less than 1 % of budget	1-2 % of budget	2-5 % of budget	5-10 % of budget	More than 10 % of budget
Production	Fire evacuation resulting in 1 hour of lost production	Fire evacuation and clean-up resulting in 1 day of lost production	Fire evacuation and clean-up resulting in 1 week of lost production	Fire evacuation, clean-up and repair work resulting in 1 month of lost production	Fire evacuation, clean-up and repair work resulting in 6 months of lost production

Next you need to decide how likely such a risk consequence might be. Table 4 shows some commonly used risk likelihood criteria to adapt to suit your circumstances. SAA/SNZ HB 436 *Risk management guidelines,* gives more information about developing such risk criteria.

Table 4 – Examples of risk likelihood criteria

Scale	Description
Almost incredible	The incident may only occur in exceptional circumstances (for example, once in 10 years)
Rare	The incident could occur at some time (for example, at least once in 5 years)
Unlikely	The incident will probably occur at some time (for example, once in 3 years)
Possible	The incident will probably occur in most circumstances (for example, once per year)
Almost certain	The incident is expected to occur in most circumstances (for example, more than once per year, and almost guaranteed in each event)

Once you have identified your risks and analysed them using your consequence and likelihood criteria, you will need to plot them into the matrix shown in table 5. If, for example, you had decided that a fire hazard has a moderate consequence and the likelihood is possible, you would have a risk severity of high. The risk severity matrix is reproduced in Appendix B4 as one of the worksheets you can use.

Table 5 – Risk severity matrix

Likelihood	Almost certain	**Medium**	**High**	**High**	**Extreme**	**Extreme**
	Possible	**Medium**	**Medium**	**High**	**High**	**Extreme**
	Unlikely	**Low**	**Medium**	**High**	**High**	**High**
	Rare	**Low**	**Low**	**Medium**	**Medium**	**High**
	Almost incredible	**Low**	**Low**	**Medium**	**Medium**	**High**
		Negligible	Minor	Moderate	Major	Catastrophic
		Consequences				

If you use the consequence and likelihood scales and matrix shown above, you may decide that your response to the controlled or current risks that are extreme/medium/high/low will be as shown in table 6. Again, you may need to adapt table 6 to your organisation but remember that the larger a current or controlled risk is, the more senior the person or people who should decide if it is acceptable.

Table 6 – Risk response and acceptance

Evaluation of risk with controls	Risk response and acceptance
Extreme	Are all the controls effective? Only the board or equivalent can accept this level of business risk. Immediately halt any activity at this level of risk unless written approval has been given to accept it. Nobody can be asked to work if there are controlled health and safety risks at this level. The activity cannot be carried out legally; ask why this job or task needs to be done at all. The CEO and management team must be told immediately of any controlled risks at this level and (if the risk is accepted by the board) must implement remedial action approved by the board and monitor conformance daily. There should be effective crisis response plans that enable rapid response.
High	Are all the controls effective? Only the CEO or equivalent or board can accept this level of business risk. Immediately halt any activity at this level of risk unless written approval has been given to accept it. Nobody can be asked to work if there are controlled health and safety risks at this level, the activity cannot be carried out legally; ask why this job or task needs to be done at all. The CEO and management team must be told immediately of any controlled risks at this level and (if the risk is accepted by the CEO) must implement remedial action and monitor conformance daily. There should be effective crisis response plans that enable rapid response.
Medium	Are all the controls effective? Only the relevant senior manager or CEO can accept this level of business risk. Consider the profitability of business risks at this level. If acceptable, monitor conformance regularly. A health and safety risk that is medium should be reduced to low or the activity halted. There should be effective business continuity plans that enable rapid response to unexpected conditions.
Low	A risk at this level is probably as low as reasonably practicable. Confirm that all the controls are effective. The relevant team leader can accept this level of business risk. Consider the profitability of business risks at this level. If acceptable, monitor conformance regularly. If the risk could damage the “bottom line” or reputation, there should be effective business continuity plans that enable rapid response to unexpected conditions. A risk that will be low with controls in place should be acceptable to workers and their managers.

5.3 Identify fire risks

5.3.1 General

Once you have started your fire risk management process by establishing your context, you can identify the fire hazards in your workplace. This stage involves determining:

(a) What can ignite a fire;

(b) What can be set on fire;

(c) How the fire could spread; and

(d) Who and what could be at risk.

Using the tools identified earlier (4.5.2), you can now identify your fire hazards that could result in fire risks.

In the following decision trees (see figures 8 to 12) we give examples of risk reduction measures. If these are already in place they are risk controls. If they are options for treating or reducing a risk, they are risk treatments. For example, you may have a housekeeping programme in place (a risk control) but decide you need to develop an emergency response plan (a risk treatment). When work on the treatment is finished it becomes a control. More information about controls and treatment options is given in Appendix C.

Caution! There are many more controls than are shown in this Handbook and it may be necessary to research and apply those that are most relevant and cost effective for your business.

5.3.2 Ignition, fuels and spread of fire

Think back to the triangle of fire (figure 1) and how we need to control the *ignition source* and the *fuels*. Once a fire has started, the building may also be set on fire and (as shown in figure 2) parts of the structure can become fuel and actively spread the fire to other parts of the building. As part of identifying what can go wrong and how it can go wrong we need to look at these sources of fire hazards.

5.3.2.1 What starts fires in places of work – what is the ignition source?

In table 1 we saw that the most common heat sources that ignite fires in New Zealand are:

(a) Arson;

(b) Failure or improper use of electrical equipment or electrical wiring systems that are overloaded;

(c) Carelessly discarded lighted cigarette materials;

(d) Hot work operations (welding and cutting) and failure to follow hot work permit procedures; and

(e) Other causes such including:

  (i) Chemical reactions

  (ii) Spontaneous ignition or self heating

  (iii) Friction (when mechanical equipment is poorly lubricated or maintained)

  (iv) External fires (sparks or radiated heat)

  (v) Static electricity.

Using figure 8 you can identify possible sources of ignition and some of the controls that might already be in place. Make a note of the possible controls, especially those that you may need to think about if a fire risk is too high.

Arson is now so common that you should include it in any fire risk assessment. See Appendix C12 for more guidance.

Similarly, if you are about to have any building work done you should carry out a special fire risk assessment. See Appendix C12 for more guidance.

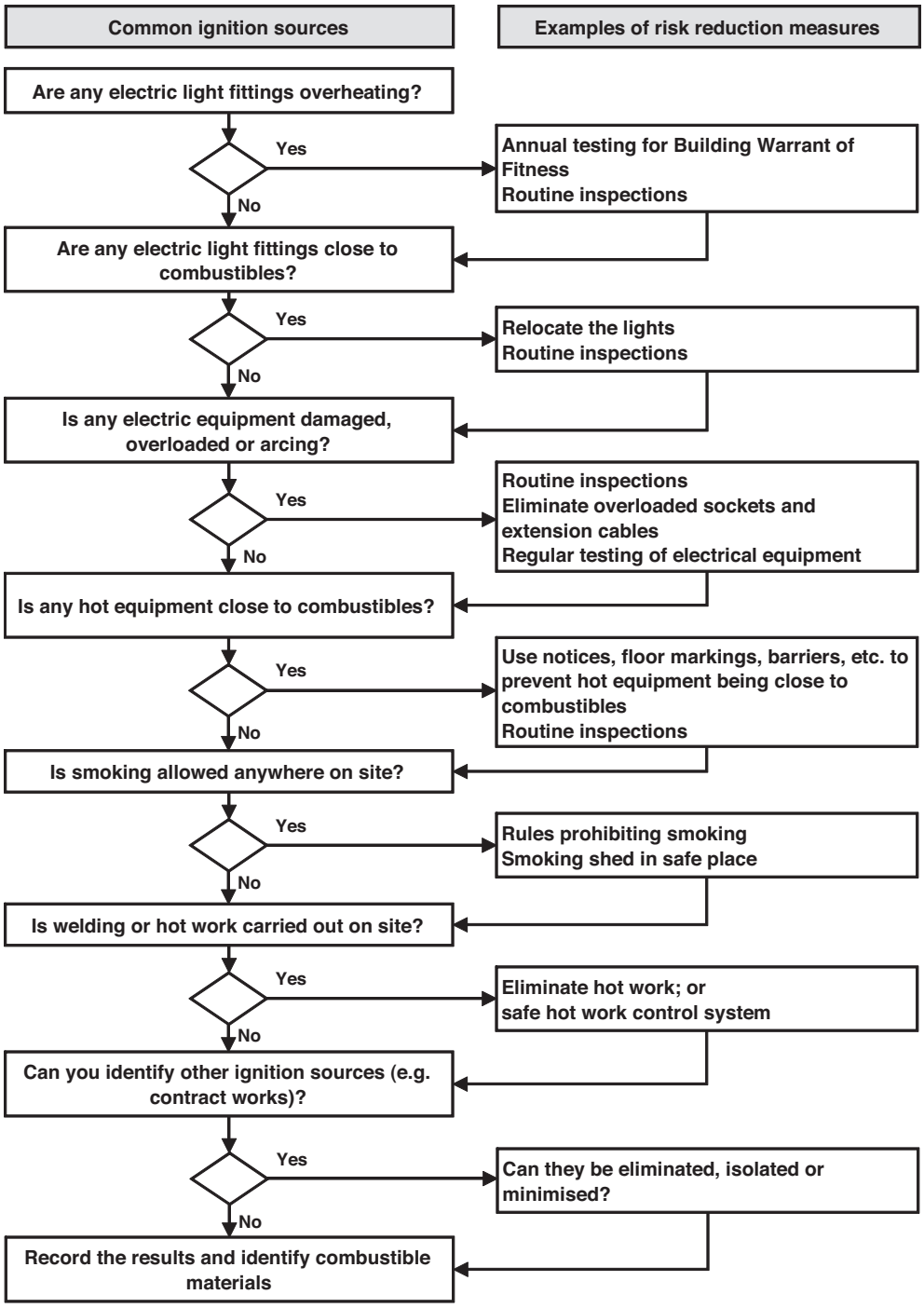


Figure 8 – Identification of fire ignition hazards

5.3.2.2 What starts fires in places of work – what is the initial fuel source?

Using figure 9 you can identify possible combustibles and some of the controls that might already be in place. Make a note of the possible controls, especially those you may need to think about if a fire risk is too high.

Common fuels that are set on fire include:

(a) Paper and cardboard (e.g. in offices);

(b) Cooking oil and cardboard (e.g. in restaurants, cafeterias and diners);

(c) Timber (e.g. in sawmills and other timber processing places of work, including construction sites);

(d) Rubbish (e.g. stored outside places of work);

(e) Natural gas;

(f) LPG;

(g) Liquid fuels such as petrol and diesel oil;

(h) Plastics;

(i) Coal and similar solid fuels;

(j) Dusts that can burn or explode (e.g. wood, flour, plastics); and

(k) Timber pallets stored under canopies or against buildings.

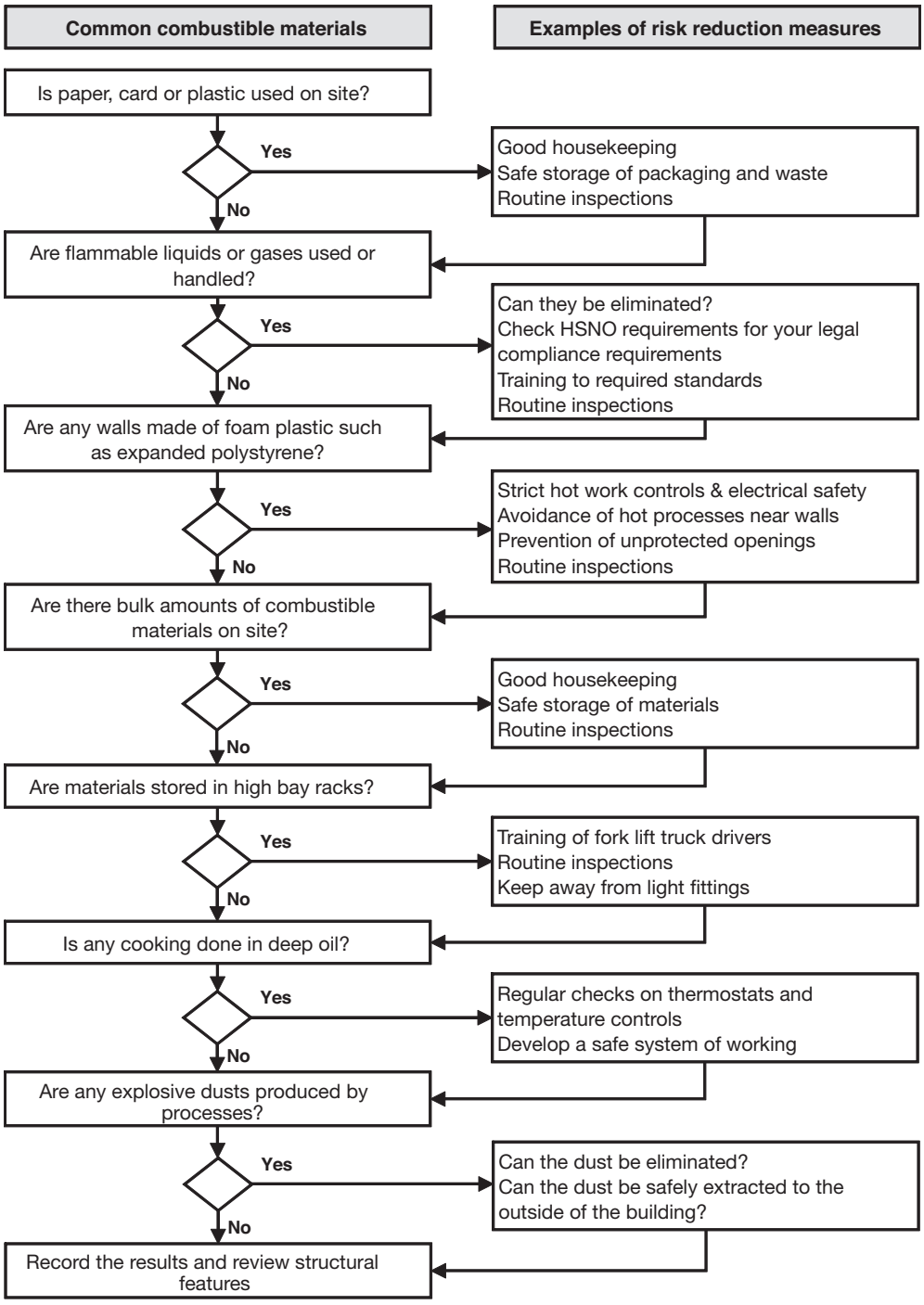


Figure 9 – Identification of combustible materials

5.3.2.3 How could a fire spread through the building?

In figure 2 we saw how a fire can move around in a building. Here, we need to identify any building features that could help a fire grow and spread. Using figure 10 you can identify some of the ways that a fire might spread in your workplace and some of the controls that might already be in place. Make a note of the possible controls, especially those you may need to think about if a fire risk is too high.

Buildings are normally designed to have fire compartments that will limit the size of a fire and enable people to escape. The fire compartments should have fire walls where they abut another fire compartment. Openings such as doors or ducts for services should be protected to stop a fire passing through. Voids under floors or in ceilings are often a serious fire hazard as a fire can smoulder for some time and spread through a void to other parts of the building. Fires can also spread vertically.

Processes that use or store flammable liquids may require the construction of a workroom that is its own fire compartment, has an ability to contain spilt liquids, and contain specialist electrical and ventilation systems to control the build-up or ignition of a hazardous atmosphere.

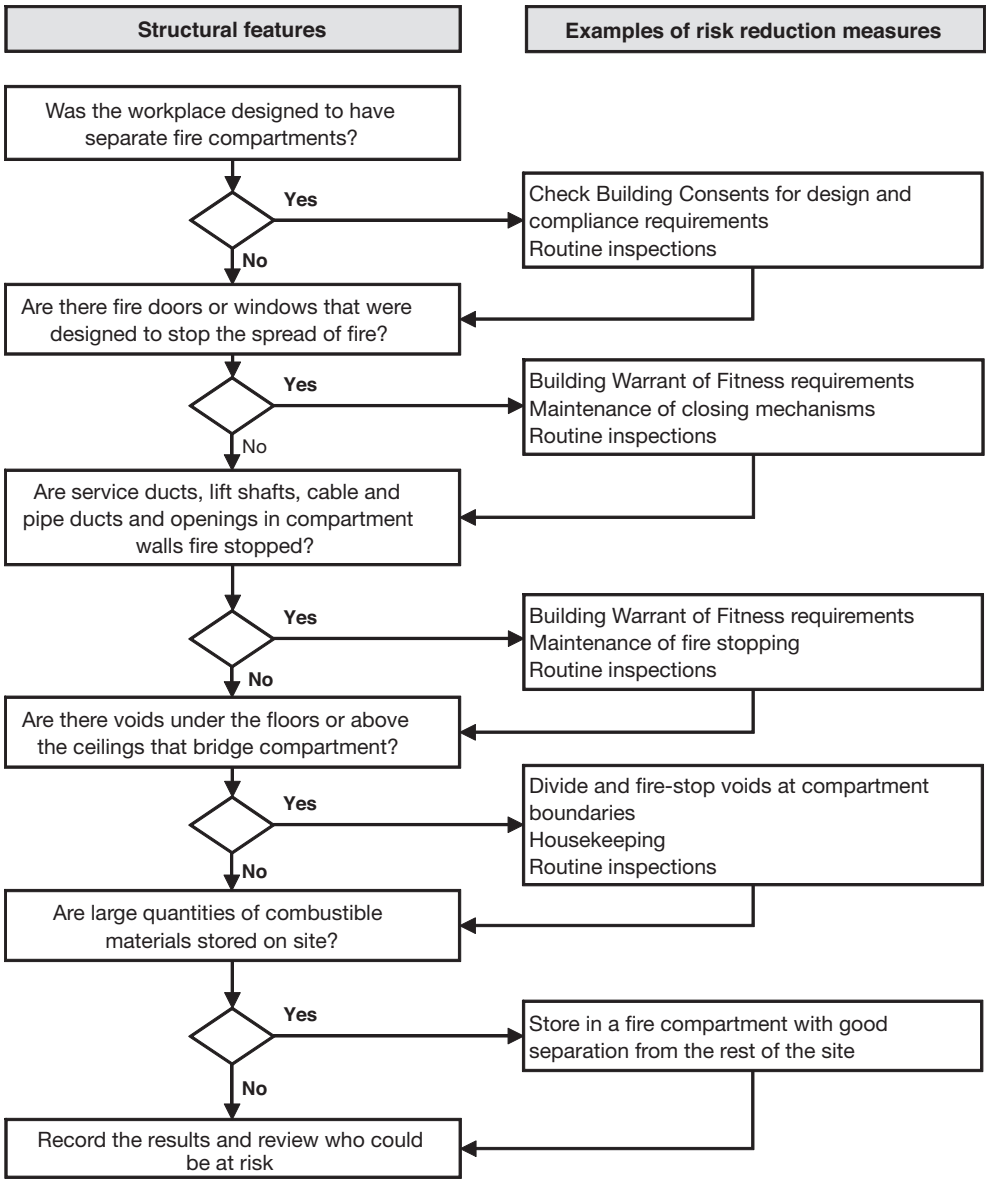


Figure 10 – Identification of building features

5.3.3 Who is at risk?

5.3.3.1 Who is at risk from a fire?

We have now looked at what could ignite a fire, what might burn and how a fire could spread. Using figure 11 you can identify who might be at risk and some of the controls that might already be in place. Make a note of the possible controls, especially those you may need to think about if a fire risk is too high.

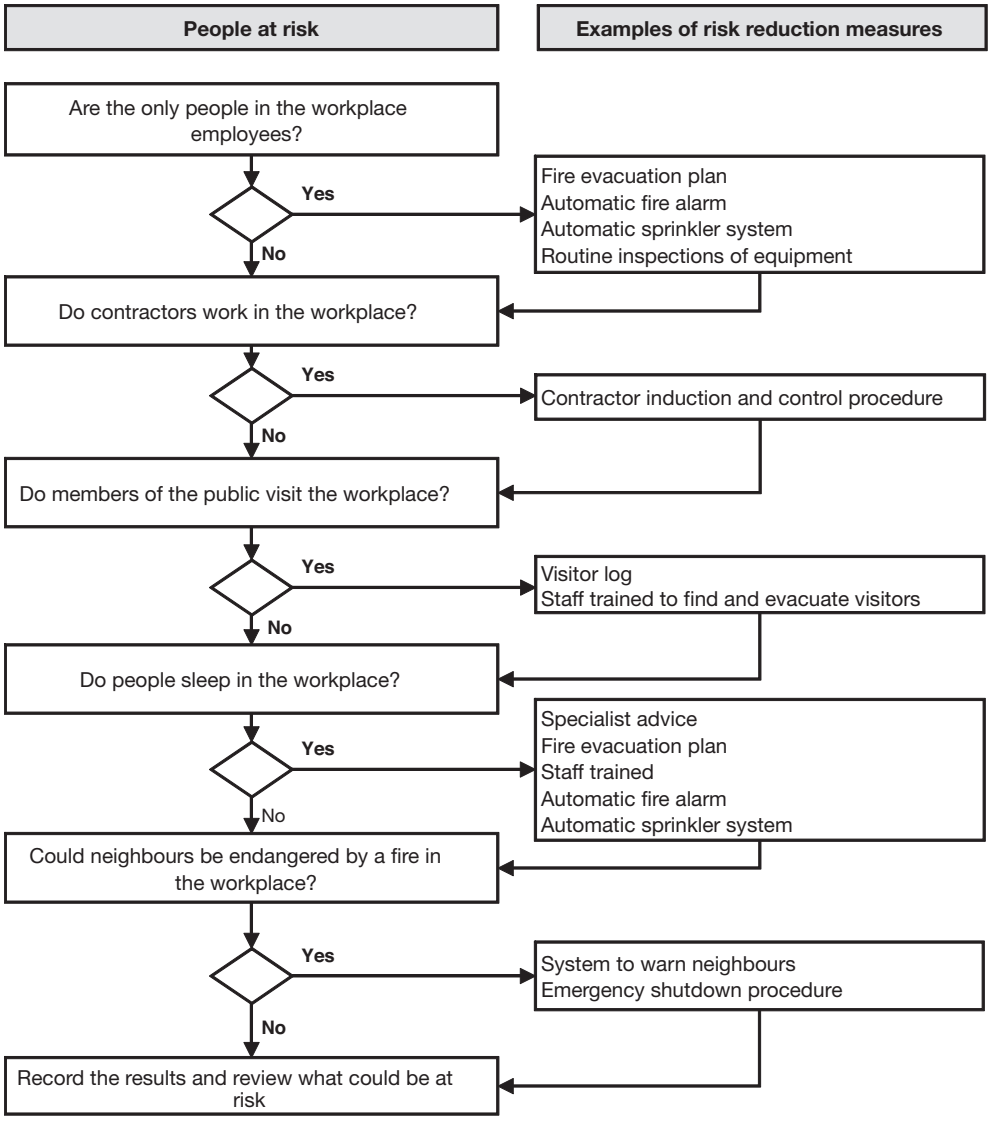


Figure 11 – Identifying who is at risk

5.3.3.2 Assets and income

As well as people, the assets and income of a workplace could be at risk from a fire. Using figure 12 you can identify assets that might be at risk and some of the controls that might already be in place. Make a note of the possible controls, especially those you may need to think about if a fire risk is too high.

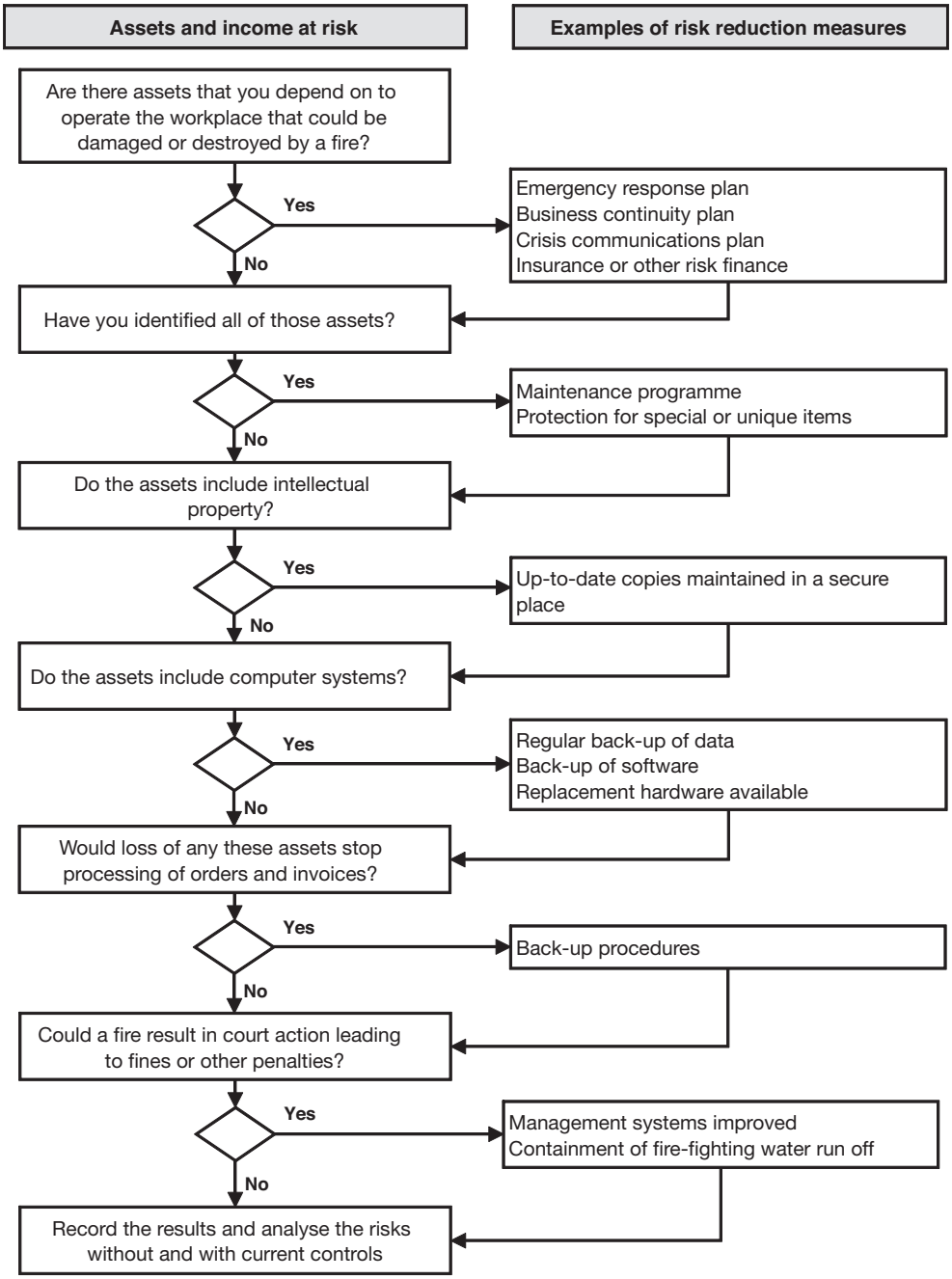


Figure 12 – Identification of assets and income that might be at risk

5.3.4 A practical example

In figure 13 we have taken the flow chart in figure 7 on page 31 and marked on it some typical fire hazards that might be found:

(a) During an inspection;

(b) By asking employees and occupational safety or fire safety professionals for their help; or

(c) By asking your insurance broker or insurer to help identify hazards.

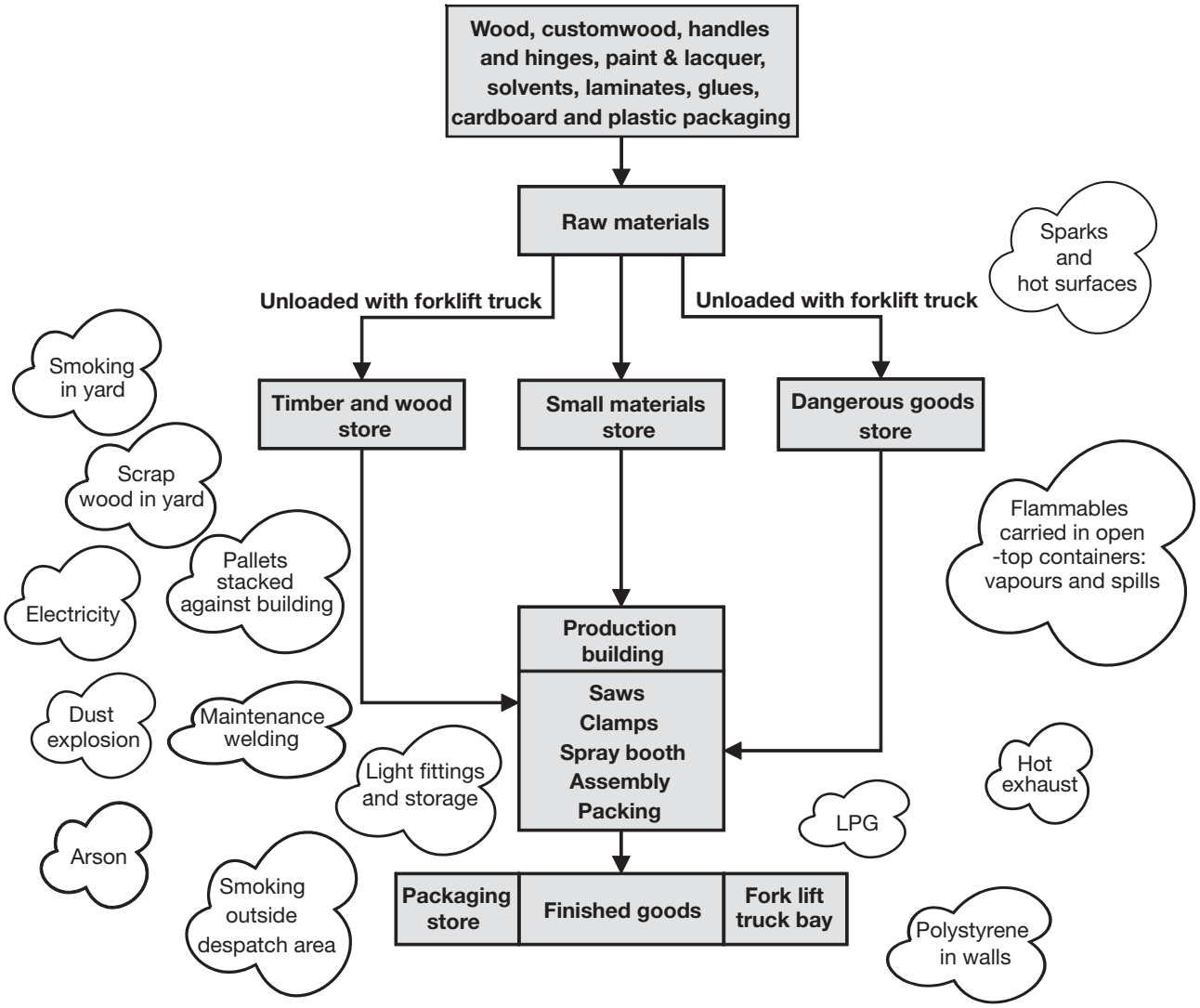


Figure 13 – Hazard map and process flow chart

5.3.5 Documentation

When you have identified your fire hazards you should record them in a risk register. Our example fire hazards have been recorded in table 7 using the sample fire risk register shown in Appendix B2. Your fire hazards and risks will probably be quite different but should be recorded in a similar way.

Tip: if you record your risks in a spreadsheet or other software try to be consistent in the way you name your risks – it helps if you need to sort them.

Table 7 – Example of hazard identification

			No controls – absolute risk			With controls – current risk		
Fire hazards	**Risk and brief description**	**Controls / Effectiveness**	**Consequences**	**Likelihood**	**Risk evaluation**	**Consequences**	**Likelihood**	**Risk evaluation**
Stacks of timber pallets against building Scrap wood and packaging stored in yard Lack of site security Smoking allowed in yard Poor housekeeping	Fire in yard damages or destroys storage building Ignited by arsonist or careless disposal of cigarette							
Too much flammable liquid held in production areas Usage not monitored Spark from electric equipment	Fire in finishing area destroys production building. Flammable vapours are given off and ignited by static electricity or electric spark							
Overheating electrical equipment Large amounts of paper records Steel/ polystyrene sandwich walls vulnerable to fire damage	Fire in offices stops administration work Overheating electrical equipment ignites large amounts of paper records; steel/ polystyrene sandwich walls vulnerable to fire damage collapse quickly							

5.4 Stage 3 – Analyse risks

5.4.1 Overview

Now that you have identified your fire hazards, you need to analyse them to understand how often they might happen, and what the consequences would be if they did. You will be making an educated guess about these things because you are looking at what might be. You will need to look at past events, your current approach to management of risks, the environment and anything else that you think will affect how often an incident might happen, or how serious it might be.

You should ask the following questions:

(a) What controls have we got in place already?

(b) How often does/will each incident happen under our current system?

(c) What would the actual outcome be if the event happened?

At this stage, you are compiling the raw data about each hazard. You will not apply your criteria to score your risks until we evaluate the risks.

In order to get a reasonable understanding of how often an incident might occur and the potential consequences of each risk, you may need to:

(A) Review records of the organisation's performance and incidents;

(B) Talk to people running similar organisations; and

(C) Seek specialist advice from your insurance broker, insurer, local Fire Safety Officer or a consultant.

Sometimes it won't be easy to pin these factors down. However, if you decide later that something is probably going to happen more often, or have a different type or level of consequence, you can always go back and revise your analysis.

5.4.2 Consider existing controls

A control is any action, procedure or thing that enhances risk management and increases the likelihood that objectives will be achieved. For example, a control could be housekeeping to prevent a build-up of combustible materials or maintenance of electrical equipment to prevent malfunction or overheating.

You need to do the analysis twice – once as if there are no controls in place (the absolute risk) and once with the current controls in place (the current or controlled risk). This will help you know how important the existing controls are; any that are really important will need to be closely monitored to make sure they are working properly. See 5.7 for more information about monitoring.

For each risk, look at each hazard and identify what is already in place to:

(a) Reduce the likelihood of the risk event occurring; or

(b) Reduce the consequences of the risk if it does happen.

You might identify external safe smoking areas to ensure that cigarettes are safely disposed of. While most fire risks and incidents arise from more than one hazard, it often takes only one hazard to cause a risk. So even if you have strong controls for nine hazards out of 10, if the tenth is weak, you could still suffer a fire.

Once you have identified the controls, consider how effective they are. Are your staff and contractors well-trained, committed, and attentive? Are procedures well enough defined and implemented to ensure staff know how to do a job properly (i.e. safely) and have they been trained in these procedures?

5.4.3 What consequences could we face if the incident happens?

In this step, you should note all of the consequences that could result if the risk were to become a reality. Any fire could have a range of consequences from death or injury to financial costs (including costs of repairs, fines, increased insurance) to damaged relationships, and loss of standing or market share. You need to consider at least three areas of consequence:

(a) People – employees, contractors and visitors;

(b) Assets; and

(c) Income.

Using the criteria provided in table 3, you could express consequences in terms of injuries, dollars or competitiveness. Remember, you are applying the categories and measures, but not the scoring system at this point. In other words, you are trying to identify the likely number of injuries or deaths, or number of weeks an employee might be off work, or the loss of assets and income an event might cause.

You also need to consider whether your activities create fire risks that will impact on other people. Even where there may be a minimal chance that your organisation may face consequences you should consider the potential consequences for others, such as fire, smoke or other environmental hazards spreading to adjacent buildings or bush.

In working through this stage, you may identify another type of consequence that you hadn't included in your evaluation criteria. If it isn't adequately covered by your criteria, you will need to go back and add it.

5.4.4 How often might the incident happen?

Is the incident likely to happen once per year? Every quarter? Once in a lifetime? In order to gather reliable information about how often incidents are likely to happen, you may need to review your records of past performance and incidents, or talk to other similar organisations about their experiences. A variety of agencies may be able to provide you with statistics, for example:

(a) Fire Service Commission maintains fire statistics;

(b) ACC maintains injury statistics; or

(c) Insurance brokers and companies may also be able to help with information.

We have added to our risk register to show the controls and the likelihood and consequences of our sample risks – see table 8.

5.4.5 Documentation

Appendix B2 provides a sample worksheet to help you document your risk analysis.

Table 8 – Example 1 of the full risk analysis

			No controls – absolute risk			With controls – current risk		
Fire hazards	**Risk and brief description**	**Controls / Effectiveness**	**Consequences**	**Likelihood**	**Risk evaluation**	**Consequences**	**Likelihood**	**Risk evaluation**
Scrap wood & packaging stored in yard	Fire in yard damages or destroys storage building Ignited by arsonist or careless disposal of cigarette	Weekly housekeeping inspections	With no controls a person could be killed, loss of finished goods and orders, could be sued, face legal action of up to $100 K **Catastrophic**	Once every 3 years with no controls **Possible**		With controls, injury resulting in more than 6 weeks recovery and disruption for 1 week **Moderate**	Once every 10 years with controls **Rare**	
Lack of site security		Boundary fence rusted and holed						
Smoking allowed in yard		Absence of smoking shed						
Poor housekeeping		Nobody accountable for the yard						
Too much flammable liquid held in production areas	Fire in finishing area destroys production building Flammable vapours are given off and ignited by static electricity or electric spark	Flammables are stored in a fire rated cabinet but it is not kept shut	With no controls, fire destroys production area resulting in 6 months disruption. **Catastrophic**	Once every month with no controls **Almost certain**		With controls, 1 week disruption **Possible**	Once every 3 years with controls **Moderate**	
Usage not monitored		Flammables are freely available						
Spark from electric equipment		Equipment not flame proofed						
Overheating electrical equipment	Fire in offices stops administration work Overheating electrical equipment ignites large amounts of paper records; steel/ polystyrene sandwich walls vulnerable to fire damage collapse quickly	Annual electrical safety tests	With no controls, fire destroys administration offices but not computer network; 1 month disruption **Major**	With no controls, once every 10 years **Rare**		With controls, 1 week disruption **Moderate**	Once every 50 years with controls **Rare**	
Large amounts of paper records		Housekeeping and storage system prevents paper touching electrical equipment						
Steel/ polystyrene sandwich walls vulnerable to fire damage		None						

5.5 Stage 4 – Evaluate risks

5.5.1 General

Evaluating risks is about scoring them with the matrix shown in table 3. You will need to confirm that your criteria are relevant to your place of work, score your risks, and find the overall level of risk for each risk.

For each fire risk, mark the consequences and likelihood of it happening in table 3 and note the risk severity. Where a risk has more than one possible consequence or likelihood, and they are at different levels, note the highest score – the worst potential outcome.

Table 9 provides an example of scoring for the risks we have been working on. For the first risk, we decided that someone could be killed. Against our consequences criteria, a death would be catastrophic, so we would give that risk a score of “catastrophic” for consequences. With our current controls, we thought this might happen every 10 years. Against our likelihood criteria, that would be “possible” and receive a severity rating of “extreme”.

Table 9 – Example 2 of the full risk analysis

			No controls – absolute risk			With controls – current risk		
Fire hazards	**Risk and brief description**	**Controls / Effectiveness**	**Consequences**	**Likelihood**	**Risk evaluation**	**Consequences**	**Likelihood**	**Risk evaluation**
Scrap wood & packaging stored in yard	Fire in yard damages or destroys storage building Ignited by arsonist or careless disposal of cigarette	Weekly housekeeping inspections	With no controls a person could be killed, loss of finished goods and orders, could be sued, face legal action of up to $100 K **Catastrophic**	Once every 3 years with no controls **Possible**	**Extreme**	With controls, injury resulting in more than 6 weeks recovery and disruption for 1 week **Moderate**	Once every 10 years with controls **Rare**	**Medium**
Lack of site security		Boundary fence rusted and holed						
Smoking allowed in yard		Absence of smoking shed						
Poor housekeeping		Nobody accountable for the yard						
Too much flammable liquid held in production areas	Fire in finishing area destroys production building Flammable vapours are given off and ignited by static electricity or electric spark	Flammables are stored in a fire rated cabinet but it is not kept shut	With no controls, fire destroys production area resulting in 6 months disruption. **Catastrophic**	Once every month with no controls **Almost certain**	**Extreme**	With controls, 1 week disruption **Possible**	Once every 3 years with controls **Moderate**	**High**
Usage not monitored		Flammables are freely available						
Spark from electric equipment		Equipment not flame proofed						
Overheating electrical equipment	Fire in offices stops administration work Overheating electrical equipment ignites large amounts of paper records; steel/ polystyrene sandwich walls vulnerable to fire damage collapse quickly	Annual electrical safety tests	With no controls, fire destroys administration offices but not computer network; 1 month disruption **Major**	With no controls, once every 10 years **Rare**	**Medium**	With controls, 1 week disruption **Moderate**	Once every 50 years with controls **Rare**	**Medium**
Large amounts of paper records		Housekeeping and storage system prevents paper touching electrical equipment						
Steel/ polystyrene sandwich walls vulnerable to fire damage		None						

5.5.2 Risk evaluation – do the risks need to be treated?

Our evaluation has been written into the analysis in table 9. This shows the risk of:

(a) A fire starting in storage area – risk can only be accepted by top management; the activity that gives rise to the risk would need to be reduced if it cannot be avoided;

(b) A flammable liquid fire in the production area – is probably not acceptable, even to top management, and the risk would need to be eliminated or reduced; and

(c) A fire starting in administration offices – the risk probably needs to be reduced if it cannot be avoided.

NOTE – The controls that reduce the risk of fire in the storage area are very important and need to be monitored to make sure they are working properly. Whatever is done to reduce the risk of a flammable liquid fire in the production area by treatment will also, when completed, be very important and need similar monitoring.

SAA/SNZ HB 436 *Risk management guidelines,* provides further information on determining the level of risk and establishing the acceptability or tolerability of risk.

5.5.3 Documentation

The sample worksheet in Appendix B2 could help you document your risk analysis and evaluation.

5.6 Treat risks

Treating risks involves setting treatment objectives, identifying and developing options for responding to individual risks, evaluating and selecting the most appropriate options, compiling the selected options into a plan, and implementing the plan. You might already be familiar with this concept as “managing risk” or “risk reduction strategy”.

The risk management process shown in figure 5 shows where treating the risks fits in.

5.6.1 Identify options

5.6.1.1 General

This step focuses on working out what you can do to treat risks that you decided you cannot accept in their current state.

The following hierarchy of risk controls and treatments is adapted from the Health and Safety in Employment Act 1992 and AS/NZS 4801 *Occupational health and safety management systems.*

You could decide to:

(a) Eliminate or avoid hazards that give rise to the risk of a fire;

(b) Reduce the likelihood of hazards that give rise to the risk of a fire;

(c) Reduce the consequences of a fire;

(d) Isolate fire hazards that give rise to the risk of a fire;

(e) Share or transfer the consequences of a fire risk; or

(f) Retain the residual consequences of a fire risk.

The questions and decisions in these steps are summarised in figure 14. As you work through these steps, you should find they suggest ideas to you. More ideas about treating risks are given after figure 14 and Appendix C gives some further examples.

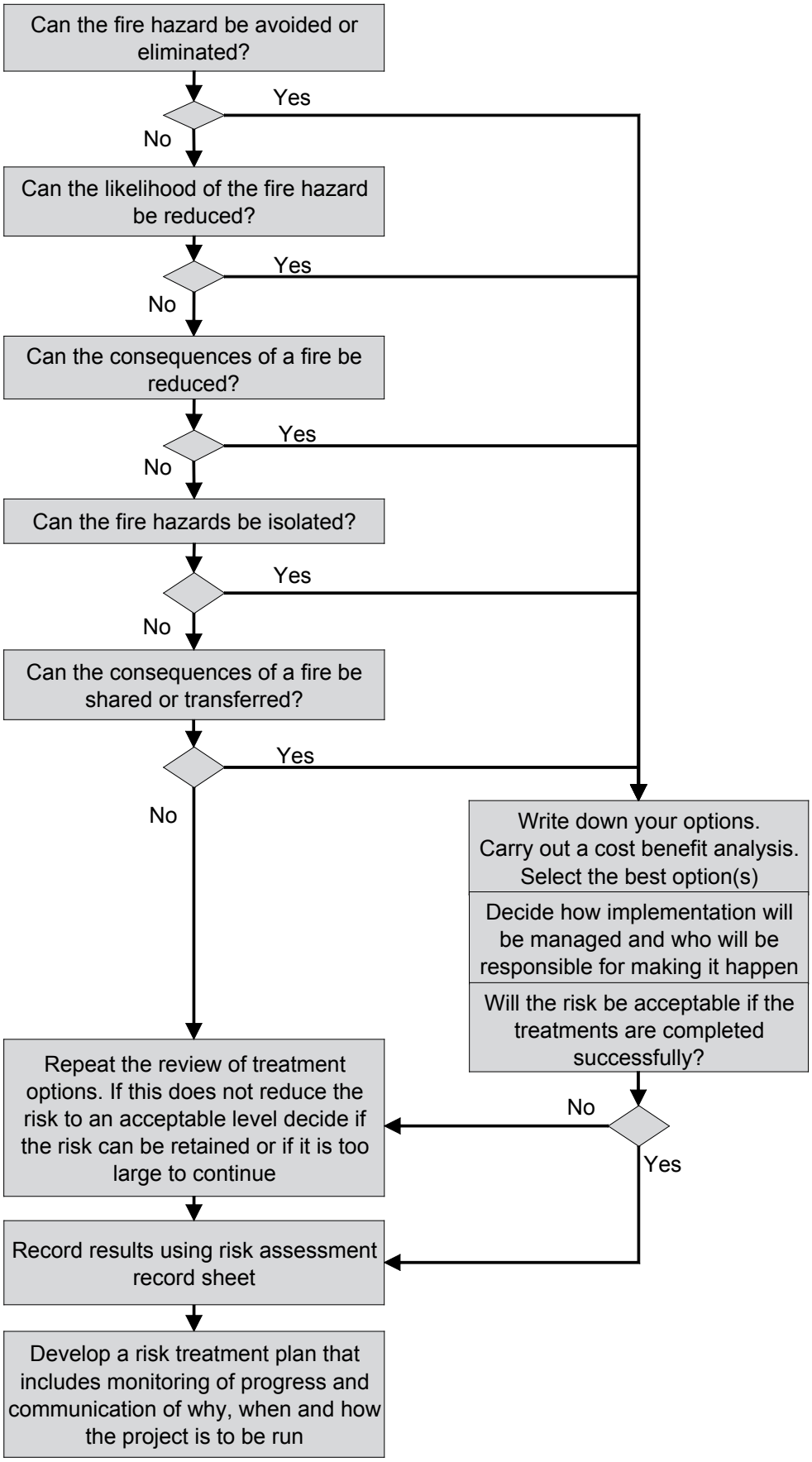


Figure 14 – Risk treatment decision diagram

5.6.1.2 Eliminate or avoid the risk

You could:

(a) Eliminate ignition hazards that could start a fire;

(b) Eliminate flammable liquids from use in a building or fire compartment; or

(c) Substitute less hazardous materials or processes by re-engineering the process.

Eliminating fire hazards may need a change in a process that requires capital expenditure. It may therefore be a medium- to long-term solution.

5.6.1.3 Reduce the likelihood of a fire occurring

You could reduce the likelihood of ignition by, for example:

(a) Maintenance of plant or equipment that produces sparks or heat;

(b) Regular testing of electrical equipment;

(c) Effective hot work controls and other permit-to-work procedures;

(d) Operating a process with intrinsically safe equipment;

(e) Developing safe operating procedures; or

(f) Replacing unsafe, old equipment.

You could reduce the likelihood of materials burning by, for example:

(A) Reducing the amount of combustible materials you keep near to ignition sources;

(B) Operating a just-in-time delivery system for combustible raw materials; or

(C) Improving housekeeping.

5.6.1.4 Reduce the consequences of a fire that does occur

You could reduce the consequences of a fire by, for example:

(a) Making sure you have the right hand-held fire extinguishers;

(b) Training employees in the correct use of hand-held fire extinguishers;

(c) Installing an automatic fire suppression system; or

(d) Developing emergency response procedures and providing emergency equipment including an automatic fire alarm system.

Even with excellent plans in place to reduce the likelihood of your risks, fires may still happen. Your risk controls should always include evacuation plans and appropriate fire-fighting equipment and incident response, disaster recovery or business continuity plans.

5.6.1.5 Isolate the fire hazard

You might decide to isolate a known fire hazard by removing all people from the immediate fire-risk area by:

(a) Operating a process in a special building with intrinsically safe equipment;

(b) Storing hazardous substances or materials in a separate building or fire compartment; or

(c) Providing engineering controls to prevent access to a process while it is operating.

5.6.1.6 Share or transfer fire risks

Sharing risk means letting someone else bear some or all of the consequences of the risk for you. Generally you do this by paying another party to do something for you.

You could, for example:

(a) Contract out a hazardous process to a well-equipped contractor where the risk can be managed to a lower level; or

(b) Insure against the financial consequences of a risk so that if your business burns down the cost of rebuilding, business interruption and increased costs of working are covered.

If you share risks, you need to make sure that the party you share them with is able to manage them. Your specialist company needs to be capable of managing the risk properly and you have a legal duty to make sure the employees of the contractor can work safely. SAA HB 240 *Guidelines for managing risk in outsourcing* provides guidance on contracting out.

You also need to be sure that your insurer will be able to pay any claims; talk to your insurance broker for advice on this. SAA HB 141 *Risk financing guidelines* contains further guidance on risk finance, including insurance.

5.6.1.7 Retain the risk

Once a risk is reduced by treatment to an acceptable level, you can decide to retain or accept it in that state.

You can retain a risk by:

(a) Making a conscious decision to accept that a fire could cause harm to your business – but you will need good advice before deciding to retain such a fire risk, especially if it could harm employees, contractors or other people; or

(b) Understanding how any insurance excess will affect your business if there is a claim.

It is important that all your stakeholders know the size and potential consequences of any retained fire risks. This means that you need to show and communicate what this means for them.

5.6.2 Assess options

When you have identified your risk treatment options, you need to decide which to apply. As you assess treatment options, you need to consider the opportunities or benefits that the organisation or its stakeholders get from the activity that the risk relates to. You need to think about whether the options would create further risks, or open up further opportunities. For example, a manufacturer may decide that, in light of a spate of small fires, an activity is too risky or that security needs to be improved to prevent arson attacks.

In assessing options, there are several questions you should ask:

(a) Is a combination of options better than one big hit?

(b) How do the costs of an option weigh up against its benefits?

(c) Is more than one option necessary to reduce the risk to an acceptable level?

(d) Does the option reduce the risk but also reduce the opportunities?

Several lower-cost options may give more resilience than one higher-cost option. In this case, failure of one low-cost option will not jeopardise your place of work whereas failure of the single high-cost option could be disastrous.

You should consider the values and expectations of your stakeholders before selecting options. If you decide to share your risk with a contractor or insurer what effect will this have on your profitability now and in the future?

5.6.3 Compile a risk treatment plan

Your risk treatment plan must clearly document the options you have selected, who is responsible for carrying them out, and any timing requirements. Your plan should also note reporting requirements, and who is responsible for managing the overall programme of activity.

Options designed to reduce the consequences of a risk may need to be quite detailed. Some of these options require a course of action once the risk has happened. In some cases this will be an emergency response plan, and its success will depend on having people and resources in place, and perhaps on having rehearsed scenarios.

While your responses to risk should be integrated into your strategic, business and operating plans, you may decide to establish a separate fire risk management plan to encourage a focus on this area of risk. A fire risk management plan should include:

(a) Your context information (including risk evaluation criteria);

(b) The list of hazards and risks identified;

(c) Your risk evaluation and priorities;

(d) The selected strategies or actions to treat risks; and

(e) Monitoring processes and review procedures.

5.6.4 Implement treatment plan

To get to this point, you have worked through the risk management process. You have arranged meetings, and gathered facts. You have collated information and sifted through it to make sense of it and to identify your priorities. You probably have a clearer understanding of your organisation and its risks than ever before. And, yet, all of this effort will go to waste if you don't implement your risk treatment plan.

Implementation means to ensure that the activities on the plan are carried out. If the plan is well developed, this should happen easily because all the tasks will be clear and will be delegated to specific people. It is critical that the plan be communicated to all those who will be responsible for carrying out actions, whose co-operation is required, and whose involvement could have an effect on the success of the plan.

Even if your plan is well developed, accurately identifies all the ways things can go wrong, and identifies an appropriate treatment for each one, disaster could strike if even a small aspect of the plan isn't properly put into action.

5.6.5 Example of a treatment plan

Earlier, we identified three fire risks each needing some treatment to reduce their severity to an acceptable level. Those risks were:

(a) Fire in yard damages or destroys storage building;

(b) Fire in finishing area destroys production building;

(c) Fire in offices stops administration work.

Table 10 shows how you might decide on some risk treatments or reduction options for one of those risks.

Table 10 – Example of how to develop risk treatment options

		Evaluation of risk					
Risk treatment/ reduction option	**Risks reduced by this option**	**Current**	**After this option**	**Cost in $**	**Priority**	**Recommended completion date**	**Who will be accountable for this?**
New boundary fence	Fire damages/ destroys storage building	Medium	Low	5,500	Medium	Within 12 months	Stores and Finished Goods Manager
Yard housekeeping programme	Fire damages/ destroys storage building	Medium	Low	0 due to sale of salvaged wood	High	Within 1 month	Stores and Finished Goods Manager
Smoking shed in yard	Fire damages/ destroys storage building	Medium	Low	2,500	Low – smoking can be banned on site	Rejected, smoking ban instead	N/A

5.6.6 Documentation

See Appendix B3 for a worksheet you might use to assess treatment options, and Appendix B5 for a worksheet to help you develop your risk treatment plan.

5.7 Monitor and review

Congratulations! If you have carefully completed the previous five stages of the risk management process, you probably have a risk management system in place. Now you need to monitor several elements of your fire risk management programme to ensure it is effective.

5.7.1 Examples of monitoring and reviewing are set out in table 11.

Table 11 – Monitoring and reviewing examples

Who should monitor?	What should they monitor?	How should they monitor/review?
Senior management	Your organisational context If anything changes in terms of your goals, the environment you operate in, or your internal situation, it could affect your risks and their controls	Review your documented context statement and risk profile: • whenever anything significant changes • once a year as part of strategic planning
Senior and middle managers	Your risk profile can change if you change objectives, or your suppliers, employees or customers change. Risks change in terms of their likelihood and potential consequences. New fire risks can arise, and old ones can disappear.	Regular management review meetings to discuss changes in the risk profile and decide what needs to be done. Regular project reports during major projects.
Middle managers and team leaders	Risk controls should be monitored for effectiveness Overall standards of hazard and risk management	Observations Regular inspections
Middle managers and team leaders	Achievement of risk treatment plans	Management or project team meetings
Employees and contractors	Adequacy of resources for them to control risks	Compare the resources they have with those set out in control plans. Ask for more resources if the job/ project changes.
Third party audits and reviews	ACC workplace safety management practices auditors, insurance broker and insurance company staff or OSH inspectors may monitor risk controls in which they have a special interest	Inspections and audits

Figure 15 shows that most monitoring effort should be on a day-to-day basis (e.g. employees and contractors checking their own work) with less frequent effort applied by managers to assessing the effectiveness of controls and (say) an annual audit of the overall management system by specialists.

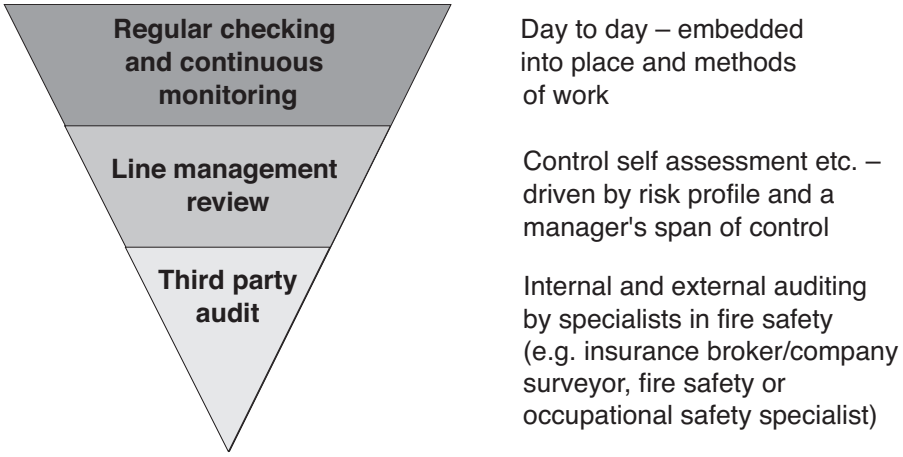


Figure 15 — Hierarchy of assurance activities

5.8 Communicate and consult

Communication and consultation are important elements of the fire risk management process. Communication is not a stage in the process, but the means of involving and informing stakeholders continually throughout the process. You want everyone to:

(a) Have the same, shared view of fire risks and the need to control them effectively;

(b) Be aware of their roles and responsibilities;

(c) Know the fire risk management programme; and

(d) Be aware of the procedures for controlling fire risks.

This is done in a variety of ways via communications. Table 12 gives some examples of who, what and how to communicate about fire risks. Some of the examples of how to communicate are included in our descriptions of controls and treatments.

Using table 12, you should be able to improve the way you communicate about fire risks and their controls in your place of work.

Table 12 — Communication needs – examples for developing a plan

Who to communicate with	What to communicate	How to communicate
Employees	Your expectations for ignition prevention (smoking, electrical safety, etc.), housekeeping (when and how to clean up, etc.), use of fire extinguishers	Training (induction, on-the-job, skills, etc.) Tool box meetings Signs and notices Whiteboards for shift handover
Contractors	Your general expectations for qualifications, experience and supervision of contractor employees	Annual briefings of preferred suppliers
	Your job-specific requirements for fire safety including ignition prevention (smoking, electrical safety, hot work control, etc.), housekeeping (when and how to clean up, etc.), flammable liquid control	Contract conditions Pre-job induction training Permit-to-work procedure setting out job/task specific requirements
All building occupants	Fire alarm and evacuation procedures	Training (induction, on-the-job, skills, etc.) Notices
All building occupants in multi-tenanted buildings	Housekeeping in common areas such as stairwells and lobbies	Lease conditions, letters, etc.
Suppliers of raw materials	Information about conditions for the use and storage of hazardous materials	Material safety data sheets

Stakeholders need to be aware that the organisation is systematically addressing risk, whether they are in governing roles responsible for the organisation's overall performance, or regulators who need to know that you are complying with relevant legislation. Stakeholders' views need to be considered in developing the criteria for evaluating risk (see 5.2.5), in order to reflect their tolerance for different kinds of risks.

By developing not only awareness, but a culture of responsiveness to risk, your organisation will begin to develop a commitment to continuous improvement.

6 Summary

6.1 The generic risk management process, as set out in AS/NZS 4360 *Risk management*, involves the following five process stages and two ongoing activities:

(a) Establish your context to consolidate your understanding of the factors that will guide how you manage risk, considering both internal factors (e.g. goals, relationships, activities and capabilities) and external factors (e.g. social standards, legal context). In this stage, you also confirm or develop your risk evaluation criteria which you will use to prioritise your risks.

(b) Identify your risks – what potential fire risks could the organisation and its people face?

(c) Analyse your risks by determining what consequences they would probably have, and how often they are likely to happen, considering controls you already have in place.

(d) Evaluate your risks against your risk evaluation criteria, and establish the overall level of risk, to determine whether each risk is acceptable or unacceptable.

(e) Treat risks – you might decide to retain a risk, avoid it altogether, reduce the likelihood or consequences, or share it with someone better able to manage the risk or the consequences.

(f) Monitor and review your risk management process, your context and risks, your treatment plan and results.

(g) Communicate and consult with internal and external stakeholders throughout the process to inform and involve them. Gather input from them on risks and their characteristics, evaluation criteria, satisfaction with the process and with the risk treatment plan. Provide them with information on the organisation's risk management policy and process, controls and their responsibilities.

6.2 While the generic Standard sets out five logically sequenced stages, you may find that you work backward and forwards as you gather information and learn things about the organisation and its risk profile. For example, at different stages there is a need to revisit your risk evaluation criteria. You may start identifying risks and realise that you need to include a further type of consequence in your criteria. As you start analysing risks you might find it necessary to go back and refine the list of risks you identified previously.

6.3 Risk management is set out in the Standard and in this *Handbook* as a separate process. It is helpful to look at it this way so that you understand the principles but, ideally, risk management should be part of everything we do. Now that you know the principles of risk management, you can apply them formally and informally, at a high level or a detailed level, as part of strategic, business, operational and project planning and delivery.

6.4 Organisations operate on many levels; at times we need to focus on the strategic, sometimes on more immediate business level needs, sometimes on day-to-day operational delivery. Depending on the focus, we may do things in a more formal, structured manner, or we might make decisions and respond to issues in a more informal or ad hoc way. While the degree of formality might differ, good managers will still apply basic management principles: ensuring compliance with organisational policies; ensuring their decisions are aligned with the organisation's goals, ensuring that action is taken once a decision is made; and checking to see that the action has brought about the desired results. At the strategic and business planning levels, this will be done through a fairly formal process, and the decisions will be documented and reported against. In the field, decisions and checking are often done quickly and verbally.

6.5 Similarly, the level of resources in your organisation will influence your approach to both management and risk management. Smaller organisations with simpler management and risk situations will probably apply less complicated risk management approaches. Larger, more complex, organisations may need to use more refined processes and tools.

6.6 While AS/NZS 4360 *Risk management* and this Handbook are designed to provide you with a process and some tools to help you manage fire risk, they cannot eliminate the need for you to think critically about your organisation, its goals, its environment, and its risks and opportunities.

APPENDIX A – GLOSSARY OF TERMS

Board – a governing or advisory body comprised of directors, which may include committees of management.

Consequences – the outcomes of an event expressed qualitatively or quantitatively, being loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event.

Control – any process, system or action (usually taken by management or other parties) to enhance risk management and increase the likelihood that established objectives will be achieved. A given control may affect either the likelihood or consequences of a risk or both.

Fire load – in simple terms, this is the total amount of heat that can be reasonably expected to be given off by all of the combustible materials that might burn in a fire compartment or fire cell.

Hazard – a source of potential harm (see AS/NZS 4360 *Risk management*) or (in the Health and Safety in Employment Act 1992):

(a) An activity, arrangement, circumstance, event, occurrence, phenomenon, process, situation, or substance (whether arising or caused within or outside a place of work) that is an actual or potential cause or source of harm; and

(b) Includes a situation where a person's behaviour may be an actual or potential cause or source of harm to the person or another person.

Fire and its consequences for people are therefore a hazard within the meaning of the Act.

The Act also says that a significant hazard means a hazard that is an actual or potential cause or source of serious harm. Fires can cause severe burns that may be life-threatening and cause long-term disability.

Insurance – a contract whereby the insurer agrees, for payment of a premium by the insured, to indemnify the insured against loss resulting from certain events. The policy is the document which contains the insurance contract.

Liability – a legal obligation or the obligation itself. A person who commits a wrong or breaks a contract or trust is said to be liable or responsible for it.

Likelihood – the chance that something will happen in a given time frame. It is expressed in terms of number of incidents per time period or series of activities.

Licensed Building Practitioner (LBP) – the licentiate must hold the relevant documentation from a certified organisation such as Building Research Association of New Zealand, Master Builders Federation or an Educational Institution.

Occupational health and safety management system – that part of the overall management system which includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the occupational health and safety policy, and so managing the risks associated with the business of the organisation (see AS/NZS 4801 *Occupational health and safety management systems*).

Organisation – a body, association, company, firm, enterprise, or other legal entity, whether incorporated or not, public or private, that has its own function(s) and administration.

Place of work – a place (whether or not within or forming part of a building, structure, or vehicle) where any person is to work, is working, for the time being works, or customarily works, for gain or reward; and, in relation to an employee, includes a place, or part of a place, under the control of the employer (not being domestic accommodation) provided for the employee where the employee comes or may come to eat, rest, or get first-aid or pay; or

(a) Where the employee comes or may come as part of the employee's duties to report in or out, get instructions, or deliver goods or vehicles; or

(b) Through which the employee may or must pass to reach a place of work.

Risk – the chance of something happening that will have an impact upon objectives. Risk is measured in terms of a combination of the consequences of an event and their likelihood and may have a positive or negative impact.

Risk assessment – the overall process of risk identification, risk analysis and risk evaluation.

Risk evaluation – the process of comparing the level of risk against criteria.

Risk management – the culture, process and structures that are directed towards realising potential opportunities whilst managing adverse effects.

Stakeholders – specific people or groups who have a stake in the outcome of the project. Normally stakeholders are from within the company, and could include internal clients, management, employees, administrators, etc. A project may also have external stakeholders, including suppliers, investors, community groups and government organisations.

APPENDIX B – SAMPLE WORKSHEETS

B1 – Fire risk context worksheet

What sort of business do we operate?	
What are our objectives?	
Who are our most important suppliers of:	
Raw materials? (Who are they and what do they supply?) Plant and equipment? (Who are they and what do they supply?) Utilities e.g. electricity, water, gas, telephone, transport. (Who are they and what they supply?)	
Who are our most important customers?	
Do we have contractors or subcontractors?	
If so, who are our most important contractors or subcontractors and what do they do for us?	
How is our business structured?	
What operational activities do we operate?	
What equipment do we use to move and process materials or stock, wrap or pack finished goods, etc?	
What are our business functions? (Describe using a flow chart or a site layout sketch.)	

Page		**of**		**Compiled by:**		**Date:**	

B2 – Fire risk analysis and evaluation worksheet

					No controls – absolute risk			With controls – current risk		
Risk	Cause(s)	Controls / Effectiveness	How often	Consequences / Outcome	Consequences	Likelihood	Risk level	Consequences	Likelihood	Risk level

Page		of		Compiled by:		Date:	

B3 – Fire risk treatment option worksheet

Use this worksheet to compile options for responding to risks. Once you have assessed the cost/benefit of all the options, you decide which one, or which combination, provides the best balance for the risk.

		Level of risk					
Risk treatment/reduction option	Risks reduced by this option	Current	After this option	Cost in $	Priority	Recommended completion date	Who will be accountable for this?

Page		of		Compiled by:		Date:	

B4 – Risk severity matrix

Likelihood						
	Almost certain	**Medium**	**High**	**High**	**Extreme**	**Extreme**
	Possible	**Medium**	**Medium**	**High**	**High**	**Extreme**
	Unlikely	**Low**	**Medium**	**High**	**High**	**High**
	Rare	**Low**	**Low**	**Medium**	**Medium**	**High**
	Almost incredible	**Low**	**Low**	**Medium**	**Medium**	**High**
		Negligible	Minor	Moderate	Major	Catastrophic
		Consequences				

B5 – Fire risk treatment plan

Use this worksheet to collate your selected risk treatment/reduction options into a comprehensive plan that can be updated to show the current status of work.

Risk treatment action	Owner of action	Status – how far has work gone with this?	Cost – show cost to date and estimated total	Priority – high medium or low	Target completion date

Page		of		Compiled by:		Date:	

APPENDIX C – EXAMPLES OF RISK CONTROLS AND TREATMENTS

C1 Tables C1 to C12 of this Appendix summarise examples of risk controls and treatment options under the broad headings of:

(a) Key features;

(b) Who should be accountable;

(c) Broad indication of control costs (high, moderate or low);

(d) What needs to be communicated;

(e) What needs to be monitored;

(f) Where to get further information.

Table C1 – Eliminate the fire hazard

	Elimination of ignition sources – general	Smoking rules	Elimination of flammable liquids and gases
Key features	Removal of all ignition sources from a specified area or building in a workplace where there are flammable liquids or gases	Although smoking is no longer legal in places of work, some people will be tempted to break the rules. Clear, enforced rules on smoking inside the workplace and the provision of a safe place for smoking will reduce the risk.	This can eliminate a fire risk completely but may be expensive or a long-term solution or both. Such an approach can also help achieve conformance with environmental management systems and resource consents issued under the Resource Management Act 1991. The general approach to elimination of flammable liquids and gases is to: (a) Replace a flammable liquid with a water-based equivalent; (b) Substitute with less hazardous materials or processes by re-engineering the process; (c) Replace a low flashpoint flammable liquid with a high flashpoint liquid. It is possible to substitute less hazardous solvents for flammable solvents and there can be considerable cost savings in doing this.
Who should be accountable?	Executive management for approval of the proposal and capital expenditure. Local management and employees for continued exclusion of ignition sources.	Senior management for rule setting and (if required) the provision of a safe smoking place. All employees and contractors for observation of smoking rules	Executive management for approval of the proposal and capital expenditure. Local management and employees for continued exclusion of flammable liquids and gases
Broad indication of control costs	High	Low	Moderate
What needs to be communicated?	Prohibition of all portable ignition sources being taken into an identified area	Smoking rules	The prohibition of flammable liquids or gases being taken into a specified part of the place of work
What needs to be monitored?	Continued exclusion of ignition sources	Observation of smoking rules	Continued exclusion of the sources of flammable liquids and gases
Further information	Local Fire Safety Officer, insurance broker or insurance company		

Table C2 – Reduce the likelihood – Control ignition sources

	Relocate lights or other ignition sources	**Eliminate overloaded sockets or extension cables**
Key features	It may be possible to relocate lights or other ignition sources so they are not near combustible materials	Overloaded sockets or needless use of extension cables can be avoided by providing enough power points that are permanently wired to the electrical system and near to the electrical equipment
Who should be accountable?	Executive management for approval of the proposal and capital expenditure. Local management and employees for planned inspections to detect changes in the fire risk	Executive management for approval of the proposal and capital expenditure. Local management and employees for planned inspections to detect changes in the fire risk
Broad indication of control costs	Moderate	Low
What needs to be communicated?	Why the lights or other ignition sources have been moved	Why extension cables are generally prohibited. Why sockets must not be overloaded
What needs to be monitored?	Continued separation of lights or other ignition sources from combustibles	Continued absence of overloaded sockets and extension cables
Further information	Your local Fire Safety Officer, insurance broker or insurance company	Your registered electrician
	Regular testing of electrical equipment	**Static electricity suppression**
Key features	Regular testing of electrical equipment, especially if it can be damaged while in use, may find faults that could ignite fires or give users electric shocks	Static electricity charges can sometimes be very large and can ignite flammable liquids or dusts. This is a specialist subject and requires special knowledge
Who should be accountable?	Maintenance engineer, contract registered electrician or similar	Senior management for risk identification and development of a budget
Broad indication of control costs	Low	Moderate
What needs to be communicated?	All electrical equipment brought on site is to be tested and certified safe before use	Continued operation of any static electricity elimination or control systems that are installed
What needs to be monitored?	That the inspection system is continuing to be operated and produce positive results	Continued operation of any static electricity elimination or control systems that are installed
Further information	AS/NZS 3760 *In-service safety inspection and testing of electrical equipment*	AS/NZS 1020 *The control of undesirable static electricity*

Table C3 – Reduce the likelihood – Control hot work

	Welding and hot work
Key features	Uncontrolled welding and hot work causes many fires that are often larger than other fires. Key features of an effective hot work control system include the following. Employees and contractors may only carry out welding or hot work if they are trained, competent and authorised. Permit issuers should not also be people who carry out the hot work. The hot work is only permitted if it is not possible to substitute a different way of doing the job such as removing the work to a safe place or cold work. A safer place that has non-combustible walls and floors and that is kept clear of all combustibles has been designated as a welding bay where welding or hot work is done. No welding or hot work is allowed outside the safe place unless a permit-to-work has been issued. Before any permit is issued, the work location must be inspected for fire hazards and a permit only issued after compliance with preparatory work. The preparation must include questioning why the hot work needs to be done at this location. All permits-to-work must require fire risk reduction measures before the work starts. These may include: (a) Removal of combustibles from a 10-metre radius of the proposed work; (b) Covering any combustibles that cannot be removed with fire blankets; (c) Ventilation of spaces where flammable vapours could accumulate; (d) Checking behind walls for stored materials that could be ignited; (e) If walls are to be worked on or heated by the welding, checking if they are constructed from combustible materials or contain polystyrene insulation or other materials that could be ignited; (f) Blocking up any holes in walls or floors through which sparks or hot slag could pass. All permits-to-work must require fire risk control measures during the work. For example: (A) Enough charged hose reels laid out near to the hot work to promptly attack any fire that does start; (B) During the work, have a person as a fire watcher who is armed with a fire extinguisher and trained in fire fighting. All permits-to-work must require fire risk control measures after the work is completed. For example: (1) Have a person as a fire watcher, armed with a fire extinguisher, for at least an hour after the hot work has finished; (2) If the work finished towards the end of the working day, leave hoses and extinguishers handy and require a security guard to visit the scene of the hot work hourly.
Who should be accountable?	Maintenance management and employees; contractors carrying out maintenance or installation work
Broad indication of control costs	Low
What needs to be communicated?	All maintenance employees and contractors must be trained in the hot work control rules
What needs to be monitored?	Compliance with in-house rules. Spot checks on individual hot work permits
Further information	Special hot work (e.g. on tyres, tanks or drums) may require additional precautions. Hot work on vessels or tanks can ignite fires and cause explosions. These fires can be fuelled by flammable deposits, vapours or gases that are often invisible unless the vessels or tanks are properly inserted and checked beforehand. See section 6 of NZS 4781 *Code of Practice for safety in welding and cutting* and the Department of Labour booklet *Hot work on drums and tanks*. AS 1674 *Safety in welding and allied processes,* Part 1*: Fire precautions*.

Table C4 – Reduce the likelihood – Control the fuels

	Housekeeping	Cooking in deep oil	Dust and explosion risks
Key features	Good housekeeping for fire safety should be straightforward but details are often overlooked. The following guidelines apply to any housekeeping programme: (a) Cleaning schedules are defined for all areas, including hard to reach places (e.g. machine rooms and ventilation ducts) and modified if experience shows cleaning is too frequent or infrequent; (b) The right cleaning equipment and materials are provided; (c) Set accountabilities for housekeeping and monitor achievement of required standards; (d) Contractors are used for specialist work such as access to extract ventilation ducts to clean out dust or grease. This may require shut-down of a process and special access equipment; (e) Clean-as-you-go practices help minimise cleaning at the end of the day; (f) Consider setting a time at the end of the day for final clean- and tidy-up; (g) Include an end-of-day shut-down and clean-up routine.	Regular checks on thermostats, high temperature cut-outs and temperature controls should be carried out to ensure they are keeping the oil at a safe temperature. A safe system of working for draining and filtering the oil should be developed to avoid burns and spillages	Many dusts (including milk powder, wood dust and flour) can explode if they are ignited in a confined space. It is safest to assume that such dusts will explode unless there is evidence to the contrary. Special precautions will need to be taken if there is an explosion risk. This area requires specialist advice
Who should be accountable?	Local management for development and implementation of effective housekeeping. All employees and contractors for daily housekeeping	Maintenance employees and contractors who carry out checks on equipment. Managers and employees who work with deep oil for cooking or processing	Senior management for capital expenditure to eliminate dusty processes or install dust control systems. Maintenance and local management for cleaning and maintenance of dust control systems. Contractors for compliance with fire safety rules
Broad indication of control costs	Low	Low	High to moderate
What needs to be communicated?	The who, when and how of good housekeeping should be included in location or task-specific training	The when and why of routine checks and safe operating procedures	Compliance with rules for the control of dust to avoid fire and explosion risks
What needs to be monitored?	Housekeeping standards should be monitored as part of the regular inspection programme	Compliance with procedures	Compliance with in-house rules and housekeeping systems
Further information	Manufacturers and suppliers of cleaning equipment and materials may provide advice and model cleaning schedules	Equipment manufacturers for their instruction and maintenance manuals	Consult your local Fire Safety Officer, insurance broker or insurance company

Table C5 – Reduce the likelihood – Control the fuels – Building materials

	Combustible building materials – Polystyrene insulated panels
Key features	Polystyrene cored insulated panels are a popular building material used for cladding and structural elements, especially in the food industry where high standards of hygiene are required. Whilst most of the core material in these panels used in New Zealand have been treated with a fire retardant and they may not be the first item to be ignited, such panels are known to burn to producing dense black smoke (making evacuation difficult) and they may delaminate and collapse at relatively low fire temperatures (typically 150 – 200 ^{O}C). Fire ignition of the core material is often due to hot work, hot processes operations on, or adjacent to the panels, fires in adjacent combustible materials such a stack of idle timber pallets, hot process plant passing through the panels and electrical faults. Ignition of polystyrene insulated panels is prevented by: (a) Installation of panels strictly in accordance with the manufacturer's specifications and detailing; (b) Strict hot work controls; (c) High standards of electrical safety; (d) Avoidance of hot processes in contact with the panels, e.g. unprotected flues, light fittings, etc. inset or passing through the panels; (e) Protection of openings and penetrations that less can expose the polystyrene core to heat sources; (f) Preventing damage to the steel skins of the panels exposing core material.
Who should be accountable?	Managers who let contracts for the design and construction of new buildings or alteration of existing buildings. Maintenance staff who supervise contractors who carry out work near to polystyrene insulated panels. Contractors who carry out work near to polystyrene insulated panels.
Broad indication of control costs	Moderate
What needs to be communicated?	The high fire risks due to polystyrene insulated panels must be communicated to all staff and contractors who work on such panels. They must also know how to prevent fires in such panels
What needs to be monitored?	Compliance with in-house rules
Further information	Further technical information is in Research Report 45 *Improving the Fire Performance of Polystyrene Insulated Panel in New Zealand* published by the NZ Fire Service Commission, Wellington, NZ

Table C6 – Reduce the likelihood – Management and administrative controls

	Training and competency	Regular inspections
Key features	A fire risk management system may require, for example, training to achieve the following competencies: (a) Proper housekeeping to minimise a build-up of combustible materials inside and outside the workplace; (b) Inspection and testing of portable electrical equipment; (c) "Approved handler" competencies under the Hazardous Substances and New Organisms Act 1996 for employees who work with hazardous substances – such training may be arranged through industry training organisations; (d) The correct use of portable fire extinguishers. For both employees and contractors, competence can be demonstrated by successful completion of relevant industry training organisation standards supplemented by in-house training on your own rules and policies.	Planned weekly or (for low-risk places of work) monthly inspections can help identify failure of controls and changed or new fire hazards. Use a team of people from different groups to carry out inspections and equip them with a checklist focused on your workplace hazards. A checklist will need to include: (a) Your ignition sources (evidence of unauthorised smoking, overheating equipment, damaged electrical equipment, etc.); (b) Housekeeping in relation to the combustibles on your site (excessive quantities of packing materials, flammable liquids, scrap and waste, etc.); (c) Safety signs (obstructed, missing, damaged, etc.); (d) Fire-fighting equipment (obstructed, missing, discharged, damaged, etc.); (e) Fire doors and windows (obstructed, damaged, etc.) Apart from rotating who carried out the inspection, consider changing the time of day and day of the week when inspections are carried out. In addition to remedying any deficiencies, ask "why did this happen?" and remedy the causes of the deficiencies.
Who should be accountable?	A senior manager who develops training for all employees. Contractors who should demonstrate the competence of their employees	Local management and teams of employees who can carry out inspections in their own areas or with colleagues from other areas
Broad indication of control costs	Moderate	Low
What needs to be communicated?	Compliance with legal requirements and in house rules for training and fire safety	The need for continued, planned inspections and the outcomes of those inspections
What needs to be monitored?	Achievement of agreed training and competence	That planned inspections are actually being carried out and producing positive results
Further information	Your industry training organisation	Your insurance broker or insurance company

Table C7 – Reduce the likelihood – Legal compliance

	Building Warrant of Fitness	Hazardous Substances and New Organisms Act requirements	Signs
Key features	Annual testing of building systems, including air conditioning and heating systems and electrical systems, may be required for many places of work. Check if a Building Warrant of Fitness is required for the building your workplace is in. If so, there may be specific requirements for testing and inspections that you are required to carry out.	There will be specific requirements for the transport, handling, storage, use and disposal of many flammable liquids and gases. Find out which apply to your workplace and implement them. A simple safety principle is VICES: • **Ventilation** of places where flammables are used or could be spilled. • **Ignition** sources have been removed. • **Containment** of flammable liquids is achieved by the use of lidded containers and spillage catchment trays. • **Exchange** of a flammable liquid for a less flammable one. • **Separation** of the area where flammable liquids are stored or used from other work areas. Under the HASNO Act and HASNO Regulations there are requirements for all sites that use or store hazardous materials to formulate adequate emergency plans	Signs should identify escape routes, emergency related features and potential hazards. They should be clearly visible under normal circumstances and fire exit signs should be visible in the event of failure of the power supply. Some signs are required under the Building Act 2004 and must be maintained as a requirement of the Building Warrant of Fitness
Who should be accountable?	Local management for design and operation of inspection and maintenance programmes for building systems	Executive management for approval of the proposal and capital expenditure. Local management and employees for continued operation of VICES	Maintenance employees
Broad indication of control costs	Moderate	High to moderate	Low
What needs to be communicated?	The what and why of planned inspections	Specific legal requirements under the Hazardous Substances and New Organisms Act. The what and why of VICES	The need to keep signs clear and in good condition
What needs to be monitored?	The continued, effective inspection and maintenance of building systems must be monitored as well as the planned inspection of specific building systems	Continued implementation of Hazardous Substances and New Organisms Act requirements and VICES	Changes to risks that require signs or the updating of existing signs
Further information	Your territorial authority for information about the compliance schedule and Building Warrant of Fitness requirements	Your Hazardous Substances and New Organisms Act regulatory agency, ERMA, local Fire Safety Officer, insurance broker or insurance company	BS 5378: *Safety signs and colours* Part 1 *Specification for colour and design* and AS 1319 *Safety signs for the occupational environment.* Your territorial authority can tell you what is in the compliance schedule for your building

Table C8 – Reduce the consequences – Automatic fire suppression systems

	Automatic sprinkler systems	**Gas flood systems**
Key features	Sprinkler systems may be required for new buildings. Existing and new systems will be covered by Building Warrant of Fitness requirements under the Building Act. A sprinkler system is designed to: (a) Detect a fire in the early stages of development; (b) Give a warning to the occupants of the building; (c) Send a signal to the Fire Service; (d) Control the fire. A sprinkler system operates by spraying water directly onto the fire and will normally limit the fire to the area under two or three sprinkler heads. Only those sprinkler heads directly in the heat plume will operate. Normally, a sprinkler system will protect a whole building and has a large enough water supply to control a fire before the Fire Service arrives.	Gas flood systems are actuated by sensors and release an inert gas into an area. The inert gas reduces the oxygen in the area to a level that will no longer sustain combustion. Gas flood systems are custom designed to protect confined spaces and are very efficient in extinguishing fires in difficult enclosed spaces, such as enclosed machinery and small high value rooms such as computer suites. To be effective they require the space being protected to be reasonably sealed to prevent the leakage of the suppressant gas. For safety reasons and to minimise false alarms the systems are actuated by the operation of two detectors (double knock) and an audible alarm must sound on the detection of any outbreak of fire. There must then be a delay of not less than 30 seconds designed into the system before the gas is discharged.
Effect on the risk	Reduces the consequences	Reduces the consequences
Who should be accountable?	Maintenance employees and contractors for routine testing and maintenance	
Broad indication of control costs	High to moderate	
What needs to be communicated?	Training of relevant new and current staff on how and when such a system operates and why it must not be impaired, especially if hot work or other high risk activities are planned	
What needs to be monitored?	Impairments, routine testing and maintenance	
Further information	Your territorial authority, Fire Safety Officer, insurance broker or insurance company, service or equipment providers	
	NZS 4541 *Automatic sprinkler systems*	AS 4214 *Gaseous fire extinguishing systems*

Table C8 – Reduce the consequences – Automatic fire suppression systems (continued)

	Foam systems	**Fusible link and lid systems**
Key features	An automatic foam flood system may be a good way of blanketing a fire in a tank or vat of flammable liquid	Open-topped tanks or vats containing flammable liquids can be protected by a hinged metal lid held open by a fusible link. Melting of the link by a fire will cause the lid to close and remove the supply of oxygen. Only protects individual high risk plant and equipment, e.g. kitchen ranges, deep fat fryers, tanks or vats.
Effect on the risk	Reduces the consequences of a fire. Not appropriate for a whole building.	Reduces the consequences of a fire. Not appropriate for a whole building.
Who should be accountable?	Maintenance employees and contractors for routine testing and maintenance.	
Broad indication of control costs	High to moderate	Moderate to low
What needs to be communicated?	Training of relevant new and current staff on how and when such a system operates and why it must not be impaired, especially if hot work or other high risk activities are planned	
What needs to be monitored?	Impairments, routine testing and maintenance	
Further information	Your territorial authority, Fire Safety Officer, insurance broker or insurance company, service or equipment providers	Your local territorial authority, Fire Safety Officer, insurance broker or insurance company, service or equipment providers

Emergency preparedness and response has been broken into a sequence of four stages:

(a) Raising the alarm;

(b) Evacuation;

(c) Emergency response with fire extinguishers and hose-reels;

(d) Business continuity planning.

Table C9 – Evacuation, emergency preparedness and emergency response

	Raising the alarm	Evacuation
Key features	Automatic fire detection systems provide 24-hour fire detection, so facilitating prompt evacuation. They are designed to: • Detect an outbreak of fire in the early stages of development • Give a warning of fire to the occupants of the building • (Where the alarm system is connected to the Fire Service) send a signal to call the Fire Service. An automatic fire alarm system fitted with heat or smoke detectors and that fully complies with NZS 4512 will have a high likelihood of quickly detecting a fire in its early stages and signalling an alarm to a monitoring station. Note that once the alarm has been signalled, you will be dependent on the Fire Service being able to attend and having sufficient water to mount an effective attack on any fire (see SNZ PAS 4509). Fire alarms that do not comply with NZS 4512 may not be as effective. Fire alarm systems that are not connected to a monitoring station will only provide limited local response to any activation. Manual fire alarm systems depend on a person activating the alarm and so are less reliable than an automatic alarm.	Emergency evacuation plans are required for most places of work under the Fire Safety and Evacuation of Buildings Regulations 1992. Additionally, the Hazardous Substances and New Organisms Emergency Management Regulations 2004 require emergency management plans to be implemented and tested for high risk activities. Regardless of whether such plans are legally required, it is good practice to develop plans that enable the prompt evacuation of all employees and visitors. Sometimes, it may be necessary to include neighbours in the evacuation plans. For example, in a multi-occupied building the landlord will include all tenants in the plan
Who should be accountable?	Senior management for capital expenditure to install an automatic fire alarm. Maintenance and local management for maintenance and testing of an alarm.	Responsibility for control of fire emergencies should be allocated to specified individuals and all employees given appropriate training in the emergency procedures
Broad indication of control costs	Moderate	Low
What needs to be communicated?	Employees and contractors should be told that activation of the alarm requires evacuation to a safe place. Impairments to any automatic fire detection system must be notified to your insurers and when the system is connected to the Fire Service.	Fire emergency instructions and emergency contacts should be clearly communicated throughout the building
What needs to be monitored?	Impairments to systems, routine testing and maintenance of the alarm system to ensure compliance with NZS 4512 and the Building Warrant of Fitness (existing and new systems will be covered by Building Warrant of Fitness requirements for servicing and maintenance).	Fire emergency equipment, exit signs and alarm systems should be inspected, tested and maintained at regular intervals. Fire evacuation drills should be held regularly (the Regulations require drills to be held six-monthly). The suitability, location and accessibility of fire emergency equipment should be assessed as part of the site fire risk assessment
Further information	Your territorial authority or local Fire Safety Officer NZS 4512 *Fire detection and alarm systems in buildings*	

Table C9 – Evacuation, emergency preparedness and emergency response (continued)

	Emergency response – fire extinguishers and hose-reels	Business continuity plan
Key features	Portable fire extinguishers and hose reels are relatively easy to use but to be effective, they need to be distributed and their positions marked so that they can be quickly found and used. Different extinguishers are used on different combustibles.	An effective business continuity plan will cover loss of key suppliers, utilities (including electricity, gas, water, telecommunications, transport and wastewater), buildings and assets you depend on and customers. You may also need to include crisis communications with your key stakeholders
Who should be accountable?	Maintenance employees for the routine inspection and testing of fire extinguishers. All employees and contractors should know how to use the portable fire extinguishers and hose reels provided in your place of work	Senior managers
Broad indication of control costs	Low	Low
What needs to be communicated?	Which extinguishers should be selected and how to use them	How the plan will work in practice
What needs to be monitored?	Monthly inspection of extinguishers to confirm they are present and in good condition. Annual servicing and testing	Like your evacuation plan, your business continuity plan should be tested from time to time and revised as circumstances change. Assess your circumstances (see 5.2) to see if they have changed.
Further information	Your local Fire Safety Officer, insurance broker, insurance company or fire extinguisher supplier can advise on the correct type of extinguishers for your place of work. NZS 4503 *Hand operated fire-fighting equipment* AS/NZS 1841 *Portable fire extinguishers*. NOTE – This is a family of standards and you should require that any extinguisher complies with AS/NZS 1841. AS/NZS 1221 *Fire hose reels*	A specialist consultant or your insurance broker or insurance company. For further guidance, see SAA/SNZ HB 221 *Business continuity management*

Table C10 – Risk isolation

	Isolate high fire risk activities
Key features	This entails moving high-risk activities to a: (a) Separate fire compartment detached from the rest of the building by a good fire wall and fire door; or a (b) Building remote from the main buildings. Generally, a separation of 10 metres will prevent a fire in the high-risk building spreading into other buildings. If the high-fire risk activity is in a fire compartment connected to the rest of the building, it may be necessary to provide both automatic, self-closing fire doors and a sprinkler system in the whole building to prevent fire spreading through any openings. In some cases, it may be possible to provide engineering controls to prevent access to a process while it is operating.
Who should be accountable?	Executive management for approval of the proposal and capital expenditure. Local management and employees for continued isolation of high risk processes
Broad indication of control costs	High to medium
What needs to be	Why the fire compartment or separate building is isolated from the rest of the site and how to control the higher fire risks inside the compartment or building
What needs to be monitored?	Continued operability of automatic, self-closing fire doors between fire compartments Compliance of any sprinkler system with NZS 4541 or NZS 4515 Integrity of any fire walls, ceilings and floors. Any penetrations of a fire compartmentalisation shall be adequately sealed with a proprietary material provided the required degree of fire resistance is met.
Further information	Local Fire Safety Officer, Building Officer of the territorial authority, insurance broker or insurance company

Table C11 – Risk sharing

	Contract with a third party to carry out the activity on your behalf	Insure assets against fire
Key features	There may be times when an activity poses a high risk of fire and reducing the risk to an acceptable level on your site is not cost-effective. A third party who has invested in special equipment may be well placed to carry out such a high risk activity more safely than you. They may charge a premium for this work, especially if their investment was large and they need a good return on their investment. Remember that you have a duty under section 18 of the Health and Safety in Employment Act to ensure the safety of employees of any contractor. In this case, you will need to be sure that the contractor really does have safer plant or systems than you	Insurance for the protection of your assets will smooth the costs of any losses (including fire) in exchange for the insurance premium. However, the insurance market fluctuates so it may be difficult to budget accurately for future costs of premiums. Insurance is often best applied to large or catastrophic losses that could put you out of business
Who should be accountable?	A senior manager who has authority to negotiate a contract and understand your legal responsibilities under the Health and Safety in Employment Act for the safety of employees of any contractor	The manager who buys insurance
Broad indication of control costs	High to moderate	Moderate
What needs to be communicated?	The contractor must be informed about hazards associated with materials in your process	Any special requirements of insurers for fire safety
What needs to be monitored?	Arrangements for protecting the safety of employees of the contractor	Compliance with any insurers requirements and annual costs of insurance and the level of the insurance excess
Further information	SAA HB 240 *Guidelines for managing risk in outsourcing* provides guidance on contracting out	Your insurance broker or insurance company. SAA HB 141 *Risk financing guidelines* contains further guidance on risk finance, including insurance

Table C12 – Special cases – Arson and construction

	Arson	Construction work
Key features	No part of New Zealand is immune from the growing risk of arson. Serial arson attacks require collaboration between the Police, Fire Service and communities that are affected. The following is general guidance for individual sites only. Arson prevention requires: • Good relations with neighbours and staff vigilance • High standards of housekeeping, especially in outside areas and yards • Good site security that may need to include: – a good perimeter fence with securely mounted lockable gates – external lights mounted on the main buildings to light up any yard and outside doors and windows – avoiding stacking goods near boundary fences where they may attract thieves or provide places to climb over the fence securing tools, plant and equipment inside buildings – locking away flammable liquids and locking off valves, taps and controls for flammable liquids – keeping rubbish either in locked bins or in a locked compound away from buildings – security guard patrols when the site is not operating.	Construction work typically results in the use of equipment and hot work in ways that are less controlled than in other places of work. It therefore poses a higher fire risk. Commonsense fire prevention during construction work includes: • Safe storage of LPG cylinders in well-ventilated and secure areas • LPG supplies turned off when not in use and LPG equipment properly maintained • Hot work and welding controls • Avoiding stockpiles of combustible building materials • Avoiding burning waste on site.
Who should be accountable?	Senior managers	A senior manager who is the project sponsor
Broad indication of control costs	Moderate to low	Moderate to low
What needs to be communicated?	The need for good security and housekeeping	Your fire safety requirements must be communicated to the contractor
What needs to be monitored?	Compliance with the arson prevention measures	Compliance with your fire safety requirements
Further information	Your Fire Safety Officer, Certified Tester, insurance broker or insurer	

APPENDIX D – LEGAL RESPONSIBILITY

D1 Introduction

The purpose of this Appendix is to help you learn to recognise your legal responsibilities and their associated risks in relation to fire in places of work rather than to identify all legal risks for organisations. Where you identify an exposure to a specific legal risk, you need to analyse the risk to understand the possible consequences for your organisation, and how likely they are to happen. If you don't have the knowledge or expertise to do this, you should research further or seek specialist legal advice.

There are many sources of legal responsibility. Legal requirements can be codified into statutes and local authority bylaws, developed through judges' decisions (common law), or created by contracts.

D2 Statutes and Regulations

By definition, we must comply with all statutes. However, our risk of breaching some statutes is greater than for others, depending on what we are doing. There are certain statutes that all organisations should be familiar with, and others that are applicable to particular activities.

D2.1 Workplace legislation

All employers must be aware of their responsibilities under a variety of Acts relating to the workplace including the:

(a) Building Act 2004;

(b) Health and Safety in Employment Act 1992;

(c) Hazardous Substances and New Organisms Act 1996;

(d) Fire Service Act 1975 and Fire Safety and Evacuation of Buildings Regulations 1992.

D2.2 Building Act 2004

The Building Act governs how buildings are to be constructed, maintained and occupied. The New Zealand Building Code (NZBC) is part of the Building Regulations made under the Act. The Code contains an objective, a functional requirement and performance criteria for the different aspects of a building. These aspects of building are referred to as the NZBC Clauses.

The NZBC does not contain prescriptive requirements. It states how a building is to perform (given in qualitative or quantitative terms), but does not prescribe detailed requirements for design and construction. Such details are found in the non-mandatory compliance documents, which the Department of Building and Housing produces to help people meet the requirements of the Building Code.

Six of the 34 clauses are specifically concerned with fire safety matters. They are: outbreak of fire; means of escape; spread of fire; structural stability during fire; hazardous substances and processes; warning systems.

Because the Act is performance-based, there are many different ways of achieving compliance. However, the Act requires that an Acceptable Solution to satisfy each Clause of the NZBC be published for building owners to use. Any Alternative Solution used by the building owner to satisfy the NZBC must be comparable to the level of construction provided by the Acceptable Solution.

Over and above the construction of a building, the Act requires that a building be maintained to the standard to which it was constructed. For buildings built since the Building Act 1991 this is the NZBC. For earlier buildings this will be whatever standard was applicable at the time of construction. An owner of an older building is under no obligation to satisfy the NZBC unless they choose to do building work, or unless the building is dangerous or insanitary.

Continuing compliance of a building with the standards to which it was constructed is required. Buildings that contain specified systems must be issued with a compliance schedule. The schedule states the systems which are in the building and frequency of testing, maintenance and inspection that must be done. The majority of this work is required to be performed by an appropriately qualified and skilled individual, referred to as a Licensed Building Practitioner (LBP).

If a compliance schedule has been issued for a building the owner must issue an annual building warrant of fitness. This can only be issued once the owner has received certification from an LBP for each specified system that is on the compliance schedule. The certification states that the LBP has performed the maintenance testing and inspection specified on the compliance schedule, and that the specified system continues to satisfy its design performance criteria.

It is a criminal offence to allow a building to be used or occupied if it is dangerous. Fire safety matters are primary considerations in determining if a building is dangerous. The New Zealand Fire Service can be asked to provide a council with advice about fire safety matters. Additionally, failure to maintain a specified system can also result in a declaration that a building is dangerous.

In summary, the Building Act plays a big part in fire safety and fire risk management that places obligations on an owner not only during construction, but also throughout the life of the building.

D2.3 Health and Safety in Employment Act 1992

The Health and Safety in Employment (HSE) Act has particular relevance to managing fire risk in New Zealand in that it contains specific safety requirements for employers, employees and contractors. The Act contains requirements for injury prevention, responding to incidents and reporting cases of serious harm.

Employers have a duty to take all practicable steps to identify workplace hazards that could harm employees and others and either eliminate, isolate or minimise significant hazards. In some cases, personal protective equipment may be required. Employees must be consulted about the hazards and the development and implementation of controls.

The term “all practicable steps” is defined to include the phrase “so far as is reasonably practicable”. The term reasonably practicable recognises that perfect safety is unattainable. However, employers and others are required to think about risks in the workplace before harm has happened. One way of doing this is to ask how much effort in time and money you need to expend to prevent harm that is foreseeable, taking account of current knowledge and technology.

If it will take much effort to prevent trivial harm, it is likely that the courts would find that all reasonably practicable steps will have been taken. If the level of potential harm is severe it is likely that the courts would expect considerable effort to have been expended to prevent the harm.

D2.4 Hazardous Substances and New Organisms Act 1996

The Hazardous Substances and New Organisms (HSNO) Act 1996 reformed the law relating to the management of hazardous substances and new organisms in New Zealand. In relation to hazardous substances, the Act replaced the Dangerous Goods Act 1974, the Explosives Act 1957, the Pesticides Act 1979 and the Toxic Substances Act 1979. The Act provides for a co-ordinated and integrated approach to the management of hazardous substances and, in particular, provides a management framework that takes account of all the hazardous properties a substance may have. Further information is available in Environmental Risk Management Authority publications (e.g. the User Guide to the HSNO Control Regulations).

A substance is considered hazardous under the HSNO Act if it triggers any one of the threshold levels for any of the following hazardous properties:

(a) Explosiveness;

(b) Flammability;

(c) Oxidising capacity;

(d) Corrosiveness;

(e) Toxicity;

(f) Ecotoxicity.

Of these, our main interest lies with substances that are explosive, flammable or oxidising. However, toxic and ecotoxic substances can adversely harm people or the environment during, or as a result of, a fire.

If you use one or more substances that have such properties you need to find out what controls the Act requires you to apply. Special care needs to be taken if two or more substances could combine to react and produce hazardous results. For a layperson, such reactions can produce unpredictable results.

D2.5 Fire Service Act 1975 and Fire Safety and Evacuation of Buildings Regulations 1992

The Fire Safety and Evacuation of Buildings Regulations 1992 require there to be approved evacuation schemes or procedures for places of work and the plans must be tested every six months.

D2.6 Crimes Act 1961

All organisations need to be aware of the Crimes Act 1961. This Act defines an “offence” as “any act or omission for which any one can be punished under this Act or under any other enactment ...”.

The Act itself defines a wide range of crimes; in this context, those against people (manslaughter, criminal nuisance, injuring by an unlawful act, etc.) are perhaps most relevant. For people and organisations which undertake dangerous acts or who are in charge of dangerous things, the Act imposes duties to take reasonable care to avoid danger to human life. Criminal responsibility then arises only if, in the circumstances, the failure is a major departure from the standard of care expected of a reasonable person in those circumstances.

Conclusion

It would be impractical to attempt to set out in this Handbook all the legislation that may apply to fire risks in places of work and all of the offences contained in New Zealand legislation that organisations might be at risk of committing. Your risk identification strategy should include reviewing the organisation's activities, support processes, and functions and thinking about what legislation applies. Appendix C includes references to useful legal resources.

D3 Common Law

Common law is also referred to as "judge-made law." It is not written into statute, but is based on decisions made through a long history of court proceedings.

Common law allows individuals to sue each other for "damages" (compensation) for "civil wrongs" (also known as "Torts"). This differs from the idea of "crime" which allows the state to punish you for wrong-doing. There are specific types of Torts including (but not limited to) defamation, nuisance and negligence.

D3.1 Nuisance

This means using your land in a manner that would unreasonably affect the use of adjacent land by the owner or occupier of that land.

D3.2 Negligence

Negligence arises if you don't take "reasonable steps" to prevent your activities causing foreseeable harm to a person or property in a proximate relationship to you.

A "proximate relationship" taken literally means "near" you; in this context it means anyone or anything that you can see, or that you should know, is in the vicinity of potential harm. If you own or manage an activity, you know that the activity will affect other people. Those people may be passers-by, neighbours or the general public and may be unaware of your activity. You need to consider carefully whether anyone could face some harm as a result of the activity, about what could happen and how, and how to prevent it.

If you should have foreseen harm and didn't, and damage or injury results, you may find yourself held liable.

Assessing what will amount to "reasonably practicable steps" depends on the circumstances of each activity, but it would encompass things like ensuring that you properly planned an activity, applied a risk management process, and effectively communicated the risk to those who might be in harm's way.

While the ACC scheme generally removes the right of individuals to sue for damages for personal injury, they can sue if their injury is not covered by ACC. In the case of "gross negligence," you could be sued for "exemplary damages." Gross negligence is a reckless disregard for the safety of others. A person would be grossly negligent if, even though they may not have directly intended to cause harm, they intentionally avoided taking reasonable care to prevent harm. Exemplary damages are designed to separately punish a grossly negligent person, over and above any compensation for the person who was hurt.

D3.3 Strict liability

In one important court case (Rylands v Fletcher) it was held that if you bring something dangerous onto your land, you must take extra precautions to prevent it from escaping

and causing harm to other people or their property. This means that if you operate some process that frequently causes minor fires that could escape into neighbouring properties, the process must be especially well controlled. You may have a strict liability for any harm against which it is difficult to mount a defence if fire or something else dangerous does escape.

D4 Contracts

D4.1 General

Contracts are enforceable agreements but they are not always in writing. Contracts always involve an exchange, for example, of money given for goods or services. A contract will include performance requirements for each party. For instance, it will set out for one party the amount of money, and how and when it will be paid, and for the other party, the goods or services, when they will be delivered or performed and what quality standards they must meet.

A contract can be for any number of arrangements including:

(a) For employment;

(b) To engage a person to carry out some physical work for you;

(c) To engage a person to provide help or advice;

(d) A lease.

Contracts can be used by the principal and the contractor to agree who is responsible for which aspects of safety, including fire safety. They may also make requirements for insurance.

D4.2 Pre-contract stage

It is increasingly common for the principal to establish a list of pre-qualified, preferred suppliers who are known to have:

(a) employees with the necessary qualifications and skills to do the required work;

(b) the right plant and equipment to do the required work;

(c) a history of completing the required type of work on time and budget with few or no losses.

D4.3 Contract conditions

As a general rule, contracts should contain conditions that are practical and can actually be implemented. And – you cannot contract your way out of a legal obligation imposed by legislation!

For further information on contracts see NZS 3902, NZS 3910 and NZS 3915.

D5 Conclusion

While the list of potential legal compliance exposures is enormous, you shouldn't be unduly worried. Many of the compliance requirements that are important here can be covered by a management system. Events will happen, and most of us will naturally work to avoid them if they might hurt us or others. If you are able to demonstrate that you maintained an awareness of risks and hazards, took all reasonable steps to mitigate them, and had measures in place to deal with an emergency, you may avoid liability.

When you are unsure, seek expert advice.

APPENDIX E – RESOURCES

The guidance set out in table E1 is designed to assist you to understand fire risk management in the New Zealand context. It provides a framework for thinking about business risks, injury risks and legal compliance. It cannot, however, provide a complete list of risks and treatments for all organisations. The table below is designed to help you identify sources of information to assist you to locate further information on:

(a) Risk management generally;

(b) Fire risks;

(c) Legal compliance;

(d) Injury risk management.

Important risk management resources include published information, other organisations delivering similar products or services and paid advisors including lawyers and consultants.

Table E1 – Sources of information

Information area	Website
Risk management generally	
AS/NZS 4360 *Risk management* and SAA/SNZ HB 436 *Risk management guidelines*	www.standards.co.nz
Australian standards	www.standards.com.au
New Zealand Society for Risk Management	www.risksociety.org.nz
Global, e.g. the Institute of Risk Management	www.theirm.org
Fire risks	
New Zealand Fire Service	www.fire.org.nz
Fire Protection Association of New Zealand	www.fireprotection.org.nz
Department of Building and Housing	www.dbh.govt.nz
Building Research Association of New Zealand Inc.	www.branz.org.nz
Department of Chemistry, University of Akron (covers chemical hazards)	ull.chemistry.uakron.edu/erd
The US National Fire Protection Association	www.nfpa.org
Institute of Fire Engineers NZ	www.ife.org.nz
Society of Fire Protection Engineers	www.sfpe.org
US Fire Administration	www.usfa.fema.gov/index.shtm
Legal compliance	
New Zealand legislation	www.legislation.govt.nz
ERMA	www.ermanz.govt.nz
Injury risk management	
ACC	www.acc.co.nz
OSH / Department of Labour	www.dol.govt.nz
Emergency management	
Ministry of Civil Defence and Emergency Management	www.mcdem.govt.nz

For specific fire risks, a library or web search on key words related to the activity will usually return useful targets from New Zealand and around the world.

NOTE – Just because an organisation has published a guide, it isn't necessarily best practice. You must still apply judgement before applying any advice. This is especially true for any overseas websites where other legislation may apply.

NOTES

© 2006 STANDARDS COUNCIL

Published by authority of the Standards Council pursuant to the provisions of section 10 of the Standards Act 1988.

First published: 18 May 2006

The following SNZ references relate to this Standard:

Project No. P 4525
Draft for comment No. DZ 4525
Typeset and printed by: Standards New Zealand