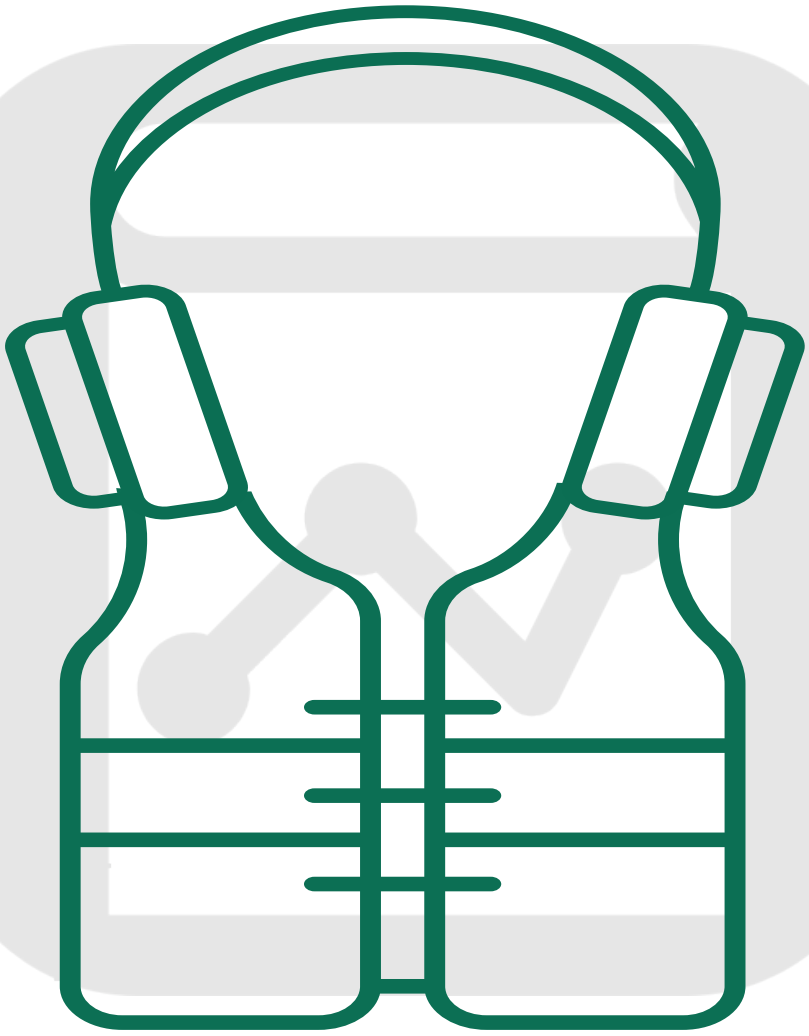
BCATS

BUILDING, CONSTRUCTION AND ALLIED TRADE SKILLS

L2 Safety



Unit Standard 24354 (v3), **Level 2**

Demonstrate knowledge of health & safety legislation & apply safe working practices in a BCATS environment

4 CREDITS

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Introduction

This handbook builds on your introduction to health and safety when you did the Level 1 unit standard 24352, *Demonstrate knowledge of and apply safe working practices in the construction of a BCATS project*.

Some of the information in this handbook will be familiar to you and is repeated for easy reference. You may wish to refer back to your student resource for the Level 1 standard, which is also available from www.bconstructive.org.nz.

Other information – such as legal rights and obligations – will be new. Being familiar with how your health and safety is reflected in law will help you understand your obligations to keep yourself and others safe. Knowing what to expect from your teacher/tutor (and then your employer) will help you to make your own judgments about how well hazards are being managed and options for if the site is or becomes unsafe.

Every year, accidents and deaths in the construction industry happen that could have been avoided. Actively thinking about how to keep yourself and others safe is always important, as is behaving in ways that will reduce the risk of anyone being harmed.

How you will be assessed

You need to complete at least one BCATS project where you can demonstrate your knowledge of health and safety legislation and safe working practices. Your teacher/tutor will tell you which project(s) to construct.

You need to show your teacher/tutor that you can:

- explain why we have health and safety in the workplace legislation and how it affects workers and a Person Conducting a Business or Undertaking (PCBU) (the employer)
- describe how to identify hazards, their level of risks, and how to control the hazards
- recognise hazard warning signs
- identify personal hazards, such as not enough training, clothing, hair, footwear, jewellery, lifting, handling, heights, and occupational overuse syndrome
- explain and demonstrate emergency procedures for each of a simulated fire, earthquake, accident, and chemical spill
- complete all tasks safely. This includes using PPE, protective clothing and protective barriers, and being trained to and using tools, equipment, and machinery safely
- keep the work area clean and tidy.

Your teacher/tutor will also give you a Knowledge Assessment Sheet that you need to complete, which they will mark.

You need to work safely throughout your project. Your teacher/tutor needs to verify you did so.

Glossary of terms

Term	Meaning
Accident	An accident is an event that: causes any person to be harmed, or in different circumstances might have caused any person to be harmed.
Being reasonably practicable	Taking action that could reasonably be expected to be taken to ensure health and safety, taking into account all relevant matters and weighing up the following: 1. the likelihood of the risk or harm occurring 2. the degree of harm that might result from the risk or hazard 3. what is known about the risk or hazard and methods of eliminating or minimising the risk 4. the availability and suitability of the methods of eliminating or minimising the risk 5. the cost associated with using these methods of eliminating or minimising the risk and whether the cost is grossly disproportionate to the risk.
Compliance	Performance requirement with the hierarchy of controls in the Health and Safety at Work Act 2015 and the Health and Safety at Work Regulations 2016.
Emergency	A sudden unforeseen situation requiring immediate action.
Harm	Illness, injury or both; including physical or mental harm caused by work-related stress.
Hazard	A hazard is something that could harm you or someone else, including a person's behaviour.
Hazard identification	The process of recognising that a hazard exists and defining its characteristics. It is part of the risk management process.
Hierarchy of hazard control	This is associated with control measures as part of the risk management process. The higher the control, the more effective it is at managing the risk.
Health and Safety at Work Act (HSWA) 2015	The HSWA is the key health and safety law in New Zealand and covers nearly all work and workplaces.
Incident	An unplanned event resulting in or having a potential for injury, ill health, damage or other loss.
Injury	The outcome of an unintentional event or accident.
Injury prevention	A process or strategy for identifying risk.

Glossary of terms

Term	Meaning
Organisation	Any business engaging, controlling or employing people.
PCBU (Person Conducting a Business or Undertaking)	While a PCBU may be an individual person or an organisation, in most cases the PCBU is an organisation such as a company. An individual, such as a sole trader, can also be a PCBU. Examples of PCBUs: • A business in the form of an incorporated company. • A sole trader or self-employed person. • A designer of plant or structures. • An organisation created by legislation (e.g. government department, university, school or local authority).
Plant	Includes: • appliances, equipment, fitting furniture, implements, machines, machinery, tools and vehicles • part of any plant, the controls of any plant, and anything connected to any plant.
Policy	A statement of intent/commitment usually by an employer reflecting their commitment to managing a healthy and safe working environment.
Risk	Risk can be described as the likelihood of certain consequences (death, injury, or illness) when a person is exposed to a hazard. Risks arise from people being exposed to a hazard (a source of harm).
Risk assessment	The overall process of considering what could happen if someone is exposed to a hazard and the likelihood of it happening.
Safe	In relation to a person, safe means not exposed to any hazards. In every other case, safe means free from hazards.
Site-Specific Safety Plan (SSSP)	A site-specific document that demonstrates an organisation's means of compliance with the Health and Safety at Work Act and includes the following: 1. assignment of responsibilities for on-site implementation 2. hazard identification methods 3. accident investigation and reporting 4. site emergency procedures 5. site communication strategy 6. site audit procedures 7. strategy for the coordination of on-site trade activities.

Glossary of terms

Term	Meaning
Strategy	A defined plan of action that when put in place will achieve the desired outcome.
Substance	Anything that is an organic material – whether living or not.
Systematic	Methodical approach to a task.
Worker	An individual who carries out work in any capacity for a PCBU. Most of the time this is an employee or subcontractor. It also includes a person doing work but not getting paid for it.
WorkSafe NZ	WorkSafe New Zealand is the government agency that is New Zealand's health and safety regulator.

The Health and Safety at Work Act 2015

There are several Acts of Parliament, regulations and codes designed to keep people safe. In the building and construction industry, the two main sets of laws you need to be aware of are:

- the Health and Safety at Work Act 2015 and the Health and Safety at Work Regulations 2016
- the Building Act 1991 and Building Regulations *.

The purpose of the Health and Safety at Work Act 2015 (HSWA) and the Health and Safety at Work Regulations 2016 are to make and keep workers and workplaces healthy and safe.

The HSWA requires risks to be eliminated as much as is 'reasonably practicable'. To be reasonably practicable simply means to consider the level of risk, what you know about ways of controlling it, and the cost in relation to the level of risk. This does not mean that if the control is too expensive it can be dispensed with. If the risk of death or serious injury exists, the question should be whether or not the job is worth the risk. If it is not reasonably practicable to eliminate the hazard, you must minimise the risk by controlling it.

The regulations made under the HSWA support business and people to better understand their health and safety responsibilities.

Under the HSWA, everyone is responsible for health and safety. This HSWA refers specifically to:

- the Officer (they make the decisions about the business)
- a Person Conducting a Business or Undertaking, known as a PCBU (they run the business)
- worker/student (they do the work).

What it means for PCBUs

Under the HSWA, your school, training provider and/or employer is a PCBU. PCBUs have the principal responsibility to keep workers and students healthy and safe.

As a PCBU, your school or training provider must ensure the health and safety of teachers/tutors (workers) and those who are affected by their work.

* Acts are laws made by Parliament. Regulations are laws made, under powers granted by an Act of Parliament, by the Governor-General, Ministers of the Crown and certain other bodies.

In particular, PCBUs are required to:

- provide and maintain a safe working environment
- ensure that machinery and equipment are safe for employees/students
- ensure that working arrangements are not hazardous to employees/students
- provide procedures to deal with emergencies that may arise while employees/students are at work.

Training is an important way to prevent or minimise harm. PCBUs have a responsibility to ensure that students/trainees are adequately trained or supervised before using or handling:

- plant and equipment
- toxic or dangerous materials.

One of the PCBU's responsibilities is to provide you with easily understood information on:

- the identified hazards that you will encounter and the level of risk assigned to them
- the identified hazards that you will or may create and the level of risk assigned to them
- the control measures to apply to those hazards to prevent harm and reduce the level of risk
- what to do in an emergency
- where all safety clothing, devices, equipment and materials are kept
- situations that require the use of safety clothing, devices, equipment and materials.

In a BCATS environment, this specifically means they must provide you with information about:

- how to use materials, tools, equipment, and machinery safely
- general safety rules and procedures for the workshop and worksites
- personal protective equipment or clothing that must be used or worn
- hazards you may come across or which you might create
- how to identify a hazard, assess the risk and what to do to control the risk
- what to do if there is an accident
- the location and use of safety equipment
- emergency procedures.

If an accident or harm occurs, the PCBU has a responsibility to investigate it and, if possible, make improvements to prevent or minimise the risk of it occurring again.

What it means for you

You also have a legal responsibility to work safely at all times. You are responsible for:

- following the rules and procedures
- identifying and reporting potential hazards and assessing the risks of them
- protecting yourself and others from potential hazards
- taking steps to eliminate or minimise (which could be isolating) the risks.

You can do this by:
carrying out instructions properly
asking for advice when in doubt
reporting any unsafe conditions to your teacher/tutor
using the correct tools and equipment
wearing or using the personal protective equipment and clothing
making sure that materials, tools, and equipment won't trip anyone over or fall on them by keeping the workplace clean and tidy
reporting any injury (however small) and having it attended to promptly
not distracting others or fooling around
using only tools, machinery and equipment that you have been trained to use
asking for help if you have forgotten or are unsure of how to use any tools, machinery, equipment, or materials safely
not starting machinery unless you have been told to do so and with all the guards in place
only using machinery under supervision.

What if I'm doing BCATS in the workplace?

Under the HSWA, all student/trainees who are involved in work experience activities, including Gateway or Star programmes and after school work, are required to be covered by the same health and safety conditions and requirements as any other employee/worker.

The Law - Health and Safety Legislation

If you are doing BCATS through a Gateway programme, start thinking about safety even before you enter the workplace.

- Listen carefully to the safety induction you're given when you come on site.
- Follow all safety precautions.
- Always wear your personal protective equipment properly.
- Don't be afraid to ask experienced workers about safety precautions and site hazards.
- Ask if you are unsure or need some help.
- Be honest if the task you're being asked to do is new to you.
- Don't use any materials, tools or machinery you haven't been trained to use and feel comfortable with using. Your supervisor/employer will expect you to ask to be shown and talked through how to use them.

What you should do if you're worried

If you are worried your BCATS environment is unhealthy or unsafe:

1. Tell your teacher/tutor of the problem. If you are doing BCATS through Gateway, talk with your supervisor about it.
2. If your teacher/tutor does not deal with the problem or you feel the problem has not been properly fixed, talk to the Head of Department/ Faculty, your Dean, or your Principal. In a workplace it would be your employer or health and safety representative you'd talk to.
3. If the matter is still unresolved, you could discuss it with the student representative on your school's Board of Trustees. In a large workplace, this could instead be a union representative.
4. If the unsafe situation still exists, contact WorkSafe NZ for further advice.

The HSWA gives everyone the right to refuse to do work that is unsafe.

Rotorua Boys' High School student routering the top of his table. Note that he's wearing eye and ear protection, there is no dangling clothing, and that the cord is arranged so that no one can trip on it and it can't be accidentally cut.

Hazards

Introduction

Hazards (dangers) continually change because of what people do or do not do and because different tasks and environments have their own hazards. The term 'hazards' includes existing hazards, new hazards and potential hazards. The ability to recognise potential hazards is a combination of observation, learning and experience.

Anyone in charge of a workplace must have processes to identify and record hazards. Everyone in the workplace needs to be consulted, trained and involved in the process of identifying and managing the hazards.

Everyone should be provided with information about the hazard identification procedures, which may include:

- information about hazards that are known to be in the workshop or on the project site
- the process you must follow to identify hazards.

PCBUs must make sure that:

- people know what to do to ensure they are not harmed by a hazard
- protective equipment is provided, used and easy to get at
- people know who to report any hazard to
- people's exposure to any hazard is monitored
- people's health is monitored, with their consent.

Identifying hazards

There are several ways to identify potential hazards. It is best to use all or at least a combination of them.

Physical inspection

This is the most practical of all hazard identification methods. It involves common sense and observation.

- Every time before starting work, take the time to check and think about the environment you will be in.
- Check equipment before using it to make sure all required safety guards are in place and the equipment is in good working order.
- Following a break, such as lunch, take a few steps back from the task and check to see whether everything is still where it should be. This is sometimes called the '5 by 5 method' – take 5 steps back and take 5 minutes to look around the working area.

Task analysis

Identify the tasks or project to be carried out and the hazards involved at each step. The best time is before you start work. Think about what needs to be done and likelihood of each of the hazards occurring while carrying out that particular job. Use your job specifications to help do this.

Area analysis

Using plans of the site and planned workflows, divide the site into identifiable areas, such as workshops, stores, plant and equipment, or the BCATS project area. Then identify the hazards area by area, paying particular consideration to the design of the workplace, the work programme and environmental and ergonomic factors.

Process analysis

Identify hazards associated at each stage of a particular process. This is best done at the planning stage, when work flow and work programmes can be considered along with all other available information about design, work methods and products (from the manufacturers' data sheets).

Occupation (trade) analysis

Identify the hazards associated with specific trades or occupations who may also be working on the job; for example, carpenter, electrician, blocklayer, painter etc.

Working safely under supervision at Central Hawkes Bay College

5 x 5

It's a good idea to make a habit of doing a 'Step Back 5x5' every time you change tasks. This is when you step back five paces from the job and spend five minutes planning.

A Step Back 5x5 is an opportunity to ask yourself:

What will I be doing?

- What are the hazards?
- What equipment and plant do I need?
- How can I get hurt?
- What if something unexpected happens?

Assessing risk

The level of risk for each hazard must be assessed once they have been identified. To assess the risk hazard, think about:

- the likelihood of a hazardous event occurring (such as a fall or cut)
- the severity of the harm that may occur.

Hazards impact people differently. For example, it might be a low risk for someone who is very experienced to carry out a task but high risk for someone still learning. Your teacher/tutor or boss may therefore see risks differently than you and your classmates. Rely on their experience and ask them to explain more if you are unsure why they approach a hazard a different way than you need to.

Risk assessment matrix

This Risk Assessment Matrix, developed by Site Safe New Zealand, shows a method of how to assess risk.

CONSIDER THE SEVERITY OF INJURY/ILLNESS	CONSIDER THE LIKELIHOOD OF A HAZARDOUS EVENT OCCURRING				
RISK ASSESSMENT MATRIX	Very unlikely to happen	Unlikely to happen	Possibly could happen	Likely to happen	Very likely to happen
Catastrophic (e.g fatal)	Moderate	Moderate	High	Critical	Critical
Major (e.g Permanent Disability)	Low	Moderate	Moderate	High	Critical
Moderate (e.g Hospitalisation/Short or Long Term Disability)	Low	Moderate	Moderate	Moderate	High
Minor (e.g First Aid)	Very Low	Low	Moderate	Moderate	Moderate
Superficial (e.g No Treatment Required)	Very Low	Very Low	Low	Low	Moderate

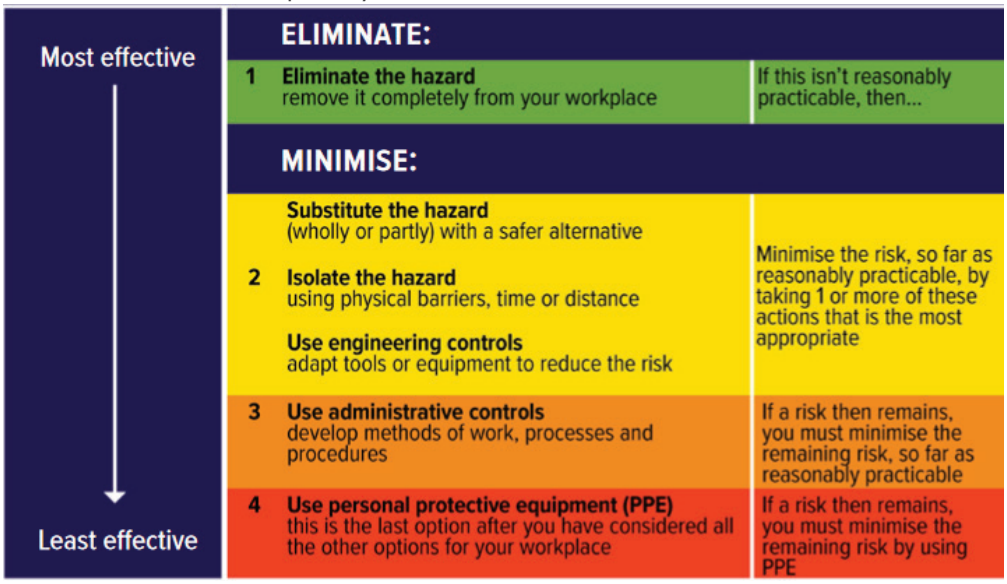
Hierarchy of Controls

Once you have identified the level of risk, you must do what is reasonable and practical to eliminate it or, where it can't be eliminated, minimise it by choosing the best controls for the situation. The better the level of control, the lower the level of risk.

Use the Hierarchy of Controls as a guide. The Hierarchy of Controls assumes that the safest possible thing to do is to remove the hazard altogether. When this isn't possible you need to think about what the next best course of action might be.

Assessing risk

The diagram below shows how the hierarchy of controls can be used to eliminate and minimise hazards and risks. This interpretation of the hierarchy of controls was developed by Site Safe New Zealand.



USING UNSAFE MACHINES AND NO SUPERVISION – ARM DEGLOVED AND BROKEN BONES

A failure to ensure simple safety measures, such as machine guarding and supervision are in place, left a worker with severe injuries after his arm got caught in a machine used to shred tyres.

A worker was operating a tyre shredder. When debris obstructed the conveyor belt to the tyre shredder, the worker attempted to remove it while the machine was running and his arm became trapped. The worker was unable to activate the emergency stop, but eventually managed to free his arm.

As a result of the incident the worker suffered degloving injuries and a broken forearm. Degloving is a severe injury that happens when the top layers of your skin and tissue are ripped from the underlying muscle, connective tissue, or bone. Degloving injuries are often life-threatening.

A WorkSafe investigation found guarding was missing from the conveyor belt which fed tyres into the machine. It had been removed for modification.

WorkSafe's Area Manager Danielle Henry said not only was it unacceptable that the machine was being used without guarding – there was no safe system of work in place.

"There was an emergency stop button, but its location meant it couldn't be reached if a worker became trapped in the machine, which is what happened in this incident.

"As well as this at the time of the incident the victim was operating the machine alone, when there should have been adequate supervision to assist in the case of an emergency.

"[The business] should not have allowed this machine to be used without guarding or safe processes in place.

WORKSAFE - *2020*

Think: What else could have been done to avoid the injuries?

Personal Protective Equipment and clothing

Personal Protective Equipment (PPE) minimises risks to your health and safety but it doesn't make you superhuman. The hazards you are protecting yourself against are still hazards and you or someone else can still be injured. Always be aware of your role in keeping yourself and others healthy and safe.

What PPE and safety clothing you need will depend on the types of hazards associated with what you are planning to do.

Whatever the type of PPE and clothing required, always:

- keep it readily available
- wear it whenever necessary
- keep it in good order and condition.

Care and maintenance of personal protective equipment

It is important to look after your PPE. Poorly fitting and unmaintained PPE is uncomfortable to wear, is unlikely to protect you against the hazard you're using it for, and can create its own hazards.

Keep all PPE clean and well maintained. This includes:

- cleaning the lenses of safety glasses after each use
- sterilising respiratory protection equipment and changing filters regularly
- cleaning ear muffs and checking the pads for damage
- replacing ear plugs
- checking gloves for tears or damage
- washing overalls and keeping clothing clean and tidy
- cleaning and inspecting the soles of safety boots/shoes
- checking that hard hats are in good condition and free of cracks or splits
- reporting any defects or damage to your teacher/tutor.

Important:

- *Those on worksites have their own PPE and do not share it with anyone else. In a school environment you will likely have to share all but your shoes. Always check that shared PPE is clean and safe before using it and clean it every time you've finished using it.*
- *Store all personal protective equipment in a clean, safe and easily accessible location.*
- *Maintain personal hygiene.*

Eye protection

An eye injury only needs to happen once to blind a person for life. You need to be able to identify potential eye hazards and select and use the correct type of protection to minimise the chance of an eye injury. In most cases this means wearing safety glasses or goggles.

You also need to wear eye protection when working close to anyone who is creating a hazard, e.g. someone grinding steel.

The major causes of eye injuries include:

- being struck in the eye by flying particles and objects, e.g. a nail ricocheting off a hammer face
- being hit in the eye by moving or stationary objects, e.g. walking into a piece of timber protruding from a rack
- toxic splashes, fumes and dust coming into contact with the eye, e.g. eye contact with molten metals, hot liquids or corrosive chemicals
- exposure to welding flash, laser beams, infrared radiation, laser reflection.

In accidents where the eye is penetrated, approximately:

- 1/3 result in blindness
- 1/3 result in reduced vision
- 1/3 make a full recovery.

CHEMICALS – EYE REMOVAL

A worker had to have his eye removed after an incident involving a corrosive cleaning product. He was decanting a cleaning product when a piece of tubing flicked him in the eye. The corrosive product and the impact of the tubing left him with such bad damage that his eye had to be removed. Scarring also meant he could not be fitted with a prosthetic eye.

WorkSafe successfully prosecuted his employer for not isolating the hazard entirely by setting up a system where the cleaning product didn't have to be decanted in the first place. Eye protection would also have prevented the injury.

WORKSAFE - *2018*

Think: How would the loss or damaging of your sight affect your life? What would it do to your career opportunities, sports, social relationships, and transport options?

Eyes – protective equipment

Injuries from dust particles can vary from mild irritation to complete loss of the eye itself, often from secondary infection.

Properly fitting safety glasses or goggles can help to prevent these injuries.

1. If you are grinding, using a circular saw or router, wear safety glasses/ goggles. The main hazard to your eyes will be particles being flung into your eyes.
2. Shaded safety glasses to protect your eyes from glare must be worn when brazing, using an oxy-acetylene set.
3. For arc welding, a welding helmet with the correct lenses must be worn.
4. Fixed and mobile screens should also be set up to protect other people from injuries. This would include any situation where there is a chance of bystanders being injured by objects flying off the job or radiation from welding operations.
5. Some glue contains corrosive substances, such as alkalis or acids that can cause chemical burns and permanently damage your eyesight. The eye becomes bloodshot with itching, burning pain and loss of vision. When using these glues you need to wear goggles or a full-face shield to protect your eyes.

Eyes – emergency action

A well-equipped first aid kit is also required in all work places and workshops. The standard first aid items for treating eye injuries include:

- → eye wash, to flush any foreign objects out of the eye
- → eye patch and sterile bandages.

Actions	
›	If sand, dirt or small debris gets into your eyes do not rub them. This can scratch the outer surface of the eye and cause further damage. Rinse the eye thoroughly with eye wash or water. If the particle doesn't wash out, lightly bandage the eye and go to the hospital or doctor.
›	If a foreign object penetrates the eye, never attempt to remove it. Call for urgent medical assistance.
›	For blows to the eye, gently apply a cold compress to reduce pain and swelling. Avoid putting pressure on the eye.
›	Should a chemical splash your face, immediately flush the face under **running water** and call the National Poison Centre (0800 764 766) for urgent medical assistance. **DO NOT** use an eye bath solution or eye drops, which may react with the chemical in the eye and don't contain enough water to flush the eye anyway.

Head protection

A hard hat is a helmet designed to protect the head from injury. It must be worn at all times where there is a risk of head injuries from objects falling or from collision with fixed objects, tools, plant, or equipment.

It is important to make sure hard hats are well fitted. It may be necessary to wear eye or hearing protection at the same time as wearing a helmet. These are often fitted to the helmet for comfort and convenience.

Respiratory protection

Toxic dust and chemical fumes that are produced in a BCATS environment have the potential to injure you and those around you.

Your school workshop will have an extraction system to help remove dust and fumes. Because it is rarely possible to remove all impurities, it is important to also use the appropriate respiratory equipment to protect your lungs.

When you need to use respiratory equipment, it is important you do so even if your project is outside. Remember that damage may be done to the lungs and respiratory system through either long exposure to seemingly harmless dusts or by short exposure to a chemical. Working outside does not lower the risk.

Wood dust

Breathing wood dust can be hazardous. It can irritate your nasal passages, causing sneezing or nosebleeds. Some timbers are toxic.

Fine dust can get through your nose and become lodged in the passages of your lungs causing pneumonia and long term damage.

Protection	
›	Use the extraction system and wear a dust mask over the nose and mouth.

Demolition and renovation

Be particularly wary of fibrolite and other similar asbestos-based products used in older buildings. These contain very fine fibres that may be inhaled and become lodged in your lungs. These fibres can cause cancer and other respiratory problems. Lead paint in older buildings can cause lead poisoning.

Protection

› Use special protective equipment when demolishing and renovating.

Arc welding/welding

Arc welding produces fumes and vapours. How toxic they are depends on the type of welding, the material being welded, and the airflow around the operator.

Protection

› Wear an appropriate respirator. Check that the model is suitable for the type of welding you are doing e.g. welding galvanised, mild steel will require a different level of protection than when TIG welding stainless steel.

Chemicals, fibreglass and spray painting

These produce fumes, vapours and fine particles that the operator needs to be protected from.

Protection

› Wear a respirator fitted with filters appropriate to the job. Dust masks are not suitable.

→ Check the filters regularly to ensure that they are not clogging up and change as necessary.

→ Always spray in a properly constructed spray booth.

Two-part systems (for example 'two-pot' varnishes and paints) contain highly toxic chemicals that are particularly dangerous. They require specialist equipment to be worn, especially when spraying.

Protection

› You must wear a special breathing equipment that has its own pure air supply and wear fully-protective clothing to prevent any of the paint from coming into contact with your skin.

Note: If you do not wear the correct safety protection when working with these products, you run the risk of developing lung diseases, cancer and other serious health-related problems.

Consider how respiratory damage would affect your ability to play sport, as well as to live a healthy lifestyle. Always wear the appropriate protection equipment, even on the smallest of jobs.

Hearing protection

Work sites can be noisy. You need to wear hearing protection even when machines are fitted with noise-suppressing covers.

Your ears can be protected by wearing:

- **Ear plugs** fit inside your ears and are disposable. They are often more practical than earmuffs when used in conjunction with safety goggles and/or a hardhat. However, they create extra waste and can be unhygienic when inserted with dirty hands.
- **Ear muffs** fit over your ears. They are easy to fit and generally offer better protection than earplugs.

Measuring noise levels

Noise levels are measured in decibels (dB). The effects of noise will vary with distance from source but exposure to noise above 80dB has the potential to damage hearing.

Source	dB level	Notes
-	15dB	Average hearing threshold
Soft whisper	30dB	Acceptable
Normal speech	60dB	Acceptable
Heavy city traffic	85dB	Possible damage threshold – below this level an 8-hour day can be worked without using hearing protection devices
Belt sander	90dB	Damage after prolonged exposure
Router / Grinder	100dB	Damage after 15 minutes
Circular saw	105dB	Damage after 10 minutes
Chain saw / Rock Band	110dB	Damage after 2 minutes
Sand blasting	115dB	Damage after 30 seconds
Jet engine	130dB	Above 130dB (A) will cause damage if unprotected
Other	155dB	Instant pain and damage above this level

When to use ear protection

- Select and use the class of hearing protection that is most suitable for the noise you are likely to be exposed to.
- Legally, people must wear ear protection when working in a noise level above 85dB.

Ear muffs are rated according to the level of protection that they provide. A class 5 ear muff will offer the best protection.

Hearing protection class	Equivalent continuous sound level (8 hours)
1	Less than 90dB(A)
2	90-95dB(A)
3	95-100dB(A)
4	100-105dB(A)
5	105-110dB(A)

Checking ear protection

Ensure that the hearing protection is properly fitted:

- Ear muffs should cover the ear.
- Ear plugs should sit properly in the outer ear. A poor fit will not provide sufficient protection.

Poorly fitted ear plugs and ear muffs will not provide sufficient protection.

Keep your chosen hearing protection clean and in good condition.

Class 5 ear muffs

Class 4 ear muffs

Ear plugs

Signs of hearing loss

The early signs of hearing loss may include a ringing sound in your ears or a slight muffling of sound. If this occurs, it is likely your hearing has been permanently damaged.

Even if you already have some hearing loss, wearing ear muffs will reduce any further loss.

Consider how the loss or partial loss of your hearing would affect your ability to use the telephone, be involved in a conversation, listen to music, watch television, meet people and play sport.

Skin protection

Sun - Many construction jobs will involve prolonged exposure to the sun. Sunburn is uncomfortable and has dangerous long-term side effects. However, you can protect yourself by wearing suitable clothing, a hat and sunscreen when working outside.

Sunscreen and sun block provide effective protection from the effect of the sun's harmful ultraviolet (UV) rays. They have a sun protection factor (SPF) rating. Follow the information on the product label.

Chemicals and irritants - Barrier creams can provide limited protection against the effects of solvents and chemicals that cause dermatitis or other allergic reactions.

An allergic reaction like dermatitis can be triggered by contact with a skin irritant, e.g. MDF dust and solvents. It usually shows up as swelling, redness and itching that may develop into blistering and cracking if left untreated.

The best protection for and treatment of allergies is to not use what is causing the allergy. If this is not possibel:

- → wear gloves and apply barrier creams regularly,
- → wash affected areas regularly to get rid of any dirt and contamination,
- → use hand lotion to replace lost skin oils.

Dargaville High School student wearing sunhat as he works outdoors.

Protective clothing

Protective clothing is designed to help keep the wearer protected and comfortable. Wear protective clothing appropriate to the conditions and the type of work.

Appropriate protective clothing is needed:

- around machinery, such as circular saws and lathes
- outside, for protection from the sun and the weather
- when near heat or sparks
- when spraying paint or fibre-glass
- when carrying tools.

High visibility vests are bright yellow or orange and usually have a reflective strip. These vests reduce the possibility of injury by making it easier for others to see you..

When **working outdoors** you will need to prepare for varying conditions with:

- wet weather gear
- sun block, and a hat
- durable clothing and a leather apron on building sites.

When **welding** you need to be protected from heat and sparks with:

- overalls – for complete body protection
- appropriate face protection – to protect eyes, nose and mouth
- a welding jacket – for extra protection.

When working in **dirty and dusty** environments:

- bib overalls or dustcoats for less dusty jobs
- complete overalls for dustier or dirty operations
- appropriate face protection – to protect eyes, nose and mouth.

Machine operators should wear:

- close-fitting clothing. Do not wear ties or baggy sleeves. Tie long hair back and make sure hoodie strings are tucked inside the clothing.

Spray painting or fibre-glassing requires:

- overalls for complete body protection from paint, over-spray and chemicals
- appropriate breathing protection.

Protection from **falling objects:**

- a hard hat.

Hand protection

There is a wide range of hand protection available for different jobs.

- *Leather gloves* protect against cuts and burns.
- *PVC gloves* protect you against chemicals.
- *Cotton gloves* protect finished surfaces from marks caused by the oils in your skin.
- *Leather or reinforced poly-cotton gloves* provide protection from sharp edges and coarse surfaces when stacking timber and materials.

PVC gloves

Reinforced poly-cotton gloves

Leather welding gloves

Leather gloves

Protective footwear

The most appropriate footwear for a construction area is sturdy but comfortable industrial footwear.

Safety shoes and boots have steel caps, strong leather uppers and non-skid soles. The steel caps protect your feet from falling objects and from injuries from accidentally kicking or tripping over hard objects.

Never wear open footwear in work areas as they offer minimal protection to your feet.

Boots are designed for use in a range of situations including:

- wet areas
- construction site/workshop
- welding
- on-site fitting.

Gum boot

General purpose lightweight boot

High-laced steel-capped boot

Safety shoes

Non-skid, anti-fatigue mats are designed for use in situations where people are standing for long periods of time, e.g. in front of machines. They help to minimise foot and leg fatigue, varicose veins and back pain.

Managing common hazards in a BCATS environment

This section lists common types of hazards and ideas about how to manage them. For each hazard think about:

- What is the hazard?
- What is the consequence of not addressing the hazard?
- What is the best way to control the hazard?

For example, a hazard could be long hair not tied back. A consequence could be the hair getting caught in machinery, causing the machinery to rip the hair and scalp off. The best way to avoid injuries from getting hair, jewellery, or loose clothes caught in machinery is to keep hair tied back and out of the way and to check that dangling jewellery and clothing (such as necklaces and hoodie strings) are either removed or tucked away.

Your work area

A messy work area creates many hazards. Keep it clean and tidy to prevent the risk of tripping over, slipping, or being crushed. A tidy workplace is a safe place to work.

- Put tools and equipment away after use.
- Keep walk ways clear.
- Clean up the work site and remove rubbish as it is created.
- Protect yourself and others by setting up and using fences, barriers and warning signs if working outdoors.

Tools, equipment, and machinery

You must be properly trained before using tools, equipment and machinery.

Using them without being trained can cause you, your classmates, and others serious harm. You could also damage the equipment you are using, which would create another hazard and probably incur a cost to repair.

You must follow all safety procedures and use the safety guards and equipment provided.

Because each piece of equipment has its own safety procedures:

- Your teacher/tutor is required to explain the safe working procedures for each machine before you use it.
- Repeat the instructions and demonstrate the correct actions for your teacher/tutor so the level of your understanding can be assessed.
- Ask questions to clarify any points that you don't understand.

You can refuse to work on any machine or equipment if you:

- → have not been instructed in its safe use
- → do not feel confident about your ability to use it
- → consider if the machine is in a dangerous state, for example:
  - missing safety guards
  - unprotected wiring
  - defective switch.

Maintain tools and equipment and report any damaged, worn, or faulty ones to your teacher/tutor.

USING MACHINERY WITHOUT GUARDS - AMPUTATION

A polytechnic was convicted for health and safety failings after a student's finger was partially amputated during a pre-trade carpentry course.

The student was using a draw saw to cut a length of timber. A WorkSafe investigation found the machine wasn't adequately guarded, allowing the student's fingers to slip in front of the blade. The student sustained partial amputation to his middle finger on his left hand as well as cuts and grazes in the incident. His finger was later re-attached in hospital.

WorkSafe's Chief Inspector Steve Kelly said learning institutions offering these kinds of courses should be held to the highest health and safety standards.

"As part of WorkSafe's investigation it was discovered that [the polytechnic's] risk assessments for that machine were ineffective and the machine was not adequately guarded.

"[The polytechnic] should have been well aware of health and safety risks. Instead they were allowing students to operate machinery that was not up to industry standards, which is entirely unacceptable.

WORKSAFE - *2020*

Think: What would you do if you saw a machine without its safety guard?

Noise

It is impossible to eliminate loud noises when creating BCATS projects. There are, however, steps that can be taken to minimise potential harm from it.

Any process that causes excessive noise can be isolated or insulated by doing one or more of the following:

- increasing the distance between the source of the noise and the exposed person
- placing barriers between the source of the noise and the exposed person
- decreasing the time that a person is exposed to the noise source
- using hearing protection devices.

Everyone who is exposed to noise while working should use appropriate hearing protection.

Always remember to let others close to you know that you're going to start work that will create loud noises. Give them time to put their hearing protection on or move a safe distance away before you start.

Safe lifting

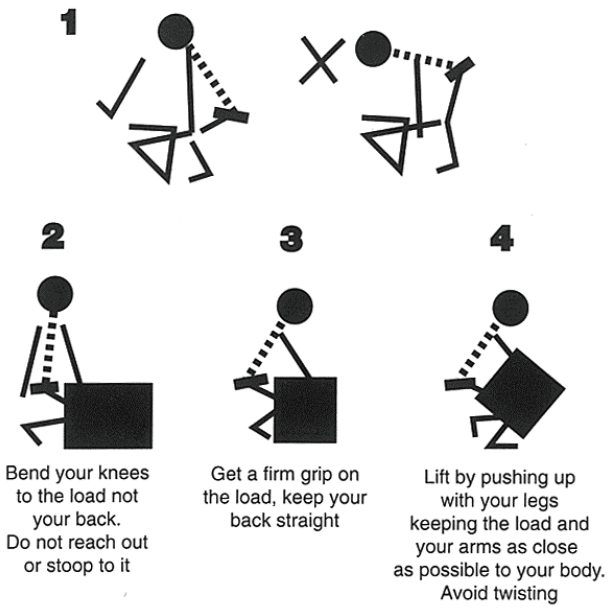
Injuries from poor handling of materials include sprains, strains, hernias, hand and foot injuries, torn ligaments and muscles and spinal injuries.

You can minimise the hazards associated with moving heavy and awkward materials by using correct lifting techniques and equipment.

- Check that the load is within your lifting capability. The load should not interfere with normal walking. If it does, it is too heavy.
- Can you make the load lighter, such as by moving parts of it instead of the whole lot?
- Lifting a bulky or awkward load is more likely to cause back strain than lifting a heavier, compact item.
- Do not be afraid to ask for someone to help you carry it. When carrying sheets of material, such as plywood, position both people on the same side of sheet.
- Use a trolley or wheelbarrow.
- Inspect the load for sharp or damaged edges. Wear gloves to protect your hands from cuts or splinters when necessary.
- Ensure that your vision is not obscured and that your route is clear.

- Bend your knees. Position your body as close to the load as possible with your feet at the same distance apart as your shoulder width.
- Carry the load as close to your body as possible.
- Stand up using your leg muscles to lift the weight.
- Keep your back straight.

A back injury can impact on a person's quality of life and lifestyle for many years. Thousands of New Zealanders suffer the misery of chronic pain as the result of back injuries. When you are considering using a poor lifting technique, ask yourself "Is it worth the risk?"



Stacking materials

- Materials should be stacked so that they cannot slip or fall.
- Stacks should be arranged in clearly defined lines with walking space between them.
- The height of any stack is restricted by the capacity of the lower layers to withstand the weight on them.
- Objects such as drums or tins need to be secured if they are stacked on their sides.
- Store materials away in designated storage areas.
- Store long lengths of timber low in the rack and ensure that they do not stick out into walk ways.
- Heavy loads should be kept low for safety and ease of handling.
- Ensure all racks are well organised, neat, tidy and secure.

FALLING FROM HEIGHTS - PARALYSED

A construction company was ordered to pay reparations to a worker who was left paralysed from the chest down after falling about two metres and landing on his head.

The worker was installing attic trusses in a garage. A bundle of trusses came loose and fell towards the worker, hitting the aluminium plank he was standing on and causing him to fall.

WorkSafe's Chief Inspector Hayden Mander says the company had failed to ensure appropriate controls were in place for the safe installation of the trusses.

"WorkSafe's investigation into the incident found that [the company] had identified the hazard of working at height and the risk it posed of serious injury or death but did not provide enough details of the equipment required to safely carry out the installation.

"The hazards and risks associated with working at height are well known and controls to manage these risks are readily available.

"This is a reminder that even a fall from a height of less than two metres can have devastating consequences."

WORKSAFE – *2018*

Think: Aside from not working at height safely, what other hazard contributed to the injury?

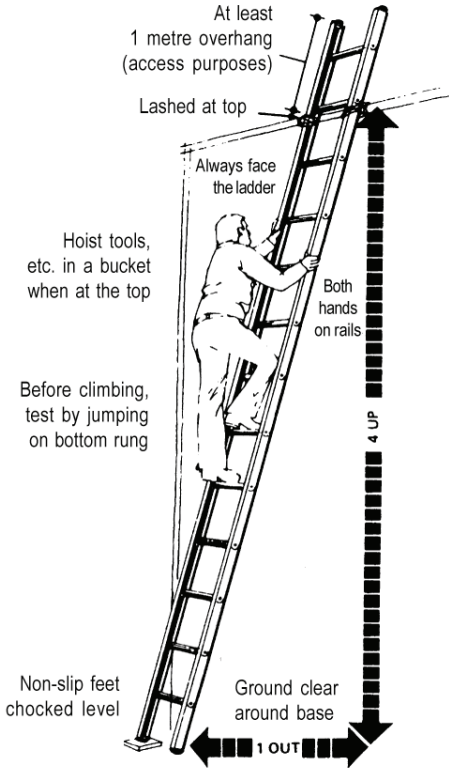
Working at height

Ladder safety

The use of ladders to gain ready access to a high workplace is a necessity on a construction site.

Before you use a ladder, always first inspect it for:

- defective rungs. Tap them with a hammer – a dull sound indicates a defective rung.
- visibly damaged, bent or cracked rungs
- its rating – it should be rated "industrial"
- grease, oil, mud, wet paint, etc. Your shoes should also be clean.



When carrying a ladder, always:

- be aware of overhead wires and live electrical circuits
- use two people to carry a long ladder.

When using a ladder, always:

- select the most suitable ladder for the task
- use only stepladders with lockable spreader bars on both sides
- set the ladder up on a firm even surface to the correct angle
- secure the top and bottom of the ladder to prevent sliding. Tie it off at the top and if necessary have someone hold the base of the ladder steady.
- ensure that the ladder is long enough. The ladder should project at least 1 metre above the landing
- face the ladder and use both hands while climbing or descending
- keep 3 body points in contact with the ladder at all times
- wear clean shoes with heels when climbing a ladder.

When working on a ladder, you should:

- be aware of overhead wires and live electrical circuits
- never reach sideways from the ladder. Get down and move the ladder instead. Over extending from the side of the ladder shifts your centre of balance to a point where the ladder can slip and cause you to fall
- never stand on any of the top three rungs
- never stand unsupported on the top tread of a stepladder.

Standards New Zealand has issued standard specifications for the design and construction of ladders and stepladders. Only ladders meeting the appropriate standards should be used.

Remember: Ladders are not designed as working platforms. They should only be used for access or to carry out minor or routine work.

Avoiding falling

The danger of a fall is increased when working on or near the following areas:

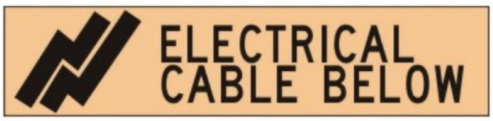
- perimeter of buildings
- openings in floors
- access areas such as stairs, ladders, ramps and walkways
- excavations
- on or around formwork and scaffolding.

Erecting physical barriers

Falls from heights kill and injure more people in construction than anything else.

Erecting physical barriers is the preferred control measure for preventing a person from falling from a height. (For example, edge protection systems, such as a guardrail erected around the edge of a building, or covers over openings in floors.) When physical barriers cannot be erected, personal fall protection equipment, such as a harness system, should be used. Roof ladders and scaffolding are also methods for ensuring safety from falls.

Electrical safety



Overhead and underground power wires are an obvious hazard on building sites. Identify power supplies and electrical hazards before starting work on the site. Be particularly vigilant when digging holes and carrying ladders.

Most power tools are double insulated. However, damaged or faulty power tools pose a safety risk. Inspect your tools regularly. If they are damaged, report the fault immediately to your teacher/tutor. Do not use damaged power tools.

When working outdoors, or in damp or wet conditions, there is a risk of electrocution. Use circuit breaker safety devices, such as a Residual Current Device (RCD), or isolating transformer, to prevent electrocution. RCD's are used more than isolating transformers as they are smaller, lighter and easier to handle.

The RCD should be positioned at the source of power so that it protects the lead and the user. When the RCD detects the first signs of leakage it cuts the power off in less than 300 milliseconds.

Compressed air

Compressed air is often used to drive tools and equipment in workshops and on construction sites. Pressures of 700kpa (100 psi) are quite common.

Never direct compressed air at anyone.

Compressed air is dangerous if used incorrectly and can cause severe or even fatal injuries.

- Eyes and ear-drums can be blown out or perforated.
- Air can penetrate the skin and may enter the blood stream through cuts or scratches. This can cause embolism, blindness or deafness.
- Compressed air penetrating any of the body's orifices can cause death.

Never use compressed air to blow down or clean machines or jobs. Particles and small objects can be blasted around the workshop at high velocity.

Regularly check air hoses and couplings for leaks, bulges in the hose wall linings or damage. Report any damage to your teacher/tutor so they can replace damaged hoses and ensure that all couplings are secure.

Compressed gases

Compressed gases also need to be treated carefully. Some of the consequences of incorrect use are listed below.

- Fires caused by leakage of fuel (propane, acetylene), usually from damaged or badly joined sections of a hose.
- Cylinder explosions caused by accidental leakage of oxygen from hoses or cutting torches.
- Operators may release oxygen to clear fumes from the air. However, this can push too much oxygen into the air – oily or greasy clothes may catch fire spontaneously and just one spark may set clean clothing on fire.
- Flashback caused by the operator trying to light the cutting torch when there is a mixture of oxygen and fuel gas in one hose.
- Explosions or fires caused by flame cutting or welding drums or tanks that contain flammable materials, even in small amounts.
- Breathing in dangerous fumes during cutting or welding operations.
- Nearby flammable material catching fire.

These hazards can be managed by using these basic safety rules.

- Never roll cylinders along the ground or handled roughly. Wherever possible, a cylinder trolley should be used, with the cylinders attached by chains.
- Never leave cylinders in a free-standing position. Always secure them so they can't be knocked over.
- Leave cylinders with time for their contents to settle after being moved before being used.
- Remove all hoses and cutting accessories as soon as you've finished the job and store them away from the cylinders.
- Store cylinders in an upright position away from other flammable substances and sources of ignition.
- Only use hoses specified in the manufacturer's instructions.
- Always check hoses for signs of damage before you use them.
- Keep the hose length as short as possible.
- If lengths of hose have to be joined following the removal of damaged sections, only proper hose couplers and proprietary hose clamps should be used. Proper couplers should be used to connect the hose to the cylinder regulator. Your teacher/tutor may show you how to do this.

Chemicals

Chemicals are dangerous. They are often highly flammable, corrosive or toxic. All chemicals are dangerous under certain conditions.

When handling chemicals, no matter what quantities, you will be at risk from:

- inhalation of fumes
- contact with skin
- accidental swallowing.

The health effects may result in asphyxiation, lung damage, burns, allergic reactions, irritation, dermatitis, poisoning, ulcers, and/or cancer.

When working with or near chemicals, always:

- recognise the hazard signs and the dangers they indicate
- be aware of the dangers associated with the types of chemicals you are working with
- carefully read the manufacturer's instructions for safe handling, use, and storage of that particular chemical
- know what to do in the case of a spillage
- know where the emergency equipment is and how to use it
- always wear appropriate PPE and protective clothing
- treat all containers with caution
- follow all hygiene rules for the job. This will always include washing all exposed skin as soon as you've finished using it but there will also almost always be requirements specific to that chemical.

Treated timber

Timber treatment consists of chemicals that may be harmful. Important measures to take when working with treated timbers are:

- reduce contact with the timber by wearing gloves, goggles and a dust mask
- dispose of off-cuts in an approved landfill - do not burn them
- wash your hands before using the toilet, drinking, or eating
- wash work clothes separately
- keep work spaces as well ventilated as possible
- do not work with solvent-damp timber.

First Aid

Even minor injuries (such as small cuts) left untreated can cause infections and other complications. When an injury or accident occurs, a person should always:

- seek immediate first aid treatment
- know where the first aid facilities are and who to contact for first aid help.

If someone is seriously injured, call an ambulance immediately. There may be occasions when immediate first aid treatment is needed to save a person's life. These could include cases of:

- severe bleeding
- severe burns
- electric shock
- poisoning.

Your teacher/tutor should be a trained first-aider and, if you're doing BCATS in the workplace, there should be someone there who is also.

If you are given the opportunity to do a first aid course, accept it. You could save lives.

Kaiapoi High School student mixing concrete. She's wearing eye, respiratory, and skin PPE to prevent chemical burns and inhaling silica from concrete dust.

Emergencies

Every site needs to have a site-specific specific emergency plan. The emergency procedures set out in the site-specific safety plan should clearly show what to do in an emergency situation.

The main types of emergencies to be prepared for in BCATS environments are:

- accidents
- fire
- people trapped in confined spaces or in an excavation
- chemical spills
- explosions.

Whatever the cause, the impact of an emergency situation is often decided by the way people react to it. Know:

- what to do in the case of an emergency
- where the fire extinguishers are and how to operate them
- where alarms are
- where fire escapes are
- where the first aid kit is and who is a trained first aider
- where the emergency assembly point is.

Fire

For your own safety, you should know as much as possible about fire precautions, the location of and how to use fire equipment, and the evacuation procedures for your BCATS environment.

Fires need the three following ingredients to be present before any combustion can take place:

- oxygen
- fuel
- heat.

If fire doesn't have oxygen, then it will burn out. If fire doesn't have heat, it wouldn't burn. If there was no fuel, there would be no fire. Given the right conditions, fires can quickly get out of control. Acting quickly to remove one or more of the elements (oxygen, fuel, heat) can extinguish or contain it early on.

Most serious fires in the building and construction industry are caused by unsafe acts or unsafe working conditions. The following are common causes of fire:

- build-up of combustible materials, such as dust and fumes
- poorly maintained or overloaded electrical wiring or equipment
- improper storage or spillages of combustible materials
- discarded cigarettes
- heaters being left on
- sparks from welding or grinding operations.

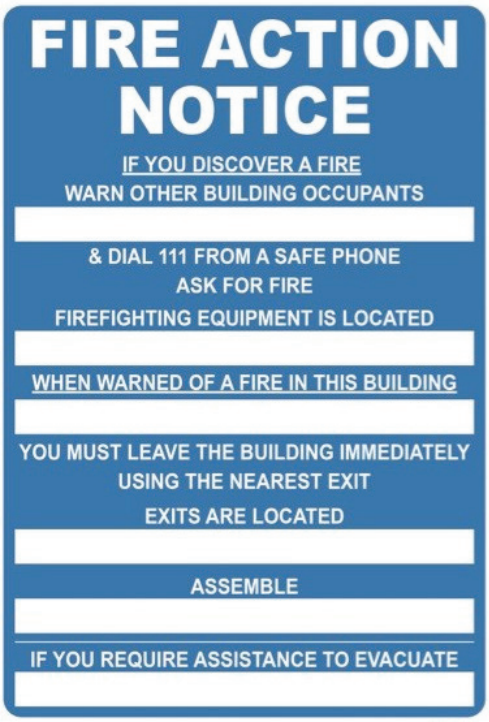
Many products give off toxic fumes when burning, which can sometimes be a greater hazard than the fire itself.

If you discover a fire your first concern must be to alert others. (Shout Fire, Fire, Fire.)

If it is safe to do so - and you know how to use the fire equipment - you may be able to extinguish the fire. If you don't know how to use it and/or it isn't safe to try, do not try to be a hero. Get out of the building and call the fire brigade.

Fire drill

Your school/workplace is required to have emergency evacuation procedures. They should also have someone qualified to administer first aid.



Evacuation procedures should include at least:

- switch off all machines
- switch off power and gas mains, if it can be done safely
- leave quickly, but do not run
- close all doors when everyone is out
- move directly to the emergency evacuation assembly point and check that everyone who was in the building/on the site are there rather than trapped inside.

Fire Extinguishers

You may be able to stop or slow down a small fire, by using the correct type of fire extinguisher. The incorrect type of extinguisher may endanger the user or make the fire worse.

There are three classes of fire and you need a different type of extinguisher to fight each of them. Fire extinguishers will have clear labels as to their contents and use such as the labels shown below.

CLASS A FIRES Wood fires.	CLASS B FIRES Flammable liquid fire.	CLASS C FIRES Electrical
Use a water extinguisher or a fire hose.	Use dry powder or CO2 extinguishers (carbon dioxide).	Use BCF dry powder or CO2 extinguishers.
		
Never use a water extinguisher on solvent or paint fires. Water will only spread the flames, and will not put the fire out.	Use this extinguisher also for fires in the finishing area, where glues, cleaning agents and other chemicals are used.	Never use water on an electrical fire. Water conducts electricity - you could be electrocuted and/or cause an explosion.

Aim the extinguisher at the top of the fire and move the extinguisher down in a steady, continuous 's' motion for maximum effectiveness.

Chemical Spills

A chemical spill is the unplanned or uncontrolled release of any solid, semi-solid, liquid or gaseous hazardous chemical that can pose a potential safety or health risk to people or the environment.

In the event of a chemical spill, immediately inform your teacher/tutor who will determine:

- if the area should be evacuated
- if it is safe to clean it up
- how to clean it up
- if an appropriately qualified person needs to be brought in to clean it up.