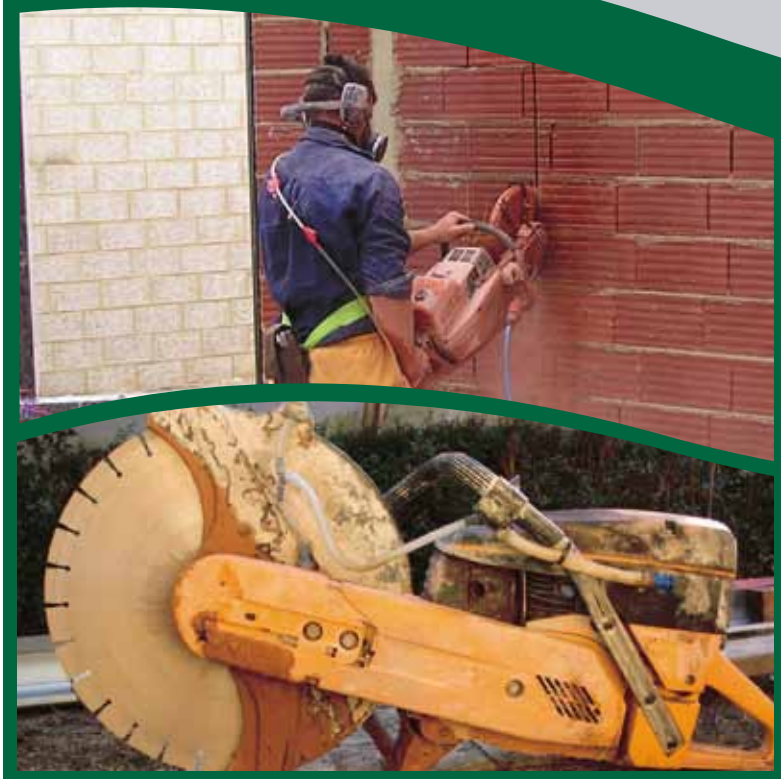
CODE OF PRACTICE

CONCRETE AND MASONRY CUTTING AND DRILLNG

COMMISSION

Government of **Western Australia**
Department of **Commerce**

Code of practice
Concrete and masonry cutting and drilling
2010



commission
for occupational
safety and health

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Foreword

This code of practice is issued by the Commission for Occupational Safety and Health, under provisions of the *Occupational Safety and Health Act 1984* (the OSH Act). The introduction of the OSH Act enabled the establishment of the Commission. It comprises representatives of employers, unions and government, as well as experts, and has the function of developing the occupational safety and health legislation and supporting guidance material, and making recommendations to the Minister for Commerce for their implementation. To fulfil its functions, the Commission is empowered to establish advisory committees, hold public inquiries and publish and disseminate information.

The Commission's objective is to promote comprehensive and practical preventive strategies that improve the working environment of Western Australians. This code of practice has been developed through a tripartite consultative process and the views of employers and unions, along with those of government and experts have been considered.

Scope and application of this code of practice

This code of practice applies to all workplaces in Western Australia covered by the OSH Act where concrete and masonry cutting and drilling equipment is used. It should be used by all people involved in concrete and masonry cutting and drilling, including employers, contractors, workers, self-employed people, safety and health representatives and the designers, manufacturers, importers and suppliers of plant.

Legislative framework for occupational safety and health

The Occupational Safety and Health Act 1984

The OSH Act provides for the promotion, co-ordination, administration and enforcement of occupational safety and health in Western Australia. It applies to all workplaces with the exception of mining and petroleum.

With the objective of preventing occupational injuries and diseases, the OSH Act places certain duties on employers, employees, self-employed people, manufacturers, designers, importers and suppliers. These broad duties are supported by further legislation, commonly referred to as regulations, together with non-statutory codes of practice and guidance notes.

Occupational Safety and Health Regulations 1996

The Occupational Safety and Health Regulations 1996 (the OSH Regulations) set out specific requirements of the legislation. They prescribe minimum standards and have a general application, or define specific requirements related to a particular hazard or type of work. They may allow licensing or granting of approvals and certificates.

If there is a regulation about a risk in the OSH Regulations, it must be complied with.

Codes of practice published under the OSH Act

Codes of practice published under the OSH Act provide practical guidance on how to comply with a general duty or specific duties under the legislation. Codes of practice may contain explanatory information. However, the preventive strategies outlined do not represent the only acceptable means of achieving a certain standard.

A code of practice does not have the same legal force as a regulation and is not sufficient reason, of itself, for prosecution under the legislation, but it may be used by courts as a standard when assessing other methods or practices used.

If there is a code of practice about a risk, either:

- do what the code of practice says; or
- adopt and follow another way that gives the same level of protection against the risk.

If there is no regulation or code of practice about a risk, choose an appropriate way and take reasonable precautions and exercise proper diligence to ensure obligations are met.

Note: There may be additional risks at the workplace not specifically addressed in this code of practice. The OSH Act requires identification and assessment of them and implementation of control measures to prevent or minimise risk.

Contents

Introduction

People using concrete and masonry cutting and drilling equipment face a wide range of hazards, such as silica dust, toxic exhaust fumes, saw kick-back, blade fracture, falling walls, electrocution, vibration, noise, slips, falls and manual handling.

Most at risk are operators of hand-held concrete and masonry saws. This equipment is more prone to the violent forces unleashed when a saw blade jams inside a cut than from fixed saws. These forces, commonly referred to as kick-back, push-back or pull-in, are difficult and sometimes impossible to control, and place the operator at risk of serious and potentially fatal injury from an out-of control circular saw.

The best way to minimise the risk of kick-back injuries is to follow written safe work procedures that minimise the possibility that the blade may jam or bite. If jamming or biting does occur, the operator is then safely positioned away from the direction of the kick-back.

Inverted cutting, that is, cutting the underside of a slab, floor or overhang should never be done with a handheld saw, because the operator has little control of a cutting machine held above shoulder height.

Information, instruction, training and supervision are essential in all concrete and masonry cutting and drilling operations.

When using concrete or masonry cutting or drilling equipment:

- **always** follow the manufacturer's instructions for safe use;
- **always** use the correct blade size recommended by the manufacturer. Oversize blades are dangerous;
- **never** remove the guards;
- **never** work off ladders, milk crates, steel drums or chairs. Use a scaffold if the work cannot be safely reached from the ground;
- **never** hold a hand-held saw or drill higher than shoulder height; and
- **never** use a hand-held saw for inverted cutting or drilling.

1. What this code is about

What work is covered?

This code of practice provides practical advice on ways to manage health and safety risks arising from the use of diamond-tipped and abrasive concrete and masonry cutting and drilling equipment used for:

- **chasing** gutters or grooves in concrete, brickwork or other building masonry surfaces to allow for the inclusion of wires, cables, pipes or flashing;
- **wall sawing** in concrete, brick or other masonry walls to provide for doors, windows, vaults, silo openings, foundations, ducts or pipes, or to remove part or all of existing walls;
- **reinforced slab cutting** through reasonably flat and level surfaces of reinforced concrete, pre-stressed slabs or beams, pre-cast concrete and other structural materials, such as floors, roofs, bridge decks and suspended slabs;
- **core drilling** circular holes in reinforced or pre-cast concrete, bitumen surfaces, panels for tilt-up structures, brick and other structural materials, usually for electrical, plumbing, heating, sewer and sprinkler installations. Other applications include drilling holes to anchor bolts or lifting rods, placing explosive charges or installing load carrying devices, or for analysis of structures or rock;
- **concrete pipe cutting** (reinforced or not) usually done with hand-held petrol engine driven concrete cutting saws;
- **brick cutting** using fixed water-cooled circular saws for brick, tiles, pavers and similar materials;
- **block cutting** limestone or other stone blocks to shape components for perimeter and landscaping walls, usually done with hand-held petrol engine driven concrete cutting saws;
- **safety grooving and texturing** to make concrete, bitumen and other surfaces more comfortable and safer to walk on, such as footpaths, stairs, public platforms and ramps; and
- **road cutting** roadways, ramps or curves for the installation of sub-surface services.

What equipment is covered?

This code of practice covers:

- diamond-blade and water-cooled circular saws;
- saws powered by electricity, petrol engines, compressed air (pneumatic) or hydraulics;
- saws that are either hand-held, fixed to tracks on surfaces to be cut, or fitted to trolleys that may be hand moved or propelled by a motor; and
- power drills and core drills used for concrete and other masonry.

Who is responsible?

See sections 19, 20, 21, 23D, 23E and 23F of the OSH Act

The Occupational Safety and Health Act 1984 (the OSH Act) places responsibility for workplace safety on employers, workers, self employed people, people in control of workplaces, and the manufacturers and distributors of plant and equipment.

Employers must provide and maintain a working environment in which workers are not exposed to hazards as fas as practicable. This includes providing information, instruction, training and supervision to enable workers to perform their work safely.

Workers must take reasonable care of their own safety and health and that of others, follow safety instructions and use protective clothing and equipment as instructed.

The Occupational Safety and Health Regulations 1996 (the OSH Regulations) require employers, main contractors, self-employed people and those in control of workplaces or access to workplaces, as far as practical, to:

- identify each hazard to which a person at the workplace is likely to be exposed;
- assess the risk of injury or harm to a person resulting from each hazard; and
- take action to control or reduce the risk.

Protective clothing and equipment

The OSH Regulations place personal protective clothing and equipment (PPE) last as an option in reducing risk.

However, everyone involved in concrete or masonry cutting and drilling operations requires some level of PPE, depending on the outcome of the risk assessments for each workplace and job.

Basic protective requirements for most concrete or masonry cutting or drilling are:

- a safety helmet;
- safety footwear;
- safety goggles;
- a face shield;
- hearing protection;
- sun and weather protection;
- gloves to improve grip and reduce force and vibration; and
- where hazardous dusts or fumes cannot be eliminated, respiratory protection.

Operators should avoid wearing loose fitting clothing or jewellery. Long hair worn loose and long beards can also be hazardous.

Cutting and drilling equipment, especially saw blade discs and drill bits, should be removed from machines and stored where they will not be damaged between use.

More information on choosing and maintaining PPE is in Section 4 of this code.

Hired equipment

People who supply concrete and masonry cutting and drilling equipment for hire have an obligation under the OSH Act to take all reasonable steps to ensure appropriate information about the safe use of the equipment is available.

The preferred way of doing this is for the supplier to demonstrate operating the machine to each customer, and allow the customer a practice run, following the manufacturer's instructions and written safe procedures on starting, operating and stopping.

More information on supplying equipment for hire is in Section 4 of this code.

2. Risks and hazards

Who is at risk?

The people most at risk of injury or harm from concrete and masonry cutting and drilling are those operating the equipment and anyone who is nearby.

Operators who occasionally use hired concrete cutting equipment, in particular hand-held or 'quick-cut' saws or unfamiliar machines, are at greatest risk because of their likely inexperience and often inadequate safety information, instruction, training and supervision.

People using hired concrete cutting equipment are also less likely to have the recommended back-up person standing by in case of a hazardous situation arising.

Operators are least at risk when employers, in consultation with workers, have developed an effective workplace safety policy covering concrete and masonry cutting and drilling operations and safe site and work procedures for each type of concrete and masonry cutting equipment and job.

What are the hazards?

Some hazards are common to all concrete and masonry cutting and drilling operations, however there are also hazards specific to individual types of equipment, such as:

See section 5 for more information on kick-back.

Kick-back, push-back or pull-in – these are potentially violent forces that occur suddenly and can be difficult to control. They are most likely to cause injury when hand-held or 'quick-cut' concrete or masonry saws are used, especially when chasing. They can also cause fixed concrete saws to be wrenched from their fittings, with the potential of the saw running free on the ground. It is important that training for operators includes awareness of safe work practices and the risks of kick-back. Employers and hire equipment suppliers must ensure operators have information and training on safe work practices.

Obstructions or resistance in the material being cut – these can cause sudden kick-back, push back or pull-in movements of the saw. They occur when different quadrants of the blade come into contact with obstructions or resistance within the concrete or masonry such as from reinforcing steel bars, steel mesh or brick ties.

Crooked or off-line cuts – these can cause the saw to bite or pinch resulting in kick-back, push-back or pull-in reactions. These reactions are also most likely to occur with hand-held saws.

Pinched cuts – these are caused when the object being cut moves, resulting in the cutting groove tightening on the saw blade, thus increasing the risk of kick-back etc.

Blunt cutting edges – these are caused by using a saw blade or drill bit with the wrong diamond cutting bond. If the bond or matrix holding the cutting diamonds together is too hard for the material being cut, the bonding material does not wear away quickly enough, resulting in the surface diamonds becoming blunt. This means extra force has to be applied by the operator, especially with hand-held saws, increasing the risk of kick-back, push-back or pull-in.

Unsafe grip, stance or stop-start procedures for hand-held saws – these can cause the saw to swing out of control and come into contact with the operator, or strike objects that may cause the saw to fall and run free on the ground.

Worn, misshapen, cracked or damaged saw blades, or the wrong type of blade – these can cause the blade to wobble, vibrate, shatter, or fragment and fly off. Guarding on most concrete and masonry equipment is designed to protect the operator from flying blade fragments, but not others in the workplace. Guarding should, therefore, not be regarded as a total safeguard. Blades are most likely to disintegrate when force is used, for example when the diamond cutting edge becomes dull, an obstruction is encountered, the cutting groove is not straight or the blade is pinched.

Worn blade shaft – incorrectly fitted blades or the wrong type of blade for the job can cause wear on the central shaft causing even new blades to shudder, resulting in early wearing and risk of shatter.

Wrong-size blades – these are blades either too large, too small, or the wrong type for the cutting machine or size and shape of the concrete or masonry item being cut. For example, a small diameter blade used to cut a thick slab may not penetrate sufficiently, increasing the risk of kick-back or blade-shatter should the blade strike resistance.

Hazardous dusts – these are emitted by cutting and drilling operations or equipment that does not use water for cooling cutting parts and capturing dust.

Refer to section 5 for more information on hazards.

Concrete dust may carry high levels of silica dust and repeated exposure can cause silicosis, which is a scarring and stiffening of the lungs. The effects are irreversible, invariably resulting in death. Coarser rock particles can cause short term throat irritation and bronchitis.

Insufficient flow of coolant water – this can cause overheating and expansion of both metal and masonry, resulting in poor performance, jamming, severe blade damage and projectile hazards.

Incompatible flanges and blades – these can cause uneven blade movement, wear and tear and the risk of blade-shatter.

Incorrectly secured blades – these are caused by nuts and flanges which are not tightened sufficiently on the saw shaft, which can cause uneven blade movement and the risk of blade-shatter.

Inadequate securing of anchor points – these can cause a fixed saw to break free from its track fittings.

A beard, loose hair or loose clothing – these can cause the operator to become entangled with moving saw blades, drill bits and other moving parts.

Hand-held saw cutting above shoulder or below knee-height – this can reduce operator control and increase the risk of kick-back, push-back or pull-in injury.

Cutting concrete pipes – this requires special safe procedures to prevent the pipe from rolling or moving during cutting, particularly when a handheld saw is used. A specific hazard during pipe cutting is pressure from the raised flange on the pipe-end causing the cut to close and pinch the saw blade, resulting in kick-back or blade shatter injury. Other hazards include the presence of steel reinforcing mesh in concrete pipes, and a practice sometimes used for pipe-cutting involving a series of plunge cuts around a pre-drawn line on the pipe's outer surface.

Toxic fumes – without adequate ventilation, petrol motor emissions containing carbon monoxide and other toxic gases can build up to hazardous levels.

Insufficient guarding – guarding on some concrete or masonry saws is more effective than on others. When purchasing, consider the adequacy of guarding. Part of a safe work procedure should be to ensure that the manufacturer's recommended guarding is fitted to such saws. Removing guarding can greatly increase injury risk.

Electric wires, gas or water pipes – exposing services, especially in existing structures, can put the operator at risk of slipping, electrocution, exposure to toxic gases, or explosion.

Power cords – when attached to electric-powered cutting equipment and other machinery, these may be cut or damaged. Pools of water coolant and slurry could cause electrocution due to an immersed cord.

Uneven or unstable surfaces – these can increase the likelihood that the operator may trip or stumble, causing an unexpected movement of the blade resulting in kick-back.

Wet, slippery floors – coolant water and slurry on floors can cause slips and falls.

Obstructions in access ways – blocks of masonry and bricks in areas where the operator and others must stand, work or move can cause trips and falls.

Vibration – whole body or hand or arm vibration caused by prolonged use of cutting or drilling equipment can cause nerve, circulatory and joint damage.

Working alone – this can be hazardous because of the potential need for assistance in the event of an emergency situation or injury.

Noise – excessive noise from concrete cutting and drilling is a workplace hazard.

An appropriately qualified engineer should carry out an on-site assessment before any cutting or drilling of a pre-tensioned or post-tensioned structural component of a building or structure commences. The assessment should be documented and provided to the person contracted to carry out the work. Also, as all pre-tensioned and post-tensioned cutting will affect the structural integrity of the building or structure, a Class 1 Demolition Licence is required to carry out such work.

What are the risks?

The most likely risks of injury or harm come from:

- flying saw fragments;
- saw kick-back, push-back or pull-in;
- out-of-control or free-running cutting machines;
- falling concrete and masonry;
- inadequate scaffolding;
- noise;
- electrocution;
- hazardous dusts from dry cutting and drilling, such as silica dust, contributing to lung disease;
- slips, trips and falls;
- manual handling or strain injuries;
- vibration damage to circulation, nerves and joints; and
- suffocation or poisoning from hazardous fumes or gases emitted by petrol motors and other equipment or damaged gas supply services.

3. Risk management

Identifying hazards and controlling risks

The OSH Regulations require employers, self employed people and people in control of workplaces to:

- identify hazards;
- assess risk of injury or harm; and
- consider how the risk should be controlled.

These steps and the resulting safe work procedures should be regularly reviewed, especially if there are changes in the work environment, new technology or safety standards.

Developing a risk control procedure should involve consultation with all parties at the workplace, including senior managers, contractors, supervisors, self-employed people, workers and safety and health representatives.

In workplaces where concrete and masonry cutting and drilling equipment are used, identifying hazards and controlling risks means undertaking the following steps:

Step one: Hazard identification

Identifying hazards should include:

- regular review of safety procedures for each type of equipment and job;
- regular checking of information, instruction, training and supervision provided to operators for each type of equipment and job;
- regular referral to manufacturers' safety recommendations;
- regular inspection of equipment before each job, for example checking saw blades, shafts, flanges, guarding, hand grips, drive belts and drill bits, for wear and tear, correct assembly, and the correct functioning of safety features;
- checking the texture, shape and composition of each item to be cut or drilled;
- checking the possible presence and location of obstructions, such as steel reinforcing or plumbing in material to be cut;
- checking whether the proposed cut will require the operator to raise their hands above shoulder height;
- identifying toxic or hazardous substances including dust or fumes;
- identifying concrete or masonry sections that will need to be supported to prevent hazardous or premature falls during cutting;
- locating embedded electrified wires, cables, gas or water lines;
- identifying objects likely to shift during cutting, such as concrete pipes;
- checking objects likely to pinch on the saw blade during cutting;
- checking correct assembly of cutting or drilling equipment components;
- securing the anchoring of guide tracks for fixed sawing of walls or floors;
- checking correct hardness of diamond cutting bond for the material being cut;
- checking compatibility of saw blade size to size, thickness, hardness and shape of material to be cut;
- identifying the likely presence of workers or members of the public nearby;
- identifying sections of concrete or masonry likely to fall;
- checking the presence of water and slurry lying around during cutting operations, causing electrical and slip hazards;

- identifying manual or mechanical tasks such as moving cut concrete or masonry sections and heavy equipment;
- identifying any excessive noise exposure; and
- identifying any excessive exposure to vibration from hand-held saws and drills.

Step two: Risk assessment

Assessing risks involves calculating the likelihood and severity of injury or harm resulting from identified hazards, such as the likelihood of:

- a kick-back injury to the operator from obstructions in the material to be cut;
- serious injury by potential loss of control, such as operating hand-held equipment above shoulder height;
- an injury to an operator who has not been given information, instruction, training or supervision;
- a slip injury, electrocution or loss of saw control because of accumulated coolant water and slurry; or
- an injury from an incorrect diamond bond causing blade cracking and disintegration.

Step three: Controlling risks

Control risks by introducing safety measures to eliminate or minimise the risk of a person being exposed to a hazard.

The OSH Regulations state risks relating to plant (including concrete and masonry cutting and drilling equipment) should be reduced by one or a combination of measures. They are:

- **substitution of the plant with less hazardous plant**, for example using a fixed instead of a handheld saw for large wall and floor-cutting jobs, or using a handheld saw specifically designed for chasing;
- **modification of the design of the plant**, such as ensuring saw blades are sufficiently large in diameter to penetrate through the thickness of material being cut. Any design modification or physical changes to plant must have the manufacturer's permission and approval;
- **isolation of the plant**, for example, erecting barricades and clear no-entry signs to areas where concrete cutting and drilling are in progress;
- **using engineering methods to change physical characteristics of the plant**, such as attaching the concrete saw to a motorised trolley with anchored guide tracks, or using scaffolding to ensure the operator of a hand-held saw does not raise the equipment above shoulder height;
- **attaching a ventilation system** to the saw exhaust and venting to the outside of the building to minimise the risks from toxic exhaust fumes; or
- **implementing, maintaining and supervising control measures**, for example ensuring agreed safe procedures for concrete and masonry cutting and drilling are carried out according to the job and the type of machinery used.

4. Safe procedures

Developing safe procedures

Hazard identification and risk assessment procedures should be carried out for each type of concrete or masonry cutting or drilling job, in order to develop, implement and maintain control measures for each item of equipment and each job.

Control measures, which include safe work procedures, should be developed in consultation with all people at the workplace, including employers, workers, supervisors, people in charge of workplaces, self-employed people, and safety and health representatives.

Control measures should be regularly reviewed through:

- workplace communication and consultation;
- safety and health committee meetings;
- regular equipment and work safety checks;
- incident, accident and near-miss records;
- injury and lost time records; and
- repair and maintenance reports.

Choosing and maintaining personal protective clothing and equipment

The type of PPE selected for concrete or masonry cutting or drilling will depend on identified hazards associated with particular sites, conditions, materials, tasks and cutting or drilling equipment.

Selecting and providing PPE is the responsibility of the person in charge of workplace safety and health, usually the principal contractor, and should conform with agreed written procedures.

Standard PPE for concrete or masonry cutting or drilling includes a safety helmet, eye and hearing protection, boots, gloves and sun protection.

Engineering controls are generally practical for the control of dust and fumes, however if it can be demonstrated that it is impractical to remove hazardous dusts or fumes at the source, or where engineering controls do not adequately control the hazard, appropriate respiratory equipment should be provided and worn.

Gloves help minimise cut and crush injuries as well as maintaining a safe grip on cutting and drilling equipment. Anti-vibration gloves, while not a total protection, go a long way in preventing vibration hazards leading to Raynaud's Disease (white finger).

If direct or reflected sunlight cannot be avoided by restricting outdoor work to low-sunlight hours or using temporary sun shelters, sun protection should include a broad-brim hat, sunglasses, long sleeve shirt and long trousers, as well as SPF30$^+$ sunscreen. If working in cold weather, operators should wear waterproof gear and heavy boots if outdoor work cannot be restricted.

All clothing needs to be comfortable and suitable for the work and weather conditions. Operators should not wear loose clothing that could tangle in equipment and long hair and beards should be covered or tied back.

PPE must be stored in a clean and fully operational condition. Storage arrangements should ensure the equipment is safe from interference and damage, and is easily accessible and ready to use when needed.

Items of PPE should be inspected regularly, as specified by the manufacturer or supplier, to ensure they remain serviceable. Damaged or defective PPE items must be repaired or discarded.

General guidance on selecting, using, storing and maintaining PPE is provided in the Commission's *Codes of practice: First aid facilities and services, workplace amenities and facilities and personal protective clothing and equipment.*

Training and instruction

All operators using concrete and masonry cutting and drilling equipment, including hired equipment, must know how to work safely and must be able to demonstrate a certain level of competency.

This includes self-employed people, who have an obligation to ensure their own workplace safety and health and workers whose training is the employer's responsibility.

> Employers must ensure workers are trained in safe concrete and masonry cutting and drilling work practices and supervised by experienced people, or assessed on their competency to work unsupervised before being allowed to do so.

Training of workers should include information and instruction on:

- workplace safety and health;
- hazards and risks associated with work activities;
- safe work practices and procedures, safe handling (including lifting and moving), safe operation of equipment and the control measures in place;
- safe use of plant and associated equipment, electrical safety, safety in confined spaces and other training required under hazard-specific regulations;
- hazardous substances relevant to the work to be performed;
- correct use, fit and care of PPE, tools and equipment and why the equipment is needed;
- emergency and first aid procedures;
- sun protection to prevent skin cancer;
- fire protection;
- information on dust, fumes and air quality; and
- recognition of poorly ventilated areas and confined spaces.

Supplying equipment for hire

Under the OSH Act, suppliers of hired concrete and masonry cutting or drilling equipment must take all reasonable steps to provide safety information to customers.

This could reasonably include:

- a safety demonstration of the equipment, involving start-up, operating and shut-down procedures;
- uses for which the equipment has been designed and tested;
- manufacturer's instructions and/or operator's manual;
- access to records of checks, tests and inspections which demonstrate the equipment is in safe working order;
- risk assessment, including any information about any known residual risk that cannot be eliminated or sufficiently reduced by design, and against which guarding is not totally effective;
- control measures, for example safety training to reduce associated risks;
- PPE that should be used; and
- ways in which the equipment should not be used.

The duties of people who supply equipment by way of hiring or leasing are covered in the OSH Regulations.

5. Specific hazards

Kick-back

Kick-back is the sudden and violent movement of a saw away from the cutting surface. Kick-back presents an extreme risk for the operator and for bystanders. The operators of hand-held saws are most likely to suffer injury from kickback. Potential injuries include fractures, strains, cuts and bruises. Contact with the blade itself can cause lethal lacerations.

Kick-back has numerous causes, including:

- slewing the saw to change direction of the cut without removing it from the wall;
- encountering embedded objects such as wires and pipes;
- sawing on an unstable surface; and
- cutting above shoulder height.

It is important to take a methodical approach to cutting to minimise the risk of kick-back. This includes:

- selecting equipment specifically designed for the job;
- using scaffolding for work above shoulder height;
- carefully consulting builder's plans to avoid embedded objects;
- ensuring bystanders are at a safe distance from your work area; and
- **never** removing or circumventing guards.

A methodical approach is best documented in a safe work procedure.

Inverted cutting

Inverted cutting (cutting the underside of a slab, floor or overhang) should never be done with a hand-held saw, because the operator has little control of a cutting machine held above shoulder height.

Usually, inverted cutting is not necessary because it should be possible to make the cut from on top of the slab. This work should only be performed by appropriately trained people.

On the few occasions when inverted saw cutting would be necessary, a track-mounted wall saw should be attached to guide tracks bolted to the slab.

Water-cooled saws should not be electric powered and should never be used in inverted cutting. If the saw is turned upside down, water can flood into the motor and cause the electricity to earth through the operator.

Dust and gases

Where it is not practical to use water suppression or dust extraction equipment, alternatives should be considered. Examples include using liquid nitrogen when working in furnaces or dry ice in cool rooms.

Electric saws can be fitted with a vacuum bag ventilation system, however as the bag fills, efficiency may reduce and a respirator may be required for longer periods of use.

Consideration could also be given to the use of slower concrete and masonry cutting and drilling equipment now on the market, which produce little dust.

Respiratory protection may be necessary where none of these methods are practical. In such cases, appropriate particulate filter respirators will protect workers against dust and fibres, the toxic effects of substances such as lead fumes, or respiratory diseases caused by silica and asbestos.

The major risk from silica dust is silicosis. This is a chronic disease that causes stiffening and scarring of the lungs. Symptoms usually take a number of years to appear. They include shortness of breath, coughing and chest pain. This leads to degeneration in the person's health. The risk of disease is directly related to the amount of dust inhaled. Crystalline silica (inhaled quartz or cristobalite from occupational sources) has also been classified as carcinogenic to humans (Group 1) by the International Agency for Research on Cancer (in relation to lung cancer).

Dry cutting of bricks and concrete with diamond tipped blades is known to produce very high levels of silica dust.

Where petrol-driven machines such as hand-held saws are used, filtered air respirators are not effective against toxic exhaust gases and air supplied respirators are required if fumes cannot be adequately controlled through ventilation.

The most dangerous of these gases is carbon monoxide, an invisible, odourless chemical asphyxiate that can cause rapid loss of coordination, unconsciousness and death.

In some instances, chemicals or other hazardous substances may be added as aids in the cutting or drilling operations. Safe procedures will depend on information supplied by manufacturers in the material safety data sheet (MSDS) that must be supplied with each hazardous substance.

Respirators are covered by the OSH Regulations, and must comply with Australian/New Zealand Standard, *AS/NZS 1716 Respiratory protective devices* and be selected in accordance with Australian/New Zealand Standard, *AS/NZS 1715 Selection, use and maintenance of respiratory protective devices.*

Noise

Excessive noise from concrete cutting and drilling is a workplace hazard. An operator's hearing may be damaged by very loud noise over a relatively short period or by exposure to a lower level of noise over a longer period.

In a normal working day, noise from concrete and masonry cutting and drilling equipment will result in exposure to excessive noise for the operator and others nearby.

The hearing ability of operators and workers will be at risk if no control measures are implemented.

> The OSH Regulations require an employer, main contractor or self-employed person, as far as practical, to ensure that people at the workplace are not exposed to excessive noise.

The Commission's *Code of practice: Managing noise at workplaces* provides practical advice about identifying noise sources, assessing exposure, eliminating or minimising noise risk, and training.

All currently available concrete or masonry cutting or drilling equipment creates excessive noise with normal daily use.

Employers, contractors, self-employed people and workers should:

- prior to purchase or hire, obtain information on the noise output of different models from manufacturers and suppliers;
- assess the suitability of using noise-reduced saw blades for a particular job;
- select the quietest suitable model and blade available;
- keep people not directly involved in cutting or drilling at least seven metres away from excessive noise areas;
- erect temporary acoustic barriers around cutting and drilling areas to further reduce the spread of noise;
- provide training and instruction about noise, its effects, noise control measures and the proper use and maintenance of hearing protectors; and

- provide operators and nearby workers who need to be in excessive noise areas with hearing protectors selected in accordance with Australian/New Zealand Standard, *AS/NZS 1269.3 Occupational noise management – Hearing protector program*.

The *Workers' Compensation and Injury Management Act 1981* and Workers' Compensation and Injury Management Regulations 1982 require certain hearing tests and audiometric assessments to be carried out for compensation purposes. Contact WorkCover Western Australia for more information on these matters.

Manual tasks

1. Requirements

Concrete and masonry cutting and drilling involves a variety of manual tasks that can cause strain injuries.

A manual task is any activity requiring force by a person to lift, lever, push, pull, carry or move, hold or restrain a person, animal or thing, that may increase the risk of injury or harm.

Concrete and masonry cutting and drilling equipment can weigh up to 30kg, and the operator may be required to hold the saw in the same awkward position for a long time.

The Commission's *Code of Practice: Manual tasks* provides guidance on hazard identification, risk assessment and risk control where the weights of loads handled or the forces required to move or restrain them are of concern.

2. Hazards

Manual task hazards in concrete and masonry cutting and drilling operations include:

- awkward or static working positions repeated or maintained for long periods;
- holding handheld equipment over extended periods;
- lifting, pushing, levering, holding or carrying plant, equipment and cut sections of concrete or masonry;
- slip and trip hazards while handling plant, equipment or materials; and
- sudden violent reactions (kick-back, push-back or pull-in) by a saw when the blade strikes a hidden object or resistance, or is pinched or jams in the cut.

3. Solutions

Manual task solutions include:

- suspending or supporting cutting or drilling equipment in a frame to reduce the forces and the awkward and static working positions needed to position it;
- choosing lighter equipment, including smaller diameter blades, where possible;
- reducing the range of movement of the equipment to minimise the effect or forces needed to guide or control it;
- training operators in safe systems of work for handling the equipment and materials involved;
- avoiding kick-back, push-back and pull-in situations by pre-checking blades and other saw components for wear and tear, assessing materials to be cut and locating hidden steel reinforcing and other obstructions; and
- avoiding hazardous cutting situations.

Vibration

Vibration transmitted from concrete and masonry cutting and drilling equipment can affect the operator's whole body or parts of the body, such as the hands and arms.

Whole body effects are generally musculoskeletal, especially affecting the lower spine region.

Other effects include fatigue, headaches, gastrointestinal problems and reduced job efficiency.

Hand and arm vibrations may cause disturbances in the peripheral nerve and vascular systems of the hands, resulting in Raynaud's Disease (white finger), causing loss of senses of touch, heat, numbness and loss of grip strength. Other effects can include damage to tendons, bones and joints in the hands, wrists, arms, elbows and shoulders, and carpal tunnel syndrome.

Purchase or hire equipment that:

- vibrates less or does not have to be held or manually supported;
- is well-balanced, as light as possible and capable of being held in either hand (and different sized hands); and
- has vibration-absorbing handles, or with an even surface on the handles to distribute gripping force.

Wrapping metal handles with soft resilient rubber lagging can also effectively reduce vibration exposure.

Gloves have minimal effect on vibration exposure, though they can improve grip on the equipment and increase blood flow to the fingers by keeping hands warm.

Where practical, use concrete or masonry cutting or drilling equipment rather than hand-held jackhammers.

If there is no alternative available, hand-held jack hammers should be used as little as possible and for not more than 30 minutes in a working day.

Working at height

Using concrete and masonry cutting and drilling equipment at height increases the risk of falling. People required to work from a height where there is a risk of falling must be provided with a safe working platform and a safe means of getting to and from, and moving around, the work area.

Do not operate concrete and masonry cutting and drilling equipment when standing on a ladder.

All work at height should be done from a safe working platform, preferably scaffolding. Where scaffolding is not practical, elevating work platforms should be used. Access to and egress from the working platform should be by:

- walkway or stairway; or
- a temporary work platform such as an elevating work platform, scaffold or personnel cage on a forklift.

Before any cutting or drilling equipment is passed from one operator to another, its motor should be shut off in case the throttle is accidentally activated.

For further guidance, see the Commission's *Code of practice: Prevention of falls at workplaces*.

Cuts above shoulder height

When using hand-held equipment, the operator should never raise their arms above shoulder height as this significantly reduces control of the saw, increasing the risk of injury from kick-back. If a cut must be continued above shoulder height, common in chasing, consideration should be given to using equipment with sufficient reach to maintain control without extending the arms, or working from a scaffold.

Electricity

Pooled water in a workplace (such as coolant water used in concrete or masonry cutting and drilling), increases the risk of electrocution. It should be removed with a wet and dry vacuum cleaner before any electrical equipment is used in the area.

Extension leads, plugs and electric powered tools must be kept away from dry cutting equipment, or drilling water or slurry that cannot be easily removed.

Wet cutting should be done by hydraulic, pneumatic or petrol engine powered equipment, but never electrically powered.

The OSH Regulations require any existing electrical or other services (such as gas, water, and sewerage) to be established and a diagram (or 'as constructed' drawing) drawn to show their location before work begins.

Users of portable electrical equipment at workplaces must be protected against earth leakage shock by a residual current device (RCD).

All electrical equipment used in concrete or masonry cutting or drilling operations must be inspected and tagged by a competent person.

Concrete or masonry cutting and drilling operations must comply with Australian/New Zealand Standard, *AS/NZS 3012 Electrical installations – Construction and demolition sites*. This standard requires that:

- portable RCDs must be tested at prescribed intervals and withdrawn from use if not working properly; and
- cords and extension leads should be suspended above head height on stands, and waterproof connectors used where water is present.

Note: Do not use electrical cutting or drilling equipment for inverted cutting.

Damage to structures

Operators and others can be at serious risk if stressed components or components affecting the integrity of a building are damaged during cutting or drilling.

If components such as stressing tendons must be cut, the person responsible for workplace safety and health must assess the risk.

This person, usually the principal contractor, should locate and mark the location of all components that will affect the strength of a structure if cut, as part of initial planning for safety.

Advice and supervision from a structural engineer should be sought for all cuts to structural components.

Damage to services

Operators risk injury to themselves and others at a work site by cutting through gas, electricity or water services. Damage could also occur to communications services.

The person responsible for workplace safety, usually the principal contractor, should locate and mark the location of all services during initial planning for safety, using the Dial 1100 Before You Dig service or by contacting the local government authority.

The original drawings of the services should be consulted and a search conducted for any 'as constructed' drawings, in the event of a change of location of services during installation.

If the services have been moved, specialist equipment can be used to accurately determine where the services are now located prior to any cuts being made.

If services are to be cut through, they should be disconnected. Disconnections should be confirmed and tagged by the relevant service personnel before the work begins. At conclusion of the work, the service personnel should reconnect the service and, if safe, remove the tags.

Loss of vacuum pressure

Operators using a vacuum assembly to anchor a core drill stand to a surface may risk injury if the vacuum pump fills with slurry. This can cause loss of vacuum, which can result in the drill stand breaking free and rotating round the drill.

Operators should:

- use bolt down stands where practical;
- if a vacuum attachment must be used, ensure the surface to be cut is sound; and
- monitor the equipment to ensure that vacuum pressure is maintained.

When a vacuum system is used to secure a drill stand to concrete, the compressor should have a receiver tank to ensure the operator has time to take action (if power is cut to the compressor) before the drill loses its hold.

Working alone

The risk of injury or harm may increase when an operator is working alone because of difficulties in setting up and relocating equipment on site, the nature of the work and the absence of a back-up person should an emergency arise.

An operator may be considered to be working alone when they cannot be seen or heard by another person, and cannot expect a visit from a supervisor, another worker or a member of the public for some time.

Supervision and dealing with an emergency situation should be considered for people working alone when developing safe systems of work.

For further information refer to the Commission's publication, *Guidance note: Working alone*.

6. General duties

Following the OSH Act and the OSH Regulations

Safe procedures developed at workplaces for concrete or masonry cutting and drilling must comply with the OSH Act.

The OSH Act sets out particular duties for designers, manufacturers, importers, suppliers, installers and users of plant. 'Plant' is a general name for machinery, tools, appliances and equipment. It can include things as diverse as presses in a foundry and computers in an office.

A risk management process is a systematic method for making plant as safe as possible. It can be implemented in various ways, but the basic steps remain the same. For further information, refer to the WorkSafe website, www.worksafe.wa.gov.au

Main contractors must ensure, as far as is practical, that information in their control relating to the hazard identification, risk assessment and risk control processes for a construction project is compiled, recorded and kept until the construction work is complete.

Main contractors must ensure that a site-specific occupational safety and health management plan is prepared for each construction site where five or more people are working, or are likely to be working, at the same time. The plan must be prepared before work starts at the construction site and must be kept up to date as the project progresses. Each person doing construction work at the site must be made aware of the plan and how it applies to their work.

Details of what must be included in an occupational safety and health management plan are provided in the publication *National standard for construction work – Guidance for main contractors and people with control of construction work*, available from the WorkSafe website.

Site safety

One outcome of the risk assessment procedure should be a safe procedure for setting up and preparing a site before cutting and drilling operations. Consideration should be given to:

- weather and environmental conditions likely to affect safety;
- safe access to and from the site;
- barricades, exclusion zones and warning signs;
- specific safety and health instructions for the site and work to be done;
- whether the equipment is suitable for the work, is properly maintained and will be used according to manufacturer's recommendations;
- provision of RCDs for electrical equipment;
- safe removal of cut pieces and cores;
- means of collecting water and slurry to prevent surfaces becoming slippery and residue entering storm drains. Residue should be disposed of according to environmental protection requirements; and
- ensuring adequate supplies of PPE are available at the workplace.

Site responsibility

The person controlling the site should ensure:

- work areas or platforms are suitable and safe;
- locations of all services are clearly marked and services disconnected;
- exact locations of cut lines or drill holes are clearly marked;
- cutting or drilling equipment are the correct type and in good condition;
- ground surface conditions and footwear worn ensure firm footing;
- appropriate barriers, barricades and warning signs are erected;
- the work area is adequately ventilated if fuel fumes are to be emitted;
- adequate lighting is available or provided;
- specific site hazards have been identified and safe systems of work are in place, such as relocating other workers to alternative work areas; and
- wet residues and cut pieces are collected and removed.

Public safety

If cutting or drilling is to be carried out on a road or in a public place, the local government authority will require certain measures to protect the public and provide a safe route around the work area.

Local government legislation and the OSH Regulations include requirements such as:

- closing roads or footpaths;
- barricading or screening the work area to protect pedestrians and prevent vehicle entry;
- displaying warning signs and caution lighting where necessary;
- lighting the area, but ensuring there is no glare or shadowing, for example if floodlighting is used, position it so as not to blind the operator or motorists; and
- providing level pedestrian and wheelchair access around the area.

Plant and equipment safety

The employer, contractor or owner of a floor saw, wall saw, hand-held saw or core drill should ensure the equipment is appropriate for the job and safe to operate before any cutting begins.

The operator should check the general condition of the cutting or drilling equipment before each job to ensure the machine, saw blades, drill bits, diamond surfaces, guards, leads, hydraulic hoses, electric leads and other components are in good working order.

The employer, contractor, owner or hirer should ensure, and the operator should check:

- that appropriate checks, tests and inspections of equipment are carried out as necessary to ensure the equipment is in safe working order;
- records of inspection, repair, maintenance, alteration and cleaning of equipment are accessible and demonstrate that the equipment is in safe working order;
- the cutting blade is the correct size and type for the machine. Oversize blades should not be fitted under any circumstances;
- the diamond surface and bonding matrix comply with the manufacturer's recommendation for the material to be cut or drilled;
- blunt diamond blades are sharpened by making cuts in a soft abrasive material, such as bitumen, brick work or limestone, until new diamonds are exposed;
- the blade is in good working condition, free from cracks or deterioration;

- the specified blade speed matches the saw drive speed. Only recommended blades, ensuring the revolutions per minute (rpm) rating suited for the operation, should be fitted;
- the shaft and flanges are clean, undamaged, and fit snugly;
- the blade fits securely over the shaft;
- the shaft nut is tightened over the outside flange;
- the blade guard is fitted and in good working order;
- the drive belt is at the correct tension;
- for wet cutting, adequate coolant water is available;
- a floor saw is used for horizontal work at low level, so operators don't have to work on their knees. If a hand-held saw is used, it should be supported by a trolley;
- make sure other people on the site are not at risk;
- there is safe removal or support of cut pieces or cores is provided;
- the equipment is protected at the power outlet with a RCD;
- the area behind the cut is barricaded and warning signs are posted when cutting through floors or walls to prevent people entering the area;
- safe ventilation procedures are in place when petrol-driven saws are used indoors; and
- appropriate PPE is provided and worn, where a risk assessment determines it should be used.

7. Cutting and drilling equipment – Safe practices

Track-mounted hydraulic/pneumatic wall saw

Preparation:

- an exclusion zone is established around the area to be sawed to remove the potential for other people in the workplace to be injured in the event that the blade shatters;
- bunds are placed round the cut area to contain excess water and slurry, later to be removed with a wet and dry vacuum cleaner;
- the area to be cut is secured (especially suspended slabs or ceilings), using either a crane or propping;
- a cut-line is pre-marked with waterproof crayon or permanent marker pen;
- the wall-saw track length is measured to determine the length of cut to be carried out, allowing extra track length for the saw head;
- holes are hammer drilled along the cut line to check for reinforced bars running on the same line;
- alternatively, a wider core drill hole is drilled in each corner to locate bars;
- bolt holes are drilled with templates to fix tracks to the wall, using suitable drop-in steel anchors;
- the saw blade diameter is selected to suit the requirements of the cut and technical conditions;
- oil levels are checked in the power pack and any leaks or loose hoses rectified; and
- pressure is checked on the hydraulics gauge.

Operation:

- the operator and others stand away from the path of the blade when starting the machine;
- the maximum saw blade diameter (or start blade) is 730mm when making the first cut. When changing to a second blade, the blade is aligned with the previous cut before cutting resumes;
- engine revolutions should be set to provide the cutting speed recommended by the manufacturer for the material to avoid overworking the saw;
- a saw is used only with the blade rotating in the opposite direction to the cut and is not used for inverted cutting;
- the feed pressure is adjusted to match the cutting ability of the blade and the hardness of the wall to be cut;
- the main switch on the power unit is turned off if an emergency arises. This is the quickest way to stop the blade and the power unit;
- when fitting the rails, the cutting line is marked and the positions of the drill holes for the expander bolts are marked at a distance of at least 210mm from the cutting line;
- the wall mountings are hung loosely from the expander bolts so they can be adjusted when the rails are put in place and before tightening the bolts;
- correct manual handling techniques are used when lifting the wall saw onto the rails;
- any concrete blocks cut loose are secured or anchored to avoid unintentional movement;
- the area at the back of the wall, where the blade comes out when cutting through, is cordoned off to avoid injury to other people and damage to materials;
- sufficient water or coolant is used to suppress dust at the point of generation;
- appropriate PPE is worn;
- any electrical leads are safely placed so they cannot be cut or allowed to lie in wet slurry;

- the area around the hydraulic hoses is kept clean at all times;
- if the hydraulic hose is to be disconnected, switch off the power first and allow the motor to stop completely;
- anyone assisting the operator is located where they will not be exposed to danger from sudden saw movement, ejection of material, a dropped machine or falling off cuts;
- if the machine stalls, the blade is raised, the machine is switched off, and the outside flanges and nuts are checked for tightness;
- the power pack is turned off and the saw blade is removed before the cutting head is lifted from the rails;
- when retracting the blade out of the wall, the saw unit is moved with the trolley feed valve to the easiest position on the rail for it to be lifted off;
- blades are removed and stored in a safe, dry place when not in use; and
- operators are given information, instruction, training and supervision for operating concrete and masonry saws and drills.

Some older saws may still have a throttle lock or ‘dead man’s switch’ that should be used only when starting the machine. If the throttle lock is used during normal operation, it may be difficult to cut power if the machine jams. Most concrete and masonry saws these days do not have a throttle lock.

Floor-cut concrete saws

Preparation:

Floor saws should be used to avoid the operator having to work in a kneeling position.

Preparation and development of safe procedures prior to cutting is the same as for wall saw cutting, except there is usually no need for rails to be attached to guide the saw.

The blade should be lifted off the ground before starting or stopping the machine.

Operation:

- cut in a straight line;
- saw only as deep as the job specifications and conditions require;
- for masonry saws, maintain a secure grip on the material being cut, and feed the material in slowly to avoid jamming the blade;
- for concrete saws, lower the blade into the cut slowly and proceed to cut forward;
- use consistent pressure that does not force the blade to ‘climb’ out of the cut; and
- engine revolutions should be set to provide the cutting speed recommended by the manufacturer for the material to avoid overworking the saw.

Suspended slab removal

Horizontal concrete slab areas to be cut away should have a pre-cut procedure developed that determines the method of cut and ensures the slab to be cut can be supported from beneath by scaffolding and prevented from moving.

A competent scaffolder should ensure that adequate propping is tied into the remaining slab.

Barricading should be erected around areas to be cut to ensure only those involved have access.

The slab should be cut into block sizes that can be lifted by a crane or a lifting device approved by an engineer.

A bund dam should be placed beneath the cut area to contain coolant water and slurry until it can be removed by a wet and dry vacuum cleaner or contained in a slurry bin.

Hand-held saws

Hand-held concrete saws should be used only in situations where the use of a self-supporting saw is not practical.

Hand-held concrete and masonry saws may be petrol engine-driven, electric or hydraulic types. Designed like a chain saw, they have a belt drive instead of a chain to power the circular saw attachment.

These saws are inexpensive to buy and easy to operate. They are frequently hired and have a different range of associated hazards. Due to their common use, they are more likely to cause injury or harm than self-supporting concrete and masonry cutting or drilling equipment.

They are also more likely to be used by people who have not received sufficient information, instruction, training or supervision.

Being hand-held, they are more prone to potentially fatal kick-back, push-back and pull-in movements. Because they are petrol driven, they are also more likely to cause hazardous fume build-up indoors.

The most important safety procedure for operators of this equipment is proper instruction and training. Without these, the risk of injury is high.

Of major concern is that they are often wrongly regarded as all-purpose cutters.

Choosing equipment designed specifically for chasing may reduce some of the risks.

Inverted cutting – a major hazard

Inverted cutting entails using the top part of the circular saw blade to cut under an overhanging floor, ceiling or horizontal slab of concrete or masonry.

Inverted cutting also involves using the front upper quadrant of the blade – the blade's highest risk kick-back zone.

Kick-back becomes even more probable if the concrete contains hidden obstructions or resistance, for example from steel reinforcing rods or mesh.

An additional hazard occurs when an electric saw is used for inverted cutting, as coolant water flowing into the motor can cause electrocution.

Never use a hand-held saw for inverted cutting. This is probably the most dangerous way of all to use a hand-held concrete saw.

Danger occurs because the top section of the saw blade used for inverted cutting moves away from the operator, greatly increasing the risk of kick-back or push-back.

The safest procedure is to always cut from the top of a horizontal slab of concrete.

Case study

An operator was killed in Western Australia while using a hand-held saw to cut through a section of steel-reinforced concrete pipe. The pipe was resting on the flange at one end and on the plain pipe end at the other, causing the pipe to be in a bending mode.

Pressure from the flanged pipe-end caused the cut to pinch on the saw blade, causing a fatal kick-back.

Inquiries showed that, because the saw blade was not big enough for a continuous cut, the operator was using a series of 'plunge-cuts' along a pre-drawn line.

Not only did this make it difficult for each cut to line up with the next, but it meant the saw blade's most hazardous component – the front upper quadrant – was being repeatedly thrust into the pipe against kick-back forces.

Pinching of the saw cut may have caused enough resistance to trigger the kick-back.

Preparation:

- there should be a hand-hold for the operator's non-trigger hand;
- there should be suitable grips for both right and left handed operators;
- saw should be as light as practical for the type of work, to reduce risk of strain injury;
- blade should be appropriately guarded;
- well balanced equipment should have anti-vibration hand-grips that are comfortable to use and provide sufficient support. A poorly balanced machine might require the operator's hands to be placed in dangerous positions near the blade or vibrate unnecessarily when in use, risking damage to the operator's circulation, nerves and joints;
- correct diamond cutting or abrasive compound should be used for the material being cut, as recommended by the manufacturer, so the operator does not have to force the cut;
- for horizontal cutting, the saw should be capable of cutting right-to-left as well as left to-right without having to reposition the blade or guard;
- automatic cut-off switch should be fitted;
- no modifications should have occurred from the original manufactured form;
- establish that a pre-cut procedure is developed for the site, which has been signed off by the safety officer, electrician, plumber and saw operator;
- check the original drawings and 'as-constructed' drawings (if they exist) as well as the site for enclosed cables, wiring, plumbing, steel reinforcing and structural stress components;
- ensure if pipes are to be cut that they are properly supported and chocked;
- inform others at the workplace that cutting or drilling is about to begin;
- cordon off the area with 'Noise Warning' and 'Danger Diamond Drilling' signs in appropriate places;
- locate any persons assisting the operator away from any danger of sudden saw movements or ejection of material;
- fuelling should be done with the saw switched off and well away from the work area;
- add fuel using a funnel, not direct from a jerry can;
- check the cutting area has a clear working surface;
- check the cutting area for ventilation. When indoors, use a compressed air or hydraulically-driven saw; if a petrol motor must be used in an enclosed area, ensure a proper exhaust ventilation system is provided;
- collect all slurry with a wet and dry vacuum cleaner and dispose of it safely;
- no cutting above shoulder height. Anything higher should be done from a platform or scaffold;
- ensure hoses on hydraulic machines are secure and oil levels in power packs are at the correct levels;
- check ground conditions to ensure safe footing for operators;
- suspend all electrical cables safely above the floor or ground level;
- when starting the machine, the operator and others should stand away from the path of the blade, and the operator should ensure the blade is not touching any object;
- ensure the engine is warmed up and the blade is spinning at the correct speed before commencing cutting;
- ensure both hands are on the machine when cutting;
- never leave a running machine unattended;
- never carry or place the machine on the ground, or change grips between horizontal and vertical cuts, without first turning it off;

- use the handles (rather than the belt guard) to support the equipment;
- cutting and drilling should be done away from combustible material, fumes, wet slurry and electrically powered equipment; and
- stop work immediately if unauthorised people enter the work area or if any machine or blade fault is detected.

Operation:

- mark the cut line with a waterproof crayon or permanent marker;
- when cutting, stand with one foot firmly in front of the other, the body balanced and the back close to vertical;
- the operator should maintain an upright posture with both feet flat on the ground;
- avoid standing directly behind the saw;
- ensure the operator's hands do not move above shoulder height, with all vertical work above 1.7 metres done using a scaffold or safe platform;
- when cutting horizontally across a wall, the operator's hands should be at waist level;
- allow at least five minutes for a dry blade to cool enough to touch. Wet blades remain cool;
- if cutting a pipe, pull the saw forward to ensure cutting always takes place in the lower quadrant of the blade;
- make the first cut about 25-50mm deep enabling a straight cut;
- when cutting a pipe, make the cut on top of the pipe by rotating the pipe between cuts;
- if cutting a pipe, rotate the blade guard to reduce the chance of the upper quadrant of the blade contacting the pipe;
- after pre-cutting and changing to a second blade, align the blade with the previous cut before resuming cutting;
- let the machine do the work. Do not unduly push or pull the machine;
- operate at optimum blade revolutions and listen – the blade makes a swishing sound when cutting correctly; and
- immediately release the trigger if the blade jams for any reason.

Concrete core drilling

Concrete core drilling, or ring sawing, involves cutting circular holes and removing cores to allow for services such as electrical, plumbing, heating, sewer and sprinkler installations.

The procedure involves bolting a drilling mast to the concrete surface to be core-drilled.

During drilling with a circular drill bit, water from a hose connected to a tap is flushed down the hole to capture dust, remove slurry and keep the drill bit cool.

This procedure is common for all core drilling equipment, despite the fact that most equipment is electricity-driven.

Preparation:

- make sure all drill areas have been scanned for electric cables;
- check all electrical equipment has current safety tags complying with the OSH Regulations;
- suspend all electric cables safely above floor or ground level;
- check all mechanical parts for loose components;
- ensure each power cable is fitted with a RCD;
- erect barricades and clear no-entry signs to areas where drilling is in progress;

- isolate the area below drill sites on horizontal slabs, with either a spotter or ‘Danger Diamond Drilling’ signs; and
- erect barricades around drill areas.

Operation:

- ensure holes have been marked and centres given;
- secure the core drill with anchor bolts using a hammer drill;
- ensure the drill machine is solidly fixed, with no movement of the mast. A loose fitting will mean problems down the hole;
- attach the drill to the mast, making sure it is secure;
- never attach the drill carriage to the mast with the motor running;
- drilling of all holes should start in low gear; stopping the motor before changing to a higher gear;
- feed tap pressure water into the hole to bring up slurry and keep the drill bit cool;
- fit safety covers over drilled core holes, with warning signs fixed according to the OSH Regulations;
- remove slurry and cores to prevent slip and trip hazards; and
- never drill inverted holes using an electric drill unless the equipment is fitted with a specifically designed water collection ring. Use hydraulically driven equipment as a safer alternative.

Appendix 1: General principles for managing occupational safety and health in workplaces

The OSH Act sets objectives to promote and improve occupational safety and health standards. It sets out broad duties and is supported by more detailed requirements in the OSH Regulations. The legislation is further supported by approved codes of practice and guidance notes. This legislative framework is depicted below.

OCCUPATIONAL SAFETY AND HEALTH ACT 1984

Major provisions:

- general duties;
- resolution of issues;
- safety and health representatives;
- safety and health committees; and
- enforcement of the OSH Act and the OSH Regulations.

OCCUPATIONAL SAFETY AND HEALTH REGULATIONS 1996

The OSH Regulations set minimum requirements for specific hazards and work practices. They include references to:

- **national standards** developed by Safe Work Australia; and
- **Australian and Australian/New Zealand standards** developed by Standards Australia or jointly by Standards Australia and Standards New Zealand.

GUIDANCE MATERIAL

Guidance material includes:

- **codes of practice** approved for Western Australia in accordance with Section 57 of the OSH Act;
- **guidance notes** developed by the Commission for Occupational Safety and Health;
- **national codes of practice and national standards** developed by Safe Work Australia; and
- **Australian and Australian/New Zealand standards** developed by Standards Australia or jointly by Standards Australia and Standards New Zealand.

The general duties – an overview

The OSH Act contains general duties, which describe the responsibilities of people who affect safety and health at work. Employers must, as far as practicable:

- provide a workplace and safe system of work so that workers are not exposed to hazards;
- provide workers with information, instruction, training and supervision to allow them to work in a safe manner;
- consult and co-operate with safety and health representatives in matters related to safety and health at work;

- provide adequate PPE where hazards cannot be eliminated; and
- ensure plant is installed or erected so it can be used safely.

Workers must take reasonable care to ensure their own safety and health at work and the safety and health of others affected by their work.

Self-employed people also must take reasonable care to ensure their own safety and health at work and, as far as practicable, ensure the work does not affect the safety and health of others.

Designers, manufacturers, importers and suppliers of plant must ensure that the plant is safe to install, maintain and use at workplaces. Safety and health information must be supplied with all plant and substances used at work.

Designers or builders of a building or structure for use as a workplace must ensure, as far as practicable, that persons constructing, maintaining, repairing, servicing or using the building or structure are not exposed to hazards.

The Commission's *Guidance note: The general duty of care in Western Australian workplaces* provides detailed information on the 'duty of care'.

The meaning of practicable

Some of the general duty provisions in the OSH Act and some requirements in the OSH Regulations are qualified by the phrase 'so far as is practicable'. 'Practicability' applies to general duties for employers, self-employed people, people with control of workplaces, designers, manufacturers, importers, suppliers, erectors and installers, and to certain requirements in the OSH Regulations.

These people are expected to take practicable and reasonable measures to comply with the requirements.

If something is practicable, it is capable of being done. Whether it is also reasonable takes into account:

- the severity of any injury or harm to health that may occur;
- the degree of risk (or likelihood) of that injury or harm occurring;
- how much is known about the hazard and the ways of reducing, eliminating or controlling it; and
- the availability, suitability and cost of the safeguards.

The risk and severity of injury must be weighed up against the overall cost and feasibility of the safeguards needed to remove the risk.

Common practice and knowledge throughout the relevant industry are taken into account when judging whether a safeguard is 'reasonably practicable'. Individual employers could not claim that they did not know what to do about certain hazards if those hazards are widely known by others in the same industry, and safeguards were available.

The cost of putting safeguards in place is measured against the consequences of failing to do so. It is not a measure of whether the employer can afford to put the necessary safeguards in place.

In some instances, a combination of control measures may be appropriate. Control measure should be designed:

- to eliminate or reduce the risks of a hazardous work process and to minimise the effects of injury or disease; and
- to reduce the risk of exposure to a hazardous substance.

While cost is a factor, it is not an excuse for failing to provide appropriate safeguards, particularly where there is risk of serious, or frequent but less severe, injury.

Where a regulation exists and is not qualified by the words 'as far as is practicable', the regulation must be complied with as a minimum requirement.

Appendix 2: Pre-site safety checklist

Site and equipment safety

Contractor's name: _____

Type of job: _____

Site location: _____

Operator's name: _____

Check the SITE for SAFETY

On arrival at the site, tick the correct answer where relevant to the job. If the answer is NO, the situation is unsafe. Alert the office.

	YES	NO	COMMENT
SITE EVACUATION			
Checked with client	☐	☐	_____
Located first aid/accessible	☐	☐	_____
SCAFFOLDING			
Erected as required	☐	☐	_____
SERVICES located/marked			
Electricity	☐	☐	_____
Gas	☐	☐	_____
Water	☐	☐	_____
Other	☐	☐	_____
VENTILATION			
Adequate	☐	☐	_____
LIGHTING			
Lighting in place	☐	☐	_____
CONTROL/PUBLIC SAFETY			
Barricades in position	☐	☐	_____
Warning signs displayed	☐	☐	_____
Traffic control in place	☐	☐	_____
SAFETY EQUIPMENT			
Safety equipment is functional, clean and safe	☐	☐	_____
FALL PROTECTION	☐	☐	_____
HAZARDOUS SUBSTANCES	☐	☐	_____
SAFE SYSTEM OF WORK	☐	☐	_____

Check the EQUIPMENT for SAFETY

On setting up, tick the correct answer where relevant to the job and equipment. If the answer is NO the situation is unsafe. Alert your employer.

	YES	NO	COMMENT
FLOOR SAW			
Shaft nut secure	☐	☐	_____
Belt tensioned and undamaged	☐	☐	_____
Adequate water and waterways clear	☐	☐	_____
Flaps in place	☐	☐	_____
Guards in place	☐	☐	_____
HAND-HELD SAW			
Belts tensioned and intact	☐	☐	_____
Flange locking nut secure	☐	☐	_____
Water supply adequate	☐	☐	_____
Guards in place	☐	☐	_____
WALL SAW			
Tracks securely fastened	☐	☐	_____
Blade secured	☐	☐	_____
Job wedged/securely supported	☐	☐	_____
WIRE SAW			
Pulleys secure	☐	☐	_____
Hydraulic pressure correct	☐	☐	_____
DRILLS			
Electric switch, plug and lead safe	☐	☐	_____
Water collar operable	☐	☐	_____
Carriage clamp and shims operable	☐	☐	_____
BLADE AND BITS			
No undercutting evident	☐	☐	_____
Blades free of cracks and deterioration	☐	☐	_____
Blade is the right size and the right type for the machine	☐	☐	_____
All segments secure	☐	☐	_____
ELECTRICAL LEADS			
Plugs in good condition	☐	☐	_____
Outer casing intact	☐	☐	_____
Correctly tagged	☐	☐	_____
RCDs fitted	☐	☐	_____
Lead stands	☐	☐	_____

The preparation of a Job Safety Analysis (JSA) is an example of an industry-accepted method for undertaking and recording the workplace health and safety risk management process.

Appendix 3: Other sources of information

Occupational safety and health laws and regulations

The *Occupational Safety and Health Act 1984* and the Occupational Safety and Health Regulations 1996 can be accessed free of charge from the State Law Publisher's website at www.slp.wa.gov.au or purchased by telephoning (08) 9426 0000.

Commission for Occupational Safety and Health publications

- *Codes of practice: First aid facilities and services, workplace amenities and facilities and personal protective clothing and equipment.*
- *Code of practice: Managing noise at workplaces.*
- *Code of practice: Manual tasks* (to be published in 2010)
- *Code of practice: Prevention of falls at workplaces*
- *Guidance note: General duty of care in Western Australian workplaces*
- *Guidance note: Working alone*

Commission publications are available from www.worksafe.wa.gov.au or for purchase by contacting WorkSafe on 1300 307 877.

Australian and Australian/New Zealand Standards

Australian and Australian/New Zealand Standards can be purchased from SAI Global at www.saiglobal.com. Copies are also held in the WorkSafe library.

- *AS/NZS 1269.3 Occupational noise management – Hearing protector program*
- *AS/NZS 1716 Respiratory protective devices*
- *AS/NZS 1715 Selection, use and maintenance of respiratory protective devices.*
- *AS/ANZ 3012 Electrical Installations – Construction and demolition sites*

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Comprehensive work safety and health information provided by the Department of Commerce can be found at:
www.worksafe.wa.gov.au

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