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CODE OF PRACTICE

CONCRETE AND MASONRY CUTTING AND DRILLING

Commission for Occupational Safety and Health

FOREWORD

The Occupational Safety and Health Act 1984 **established the Commission for Occupational Safety & Health, which comprises representatives of employers, unions, government and independent experts. The Commission has the function of developing the legislation and supporting guidance material and making recommendations to the Minister for implementation. To fulfil its functions the Commission is empowered to establish advisory committees, hold public enquiries and publish and disseminate information.**

The Commission's objective is to promote comprehensive and practical preventive strategies that improve the working environment of New Zealand.

This code of practice has been developed through this tripartite consultative process and the views of employers and unions along with those of government have been considered.

THE ACT

The Health & Safety Employment Amendment Bill 2002 provides for the promotion, co-ordination, administration and enforcement of occupational safety and health in New Zealand

With the objective of preventing occupational injuries and diseases, the Act places certain duties on employers, employees, self-employed persons, manufacturers, designers, importers and suppliers.

In addition to the broad duties established the Act, it is supported by a further tier of statute, commonly referred to as regulations, together with lower tiers of non-statutory codes of practice and guidance notes.

Regulations

Regulations have the effect of spelling out the specific requirements of the legislation.

Regulations may prescribe minimum standards to be achieved or prescribe what must be done in respect of recognised hazards at work.

Codes of Practice

A code of practice is defined in the Act as a document prepared for the purpose of providing practical guidance on acceptable ways of achieving compliance with statutory duties and regulatory requirements.

Codes of practice:

- Should be followed, unless there is another solution which achieves the same or better safety or health result; and
- Can be used to support prosecution for non-compliance.

Guidance Notes

A guidance note is an explanatory document approved by the Commission providing detailed information on the requirements of legislation, regulations, standards, codes of practice or matters relating to occupational safety and health.

This code of practice was approved pursuant to section 57 of the Occupational Safety and Health Act 1984 by the Hon Minister for Consumer and Employment Protection on 28 January 2004.

Scope

This code applies to all workplaces in New Zealand covered by *The Health & Safety Employment Amendment Bill 2002*.

It provides practical guidance for users and operators of concrete and masonry cutting and drilling equipment on carrying out their duties under the *Occupational Safety and Health Act 1984 and* meeting the requirements of the

The code will apply to all workplaces covered by the Act where concrete and masonry cutting and drilling equipment is used and should be used by all persons involved in concrete and masonry cutting and drilling, employers, contractors, employees, self-employed persons, safety and health representatives and the designers, manufacturers, importers and suppliers of the plant.

Contents

Introduction

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

Most at risk are operators of hand-held concrete and masonry saws. They are more prone to the violent forces unleashed when a saw blade jams inside a cut than fixed saws. These forces, commonly referred to as recoil, push-back or pull-in, are difficult sometimes unpredictable 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 recoil (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 safely positioned away from the direction of the kick-back normally achieved through cutting posture.

Inverted cutting i.e. 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.

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

CAUTIONS FOR USING CONCRETE OR MASONRY CUTTING OR DRILLING EQUIPMENT

- **ALWAYS** follow the manufacturer's instructions for safe use.
- **ALWAYS** use the correct blade size, as 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.
- **NEVER** use a hand-held saw for inverted cutting or drilling.

Section 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 cutting and drilling equipment used for:

- **Chasing –** cutting gutters or grooves in concrete, brickwork or other building masonry surfaces to allow for the inclusion of wires, cables, pipes or flashing.
- **Wall sawing –** cutting openings 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 –** 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 –** 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 –** cutting concrete pipes (reinforced or not), usually done with hand-held petrol engine driven concrete cutting saws.
- **Brick & power cutting –** using fixed water-cooled and air-cooled circular saws or grinders for brick, tiles, pavers and similar.
- **Block cutting –** 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, e.g. on footpaths, stairs, and public platforms and ramps.

- **Road cutting –** cutting roadways, ramps or curves for the installation of sub-surface services

What equipment is covered?

This code of practice covers diamond-blade, water-cooled circular saws, saws and grinders powered by electricity, petrol engine, compressed air (i.e. pneumatic) or hydraulics, and 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. The code also covers power drills and core drills used for concrete and other masonry.

Who is responsible?

The Occupational Safety and Health Act 1992 *and revision 2002* places responsibility for workplace safety on employers, employees, self employed persons, people in control of workplaces, and the manufacturers and distributors of plant and equipment.

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

Employees 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 Act 1992 *and revision 2002* require employers, main contractors, self-employed persons and those in control of workplaces or access to workplaces, as far as practicable, 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 equipment

The Regulations place personal protective equipment last as an option in reducing risk.

However, due to the unpredictable nature of the work, everyone involved in concrete or masonry cutting and drilling operations require personal protective equipment, depending on the risk assessment outcomes for each workplace and job.

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

- safety helmet;
- safety footwear;
- safety goggles;
- 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 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 PERSONAL PROTECTIVE EQUIPMENT is in Section 4 of this code.

Hire equipment

People who supply concrete and masonry cutting and drilling equipment for hire have an obligation under the 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 up, operating and stopping the machine. Personal protective equipment shall be available for hand held concrete saws.

More information on SUPPLYING EQUIPMENT FOR HIRE is in Section 4 of this code.

Section 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 else who is nearby.

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

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

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

What are the hazards?

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.

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:

Obstructions or resistance in the material being cut – can cause sudden recoil kick-back, push-back or pull-in movements of the saw. These occur when different quadrants of the blade come in contact with obstructions or resistance within the concrete or masonry, e.g. from reinforcing steel bars, steel mesh or brick ties. These potentially violent forces can be difficult to control and are most likely to cause serious injury when hand-held or "quick-cut" concrete saws are used. They can also cause fixed concrete saws to be wrenched from their fittings, with the potential of the saw running free on the ground.

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

Pinched cuts – caused when the object being cut moves, resulting in the cutting groove tightening on the saw blade, thus increasing the risk of recoil kickback etc.

Blunt cutting edges – 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 recoil kick-back, push-back or pull-in.

Unsafe grip, posture or stop-start procedures for hand-held saws – can cause the saw to swing out of control and come in 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 – 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, e.g. when the diamond cutting edge becomes dull, if an obstruction is encountered, the cutting groove is not straight or the blade is pinched. A previously damaged blade may foil many jobs later on, hence the importance of blade removal and inspection prior to use.

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.

Hazardous dusts – emitted by cutting and drilling operations or equipment that does not use water for cooling cutting parts and capturing dust. Concrete dust may carry high levels of respirable silica dust. Repeated exposure can cause silicosis, 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. Vacuum dust removal systems and muzzles are readily available for dust free environments.

Insufficient flow of coolant water – 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 – can cause uneven blade movement, wear and tear and the risk of blade-shatter.

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

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

A beard, loose hair or loose clothing – 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 – can reduce operator control and increase the risk of recoil kick-back, push-back or pull-in injury.

Cutting concrete pipes – requires special safe procedures to prevent the pipe from rolling or moving during cutting, particularly when a hand-held 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 predrawn line on the pipe's outer surface.

Confined spaces – 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. Purchasing policy should include consideration of 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 electrocution or exposure to toxic gases, or of explosion. Water can cause drowning or slipping.

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

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

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

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

Working alone – can be hazardous because of the potential need to provide assistance to the operator in the event off an unsafe incident or emergency situation.

What are the risks?

The most likely risks of injury serious harm and death come from:

- flying saw fragments;
- saw recoil kick-back, push-back or pull-in;
- out-of-control or fee-running cutting machines;
- falling concrete and masonry;
- inadequate scaffolding;
- noise;
- fire;
- electrocution;
- explosion;
- hazardous dusts from dry cutting and drilling, 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 in confined spaces, or damaged gas supply services.

Section 3

Risk Analysis

Identifying hazards and controlling risks

The Occupational Safety and Health Act 1992 require employers, self employed persons and people in control of workplaces and workplace access to identify hazards, assess risk or 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 all parties at the workplace, including senior managers, contractors, supervisors, self-employed persons, employees and safety and health representatives.

Decisions on safe systems of work and the means of eliminating or controlling hazards should be made in consultation with these people.

In workplaces where concrete and masonry cutting and drilling equipment is used, the following need to be adhered to:

1. Hazard identification

Identifying hazards – this 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, e.g. 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;
- Check the texture, shape and composition of each item to be cut or drilled;
- Check the possible presence and location of obstructions, e.g. steel reinforcing or plumbing in material to be cut;
- Identify toxic or hazardous substances;
- Identify concrete or masonry sections that will need to be supported to prevent hazardous or premature falls during cutting;
- Locate imbedded electrified wires, cables, gas or water lines;
- Identify objects likely to shift during cutting, e.g. concrete pipes;
- Check objects likely to pinch on the saw blade during cutting;
- Check correct assembly of cutting or drilling equipment components;
- Secure anchoring of guide tracks for fixed sawing of walls or floors;
- Check correct hardness of diamond cutting bond for the material being cut;
- Check compatibility of saw blade size to size, thickness, hardness and shape of material to be cut;
- Identify the likely presence of workers or the public nearby;
- Identify sections of concrete or masonry likely to fall;
- Check the presence of water and slurry lying around during cutting operations, causing electrical and slip hazards;
- Identify the manual or mechanical handling needs of cut concrete or masonry sections and heavy equipment;
- Identify any excessive noise exposure;

- Identify any excessive exposure to vibration from hand-held saws and drills.

2. Risk assessment

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

- Recoil kick-back injury to the operator from obstructions in the material to be cut;
- Injury to an operator who has not been given information, instruction, training or supervision;
- Slip injury, electrocution or loss of saw control because of accumulated coolant water and slurry;
- Injury from an incorrect diamond bond causing blade cracking and disintegration, or thermally degraded dry bond.

Controlling risks

Considering means of controlling risks – e.g. by introducing safety measures to eliminate or minimise the risk of a person being exposed to a hazard.

The Occupational Safety and Health Act 1992 says risks relating to plant (including concrete and masonry cutting and drilling equipment) should be reduced by one or a combination of the following:

- **Substitution of the plant by less hazardous plant** e.g. using a fixed instead of a hand-held saw for large wall and floor-cutting jobs;
- **Modification of the design of the plant** e.g. ensuring saw blades are sufficiently large in diameter to penetrate sufficiently through the thickness of material being cut;
- **Isolation of the plant** e.g. erecting barricades and clear no-entry signs to areas where concrete cutting and drilling is in progress;
- **Using engineering methods to change physical characteristics of the plant** e.g. attaching the concrete saw to a motorised trolley with anchored guide tracks, or using a floor saw, to ensure the blade stays on course during cutting;
- **Implementing, maintaining and supervising control measures to reduce the risk as far as practicable** e.g. ensuring agreed safe procedures for concrete and masonry cutting and drilling are carried out according to the job and the type of machinery used.

Any design modification or physical changes to plant must have the manufacturer's permission and approval.

Section 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 persons at the workplace, including employers, employees, supervisors, self-employed persons, persons in charge of workplaces and access, 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 protective equipment

The type of personal protective equipment (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 safe procedures.

Standard PPE for concrete or masonry cutting or drilling includes safety helmet, visor, eye and hearing protection, boots and gloves and sun protection. If it is impracticable to remove hazardous dusts at the source or exhaust fumes in a confined space, appropriate respiratory equipment should be provided and worn.

Gloves help minimize 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 broad-brim hat, sunglasses, long sleeve shirt and long trousers, as well as SPF15+ 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.

Damage or defective PPE items must be repaired or discarded.

General advice and guidance on selecting, using, storing and maintaining PPE is provided in the Commission's *Code of Practice: First Aid, Workplace Amenities and Personal Protective Clothing and Equipment 2002*.

Training and instruction

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

This includes employed and self-employed persons 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 cutting and drilling work practices, and procedures are supervised by experienced people and assessed on their competency to work unsupervised before being allowed to do so.

Training of employees should include information and instruction on:

- workplace safety and health;
- hazards and risks associated with work activities;
- safe work practices and procedures, the safe handling (including lifting and moving) and safe operation of equipment and the control measures in place;

- safe use of plant and associated equipment, safe use of hazardous substances, 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 personal protective equipment, tools and equipment and why the equipment is needed;
- emergency and first aid procedures;
- sun protection to prevent skin cancer;
- explosion;
- fire protection;
- information on dust, fumes and air quality; and
- recognition of poorly ventilated areas and confined spaces.

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Supplying equipment for hire

Under the Occupational Safety and Health Act 1992, suppliers of hired concrete and masonry cutting or drilling equipment must take all reasonable steps to provide safety information to customers.

This could reasonable include:

- a