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INTERNATIONAL GENERAL CERTIFICATE IN OCCUPATIONAL HEALTH AND SAFETY

Element 9: Work equipment

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SCOPE OF LEARNING

- 9.1 General requirements
- 9.2 Hand-held tools
- 9.3 Machinery hazards
- 9.4 Control measures for machinery



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9.1 GENERAL REQUIREMENTS

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PROVIDING SUITABLE EQUIPMENT

Before you start

- Verify that everything is complete, with all safety features installed, and devoid of flaws
- Develop a safe procedure for operating and maintaining the machine
- Verify that every static machine has been installed correctly, is stable (typically bolted down), and is not in an area where other employees, customers, or visitors could be at risk.
- Select the appropriate tool for the job.

The CE mark, which stands for "Conformite Europeenne" in French, demonstrates to an item's compliance with EU regulations, which ensure consumer safety. To market their products in Europe, producers both inside and outside the European Union (EU) must meet CE certification criteria.



PROVIDING SUITABLE EQUIPMENT

Make sure the machine is:

- Safe for any job that must be performed during installation, routine use, clearing obstructions, performing repairs for breakdowns, and scheduled maintenance;
- Before removing clogs, cleaning, or adjusting the machine, it must be properly turned off, isolated, or locked off.

Also, make sure you identify and deal with the risks from:

- Electrical, hydraulic, and pneumatic energy sources;
- improperly conceived safeguards. They may be inconvenient or readily circumvented, which may encourage your employees to risk injury and violate the law. If they are, find out why they are doing it and take the necessary steps to address the issues.



MOBILE WORK EQUIPMENT

Part III of PUWER comprises specific duties involving mobile work equipment, such as forklifts and dump trucks, in addition to these general standards that apply to all work equipment.

Where mobile work equipment is used to transport people, you should ensure that it is acceptable for this function. Those being transported, the operator, and anybody else should be protected from potential dangers (such as tipping over) by taking precautions.





POWER PRESSES

In addition, Part IV of the Rules includes particular criteria for power presses. To ensure the safety of a power press and its related guard or safety device, it should be properly evaluated at set intervals and inspected regularly when in use. Only a qualified individual should undertake this task, and records should be preserved.





DOS AND DON'TS OF MACHINERY SAFETY

DO

- ✓ Check that the machine is well-maintained and fit for use, i.e. suitable for the job, functioning properly, and that all safety precautions – guards, isolators, locking mechanisms, emergency off switches, etc. – are in place;
- ✓ Use the machine in accordance with the manufacturer's guidelines;
- ✓ Ensure that staff are using the required protective clothes and equipment, such as safety glasses, hearing protection, and safety shoes, when operating this machine.
- ✓ Ensure that those who operate machinery are capable of doing so safely and give training as needed. Certain machinery requires a formal qualification.



DOS AND DON'TS OF MACHINERY SAFETY

DON'T

- ✘ Use a machine or appliance with a warning label or notice affixed. Only an authorised individual who is satisfied that the machine or procedure is now safe may remove warning labels.
- ✘ Remove any precautions, even if their presence makes the task more challenging;
- ✘ Do not wear chains, loose clothing, rings, or long hair that could become entangled in moving parts.
- ✘ Distract individuals using machines.



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9.2 HAND-HELD TOOLS

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HAZARDS OF HAND TOOLS

- If a chisel is used as a screwdriver, the chisel's tip could break off and strike the user or other personnel.
- If the wooden handle of a tool, like a hammer or an axe, is loose, splintered, or broken, the tool's head may fly off and injure the user or other personnel.
- If a wrench's jaws are spring-loaded, the wrench may slip.
- If impact tools like chisels, wedges, or drift pins have mushroomed heads, the heads may shatter upon impact, sending sharp shards hurtling towards the user and other personnel.



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HAZARDS AND PRECAUTIONS

- The employer is responsible for ensuring that all tools and equipment used by employees are in a safe condition. Employers are prohibited from issuing or allowing the use of dangerous hand tools. The proper use and manipulation of tools and equipment must be taught to employees.
- When utilising saw blades, knives, or other instruments, personnel should steer them away from aisles and other employees who are working in close proximity. Knives and scissors must be sharp; dull equipment pose a greater risk of injury. Saw blades with cracks must be removed from service.
- When the jaws are sprung to the point of slipping, wrenches must not be utilised. The heads of impact tools such as drift pins, wedges, and chisels must not be mushroomed. The tool handles must not have shattered wood.
- Sparks from iron or steel hand tools can be a source of fire near combustible substances. Wherever flammable gases, highly volatile liquids, or other explosive chemicals are stored or utilised, spark-resistant equipment constructed from non-ferrous materials must be employed.



HAZARDS OF HANDHELD POWER TOOLS

- mechanical entanglement in rotating spindles or sanding discs;
- waste material flying out of the cutting area;
- coming into contact with the cutting blades or drill bits;
- risk of hitting electrical, gas or water services when drilling into building surfaces;
- electrocution/electric shock from poorly maintained equipment and cables or cutting the electrical cable;
- manual handling problem with a risk of injury if the tool is heavy or very powerful;
- hand-arm vibration, especially with pneumatic drills and chainsaws, disc cutters and petrol-driven units;
- tripping hazard from trailing cables, hoses or power supplies;
- eye hazard from flying particles;
- injury from poorly secured or clamped work-pieces;
- fire and explosion hazard with petrol-driven tools or when used near flammable liquids, explosive dusts or gases;
- high noise levels with pneumatic chisels, planes and saws in particular





PRECAUTIONS

- Personal protection equipment, such as safety goggles and gloves, must be worn while using hand tools to protect against potential risks.
- The flooring of the workplace must be kept as clean and dry as possible to prevent mishaps involving or near dangerous hand instruments.
- Power tools must be equipped with guards and safety switches; inappropriate use is exceedingly harmful. The power source determines the sorts of power tools: electric, pneumatic, liquid fuel, hydraulic, and powder-operated.

To avoid risks related with the use of power tools, employees must take the following general precautions:

- Never transport a device by its lead or hose.
- Never yank on the lead or hose to detach it from the outlet.
- Keep electrical wires and hoses away from heat, grease, and sharp objects.
- When not in use, prior to servicing and cleaning, and when replacing blades, bits, and cutters, disconnect power tools.
- Keep all non-workers at a safe distance from the site of the project.



PRECAUTIONS

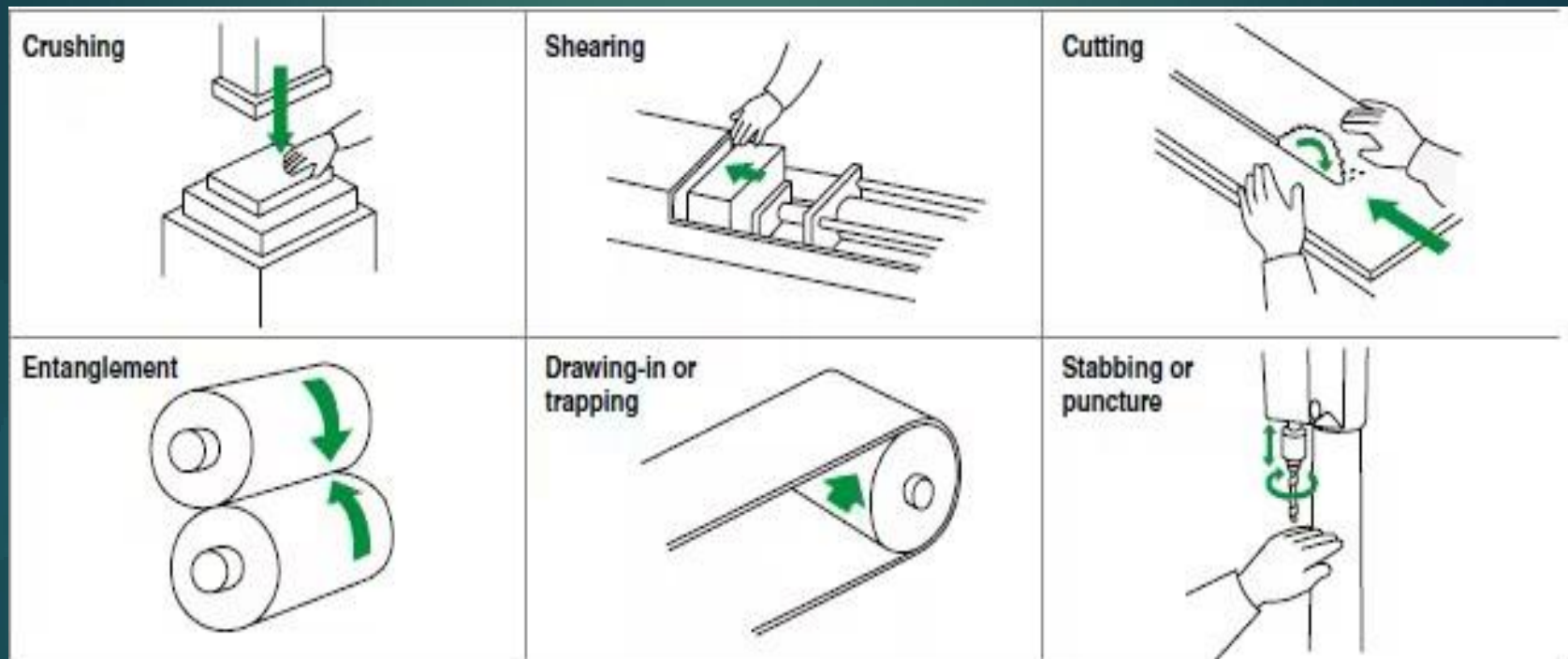
- Personal protection equipment, such as safety goggles and gloves, must be worn while using hand tools to protect against potential risks.
- The flooring of the workplace must be kept as clean and dry as possible to prevent mishaps involving or near dangerous hand instruments.
- Power tools must be equipped with guards and safety switches; inappropriate use is exceedingly harmful. The power source determines the sorts of power tools: electric, pneumatic, liquid fuel, hydraulic, and powder-operated.
 - Secure the work with clamps or a vice to free both hands for tool operation.
 - Prevent accidental starting. Do not hold the switch button while transporting a device that is plugged in.
 - Maintain your tools; keep them sharp and clean for optimal performance.
 - Refer to the user handbook for lubrication and accessory replacement instructions.
- When utilising power tools, be sure to keep your footing and balance steady.
- Dress appropriately for the task at hand. Loose garments, neckties, and jewellery can become entangled in moving components.
- Remove from service all damaged portable electric tools and label them: "Do Not Use."



9.3 MACHINERY HAZARDS



MACHINERY HAZARDS





MACHINERY HAZARDS

No.	Type	Origin	Potential Consequences
1	Mechanical hazards	<ul style="list-style-type: none">- acceleration, deceleration;- angular parts;- approach of a moving element to a fixed part;- cutting parts;- elastic elements; - falling objects;- gravity;- height from the ground;- high pressure;- instability;- kinetic energy;- machinery mobility;- moving elements; - rotating elements; - rough, slippery surface;- sharp edges;- stored energy;- Vacuum.	<ul style="list-style-type: none">- being run over;- being thrown;- crushing;- cutting or severing;- drawing-in or trapping;- entanglement;- friction or abrasion;- impact;- injection;- shearing;- slipping, tripping and falling;- stabbing or puncture;- Suffocation.
2	Electrical <ul style="list-style-type: none">- arc;- electromagnetic phenomena;- electrostatic phenomena;- live parts;- not enough distance to live parts under high voltage;- overload;- parts which have become live under fault conditions;- short-circuit;- Thermal radiation.	<ul style="list-style-type: none">- burn;- chemical effects;- effects on medical implants;- electrocution;- falling, being thrown;- fire;- projection of molten particles;- Shock.	



MACHINERY HAZARDS

3	Thermal hazards	<ul style="list-style-type: none">- explosion;- flame;- objects or materials with a high or low temperature;- Radiation from heat sources.	<ul style="list-style-type: none">- burn;- dehydration;- discomfort;- frostbite;- injuries by the radiation of heat sources;- scald
4	Noise hazards	<ul style="list-style-type: none">- cavitation phenomena;- exhausting system;- gas leaking at high speed;- Manufacturing process (stamping, cutting, etc.);- moving parts;- scraping surfaces;- unbalanced rotating parts;- whistling pneumatics;- worn parts.	<ul style="list-style-type: none">- discomfort;- loss of awareness;- loss of balance;- permanent hearing loss;- stress;- tinnitus;- tiredness;- any other (for example, mechanical, electrical) as a consequence of an interference with speech communication or with acoustic signals
5	Vibration hazards	<ul style="list-style-type: none">- cavitation phenomena;- misalignment of moving parts;- mobile equipment;- scraping surfaces;- unbalanced rotating parts;- vibrating equipment;- worn parts	<ul style="list-style-type: none">- discomfort;- low-back morbidity;- neurological disorder;- osteo-articular disorder;- trauma of the spine;- vascular disorder.



MACHINERY HAZARDS

6	Radiation hazards	<ul style="list-style-type: none">- ionizing radiation source;- low frequency electromagnetic radiation;- optical radiation (infrared, visible and ultraviolet), including laser;- radio frequency electromagnetic Radiation.	<ul style="list-style-type: none">- burn;- damage to eyes and skin;- effects on reproductive capability;- mutation;- headache, insomnia, etc.
7	Material/ substance hazards	<ul style="list-style-type: none">- aerosol;- biological and microbiological (viral or bacterial) agent;- combustible;- dust;- explosive;- fibre;- flammable;- fluid;- fume;- gas;- mist;- Oxidizer.	<ul style="list-style-type: none">- breathing difficulties, suffocation;- cancer;- corrosion;- effects on reproductive capability;- explosion;- fire;- infection;- mutation;- poisoning;- Sensitization.
8	Ergonomic hazards	<ul style="list-style-type: none">- access;- design or location of indicators and visual displays units;- design, location or identification of control devices;- effort;- flicker, dazzling, shadow, stroboscopic effect;- local lighting;- mental overload/underload;- posture;- repetitive activity;- Visibility.	<ul style="list-style-type: none">- discomfort;- fatigue;- musculoskeletal disorder;- stress;- any other (for example, mechanical, electrical) as a Consequence of a human error.



MACHINERY HAZARDS

9	Hazards associated with the environment in which the machine is used	<ul style="list-style-type: none">– dust and fog;– electromagnetic disturbance;– lightning;– moisture;– pollution;– snow;– temperature;– water;– wind;– Lack of oxygen.	<ul style="list-style-type: none">– burn;– slight disease;– slipping, falling;– suffocation;– any other as a consequence of the effect caused by the sources of the hazards on the machine or parts of the Machine.
10	Combination of hazards	– for example, repetitive activity + effort + high environmental temperature	– for example, dehydration, loss of awareness, heat stroke



MANUFACTURING/MAINTENANCE MACHINERY

BENCH TOP GRINDER



Hazards

- Contact with whirling abrasive wheels causes injuries
- Impact injuries caused by exploding wheels (sometimes fatal)
- slicing and crushing injuries caused by entrapment between the wheel and the work support
- Ineffective control of grinding dust including aluminium, magnesium, and related elements causes fires and explosions.
- Eye injuries caused by neglecting to utilise eye protection or protective screens.
- hazardous handling , toxic metalworking fluids
- vibrations caused by hand-fed or hand-held grinding equipment, which may cause a condition known as vibration white finger, which can cause lifelong harm to the hands and arms
- excessive noise from the grinding action and
- Inhaling the hazardous dust and fumes.



MANUFACTURING/MAINTENANCE MACHINERY

BENCH TOP GRINDER

Tips for operators

As well as general rules for safe operation, users should be trained:

- To utilise the appropriate wheel and equipment for the task.
- Avoid to grind on the sides of straight-sided offhand grinding wheels
- Keep wheels used for offhand grinding trued and dressed to reduce out-of-balance and for close work rest adjustment.
 - Regularly lubricate spindles
 - To allow brand-new wheels to spin freely for about a minute with no one present.
 - To support heavy work pieces and employ jigs to prevent vibration at pedestal and bench grinding machines routinely used for extended periods, especially for tool sharpening.



MANUFACTURING/MAINTENANCE MACHINERY

BENCH TOP GRINDER

Tips for operators

- not to stop wheels by pressing on the wheel face or periphery
- Not to submerge wheels in coolant, which could cause them to get out of balance. Before wheels are stopped, the coolant should be turned off to allow them to dry.
- Care should be taken not to introduce large components into centreless grinders in order to reduce the possibility of ejection and wheel breaking.
- to utilise wheel dressers that limit vibration white finger dangers..



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MANUFACTURING/MAINTENANCE MACHINERY

BENCH TOP GRINDER

Key safety measures

At an infrequently used, manually operated pedestal grinding machine, tools are occasionally sharpened.

- Opening in guard constrained to what is required to accomplish work
- Guard of sufficient strength to contain shattered wheel fragments
- Appropriate work rest
- rpm of spindle is distinctly indicated
- Simple accessibility and use of the on/off switch
- Clear flooring.

For surface grinding equipment operated manually:

In addition to the description of the machine above:

- Deliver extraction, inspect and test it every fourteen months, and document the results
- Secure the object firmly



MANUFACTURING/MAINTENANCE MACHINERY

PEDESTAL DRILLS

Key safety measures

For a manually operated, batch-production machine:

If applicable to component sizes and quantities

- fixed guard
- feed magazine
- discharge slide to
- prevent access to all dangerous parts

Training specifics

In addition to standard rules for safe operation, the following must be taught to users:

- To wear eye protection, and





MANUFACTURING/MAINTENANCE MACHINERY

PEDESTAL DRILLS

Key safety measures

NOT

- to wear jewellery, loose attire, or untied long hair
- unless complete enclosure of rotating chucks, spindles, and associated rotating parts is given, gloves must be worn.
- leaving chuck keys within chucks



MANUFACTURING/MAINTENANCE MACHINERY

PEDESTAL DRILLS

Key safety measures

For a manually operated radial arm drilling machine:

- Use a proper tripping device and routinely test its functionality
- Vertical trip within 75 mm of the tool and within the first 90° of rotation from the operator's location.
- Securely clamp workpiece to machine table
- Alternately, adjustable, fixed guards may be utilised..

For a small, manually-operated bench-mounted drill used for a variety of one-time jobs:

- Adjustable fixed guard so that spindle and drill tip are protected to the fullest extent possible.
- vice firmly gripped to table



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CYLINDER MOWERS

Hazards

The biggest danger of damage is posed by the machine's moving parts, which include:

- Moving blades or flails;
- Mobile drive systems;
- PTO (power take-off) shafts that rotate;
- Swiftly moving blades, flails, or other machine-ejected attachments.

Other risks created by mowing work include:

- interaction with moving elements during obstruction clearance;
- becoming stuck or crushed during the transition between the work and transport positions of the mower





AGRICULTURAL/HORTICULTURAL MACHINERY

CYLINDER MOWERS

Control measures

- Guarding
- General guidance on safe working practice
- Maintenance



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AGRICULTURAL/HORTICULTURAL MACHINERY

BRUSH CUTTERS

Hazards

- Contact with moving blade
- Exhaust fumes
- Ignition of fuel
- Trainee and newly qualified operators
- Wet, slippery or unstable ground
- Flying debris
- Manual handling
- Noise
- Vibration





AGRICULTURAL/HORTICULTURAL MACHINERY

BRUSH CUTTERS

Precautions

- Operators should adhere to manufacturers' instructions about the required level of PPE to be worn.
- When operating brush cutters/trimmers, snug-fitting clothing must be worn and long hair must be secured.
- Safety features must be inspected before beginning.
- The engine must be shut down and allowed to cool prior to any maintenance or refilling.
- Machinery must be maintained in accordance with the manufacturer's guidelines by a qualified individual, serviced at regular intervals, and inspected before each use.
- records kept.
- Operators should not cut in close proximity to things that could damage the cutting head, such as wire fences.
- Brush cutters / trimmers require two hands to operate.
- Signs should be posted at work or site entrances to alert the public of the dangers, or a lookout should be erected if public access is anticipated.
- Gloves must be worn when cleaning the blade guard in order to reduce the danger of tetanus and personal injury.



AGRICULTURAL/HORTICULTURAL MACHINERY

BRUSH CUTTERS

Precautions

- Strimmer never to be left unattended.
- Consider the average populace.
- Cease trimming if members of the public approach the work site.
- Permit the machine to cool prior to refuelling. Place the refuelling station at least 30 metres away from the work area and ignition sources.
- Use safety glasses when filling containers unless non-spill nozzles are installed.
- Avoid working in restricted places. Conform to manufacturer instructions.
- Ensure exhaust system is visible and away from the operator.
- Machines should not be operated indoors to avoid noise and exhaust fume accumulation.
- New operatives must be overseen by a qualified operator until they are competent, and their training must be documented.
- Frequent refresher training should be provided - every three years (for infrequent users) and every five years (for weekly users). Or according to certification.
- No child or adult with special educational needs (SEN) should operate machinery.
- Brush cutters and trimmers should not be used on steep slopes where solid footing cannot be maintained. Do not operate uneven ground



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BRUSH CUTTERS

Precautions

- where footing could be impaired or where conditions would make escape difficult.
- Brush cutters/trimmers must not be used when there are severe winds or heavy rain.
- Brush cutters and trimmers will not be used if anyone is within a 15-meter radius.
- Ensure the use of PPE and the maintenance of safe working distances. Remove debris from escape routes in all directions.
- Close and place lookouts along walkways while falling on or near footpaths. Install safety signage at all public locations.
- Before work can begin, the ground must be cleansed of garbage such as bottles and cans and inspected for dog faeces.
- Visual inspection of the region for stones, raised manhole covers, and ancient posts, etc.
- Visually inspect the area for surface-laid or shallow services prior to mowing the grass. Any exposed cables must be reported immediately to the proper company.
- Strimming should be carried with the back facing traffic when it is safe to do so.
- Offer carrying aids for equipment conveyance to the site.
- Ensure that all team members are aware of safe lifting techniques and assist one another when lifting large logs. Use log tongs and pulp hooks for larger things.



AGRICULTURAL/HORTICULTURAL MACHINERY

BRUSH CUTTERS

Precautions

- Earplugs must be worn at all times by the operator.
- Those personnel authorised to be within 10 metres of the chainsaw operator must wear ear protection. See HSE recommendations below.
- Take a 10-minute pause after each gasoline tank and a 30-minute rest after every third fuel tank.
- Consider arm-vibration limits.
- Adjust harness and grips for user comfort prior to beginning work.
- Operators should be made aware of the health concerns associated with HAVS and should promptly report any numbness to the Trust.
- Work rotation by only trained personnel.
- The brush cutter should only be used for:
 - Standard brush cutters – 2 hours per day of operation.
 - Professional-grade brush cutter with a daily operating time of 3.5 hours.
- Ensuring equipment is maintained according to manufacturer's guidelines and records are retained



AGRICULTURAL/HORTICULTURAL MACHINERY

CHAINSAW

Hazards

- Interaction with chain
- Impact with Repercussions
- Descending trees and debris
- Combustion of fuel
- Felling and chopping activities (including dangling trees).
- Flying debris
- Manual Handling
- Noise and Vibration
- Wet, slippery or unstable ground
- Spillage causing explosion, fire, or environmental contamination
- Spillages resulting in inhalation of fumes, physical touch, or ignition and explosion.





AGRICULTURAL/HORTICULTURAL MACHINERY

CHAINSAW

Precautions

- Users must operate within their skill levels and in accordance with their training and the manufacturer's instructions.
- Full and compliant PPE MUST be worn
- Permit the machine to cool prior to refuelling. Place the refuelling station at least 30 metres away from the work area and ignition sources.
- Use safety glasses when filling containers unless non-spill nozzles are installed.
- Use safe sawing practises in accordance with training and periodic refresher training.
- Do a thorough analysis of the weight distribution in the tree's crown, the expected direction of the tree's fall, and any potential areas of stress or compression. Clear escape routes prior to a tree falling. Maintain safe distances of 2.5 times the diameter of the tree being felled
- length or 5 metres if cutting across. Only the operator will work in hazardous locations, accompanied by a spotter. Ensure that all team members are aware of how to approach the operator; these instructions should be included in the "task talk." Inspect the working space before beginning work, and avoid working beneath cables.



AGRICULTURAL/HORTICULTURAL MACHINERY

CHAINSAW

Precautions

- No chainsaw part may be used above shoulder height.
- Ensure the use of PPE and the maintenance of safe working distances. Remove debris from escape routes in all directions.
- Close and place lookouts along walkways while falling on or near footpaths. Install safety signs at all public locations.
- Supply carrying aids for transporting equipment to the job site. Ensure that all team members are aware of safe lifting techniques and collaborate when lifting large logs. Use log tongs and pulp hooks for larger things.
- Those personnel authorised to be within 10 metres of the chainsaw operator must wear ear protection. See HSE recommendations below.
- Take a 10-minute pause after each gasoline tank and a 30-minute rest after every third fuel tank.
- Consider arm-vibration limits.
- Chainsaw usage should be restricted to
- Standard chainsaws – 2 hours per day of operation
- Professional-grade saws have a daily operating time of 3.5 hours.
- Ensuring equipment is maintained according to manufacturer's guidelines and records are retained



AGRICULTURAL/HORTICULTURAL MACHINERY

CHAINSAW

Precautions

- Do not operate a chainsaw on slopes or uneven terrain where your footing could be affected or in conditions that would hinder your ability to flee.
- Never refuel while the engine is operating. Fuel containers must be labelled with their contents. Keep the container at least two tree lengths away from the felling area and away from fire sources and sunshine. Observe COSHH assessment. Gasoline must not be left unattended. Fuel must be stored properly, and a fire extinguisher and spill kit must be readily available. Use a fuel container with an automatic fuel shutoff to prevent spills and overfilling. Immediate cleanup of all spills, especially those on clothing. In sensitive areas, use only bio-chain oil
- The saw must be housed in a saw box and a secure storage space. Fuel/oil to be stored in fume cabinet. Restrict the amount of stored fuel at all times. Warning signs must be displayed.



CONSTRUCTION MACHINERY

BENCH MOUNTED CIRCULAR SAW

Hazards

The following are the most serious dangers linked with circular saw operations:

- Entanglement due to blade contact
- Contact or impact due to shoddy equipment
- Noise
- Dust
- Slips, trips & falls
- Contact or contact resulting from sudden motion (during maintenance, cleaning & repairs)



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AGRICULTURAL/HORTICULTURAL MACHINERY

BENCH MOUNTED CIRCULAR SAW

Precautions

- Installing adjustable hood guards large enough to cover the blades on all benches to avoid blade contact and access underneath the machine table.
- Push sticks assigned to each machine (at least 300 mm long and pointed to grip the work piece).
- Attach a steel riving knife to each circular saw.
- Knives are securely fixed, have a smooth surface, a slanted leading edge, and a saw-blade-like curve.
- Expansion tables and roller stands on the infeed and output sides of the machine to support larger work pieces
- Equipment properly maintained.
- Marking tools that rotate at their full speed.
- Every woodworking equipment must be equipped with a brake mechanism.
- Where possible, retrofit older equipment with a brake device.
- Separate saws to reduce the risk of timber striking a person.
- Lower noise levels by isolating devices and putting them with noise barriers.
- Monitor noise levels.



AGRICULTURAL/HORTICULTURAL MACHINERY

BENCH MOUNTED CIRCULAR SAW

Precautions

- Always use hearing protection
- Dust extraction equipment to decrease dust in the breathing zone of the operator.
- Use of respiratory protection.
- Vision protection.
- Regular housekeeping.
- Clear zone surrounding saws of slip and trip hazards
- Lockout/tagout all power sources before doing maintenance, cleaning, or repairs.
- Assure regular maintenance and testing in compliance with the standards of the original manufacturer.



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9.4 CONTROL MEASURES FOR MACHINERY

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RISK CONTROL OF MECHANICAL HAZARDS

Separation is a basic and effective risk control for machinery and equipment that can be performed through distance, barrier, or time.

- Due of the disparity in distance, a person cannot access the hazard.
- Barrier separation implies that an effective barrier or guard prevents entry and regulates the ejection of components, products, or waste.
- Temporal separation implies that the machinery and/or equipment is disabled at the time of access.

Examples of separation include:

- Physical barriers and guards, such as fences, screens, and material-specific fixed panels
- Many forms of protection and interlocking
- preventing the hazard from being reached (where the distance between a person and the hazard forms an effective barrier).



GUARDING

When no access is anticipated, a **fixed guard** can be permanently installed using a bonding agent, welding, or one-way screws. If access is not generally required, the ideal solution is a permanent barrier.

Adjustable guarding allows material or parts to be fed into the guarded area while preventing physical touch.

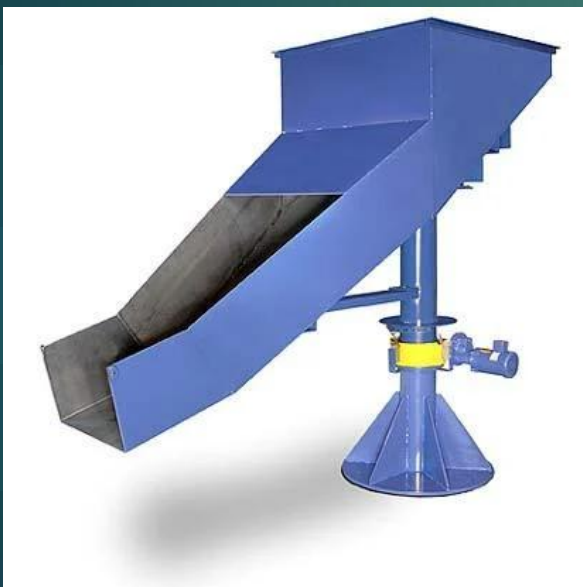




GUARDING

Tunnel guards provide a tunnel, aperture, or chute via which material can be introduced into machinery and equipment; but, due to the opening's limiting design and depth, fingers, hands, arms, or the full body are prevented from entering the hazardous region..

Interlock guarding occurs when the act of moving the guard to provide access (opening, sliding, or removing) pauses the activity of the hazardous device.





CAPTIVE KEY SYSTEM

Captive key systems utilise a single key that is shared between the control panel ('on' switch) and the physical barrier's entry gate lock. The key can only be removed from the control panel when the switch is in the "off" position, and the gate will only unlock when the key has been removed.

Captive key systems do not completely isolate the power supply, but they may give limited temporary access under regulated situations.





ADMINISTRATIVE CONTROLS

Administrative controls, such as appropriate supervision, education, and training, are essential to guarantee that only one key is available for the system and that a second operator does not remove the key from the access gate or guard while a person is exposed to the danger zone of the plant. Activities such as maintenance, repair, installation servicing, and cleaning may necessitate isolating and locking out all energy sources to prevent inadvertent startup.



OTHER MECHANICAL HAZARD RISK CONTROL OPTIONS

SIMULTANEOUS TWO-HANDED OPERATION

When there is only one person operating a machine, the usage of **two-handed operation** buttons can act as a risk control. This ensures that the dangerous mechanism cannot be activated until both hands are removed from the danger zone.

The two buttons must be pressed simultaneously and are separated by a distance that hinders simultaneous operation with one hand.

The operation should be constructed so that if one or both buttons are released, the hazardous action of the machinery and/or equipment cannot be reached, or if it can, the system returns to a safe state.



Two-hand Control on a Press

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OTHER MECHANICAL HAZARD RISK CONTROL OPTIONS

PRESENCE SENSING SYSTEMS

If physical guards cannot be deployed to mitigate risk, a presence detection system can be used as an alternative. People can employ presence detecting devices in situations where moving production equipment is present.

Regarding access, presence sensing systems are capable of providing a great deal of flexibility.

At the time of entry, presence sensing systems stop or limit the power or speed of the mechanism in order to provide safe access.

Foot pressure pads, infrared sensors, light beams, and laser scanning can be utilised by presence sensing systems. The optimal sort of sensing device will be determined by the operational environment and required access.



OTHER MECHANICAL HAZARD RISK CONTROL OPTIONS

HIGH INTEGRITY/FAIL-SAFE CONTROL

All safety control systems should be planned and constructed to prevent failure or, in the event of failure, to deactivate the machinery and equipment's operation.

Numerous types of machinery and equipment employ safety mechanisms with high integrity that disable a mechanism upon entry. Such instances include:

- brake press
- power press
- robotic machine (automated machines)
- injection moulders
- powered guillotines
- programmable lathe and milling equipment
- industrial mixers
- mincing equipment
- plasma cutting tables
- laser cutting tables.



PERSONAL PROTECTIVE EQUIPMENT

When it is not practicable to regulate emissions at their source or remove or diminish them by appropriate ventilation, extraction, or diversion, personal protective equipment must be used.

As a last safety step, (PPE) must be considered.

PPE is a lower-order control that can only be employed in situations where higher-order controls are impossible or ineffective.

There are numerous varieties of PPE that lower the risk of injury from contact with or exposure to a hazard, therefore their selection and use must be deliberate.

The improper usage of PPE or the purchase of unsuitable PPE can contribute to serious workplace mishaps.

Uncomfortable, restricted, or heavy PPE may cause secondary hazards, necessitating regular supervision to ensure that it is utilised appropriately.





END OF SESSION QUIZ

1. Which of the following is a Mechanical associated with machine operation?

(Choose the correct option)

1. Noise
2. Dust
3. Entanglement



END OF SESSION QUIZ

Which of the following is a mechanical hazard control measure?

(Choose the correct answer)

1. Providing ear muffs
2. Suitable guards on machinery/equipment



END OF SESSION QUIZ

Can we use percussion tools in flammable atmosphere?
(Choose the correct option)

1. Yes
2. No



END OF SESSION QUIZ

Push sticks can be used for which of the following machinery operation?

(choose the correct option)

1. Portable Drills
2. Bench mounted circular Saw



END OF SESSION QUIZ

Two handed control switch can be used for which of the following devices?

(Choose the correct answer)

1. Grinders
2. Power Press