

GUIDELINES FOR THE SAFE USE OF

PORTABLE MECHANICALLY POWERED NAILERS AND STAPLERS

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FOREWORD

Modern technology, with its accompanying labour-saving devices, is seldom free from potential hazards. The use of mechanically powered nailers and staplers, in place of the traditional carpenter's hammer, is one example of this.

The use of compressed air, compressed inert gas, internal combustion or electricity as an energy medium has many applications. When it is used to deliver a force capable of penetrating body tissue, proper standards and recommended work practices are of the utmost importance in minimising accidents.

The main rules are to ensure that the safety features are working, to avoid pointing the nailer at people, and to ensure that the fastening goes into the workpieces where it is intended.

The range of fasteners fired mechanically varies from staples with legs approximately 6 mm long to nails which penetrate approximately 90 mm into wood. Given different fastening methods and different levels of hazard, it is appropriate to encourage hazard management to suit the job and the tool.

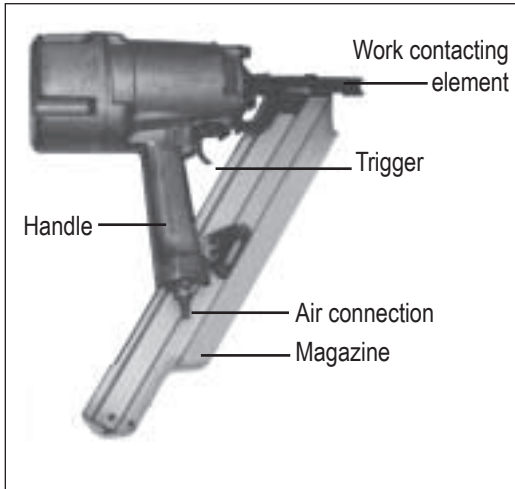
The view of the Occupational Safety and Health Service (OSH) is that the practice known as contact trip or “bump nailing” when using a powered-portable nailer or stapler may be unsafe if not used in accordance with manufacturers' warnings and instructions and safe workplace practices and that the recommendation “no bump nailing” in Section 5.1 of *Guidelines for Provision of Facilities and General Safety in the Construction Industry to Meet the Requirements of the Health and Safety in Employment Act 1992 and the Regulations 1995* should apply to construction. Bump nailing may be relatively safe in some high-volume production operations — see section 11.

Using terms from the Health and Safety in Employment Act 1992, the hazards of firing nailers can only be minimised. In the worst cases, regrettably, there will be injuries. The hand which holds the workpiece,

rather than the hand which holds the nailer, is especially at risk. Features which make nailers desirable for production, especially the ability to drive a fastener deeply and securely into timber at a single stroke, present challenges for medical treatment when fasteners shoot into people. Nail removal and wound treatment is described in section 23 by experienced physicians.

This guideline is not a complete manual. It is intended to be read in conjunction with manufacturers' operating instructions, which in some cases includes training programmes available from suppliers of mechanically powered nailers and staplers. It is intended that it will assist employers and employees to follow safe practices when using powered nailers and staplers on construction and manufacturing work.

GLOSSARY OF TERMS



Contact trip

The method of holding the trigger in the firing position while the nose of the tool (work-contacting element) is extended and depressed for the purpose of rapid continuous fastening. This guideline only considers the practice using powered-portable hand-held nailers or staplers. Contact trip is sometimes called “bump nailing”.

Engineering hand tool

A simple tool used to change the setting of a fastening or of an operating control. It may be a screwdriver or spanner, preferably not a coin. The intention is to secure the fastening or control until a deliberate effort is made to alter its setting or position.

Guideline

An advisory publication describing recommended safe methods and practices based on experience gathered from the industry. It can include a description of a commodity.

LPG

Liquefied petroleum gas. Mixtures of propane, butane, and pentanes used as a fuel for internal combustion engines. Odourless, but a distinct smelling odorant such as ethyl mercaptan is added as a detection agent.

Operating control (trigger)

A finger-operated lever on which pressure is exerted to discharge a fastener.

Piezoelectric effect

Production of an electric field by applying mechanical strain to crystals such as quartz.

Sequential trip mechanism

A design feature which necessitates depressing the work-contacting element followed by pressure upon the trigger in order to discharge a single fastener.

Trigger operated

When the trigger is pulled and the nail or staple fires.

Work-contacting element

A spring-loaded device on the nose of the tool which must be deliberately depressed against the work surface before a fastener can be discharged. Sometimes called the “contact plate”.

GENERAL SAFETY

1. General

This guide gives a summary of recommendations for the safe use in construction and manufacturing work of compressed air, combustible gas with an ignition system, inert gas or electrically-powered portable tools for driving fasteners into material by means of a single blow.

It is issued for the benefit of mechanically-powered nail and staple gun operators on construction and manufacturing work, persons supervising construction and manufacturing work, and others involved in construction and manufacturing operations.

There is a section for medical practitioners attending injury from nailers.

In this guide “Act” means the Health and Safety in Employment Act 1992 and “Regulations” means the Health and Safety in Employment Regulations 1995. This guide contains recommendations applicable to places of work as defined in section 2 of the Act.

Fixed nailers which are not portable and hand held, typically incorporated in pallet-making machines and isolated from staff, are outside the guidance of this document. Fixed staplers used in binderies and similar operations are outside the guidance of this document.

2. Care of Tools

Nailers or staplers should be examined daily by a competent person before they are used. Any defect in the machine or its energy supply or connections to its energy supply must be repaired before the machine is used or reused, if the defect may degrade safety.

Thus, examination should include air hoses, air lines, compressor, or electric power leads. If necessary, employers should ask tool suppliers for help to set up an inspection and maintenance programme.

Examination shall include checking for gas leaks where the power source is cartridges of flammable gas. The gas will be treated and have an unpleasant smell. When this type of nailer is to be transported, loaded, or stored, the unburned gas should be pumped from the combustion chamber, and the fuel cell removed. Any battery used for ignition should also be removed.



When taking a nailer or stapler from place to place on a construction and manufacturing site, or transporting it from site to site, it is advisable to keep the machine in a suitably constructed container.

This container should be strong enough to prevent accidental damage. As well as the machine, it should contain the manufacturer's operating and maintenance instructions, cleaning and maintenance equipment and a copy of this guide.

Always check to see what parts of the nail gun, if any, are to be lubricated. Always use the grade of oil recommended by the manufacturer for lubricating the tool.

Recent developments include tools with nylon cylinders and carbon fibre piston rings. These tools are usually marked and should not be oiled. If in doubt, contact your supplier or the agents for the tool.

3. Ancillary Equipment

When power is supplied through a compressor, operators should ensure that the air supply is clean and that there are no breaks or defects in the air lines.

If electricity is the source of power for the tool, usually a stapler, operators must ensure that the power is supplied through an isolating transformer or, if this is impractical, some other protection such as a residual current device. The lead supplying power to the tool needs to

be electrically safe, either through an isolating transformer or RCD, even when double insulated tools marked with a double☐ square are used.

Under no circumstances should air or inert gas pressure exceed that recommended by the tool's manufacturer.

LPG-powered tools should use cartridges recommended by the manufacturer. Service instructions supplied by the manufacturer for the carburettor or air and fuel mixing system, piezo or battery-powered ignition, and internal combustion engine or prime mover should be read and applied.

Air or gas lines fitted with moisture filters or self-feed lubricators should be regularly serviced by draining or replacing the filters or replenishing the oil. Always use the type and grade of oil recommended by the manufacturer.

4. Fasteners



Fasteners are staples or nails supplied in strips or coils, to fit the magazine in the stapler or nailer. They are joined with paper, plastic, or wire, some of which will be discharged from the nailer. Most of the joining material will be carried into the target with the fastening. Owners should

ensure that fasteners work reliably with the nailer or stapler. Nail heads must be the right size for the exit.

5. Identification of Tools

Depending on the energy source, all tools should be clearly marked with either:

- (a) maximum air or inert gas pressure; or
- (b) voltage and insulation; or
- (c) LPG cartridge type.

Inclusion of a tool number would assist in recording maintenance frequency and replacement parts fitted.

6. Personal Protection

Operators of mechanical nailers or staplers must wear eye protection and hearing protection. Eye protection should not be inferior to the specification set in AS/NZS 1337:1992 *Eye protectors for industrial applications*. Hearing protection equipment should be of a reputable make and manufactured to an acceptable standard, for example AS/NZS 1270:1999 *Acoustics — Hearing protectors*. A list of tested and graded hearing protectors is available from OSH.



7. Power Connections

Air or inert gas-powered nailers or staplers must be connected by means of a quick release or snap coupler that, when disconnected, releases all of the pressure from the tool.

Electrically-powered tools must be connected with fully insulated leads, that is, with each conductor insulated and a protective insulation casing overall. Insulation must be continuous from within the terminals at each end. Never use an electric tool that has conductor wires exposed or terminal casings cracked or broken.

Cartridges of LPG fit within the nailer and make it self-contained. Cartridges should be removed while the tool is stored.

8. Safety Rules

Here are the safety rules you should follow when using hand-held powered nailers and staplers:

- (a) Always assume that the tool contains fasteners.
- (b) Do not point the tool towards yourself or anyone else, whether it contains fasteners or not.

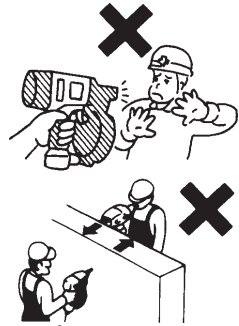
(c) Never depress the operating mechanism or work-contacting element unless the nose of the tool is directed onto a safe work surface or test material.

(d) Never horseplay or skylark with any tool.

(e) Never trigger the tool when moving it from fixing to fixing.

(f) Do not load the tool with fasteners while any part of the operating mechanism is depressed.

(g) Always take extra care when nailing near to the edge of material and when skew nailing.



(h) Never use volatile or combustible gas to power a pneumatic tool, that is a tool designed to be powered with compressed air. Never use bottled oxygen.

(i) If the tool is designed to use combustible gas, always follow the manufacturer's recommendation for emptying the combustion chamber and removing the fuel cell, and battery if fitted before examination or cleaning.

(j) LPG-powered tools exhaust carbon monoxide. They must be used with adequate ventilation.

(k) Spent LPG cartridges must be disposed of without piercing or burning. Burning will almost certainly cause an explosion.

(l) Always disconnect the tool when it is left unattended. If a suitable stand is available, the tool should be left in that (see sections 11 and 13).

(m) Always disconnect the tool before carrying out cleaning or adjustment.

(n) Never use a defective tool.

(o) Always have a competent experienced person carry out repairs or maintenance.

- (p) Always check safety mechanisms before use or after any accident, dent, repair or maintenance.
- (q) Never use a tool that has loose bolts, screws or fittings.

MECHANICAL REQUIREMENTS

9. Operating Control

All hand-held tools should be designed so that when the trigger is released the tool is dormant. The trigger should be designed and located in a position on the tool so as to prevent accidental operation.

10. Safety Mechanism

Tools should be equipped with “either” a sequential trip or a restrictive trigger non-sequential trip mechanism unless used for high-volume production with precautions as described in section 11.

A summary of sequential nailing is:

- (a) Firmly press the tool’s job contact plate onto the timber.
- (b) Press the trigger to drive the fastener.
- (c) The next fastener will then move into the driving position.
- (d) Release the trigger.
- (e) Lift the tool to release the job contact pressure.

A summary of restrictive trigger non-sequential is:

- (a) Firmly press the tool’s work contacting element or job contact plate onto the timber.
- (b) Press the trigger to drive the fastener.
- (c) The next fastener will then move into the driving position.
- (d) Release the trigger.
- (e) Lift the tool to release the job contact pressure, or keep the tool’s contact plate on the timber and press the trigger to drive the fastener.

Staplers which fire staples less than 20 mm long, of the kind used for upholstering or for securing posters to walls, are often manufactured without a work-contacting element. They are powered by various

energy sources, for example electricity, compressed air, or by the release of a spring. Release of energy requires deliberate operation of a trigger. The risk of accidental serious harm from these staplers is very low. Staplers which fire staples less than 20 mm long may continue to be used without a work-contacting element.

Nailers or staplers capable of driving a fastener exceeding 20 mm in shank length should be fitted with a work-contacting element at the nose of the tool which must be deliberately depressed against the work surface to activate the tool when the trigger is pressed.

Any tool that can drive a fastener that is more than 50 mm in length in any other sequence should be withdrawn and serviced to return it to its correct mode of operation if it is used on a construction site. If a nailer on a construction site cannot be modified to sequential trip, it should be withdrawn from service.

Discharging fasteners by “bump nailing” is not acceptable on construction work. Nailers which can switch between bump nailing and sequential nailing without use of an engineering hand tool should be withdrawn from service.

Any linkage between the trigger and the work-contacting element should be designed and maintained so as to prevent accidental or deliberate operation of the tool when the work-contacting element is not depressed.

SAFETY FEATURES FOR HIGH-VOLUME PRODUCTION



High-volume production of standard products often requires a nailer to fire thousands of nails every day. Typical products are wooden pallets, and fruit or vegetable boxes of plywood nailed to pine frames.

Given that thousands of trigger pulls every day would slow production and probably cause an outbreak of occupational overuse syndrome, OSH accepts that firing nails by repeated operation of a work-contacting element should be less harmful, provided that the operation is safely managed.

Features of safely managed high-volume operations are:

11. Nail Gun Management

- 11.1 Out-of-use nail guns are placed on stable rests which secure the nail gun against falling over or falling out, and do not allow firing if the trigger is depressed.
- 11.2 Spare nail guns are readily available on site to allow operators to replace faulty nail guns quickly.
- 11.3 Unless trained, operators are not to perform nail gun maintenance requiring the use of hand tools.
- 11.4 Nail guns can be quickly disconnected from the energy source to allow routine maintenance.
- 11.5 While the trigger is held, the work-contacting element must lift clear of the job and contact the job again to fire a nail.
- 11.6 To minimise the likelihood of harm from misses, the area behind the target is clear of people, and the surface behind the target will stop fired nails.

12. Operator Training

Establish and maintain a training programme for operators of mechanically-powered nailers which ensures:

- 12.1 Operators are competent in safe operation of the mechanically-powered nailer in trigger mode before graduating to bump nailing. Competencies should include demonstration of correct holding and handling of the mechanically-powered nailer in relation to the wood being nailed.
- 12.2 Trainee operators have adequate supervision until deemed competent.
- 12.3 Operators are conversant with issues relating to safe operation of the nailer or stapler.
- 12.4 Employers should be able to provide evidence of training.

13. Work Station Design

Work stations should be designed to include the following ergonomic and safety features:

- 13.1 Working height which allows the user to retain safe control over the mechanically-powered nailer while reaching all required nailing positions.
- 13.2 A jig designed to protect the user from nails protruding accidentally from the side of boards, where practical.
- 13.3 Holding stands which allow the mechanically-powered nailer to be held safely, in a manner which will not allow accidental firing if the trigger was depressed and ensure the nailing tool could not fall over or the tool fall out if accidentally knocked.
- 13.4 Pneumatic lines should be suspended



from overhead in a manner that allows free movement of the mechanically powered nailer over the work area where the design of the gun and the work station allow this to be done safely.

- 13.5 As much as practical, jigs should secure components for nailing to allow the free hand to be kept clear.

SUMMARY OF LEGISLATION

14. General

This summary of legislation is neither comprehensive or complete. When full particulars are required, reference should be made to the Health and Safety in Employment Act 1992 and the Health and Safety in Employment Regulations 1995.

For detailed information relative to a particular class of construction and manufacturing work, reference should be made to the safety in construction and manufacturing codes of practice (see page 26 for list).

15. Application of the Legislation

The safety provisions in the Health and Safety in Employment Act 1992 and regulations are not the only requirements that must be complied with when carrying out construction and manufacturing work. There are provisions in other legislation that cover the safety of employees on construction and manufacturing sites. For instance, the requirements for the safe use of electricity are contained in the Electricity Act 1992 and regulations made pursuant to that Act. It follows, therefore, that not only must the provisions of the Health and Safety in Employment Act 1992 and regulations be complied with, but also those relevant requirements in other laws.

Note that provisions for the safety of employees on construction and manufacturing work also apply to all persons who are lawfully in the vicinity of that work.

16. Employer

An employer is a person who employs any other person to do any work for hire or reward.

Section 6 of the Health and Safety in Employment Act places an obligation on all employers to ensure that employees are safe at work. This

requires an employer to ensure that the Act and regulations made under the Act are fully complied with.

17. Employees

Employees are persons engaged for hire or reward.

Section 19 of the Health and Safety in Employment Act places an obligation on all employees to comply with legislation; to use responsibly any equipment provided for their safety, health or welfare; and to not do anything that may endanger themselves or others.

18. Self-Employed Persons

Self-employed persons are the principal or director of the company for which they work. Their safety obligations are practically identical to those of employees.

19. General Safety Provisions

It is important that all construction and manufacturing work is carried out under the supervision of a suitably experienced person. All practicable steps must be taken for the safety of employees, and equipment must be operated by a competent person.

Section 13 of the Act and the regulations set out these and other general precautions that must be observed.

20. Safety of Plant, Tools and Gear

Section 6 of the Act sets out the general rules that must be observed when using any items of mechanical plant, plant, tools and gear on construction and manufacturing work.

It is most important that all equipment is constructed of suitable and sound material and is adequate in strength and performance to safely carry out the work. Regulations 67 and 69 place requirements on suppliers and manufacturers of plant and of personal protective

equipment to ensure that it is safe to use, and that comprehensive and comprehensible instructions are provided to enable its safe use.

21. Safety and Health

Employers have an obligation, imposed by Part I of the Health and Safety in Employment Regulations 1995, to provide or ensure that the following are provided:

- (a) A clean supply of fresh drinking water;
- (b) Facilities for employees to take meals, store clothing not worn at work and, if necessary, facilities to dry wet clothes;
- (c) Suitable and sufficient clean toilets and hand-washing facilities;
- (d) First-aid facilities;
- (e) Adequate lighting and ventilation;
- (f) Safe means of access and egress;
- (g) Means to control atmospheric conditions;
- (h) Equipment to dewater wet places.

Section 10 of the Act requires employers to ensure employees' access to hearing protection, and with employees' informed consent, to monitor employees' hearing.

Section 19 of the Act places a duty on all employees to use all facilities provided to benefit safety and health in a responsible manner.

22. Notification of Accidents and Serious Harm

Every employer shall maintain a register in which are recorded details of accidents which harmed or which might have harmed any person in the place of work. When an accident causes death or serious injury or illness to an employee, the Secretary of Labour shall be notified as soon as possible after the occurrence. Written notice of the accident must be given or posted to the Secretary of Labour within 7 days of the accident. The Secretary of Labour is usually contacted through the

local office of Occupational Safety and Health, listed at the rear of these guidelines.

Only a health and safety inspector appointed under the Act may authorise disturbance of an accident scene. This requirement provides an incentive for early notification of accidents.

In special circumstances the Minister of Labour may direct that a Court of Inquiry be convened to establish the cause of an accident.

Part IV and the First Schedule of the Act and the Health and Safety in Employment (Prescribed Matters) Regulations 1993 is the legislation that deals with accidents.

23. Treatment of Injury from Nailers

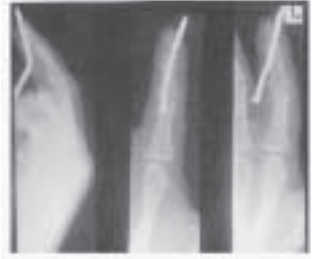


While mechanical features such as sequential trip mechanisms can minimise the hazard of using nailers, there are several ways in which nails can penetrate the user and others through accidental firing. Loading the magazines of nailers requires that nails are joined in strips or coils. Some nails carry barbs when they leave the nailer. Because nail removal from a wound without knowledge of nail

construction can make an injury worse, some information is included for the information of medical practitioners who treat this type of injury. If practicable, those accompanying a wounded person to treatment should supply a sample of the fastener to the doctor.

Treatment of a retained nail following a nail gun injury to the hand adheres to standard principles of wound management with the unique exception of nail removal, which is the most important aspect of management. A single dose of antibiotic is given intravenously or intramuscularly. Regional anaesthesia (such as a wrist block for hand injuries or a digital block for injuries involving only a finger or thumb) is usually sufficient for wound exploration, debridement and nail extraction. The use of a tourniquet is recommended for optimal visualisation.

The entrance and exit wounds are extended slightly through the skin and subcutaneous tissues only. The wounds are meticulously explored for fragments of resin, clothing or other contaminants that may have been carried into the wound at the time of injury. If barbs are present, as is usually the case, the nail is removed in the following fashion: the head of the nail is cut off at the entrance wound level, and the other end of the nail is pulled through the exit wound slowly. This technique minimises the potential for barb-induced injury. Some prefer to remove “barbless” nails in the same manner.



A wound from metal is a potential entry for tetanus infection. Tetanus causes painful muscle contractions, especially in the jaw and stomach. About 40 percent of people who get tetanus die. Enquire about the tetanus status of the patient and ensure that tetanus immunisation is up to date. The tetanus shot should be given every 10 years but, for a dirty cut, it may be given sooner (five years from the last shot). If necessary, provide a tetanus injection.

REFERENCES

Electricity Act 1992.

Health and Safety in Employment Act 1992.

Health and Safety in Employment (Prescribed Matters) Regulations 1993.

Health and Safety in Employment Regulations 1995.

Approved Code of Practice for the Management of Noise in the Workplace. Occupational Safety and Health Service, Department of Labour, published September 1996, p 59.

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