

Building and Construction

Use explosive power tools

Learner Guide



Table of Contents

Explosive Powered Tools.....	3
Fasteners.....	10
Explosive Powered Tools.....	17
Warning sign.....	23
Colour Coding	27
Attachments and Accessories	28
Limitations of Use.....	28

Explosive Powered Tools ¹

The selection and use of explosive powered tools shall be made by a competent person in accordance with *AS1873 Explosive-powered Hand-held Fastening Tools, Fasteners and Explosive Charges*.



Care in the selection of tools, examination of the material into which the fastener is to be driven, the location and placement of personnel, and operator working position are all factors to be considered. These factors influence the safety, efficiency and fatigue of operators and safety of personnel.

Note: By definition, a competent person is one who has, through a combination of training, education and experience, acquired the knowledge and skills enabling that person to perform work with explosive powered tools safely and correctly.

Explosive powered tools

Powder Actuated Fasteners are a versatile fastening system, which can eliminate time consuming set out. This is because fastenings can be made through steel and into concrete without the need to drill holes.

Powder actuated tools make use of an explosive charge to fire fasteners into the materials.

There are basically two types of powder actuated tools:

- Piston driven
- High velocity gun

These tools are commonly used on construction sites. They are also used in off-site workplaces producing pre-fabricated materials such as stairs, shopfittings, window and door frames and in stonemasonry work.

¹ Source: Construction Safety, as at <http://www.constructionsafety.ca/documents/16-explosiveactuatedtoolsafety.pdf>, as on 16th March, 2014.

Direct acting - The explosive charge is applied directly to the fastener.

Indirect acting - The explosive charge is applied to a piston within the barrel which in turn strikes the fastener.

High velocity - The fastener is propelled at a speed in excess of 100 metres per second.

Low velocity - The fastener is propelled at a speed of less than 100 metres per second.

Direct Acting Tools (High Velocity)

The setting of a fastener by a direct-acting tool is achieved by propelling a fastener at a velocity sufficient for the required penetration, by the action of the expanding gases from the explosive charge direct on the fastener.

Transfer of energy to the fastener and release of the gases generally occur before full penetration of the fastener, so as to reduce recoil.

Depth of penetration is controlled by the power of explosive charge chosen and by variation of volume in the chamber, e.g. position of the fastener.

Indirect Acting Tools (Low Velocity)

The setting of a fastener by an indirect-acting tool is achieved by introducing the necessary energy into a piston, which can then transmit this energy to the fastener in various ways.

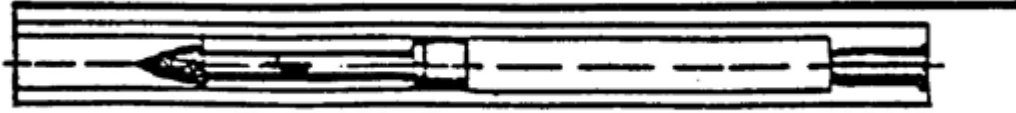
- **Co-acting Piston Tool** – The piston and fastener are propelled down the barrel by the energy from the explosive charge. The fastener attains the same velocity as the piston.
- **Impact Piston Tool** – The energy of the explosive charge is transmitted to the fastener via the piston just prior to piston arrest at the end of its travel down the barrel.

The transfer of energy from the explosive charge to the piston and release of the gases can occur before full penetration of the fastener so as to minimise recoil.

- **Contact Piston Tool** – In general this tool cannot be fired unless there is some resistance to penetration of the fastener. The velocity of the fastener is limited by the distance of the piston travel and the density of material into which the fastener is required to penetrate. The energy from the explosive charge is transferred to the fastener directly by the piston up to full penetration. Recoil is absorbed by the mass of the tool and the operator.

Explosive actuated tools are as dangerous as handguns. Referred to as "**powder actuated**" or "**explosive actuated**," these tools use a powder charge to fire a pin or fastener into hard materials such as concrete, mild steel or masonry.

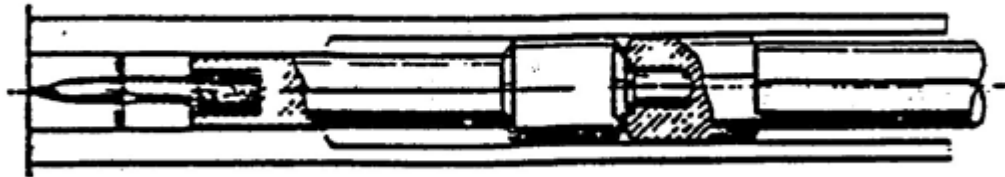
There are two types of powder actuated fastening tools: **direct-acting** and indirect-acting. In the direct-acting tool, the load essentially is a firearm cartridge without the lead bullet, acts directly against the fastener so that it is shot out the barrel of the tool, usually at high velocity into the material.



In an **indirect-acting** tool, the load acts on a piston within the tool's barrel, which in turn drives the fastener that is sitting at the end of the barrel. Because the mass of the piston acts on the pin, the pin's velocity does not need to be as high as in a direct-acting tool.

Most powder actuated tools used in construction are **low-velocity**.

Piston moves to strike the fastener.



LOW VELOCITY SYSTEM:

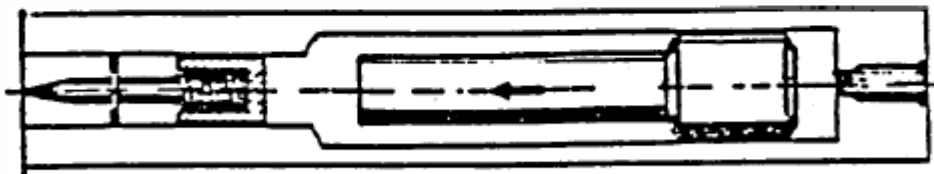
A low velocity system is basically that of a piston-driven device that drives the fastener into the material.

In a low velocity tool, the load acts on a piston within the tool's barrel which in turn drives the fastener that is sitting at the end of the barrel. Because the mass of the piston acts on the pin, the pin's velocity does not need to be as high as the older style of high velocity tools which are outdated and in some provinces no longer in use because they were much more dangerous.

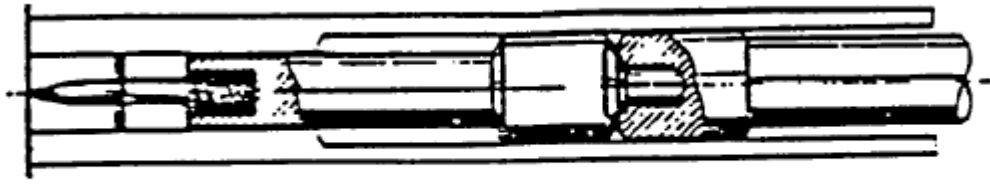
Low Velocity Systems



Piston and fastener move together.



Piston moves to strike the fastener.



Piston and fastener are in contact at the time of firing.

Piston Driven Tool

In this tool the piston possesses most of the kinetic energy after the cartridge has been fired.

The piston thrust hammers the fasteners into position. The piston itself cannot leave the tool.

The driving action stops when the piston comes to the end of its chamber. This limits the free flight velocity of the fasteners. The velocity of the fasteners is limited to about 100 meters/second.

NOTE:

DX piston principle:

The cartridge controls the energy by the power load. The fastener driving operation stops when the piston is at the end of its stroke. A through-shot is not possible.

High Velocity Gun Tool

High Velocity Gun Tools are very versatile tools for use in steel frame construction. However, for safety reasons they need to be treated with a high degree of care. The entire kinetic energy of the charge is transferred directly to the fastener. This is accelerated to the velocity of a bullet up to 600 metres/second. There may be a risk of through-shot if the gun is not used correctly. When a through shot occurs, the fastener passes through the material being fastened and embeds itself fully into the material behind. In some cases it may pass through this material and enter free flight. This situation has the potential to cause serious injury or death.

NOTE:

High velocity principle:

The fastener is accelerated directly by the power load and it takes the base material to high velocity.

There is a risk of a through-shot.

Both types of tools are useful pieces of equipment but they can also be most dangerous if used carelessly or incorrectly. Their use is subject to special regulations and licensing requirements in most states.

POWDER LOADS

The energy source used to drive a powder actuated fastener into the base material is a self contained unit called a powder load. Specific load types are designed for each unique powder actuated tool.



The crimped tip on the load retains the powder in the casing. Wadded loads which have a plug in the front of the casing should never be used in tools designed for use with crimped loads such as low velocity, piston tools. The wadding material can cause the tool to clog or jam. Rim fire refers to the method of actuation.



In a rim fire powder load, the primer is contained in the rim of the casing. When the tool is fired, the firing pin strikes the rim causing the primer to ignite which in turn ignites the powder contained in the main portion of the load.

Correct handling of powder loads demands the undivided attention of the operator. The explosive charges give the tools their proper speed and fastening penetration. All cartridges must be handled carefully. Misfired and unused cartridges must not be left lying around the job site. The impact of a falling object could explode them. This could result in serious injury.

POWDER LOAD SELECTION

Use of the proper power level is critical to the success of a powder actuated fastening. Before selecting the proper power level, conduct a centre punch test for base material suitability.

To select the proper power level to be used with a specific fastener. Always perform a test, firing at the lowest power level recommended for the tool being used. On tools that have a variable power control, use the lowest possible setting. If the lowest power does not fully drive the fastener, try a powder load having the next higher power level. Continue this procedure until the fastener penetration is obtained.

MISFIRE

If a misfire occurs, the operator shall continue to hold the tool in the firing position against the work surface for at least 15 seconds then keep the tool pointed at the work surface until

the powder load can be ejected as recommended in the manufacturer's operating instructions. An explosion could occur in these vital seconds even though the cartridge has misfired.

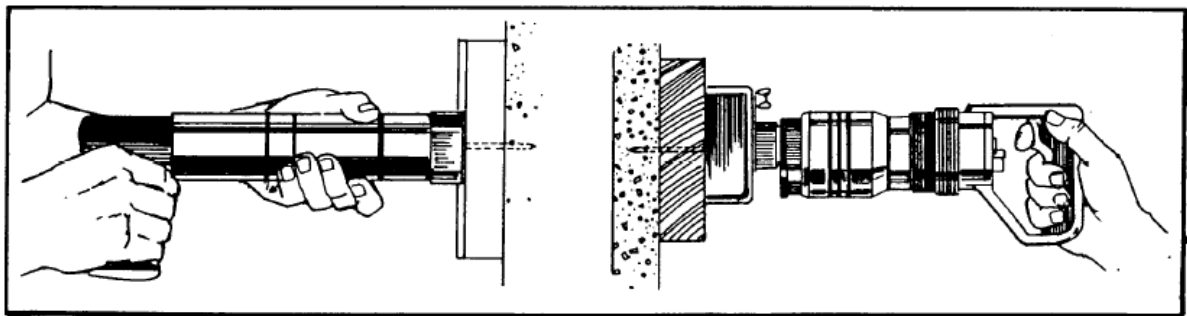
Some reasons for misfiring are:

- (A) Slow burning primer
- (B) Build-up of carbon in the breech
- (C) Malfunction in the firing mechanism

LOADING PROCEDURES

It is a simple procedure to load the tool, but it is imperative that attention is given to this simple operation. The operator must be absolutely certain that the load is fully inserted in the breech.

A fully inserted load will eliminate any undue pressure from the breech plate coming into contact with the rim of the cartridge while closing the tool. All cartridges must be properly inserted and extracted according to the manufacturer's instructions.

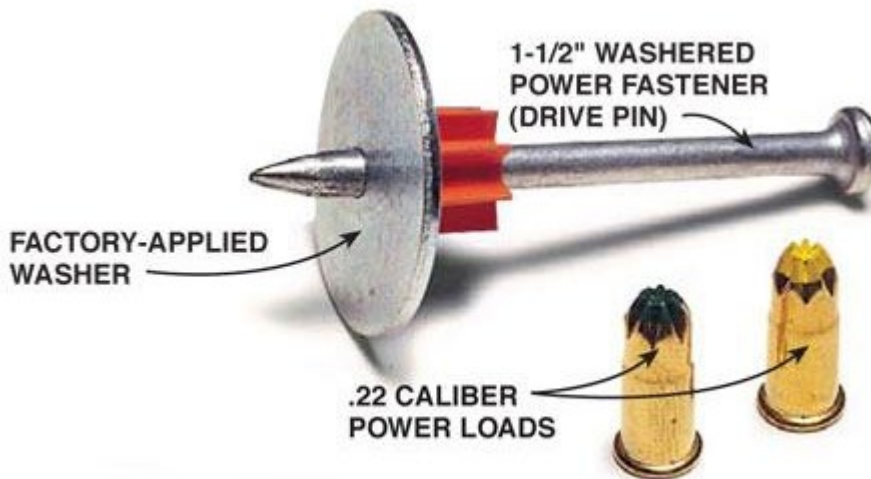


EXTRACTING CARTRIDGES:

Explosive Actuated Fastening Tools are required to have a mechanical device for extracting cartridges as part of the tool. However, there are occasions when, due to lack of knowledge on the part of the operator, or mechanical failure, a knife or other object has been used to extract the cartridge. The result has been the loss of fingers, or other serious injuries when the cartridge has exploded.

Fasteners

Fasteners are designed to obtain the maximum in penetrating and holding qualities while being safe to use. The material from which the fastener is made is necessarily harder than the material it is to penetrate. When the hardness of the material is not known it shall be tested by using a hand hammer to drive the point of the fastener into such material (centre punch test).



If the point of the fastener does not penetrate the surface, no attempt shall be made to use the tool on that surface.

IMPORTANT SAFETY PRECAUTIONS

No one should attempt to operate a Powder Actuated Fastening Tool before reading the instruction manual. Careful study of the instructions for loading, firing and maintenance of the tool will enable you to obtain the best performance.

Every operator must be fully conversant with the Local or State Government Regulations governing the use of Powder-actuated (P.A.) Fastening Tools, in addition to holding the appropriate Accredited Operators Certificate where required.

To promote safe working conditions, the following safety precautions should be observed in the use of P.A. Fastening Tools.

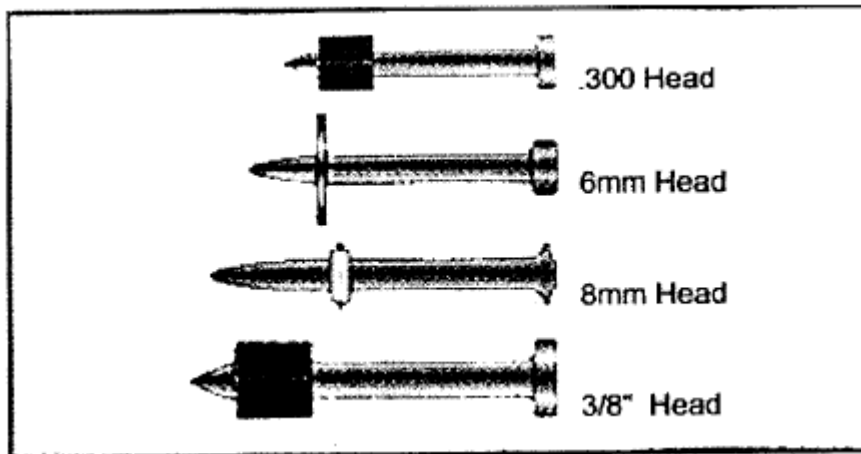
1. NEVER attempt to use your PA tool UNLESS you have satisfactorily completed authorised training and read the Instruction Manual.
2. When not in use the P.A. Tool should be placed, unloaded in its box or case, which should then be shut, locked and stored in a safe place to which only authorised persons have access.

3. ALWAYS follow the directions for care of the tool contained in the manufacturers book. Special adaptors shall be fitted and used strictly in accordance with the instructions and in a manner such that the safety features of the tool are not adversely affected.
4. ALWAYS display a suitable Authorised Warning Notice in such a manner as to be clearly visible to all persons who are at, or near, the place where a tool is being used. Such notice shall be in accordance with local Government Regulations.
5. NEVER fire the tool UNLESS you and any other people in the area are wearing safety eye and hearing protection.
6. NEVER let bystanders gather around when you are using a PA Tool.
7. NEVER use a powder-actuated tool in the presence of any explosive or inflammable gas, dust or vapour, in an atmosphere that is compressed, or in any place where the power load may be unintentionally exploded or be rendered dangerous by the presence of heat.
8. NEVER leave a tool unattended in a place where it would be available to unauthorised persons.
9. NEVER load the tool until ready to fasten. The tool should not be loaded until immediately prior to its use. If it has been loaded but not put into immediate operation, it should be unloaded and not laid down or carried around in the loaded condition. Never load the tool at other than the place at which it is to be used, thus minimising risk of unintentional firing.
10. NEVER carry fasteners or other metal objects in the same pocket or package as power loads.
11. ALWAYS check that the barrel is free from obstructions before loading.
12. NEVER point the barrel of a loaded or unloaded tool towards any person. ALWAYS point the tool downwards and as far as practical away from the operator's body. This applies in particular where a power load that has misfired is being removed.
13. NEVER place your hand over the muzzle with a power load in the tool.
14. Fasteners should not be driven into brick, concrete, or similar substances if,
 - a) Nearer than 75mm to an edge or
 - b) The thickness of which is less than 100mm, or less than three times the shank penetration into the basic material, whichever is the lesser, or
 - c) Nearer than 150mm to where a former fastener has failed.

15. Fasteners should not be driven into steel if; a. less than 4mm thick, unless, for Fastening into thinner steel, the shank diameter of the fastener is less than the thickness of the steel or b. nearer than 12mm to an edge or hole.
16. NEVER fasten into wood, fibreboard, plaster or other soft materials unless backed up by a material that will prevent the fastener from passing completely through, (Masonry or thick steel).
17. NEVER fire fasteners into brittle or hard materials such as glazed brick or tile, terracotta, marble, granite, slate, glass or into hard steel. Do not attempt to fasten into high tensile steel, case iron, heat treated steel or pressurised vessels such as gas bottles, compressed air cylinders etc.
18. NEVER attempt to fasten into a spalled area in masonry where a previous fastener has failed.
19. Fasteners shall not be driven through existing holes unless the tool is specifically equipped by for accurate alignment of the barrel.
20. DO NOT fire into material that dulls the point of a test fastener, when first tried by hand as a centre punch.
21. ALWAYS position your body comfortably in line with and behind the tool.
22. ALWAYS make certain the tool is at right angles (90°) in both directions to the work surface before firing.
23. NEVER fire tool at an angle to the work surface.
24. NEVER use the tool at or near the extremities of your reach.
25. IF A LOADED TOOL JAMS in the firing position, it should be locked in a secure place where no harm could result if it accidentally discharged. DO NOT attempt to make any adjustments to the tool.
Call your representative or supplier.
26. IF A MISFIRE OCCURS the tool should be kept firmly against the work surface for a short time. Refer to the local PA Tool Regulations for the minimum delay time (Aust./NZ/SE Asia 10 secs/ UK 30 secs.)
27. NEVER use Power Loads in firearms. They are much more powerful than ordinary ammunition and must be used only in powder-actuated tools.
28. ALWAYS wear safety eye and hearing protection when using a PA Tool.

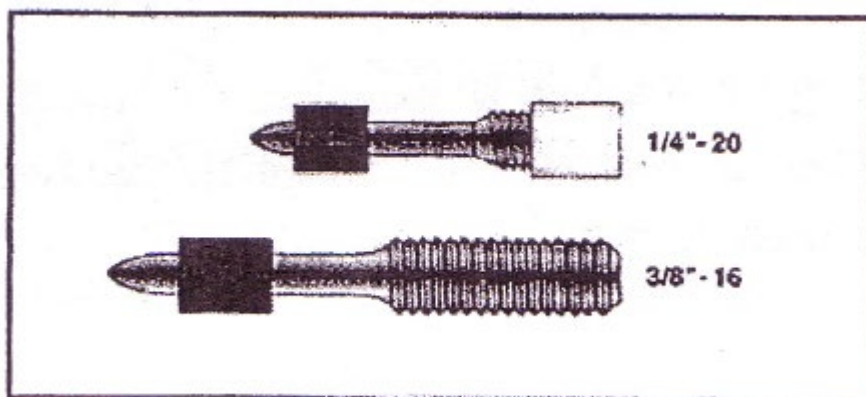
FASTENER TYPES

Several fastener types are available including drive pins and threaded studs along with special application specific assemblies.



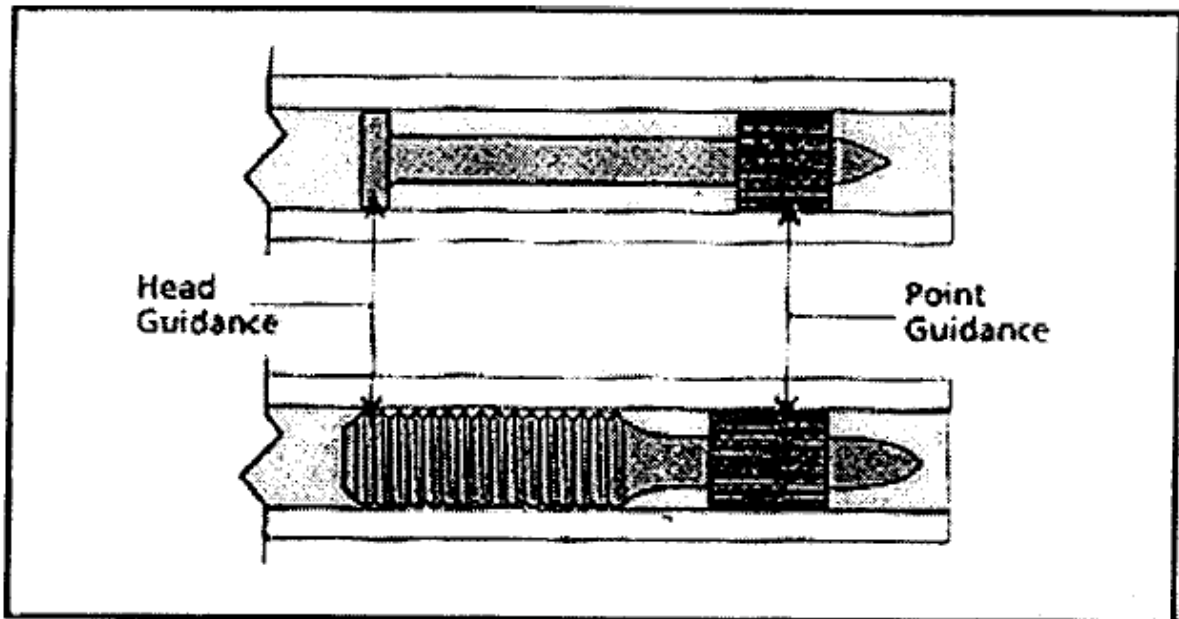
Drive pins are one of the most commonly specified type of powder actuated fasteners. They are used to fasten a fixture directly to the base material in one operation for permanent applications. Pins are available in three configurations, 0.300 head, 6mm head, 8mm head, and 3/8" head. Each of the head configurations has a corresponding shank diameter and a variety of lengths.

Some drive pins designed for use in steel have a knurled shank to provide increase load capacities.



For applications where adjustment or removability may be required, threaded studs are available with both a 1/4" or 3/8" thread diameter. Each thread size has a corresponding shank diameter and is available in a variety of shank and tread lengths.

FASTENER GUIDANCE



Both types of fasteners have pre-mounted plastic fluting or washers which hold the fastener centered in the tool guide prior to driving.

During the driving process, the fluting or washers provide guidance for the fastener head or threads.

1/4"-20 threaded studs also have a plastic cap to protect the threads of the fastener during the driving process and to provide head guidance.

If the fluting or washer is missing do not attempt the use the fastener, possible damage to the tool and its' operator could occur.

Fastener Uses

Explosive Powered Tools are widely used in the building and construction industry. They are used for fastening into hard materials such as concrete, brickwork, and structural steel.

Typical applications include:

- fixing metal and timber base plates to concrete floors
- fixing battens to brick walls
- fixing conduits to steel and concrete
- fixing suspension fittings to concrete soffits
- fastening formwork supports to concrete floors
- fixing of brick ties to concrete and steel columns
- using a projectile as a survey marker.

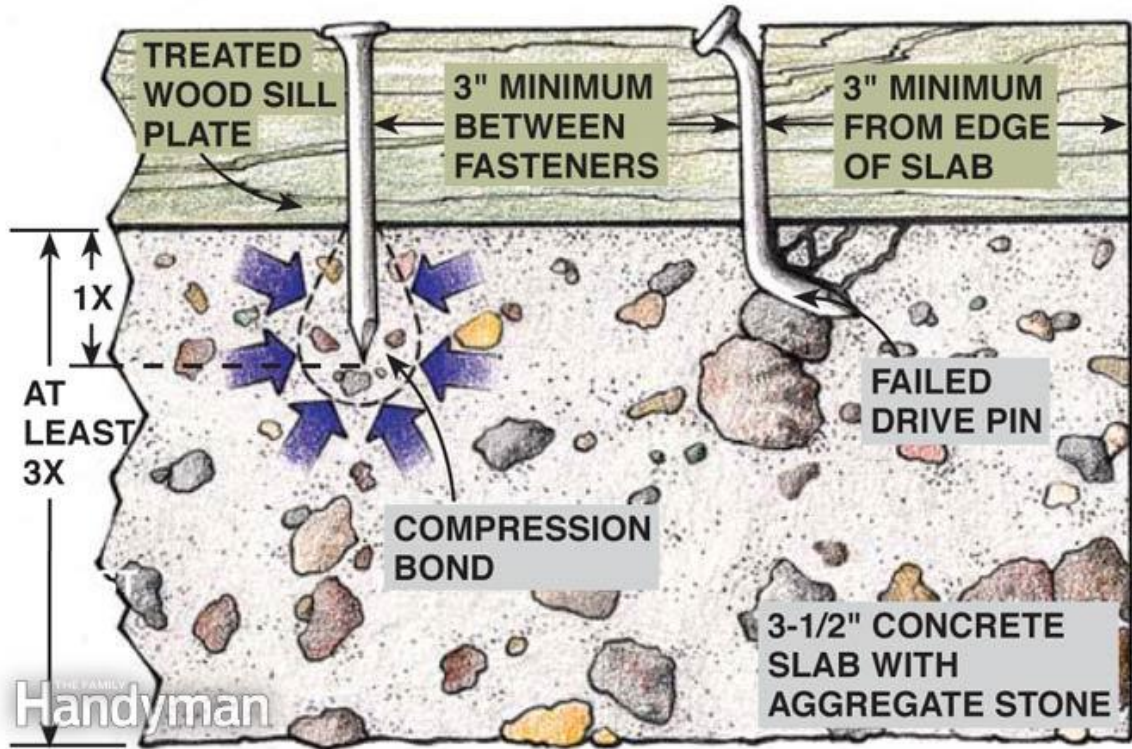
Off-site trades people also may be required to use explosive power tools particularly when they are required to install their products. These trades areas include:

- shopfitters
- joiners
- stairbuilders
- prefabricators
- stonemasons.

These trades would all be involved in fixing using the methods and skills learnt above.

Why Drive Pins Work, and Why They Fail

Know the rules for fastening into concrete. The drive pins should penetrate 1 in. to 1-1/4 in. into the concrete, but never protrude through it. Drive pins displace the concrete, which tries to return to its original form, resulting in a compression bond. Follow the spacing rules shown, and only shoot fasteners into concrete that's more than three times as thick as the fastener's intended penetration.



Explosive Powered Tools Safety

Safe Use of the Tools

There are three main areas to understand for the safe use of powder actuated tools:

- Functional Safety: How to choose the correct gun charge and fastener components.
- Operator Safety: Understand how to use the gun and its safety devices correctly and how to make the surrounding work environment safe.
- Fastening Safety and Reliability: Know how to carry out the work properly. Understand the base materials being fixed to and the components being fixed.

WorkSafe Safety Alert²

This Alert follows from an incident in which a worker was killed when a fastener (nail), fired by him from a **high-velocity** Powder Actuated Tool (PAT), ricocheted and pierced his heart. It warns employers and users of PATs of the danger and the risks to operators and other persons when these tools are used and provides advice to control such risks.

Background

Powder Actuated Tools (PATs) are used to fasten construction materials to concrete, steel or brick and consist of the tool, a fastener and an explosive charge; they are commonly referred to as explosive power tools.

PATs look like and operate in a similarly fashion to a firearm and should be subjected to the same care and safety precautions. These tools use varying strength explosive charges; so that the operator can select the appropriate charge strong enough to drive the fastener. If the charge selected applies excessive force on the fastener it can cause it to ricochet or the work surface material to chip or splatter.

Current generation PAT models are **low-velocity** types and incorporate a captive piston that contains most of the excess energy within the tool, reducing the risk of serious injury.

The older type **high-velocity** PATs are becoming obsolete and some manufacturers no longer sell them new in Australia; however they are still readily available, particularly in the second-hand market. Care should be taken when purchasing a second-hand PAT and prior to use the tool should be thoroughly checked.

² Source: WorkSafe Victoria, as at <https://www.worksafe.vic.gov.au/forms-and-publications/forms-and-publications/explosive-power-tool-fastener-kills-worker>, as on 16th March, 2014.



Figure 1 – High-velocity ‘Powder Actuated Tools’



Figure 2 – Low-velocity ‘Powder Actuated Tools’

Both **high-velocity** and **low-velocity** type PATs can be safely operated when basic safety procedures, outlined below, are observed and the manufacturers’ operational guidelines are followed.

Recommendations

WorkSafe recommends the adoption of the following safety precautions:

- The manufacturer’s specifications and operating instructions for the model of PAT being used (as well as the fasteners and charges) should be read, understood and complied with
- The PAT should not be used unless the operator is trained in the tool’s safe use
- A Job Safety Analyse (JSA) should be developed for the task and followed
- Hearing and eye protection should be worn by the operator and others in the vicinity
- The PAT should be kept in a locked container when not in use
- Before using the tool, the operator should do a (daily) function check to ensure that it’s clean, operating correctly and the barrel is free from obstructions
- The PAT should not be loaded unless it is to be used immediately and never be left unattended
- The weakest compatible charge is used for the first (test) firing and the strength of charges are selected to do the work without applying excessive force to the fastener
- Unless specified in the tool’s operating manual, fasteners should be at least 75mm from an edge, corner, or predrilled hole of concrete or brickwork (For steel, at least 12mm from an edge or hole)
- Fasteners should not be driven into material through which they can pass or into very hard or brittle materials (e.g. high-tensile or hardened steel, cast iron, hard tile, terracotta, glazed brick, marble granite etc)
- If the PAT misfires, the operator should continue to hold the tool against the work surface for at least 10 seconds before trying to fire again. If the second attempt doesn’t fire, wait at least another 10 seconds so that the faulty charge is less likely to explode, and then carefully remove the charge and place it in water

- If the PAT jams in the firing position, it should be left alone and locked away where it can not harm anyone if it accidentally discharged (then contact the manufacturer for directions)
- PATs should not be used if flammable vapours or materials may be present

Legislative Requirements

Sections 21, 22 and 23 of the ***Occupational Health and Safety Act 2004 (OHS Act)***, which is the principal safety legislation stipulates duties of care of employers to ensure that no person is exposed any risk that can affect their health and safety. The ***OHS Act*** and the ***OHS (Plant) Regulations 1995*** contain generic-type training requirements, which extend only to the obligation of an employer.

SUITABILITY

WARNING

BEFORE AN EXPLOSIVE HAND HELD TOOL IS USED, IT MUST BE FIRST ESTABLISHED THAT THE WORK IS SUITABLE FOR THE FASTENERS.

Explosive-powered tools have either a direct-acting or indirect-acting characteristic. It is the characteristic of the tool that determines its suitability for carrying out the various types of fastening applications.

Note: Direct Acting - Operation is similar to a pistol.

Indirect Acting - Operation requires the power tool to be pushed hard against an object to release the safety mechanism before firing can occur.

Not all materials will accept explosive powered fasteners and the suitability of use must be considered before use.

Fasteners shall not be driven into brittle or hard materials such as glazed brick or tile, terracotta, marble, granite, slate, glass, cast iron or hard steel.

Consider the following points when deciding whether the work is suitable for the fasteners:

- the material and thickness of the work,
- any possible inconsistencies or changes of material beneath the surface, which might cause the material to shatter or the fastener to ricochet or pass through into open space, the constraints necessary for the use of pins near the edges of work surfaces and where the working surfaces are not flat.
- There are a number of hazards associated with the use of explosive-powered tools, which must be considered when assessing suitability, including:
 - ricochet or turning back of pin against the work surface,
 - total penetration of the work surface by a fastener and potential contact with personnel and or equipment,
 - shattering of the work surface by a fastener,

- fire or explosion from the use of an explosive-powered tool in a flammable atmosphere,
- explosion from misuse/handling of misfired cartridge,
- explosion from the incorrect storage of charges and misfired charges,
- accidental firing.

MISFIRES SHALL BE DEALT WITH STRICTLY IN ACCORDANCE WITH MANUFACTURER’S INSTRUCTIONS.

The following safety precautions shall be observed when using explosive-powered tools:

- The tool and fastening devices shall be used in accordance with the manufacturer’s recommendations and shall not be modified by the user in any way.
- Explosive-powered tools shall be stored in the manufacturer’s container in a secure place.
- Explosive-powered tools shall be completely overhauled at least every 12 months.
- As a minimum, explosive-powered tools shall be inspected prior to usage every day for defects.
- Explosive-powered tools shall not be used in the presence of any explosive or flammable gas, dust or vapour, or in any place where the explosive charge may be unintentionally exploded or rendered dangerous by the presence of heat.
- When firing, the operator and those directly engaged in firing activities shall wear a full face shield, suitable eye and hearing protection, and other PPE as appropriate.
- Only cartridges recommended by the manufacturer shall be used.
- Only competent persons shall make the selection of pins and cartridges for use on a particular job.
- Explosive-powered tools shall not be loaded until immediately before use. In the event of a delay, they shall be unloaded before being laid down.
- Live or spent cartridges shall not be left in the firing chamber of the Explosive Power Tool.
- Fasteners shall not be driven:
 - less than 75 mm from the edge of concrete or brick surface,
 - into a corner brick,
 - into existing pin holes less than 12 mm from the edge of a steel plate, or any hole in the plate,
 - less than 150 mm from the existing pin hole in concrete or brick work,
 - into round steel pipes,
 - into steel less than 4 mm thick,
 - less than 12 mm from the edge of a steel plate,
- Cartridges shall not be carried loose in pockets, but always kept in the manufacturer’s box.
- Shields shall be erected in the work area to minimise the risk from ricochets.
- Unauthorised personnel and persons not involved in the work shall be kept out of the work area.
- Appropriate, clearly visible barriers and signs shall be placed around the work area in which explosive-powered tools are being used.
- All fasteners shall be fired as near perpendicular to the working surface as practicable, and in all cases within 7° of the perpendicular.

Prohibited materials

- Glass
- Ceramic tile

- Glazed brick
- Natural stone
- Cast iron
- Marble
- Slate
- Terra cotta
- Pressure vessels
- Hebel brick
- Any substance which may shatter
- Hardened steel
- Some concrete

Fasteners must never be driven into the following material:

- high tensile steel (steel with a tensile stress in excess of 695 mpa)
- other metals such as cast iron or steel hardened by heat treatment
- tile, terra cotta, glazed brick, marble, granite, and other shatterable material
- concrete which has aggregate larger than 25mm unless advised otherwise by the tool manufacturer
- reinforced concrete where the projectile can penetrate further than three quarters the distance to the reinforcing.

To determine material hardness

Place the point of the fastener to be used, against the base material and strike firmly with a hammer, if there is a clear impression in the base material and little damage to the point of the fastener, firing can proceed. Should the point of the fastener be blunted with little or no impression in the base material – do not proceed.

Hazardous environment

- In the presence of any explosive or flammable dust, gas or vapour
- In an atmosphere of compressed air
- Excessive heat
- Loose particles on work surface
- Concealed pipes or electrical wiring.

Explosive powered tools safety features

- Must comply with As1873
- Will not fire if incorrectly assembled
- Built in features to prevent accidental firing whilst being handled
- Designed not to fire unless the muzzle is held against the work surface with the required amount of force

- A protective shield is fitted which provides protection from ricochets and splinters (high velocity)
- Designed not to fire if tilted beyond 7 degrees from the perpendicular (high velocity)
- Designed not to fire if dropped from a height of up to 3 metres.

Points to remember

- Load the tool as close as possible to where it will be used
- You are deemed to be using the tool if you load or unload the tool
- Never point the tool toward yourself or at any other person
- If in doubt as to what strength of charge is required, start with the weakest
- A barrel extension can be used only with the appropriate shield
- When using the Ramset J20 white and black charges can only be used with a 3/8 barrel
- The recommended method for the removal of fasteners is to break off the protruding end with a nail breaking tool
- In normal use, the distance from the axis of the barrel to the outer edge of the guard shall be 50mm (direct-acting)
- Charges which have misfired should not be used again, return to supplier to be destroyed
- Do not use charges and fasteners that are made for another tool.

Important

Do not remove tool from work surface for at least 10 seconds if tool fails to fire.

Minimum distance from edge

- Brick – 75 mm
- Concrete – 75 mm
- Steel – 13 mm

When firing into concrete

- The fastener should penetrate 6 to 8 times the diameter of the shank.
- Concrete greater than 60Mpa or less than 10Mpa must not be fired into.
- Not nearer than 75 mm to another fastening.
- Seek advice before firing into pre-stressed or post-tensioned concrete.
- No concealed pipes or electrical wiring are present.
- No loose particles are present on work surface.

When firing into steel

- The fastener must penetrate the steel by at least 6mm.
- Do not attempt to fire into hardened steel (see following page).

- Not nearer than 25 mm to another fastener.
- Do not fire within 100 mm of an area which has been affected by heat.
- Use specialised fasteners when firing into thin steel (ie 3 and 4mm).

When not in use

- The tool and charges must be kept in a rigid lockable container.
- Charges only are to be placed in the compartment marked 'Explosive Charges'.

Inspection and maintenance

- Inspection – prior to being used on any particular day (authorised operator).
- Maintenance – cleaned each day after use and dismantled and examined for defects at least once a week (authorised operator).
- Repairs – can only be carried out by the manufacturer or manufacturer's agent. Replacement of worn parts specifically listed in the manufacturer's 'instructions for use'. Can be carried out by an authorised operator.
- Overhaul – the tool should be returned to the manufacturer or his authorised agent at least once every 12 months.

Note:

An explosive powered tool shall be:

- inspected for defects daily before use
- dismantled completely and examined for defects once a week
- dismantled completely and overhauled once a year.

Maintenance and repairs shall be carried out by an explosive powered tool operator or other competent person (e.g. the manufacturer).

Log Book

A log book shall be kept with the tool, and shall contain detailed particulars of all examinations and repairs, including the names of the persons who examined the tool, date examined and the serial number of the tool.

Warning sign

Caution – explosive powered tool in use.



Requirements

- The notice should measure not less than 500mm in width and 300mm in height.
- The word 'CAUTION' shall be not less than 50mm in height with the remainder of the wording not less than 30mm.
- A name and logo can be incorporated but shall not exceed 20mm in height.

Marking on tool

- Manufacturer's name, trade name or mark
- Model designation and serial number
- Tool classification, ie. high velocity or low velocity
- The following wording 'Refer to operating instructions before using this tool'.

Fastener Selection

Fastener sizes can be selected as follows:

- for fastening to concrete the penetration should be 22 to 32mm depending on the fastener size and the strength of the concrete
- for a drive pin add the thickness of material to be fastened to dimension y or
- for a threaded stud dimension $y = \text{shank length, thread length} = \text{thickness of material} + \text{thickness of nut and washer}$.



- for a threaded stud, choose one of the types with knurled shanks, which are designed for fastening into steel
- to select the proper thread length (z) again add the thickness of the material to be fastened (x) to the combined thickness of the required nut and washer
- to avoid withdrawal of threaded studs, do not overtighten nut the fastener is equipped with some type of tip, washer eyelet or other guide member.
- this guide aligns the fastener in the tool as it is driven, and is usually used to retain the fastener in the tool prior to discharge the following figure shows how the length of the shank should be chosen.

Explosive Charges

- All charges must be kept in a lockable approved container marked '**EXPLOSIVE CHARGES**'
- Storage container must be kept locked when not in use. Individual charges should be kept in the correct colour coded box in the container.
- Charges must be of a type suitable for the material being used.
- Some tools have power regulators, which enable them to be used for variety of fixing operations with only one or two charge sizes.

Temporary Custody of Charges

Every operator having the custody for the safe storage of any explosive charges for a tool should keep them in the approved containers provided for that purpose and should:

- except when explosive charges are being put in or removed, keep the container or containers locked or
- not permit any person, other than a person using or assisting in the use of a tool, to open any container.

Storage of Explosive Charges

The employer should:

- ensure explosive charges are kept in suitable lockable and approved container or containers provided exclusively for that purpose, and particularly designed to give protection against damp. (may be separate compartments within a lockable tool box) and
- ensure that every container in which explosive charges are kept is clearly marked with the words '**EXPLOSIVE CHARGES**'.

Colour Coding

Explosive charges must be marked according to AS 1873 on the top or bottom in a colour to indicate the relative strength:

The following scale represents the relative strengths of explosive charges.

Colour	Strength	No.
Brown	Minimum	1
Green	Weak	2
Yellow	Medium	3
Red	Strong	4
Purple	Very Strong	5
White	Especially Strong	6
Black 7	Maximum	7

Powder Load Identification

POWER LEVEL	LOAD COLOR	
1	GRAY	LOWER POWER
2	BROWN	↓ HIGHER POWER
3	GREEN	
4	YELLOW	
5	RED	
6	PURPLE	

Remember

- Always use a low charge for an initial test firing to determine the correct charge for that particular material.
- Make sure that the projectile will not pass completely through the material.
- Use both hands on the tool.
- Do not use an explosive powered tool unless you are in a well balanced position so that tilting or misalignment of the tool is not likely to occur at the time of firing.
- Make sure that the muzzle end of the barrel is flush with the material being fastened.
- Barrel extensions must be removed when not necessary for use.

Attachments and Accessories

There are many different types of attachments and accessories available for high velocity explosive powered tools. The following figure illustrates a selection. Low velocity tools have few attachments or accessories and those, which are available, tend to be highly specialised. Operators should consult the manufacturer of the tool for specifications of these accessories.



An extension barrel is an extension, which is attached to the main barrel when it does not reach the work surface. For example, when fixing through the web and between the flanges of a channel section.

- When using an extension barrel it is necessary to block out open ends of the work.
- To fit the extension barrel remove 'threaded protection cap' from liner Barrel "A",
- screw extension barrel to liner barrel, and re-attach protection cap to extension barrel "B".
- Barrel extension is used when width of channel 'X' is less than the width of the protective shield 'Y'.

Limitations of Use

- Do not use fasteners on hard or brittle materials such as glass, hard steel, cast iron, granite, or glazed brick or tile.
- Do not use explosive-powered tools to attach timber to timber.
- Do not drive fasteners into brick, concrete or similar substances;
 - nearer than 75mm to an edge
 - which are less than 100mm thick, or less than 3 times the depth of shank penetration
 - closer than 150mm to where a former fastener has failed.
- Do not drive into corner brick or mortar joints, or low strength or cracked concrete.
- Do not drive into steel less than 4mm thick unless the shank diameter of the fastener
- is less than the thickness of the steel.
- Do not drive fasteners nearer than 12mm to the edge of the steel.

- Do not drive fasteners through existing holes.
- Do not use in the presence of explosive or flammable gas, vapour or dust, or in any place where the explosive charge may be unintentionally exploded or rendered dangerous.

SAFETY ZONES

On The Roof

When using an explosive powered tool on a roof the floor below must be kept clear for a minimum distance of 6.0m in all directions.

On The Wall

When using an explosive powered tool on a wall, an area of 6.0m radius must be kept clear on both sides.

On Any Other Place

An area of 6.0m must be kept clear in all directions.

Barriers

All barriers shall be of a solid nature and shall be between 0.9m and 1.0m in height.