

Safe use of metal turning lathes

This information sheet and table provide practical advice to employers about controlling hazards while using metal turning lathes.

September 2010

Background

Metal turning lathes, more specifically centre or engine lathes, are commonly used in the manufacturing industry for machining metal parts.

Parts are created by turning the workpiece in one or both ends of the lathe and changing its shape using tools with specific cutting edges.

In Victoria, metal turning lathes have been associated with three fatalities and a number of serious incidents since 2007. Those injured have included both experienced and inexperienced operators.

Main hazards

The most common causes of death and injury from metal lathes include:

- entanglement of clothing in moving parts, such as drive gears, chucks, lead and feed screws, and the workpiece
- being hit by loose objects on the lathe, such as chuck keys, tools or swarf

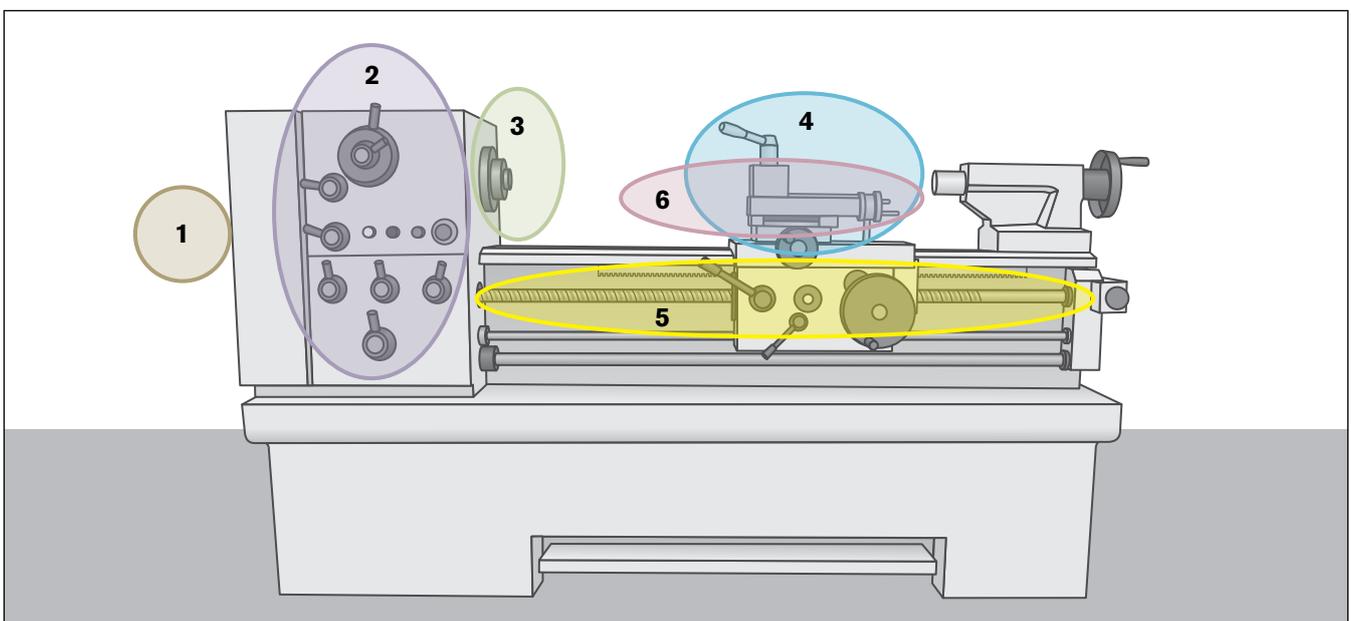
- entanglement from inappropriate tooling and polishing techniques
- being struck by a workpiece that has not been adequately secured in the lathe or is oversized.

Employers must provide a safe work environment for workers by implementing adequate controls to all identified hazards.

How to use the table

The table over the page lists and shows examples of the main hazards while using a metal turning lathe. It also includes the possible consequence (eg entanglement) of the hazard and provides a list of recommended controls. The zone numbers in the table refer to the zones in the lathe diagram below.

Before implementing controls, employers should consider what the lathe is used for and if the control is appropriate for their workplace (eg is the lathe being used for process manufacturing or jobbing tasks?).



This diagram shows the zones of metal turning lathe hazards. The recommended controls for each zone are shown in the table over the page.

Guidance Note Safe use of metal turning lathes

Hazard	Possible consequence	Recommended controls
Zone 1		
Workpiece beyond the headstock	During spindle rotation, bar can bend and strike workers nearby.	<p>Use workpieces of minimum length to reduce the amount of bar protruding from headstock.</p> <p>Use a bar feed tube to hold workpiece that extends beyond the headstock.</p> <p>Guard bar feed weights with hinged covers extending to the floor.</p> <p>Modify the lathe speeds (RPM) to ensure bar will not bend when machined.</p> <p>Install barriers to stop workers entering space around headstock.</p>
Zone 2		
Exposed drive mechanisms (pulley, belts, gears)	Workers can become entangled in pulleys, belts or gears when lathe is in operation.	<p>Ensure exposed drive mechanisms are guarded at the front and back of the lathe (see picture).</p> 
Lathe controls can only be reached by passing hand through working zone	Workers can become entangled in unguarded drive mechanisms, chuck, chuck assembly or workpiece when the lathe is in operation.	Ensure controls are within easy access of operator and away from working zone.
Lack of function markings on controls	Workers can activate incorrect controls resulting in an unplanned function.	Ensure control functions are clearly displayed.
Placement of controls do not follow the machining process	Workers can activate incorrect control resulting in an unplanned function.	Ensure operators are adequately trained in what order to use controls.
Unsecured tools and objects stored or placed on the headstock	Stored objects can fall onto the spinning chuck and be propelled at the operator or nearby workers.	<p>Ensure headstock is clear and free from clutter.</p> <p>Do not place items on headstock.</p>

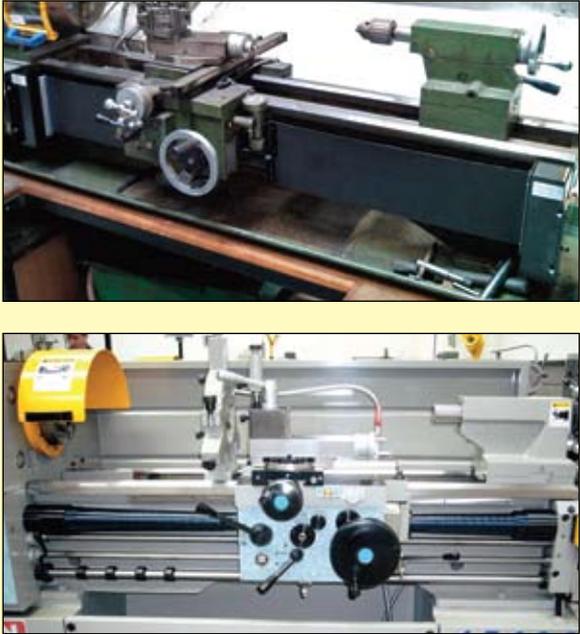
Guidance Note Safe use of metal turning lathes

Hazard	Possible consequence	Recommended controls
Zone 3		
Exposed chuck	Workers can become entangled on uneven surface of chuck or workpiece when spinning.	<p>Where appropriate, install guarding with interlocking (see picture).</p> <p>Note: Employers must ensure guarding does not stop workers using the lathe in a safe manner or block the view of the task.</p> <p>Where multiple chucks are used, guarding should cover the swing of the lathe, not the size of a chuck.</p>  
Chuck key left in chuck	Workers near lathe can be struck by key when projected from the lathe.	<p>Use spring-loaded chuck key.</p> <p>Use self-ejecting chuck key.</p> <p>Use extended key design that stops interlocked guard being lowered when inserted in chuck.</p>
Jaws of chuck unable to clamp workpiece securely	Workers can be struck by workpiece not securely held in the chuck.	Ensure chuck selected is appropriate for the workpiece being machined and meets manufacturer specifications.
Chuck has not been adequately secured to the spindle	Workers can be struck by chuck not securely held in the spindle.	Use retaining nut with left-hand thread.

Guidance Note Safe use of metal turning lathes

Hazard	Possible consequence	Recommended controls
Zone 3 continued		
Mounting and removing heavy chucks and faceplates	Workers can sustain musculoskeletal or crushing injuries when changing heavy chucks and faceplates.	<p>Use overhead crane or mounted lifting aid (see picture).</p>  
Use of a chuck that is not compatible with lathe and/or task specifications	Use of incorrect chucks can result in the chuck or workpiece becoming loose and striking workers.	<p>Ensure chuck rating is within required rating for the lathe.</p> <p>Ensure chuck is compatible with lathe and/or task specifications.</p> <p>Use independent chuck for gripping round, square or irregular-shaped work, or unmachined work requiring heavy cutting (independent chuck has greater gripping power than self-centring chuck).</p>
Chucks and faceplates used on the lathe are damaged or have catch points	Workers can become caught on chucks and faceplates that are poorly maintained or have protrusions.	<p>Ensure chucks and faceplates are selected or designed so there are no catch points (particularly where 'homemade' designs are used).</p> <p>Ensure chucks and faceplates are set up to manufacturer/supplier specifications.</p>
Oversized workpiece in self-centring chuck (three-jaw chuck)	Chuck jaws in full extension to allow for oversized workpieces can be propelled from the lathe when operated or become a point of entanglement due to extended parts sticking out.	Use appropriate-sized chuck for turning workpiece.

Guidance Note Safe use of metal turning lathes

Hazard	Possible consequence	Recommended controls
Zone 4		
Objects (eg cutting tools) unsecured on carriage (including tool post) or swarf	Unsecured objects can become projectiles when the lathe is started, possibly striking workers.	<p>Ensure nothing is unsecured on carriage.</p> <p>Ensure guarding is placed on the carriage, where appropriate (see picture).</p> 
Worn or damaged tools being used on the lathe	Use of worn or damaged tools can result in tool failure and can become projectiles or create irregular or long cuttings that can lead to lacerations.	Ensure worn or damaged tools are removed and not used.
Zone 5		
Exposed lead and feed screws (assessment of risk will need to include the speed at which the lead and feed screws travel)	Workers can become entangled in exposed lead and feed screws when the lathe is in operation, particularly if the lathe is being used by a number of users with various levels of experience (eg in learning institutions).	<p>Where appropriate, ensure lead and feed screws are guarded (see picture).</p> 

Guidance Note Safe use of metal turning lathes

Hazard	Possible consequence	Recommended controls
Zone 6		
Unguarded protrusions on the workpiece	Workers can become entangled on protrusions on the workpiece being turned.	Where possible, ensure the area of the working zone where access is not necessary is guarded.
Coupling and clamps used on the lathe are damaged or have catch points	Workers can become caught on coupling and clamps that are poorly maintained or have protrusions.	Ensure couplings and clamps are selected or designed so there are no catch points (particularly where 'homemade' designs are used). Ensure couplings and clamps are set up to manufacturer/supplier specifications.
Unsupported workpieces	Unsupported workpieces can become loose, striking workers.	Use fixed or travelling steadies to support long, slender workpieces between centres or to support outer end of long piece held in chuck for drilling or boring (see picture). 
Machining process produces continuous or unravelled cuttings	Workers can become entangled in turning cuttings.	Consider appropriate cutting speeds, feed rate and chip thickness during task planning. Use lathe tools with chip breakers of the gullet or step type. Ensure appropriate personal protective equipment is provided and used correctly.
Removing metal shavings, cuttings and swarf from machining area with hands	Unprotected handling of shavings, cutting and swarf can result in lacerations.	Ensure swarf handles and buckets are used when cleaning swarf, shaving and cuttings from lathe.
Neighbouring workspaces are exposed to swarf, cuttings or workpieces during the machining process	Swarf, cuttings or workpieces can become projectiles and strike nearby workers, causing injuries such as lacerations and fractures.	Ensure guarding is placed around lathe.
Frequent traffic (human and machinery) passing through the work area near the operator	While operating the lathe, the operator can be bumped or startled by passing traffic, causing the operator to come into contact with the lathe.	Ensure the lathe is located in an area that has little to no traffic. Use suitable barriers to stop workers/vehicles not using the lathe from unnecessarily entering the area (this should not stop workers moving workpieces on or around the lathe). Create a restricted zone around the lathe operator during machining (this must be supported with a clearly communicated policy and signage).

Guidance Note Safe use of metal turning lathes

Hazard	Possible consequence	Recommended controls
Zone 6 continued		
Incorrect methods used for polishing workpieces with emery cloth	Worker can become entangled in the lathe.	<p>Ensure emery cloth is applied using:</p> <ul style="list-style-type: none"> backing board or good quality wood tool post to place the cloth on 'nutcracker' consisting of two backing boards lined with emery cloth and joined at one end. They are shaped to allow the surface to be finished. <p>Hold emery cloth only by ends, never to be used wrapped around hands or all the way around the workpiece.</p> <p>Ensure speeds (RPM) are not excessive.</p> <p>Ensure there are no protruding bolts or counter weights on the workpiece.</p>
Other		
Lack of or poorly placed emergency stop button/pedal that results in immediate standstill of lathe operation	Operator is unable to stop the lathe in case of an emergency.	Ensure emergency stop button/pedal is present, identifiable (eg red) and can be reached by workers from all positions when operating the lathe.
Loose clothing, cuffed or rolled back sleeves, neckties, jewellery (including watches) and long hair	Loose clothing, accessories and hair can become entangled in moving parts of the lathe, chuck assembly or workpiece.	<p>Ensure close-fitting clothing with no catch points is worn by operators.</p> <p>Ensure jewellery (including watches, rings, bracelets, chains, etc) is removed before operating the lathe.</p> <p>Ensure long hair is tied back (by tie or hairnet).</p>
Environment		
Inappropriate type and position of lighting	<p>The flashing effect of fluorescent light can make a spinning lathe appear to have stopped. This can lead to workers' entanglement.</p> <p>Lighting placed over the lathe can be struck by projectiles from the machining process. Workers nearby can be injured by the light shattering.</p>	<p>Workstations should be lit with lights that do not produce a flashing effect (eg incandescent lights).</p> <p>Lighting should not be positioned where it can be damaged. If damage is a risk, lighting should be protected.</p>
Untidy and unorganised working environment	<p>Workers can slip or trip on cutting oils, swarf or cuttings that are not cleaned from the floor.</p> <p>Workers can also trip over lathe parts or workpieces that are not returned to storage areas.</p>	<p>Ensure liquids and cuttings are cleaned from the floor as soon as possible after they spill or are produced.</p> <p>Ensure lathe parts and workpieces are returned to storage areas when they are no longer being used.</p>

Guidance Note Safe use of metal turning lathes

Hazard	Possible consequences	Recommended controls
Training and supervision		
Poorly trained and supervised operators machining on the lathe	Workers who are inexperienced, lack training or adequate supervision are at risk of injuring themselves and others by becoming entangled in moving parts of the lathe or using poorly fitted chucks and work pieces that can become projectiles. Ensure all operators are appropriately	trained and competent before beginning work on the lathe. Ensure inexperienced operators are supervised by a competent person. Display safe operating procedures at the lathe.
Maintenance and repair		
Lack of power isolation switch that can be locked out	Workers can become entangled in the lathe if it is accidentally activated during maintenance and repair activities.	Ensure a lockable isolation switch is present on the lathe. Ensure standard operating procedures exist for maintenance and repair of the lathe.
Personal protective equipment		
Wearing gloves while using the lathe	When work while using or cleaning the lathe, gloves can become caught in moving parts.	Ensure gloves are not worn when operating or cleaning the lathe.
Operating the lathe without safety glasses	Shavings, cuttings and swarf may be ejected from the lathe and make contact with workers' eyes.	Ensure safety glasses are worn by workers when operating the lathe.
Working on heavy workpieces or lathe parts without steel-capped safety shoes	Workers without personal protective footwear may be exposed to a crushing foot injury if heavy workpieces or lathe parts are being moved.	Wear steel-capped safety shoes when operating the lathe.

Further information

Contact the WorkSafe Victoria Advisory Service on 1800 136 089 or go to worksafe.vic.gov.au

Note: The information presented in this Guidance Note is intended for general use only. It should not be viewed as a definitive guide to the law or standard industry practice in this area. Whilst every effort has been made to ensure the accuracy and completeness of the Guidance Note, the advice contained herein may not apply in every circumstance. You should always check any applicable legislation and make your own judgment about what action you may need to take to ensure you have complied with the law. Accordingly, the Victorian WorkCover Authority cannot be held responsible and extends no warranties as to the suitability of the information for any particular purpose; or actions taken by third parties as a result of information contained in the Guidance Note.

©2011 The information contained in this publication is protected by copyright. The Victorian WorkCover Authority hereby grants a non-exclusive licence in this publication to the recipient of this publication on the condition that it is not disseminated for profit. The Victorian WorkCover Authority encourages the free transfer, copying and printing of the information in this publication if such activities support the purposes and intent for which the publication was developed.