



Manufacturing Intelligence:

Metalworking, lathe turning, radial arm drilling and milling



Trade Overview

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Risk Features

Material Damage and Business Interruption Hazards

Employer's Liability, Public and Products Liability

We know that your clients take risk management seriously and that it plays a key role in the service you offer. We've produced this guide to provide technical insight into some common processes and highlight the controls your clients can take to help reduce the risks associated with the metalworking industry.

General metalworking activities are undertaken by independent companies that specialise specifically in metal component manufacturing, and by those companies who include an element of metal working as part of their larger production activities. Customers are wide and varied and include machine tool manufacturers, the automotive sector, plastic injection and extrusion moulders, the aerospace industry, the building services sector and many more. Metalworking and precision engineering involve the mechanical shaping, dimensioning, or surface finishing of a wide variety of metals. Activities include turning drilling, milling, sawing, boring, and grinding. The raw material can come in the form of sheets, metal blanks, rods, tubes, castings etc. or a part complete component. There are three types of common machinery items, which are listed below.

Milling

Milling machines are used to mill, drill and ream various types of surfaces from metals, whether that's on individual pieces or for small to medium quantity batches. They're a very common machine used, among other things, to manufacture gears. In the process of milling, the metal will pass over rotary cutters which will slice through the material to achieve the finished design, with different speeds being used depending on the strength of the metal being cut. Like lathes, milling machines can be CNC or manually operated.

Lathe Turning

Lathes are important workshop tools for removing material and are used for a range of functions, including shaping solid metal, cutting threads, drilling different shapes and boring openings in metal. In terms of shaping, the material is placed into the machine and then turned and curved to create different shapes. When the metal is being rotated, single point cutting tools shear away unwanted material (swarf) and create the desired shapes. Lathes can be used manually by an operator or increasingly commonly by automatic CNC (Computer Numerical Control), control running computer aided design (CAD) and computer aided manufacturing (CAM) programs.

Radial Arm Drilling

A radial drilling machine or radial arm press is common to virtually all workshops and enables the drilling of larger metal pieces that may not fit into a traditional drilling machine table. They provide manufacturers with the ability to drill a larger number of holes easily and quickly. The machine itself is a geared drill head that's mounted on an arm assembly that can be moved around. The drill head itself can also be moved, adjusted in height and rotated.



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Material Damage & Business Interruption

Friction between the cutting tool and the work piece can generate heat, with the potential for ignition of fine particles and waste swarf that's produced during the machining process. To counter heat build-up and protect the cutting tool, cutting fluids are delivered to the workpiece to lubricate and cool. There are different types of cutting fluids available ranging from mineral oils to synthetic coolants and these have different fire related properties. The likelihood of a fire occurring in the resultant coolant fluid soaked swarf increases with the use of metals such as magnesium, manganese, titanium and aluminium as these can spontaneously combust.

CNC machines work to very high repeatable tolerances and are usually enclosed, often featuring automatically selectable multiple cutting/drilling tools. An operator may supervise several machines or they may be operated unattended once running, including outside normal working hours. There are a range of machines on the market, with machinery manufacturers situated worldwide.

Some machines may be available 'off the shelf' but lead times of several months or longer can be expected depending on the complexity of the machine, especially if they're bespoke. This can create the potential for significant Business Interruption claims should the worst occur. It can also be both costly and lengthy for modern parts to be retrofitted to any older or obsolete machinery in the event of partial damage. As with many other manufacturing trades, you'll be interested in your client's machinery dependency, process bottlenecks, manufacturing capacity, outsourcing potential and the availability of replacement machinery and parts.

All these factors will influence the selection of the indemnity period, along with wider Business Interruption considerations.

Employer's Liability

All metal working processes carry the potential for injury to employees.

Metalworking is generally a noisy process and chemicals used in the production process present both respiratory and dermatological hazards. Vibration from powered hand tools and processes and noise assessments are important for any business to identify, eliminate or mitigate the injury or disease potential from everyday processes.

Most accidents involving machinery happen when operators are loading or unloading components, removing swarf or taking measurements and making adjustments. Fixed and interlocking guards play a critical role in ensuring employees are protected from dangerous machine-controlled movement. Ensuring that there are safe means to remove swarf and adjust equipment settings will also mitigate injury potential.

Every year, serious accidents occur from the use of unguarded machinery and working techniques which place the operator at risk, this needs to be avoided. Machinery must be properly guarded, guards need to be checked and maintained so that they're operational. Guards must not be removed.



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Public Liability

Public Liability occurs when Third Parties are placed at risk by your operations. These can be situations like accessing hazardous working areas inadvertently or unaccompanied and without proper controls.

Emissions from processes can also be injurious to passers-by or people living nearby and can affect your liability exposure.

Products Liability

Products manufactured may be component parts or completed items. Consideration of risk will relate to the end usage of the product and its functionality.

It's important to understand the client's position in the ultimate chain of supply and whether they provide any design function.

Products with a safety critical function or those ultimately intended for the North American market can represent additional risks that require a robust risk management approach.

Defects in batches of products may arise if there's a fault in the metal structure of a component part. Issues can manifest as brittle fractures and latent cracks which could eventually result in the failure or unsuitability of the product supplied. Quality control measures play an important role in mitigating this risk, particularly if materials are sourced from the Far East. Imports from the Far East have increased primarily as a result of lower labour prices and greater investment in modern technology.

Whilst statutory controls apply to imported goods, accompanying certification doesn't always guarantee the quality of materials and workmanship and it's important that material sourced from overseas is checked and meets the client's standards.

Where import is involved, it's important that the client retains full traceability for the materials and any parts supplied to them. Good quality control measures including ongoing reviews of the design and formulation of products, product testing, identification and recording of product distribution, controls on packaging and labelling and formulating a recall plan are all key topics to ensure the QC is robust.



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The tables below highlight some specific hazards present in metalworking environments, along with the associated controls which will help prevent major loss of physical property.

Generic risks resulting from arson, electrical sources and waste aren't mentioned here.

Features always present

Hazard	Control
Ignition hazard from the heat generated by the friction between the cutting tool and the workpiece.	<ul style="list-style-type: none">Regular maintenance of machinery and tooling.

Features sometimes present

Hazard	Control
Risk of contamination from the use of minerals, cutting oils and the generation of mist.	<ul style="list-style-type: none">Regular cleaning of surfaces and environment.Selection of safest cutting fluid for the specific material and operation.
Increased chance of ignition through machining of more readily combustible metals such as aluminium, magnesium and titanium.	<ul style="list-style-type: none">Safe collection of dusts (e.g. using wet precipitation collectors), regular removal and containment of waste material including swarf.



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Features sometimes present

Hazard	Control
Increased possibility of ignition or explosion associated with spraying highly flammable liquids and vapours.	<ul style="list-style-type: none"> ▪ Ensuring paint spraying only takes place in designated paint spraying booths/enclosures with a minimum of 30 minutes fire resistance. ▪ Ensuring suitable ventilation and extraction arrangements are in place to remove flammable vapour. ▪ Ensuring all heating in paint spraying areas comes from a heat source located outside the area, preferably in a separate building or compartment.
<p>Increased fire ignition and propagation potential when highly flammable liquids are stored to the amount of:</p> <ol style="list-style-type: none"> 1. Up to 50 litres in workroom or storeroom 2. Above 50 litres within the premises 3. Above 50 litres in open air. 	<ol style="list-style-type: none"> 1. Highly flammable liquids in a work or storeroom should be stored in a suitable closed vessel in suitably placed cupboard or bin which is a fire resisting structure. 2. Highly flammable liquids in the premises should be stored in a suitable compartment that benefits from 2 hours fire resistance with external ventilation to the open air. 3. Highly flammable liquids in the open air should be stored in a suitable building constructed with a sump or bund wall and benefiting from a minimum of 30 minutes fire resistance.

Hazard	Control
Increased theft attraction where non-ferrous metals such as aluminium, titanium and stainless-steel stocks are stored on the premises.	<ul style="list-style-type: none"> ▪ Appropriate physical security measure should be supplemented by approved intruder alarm protection with police response.
Restricted ability to replace raw materials where supply sources are limited.	<ul style="list-style-type: none"> ▪ A Business Continuity Plan should be formulated, regularly reviewed and tested.
Longer reinstatement times due to the 'manufacture to order' approach of precision engineers and the subsequent lack of stockpiled finished goods.	<ul style="list-style-type: none"> ▪ Explore opportunities to source finished products elsewhere or sub-contract production from a Third Party in the event of a disruption.



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The tables below highlight some specific hazards present in metalworking environments, along with the associated controls to help prevent significant injury or third-party property damage. Generic risks arising from manual handling, warehousing or any work away from the premises aren't mentioned here.

Hazard	Control
Machinery entrapment can lead to bodily crushing, severing, amputation and impact.	<ul style="list-style-type: none"> Training of operatives in correct processes and operations. Training of risk assessment and safe operating systems development rolled out on a formally signed basis. Specific controls to prevent entrapment where emery cloth is used as part of the machining process.
Injury caused by ejection of parts or associated waste and substances included within the process.	<ul style="list-style-type: none"> Formal process of undertaking and recording inspections of machinery guarding. Systems for defective guards that ensure machines are taken out of use if damaged until rectified. Training of operatives in handling of equipment processes.
Noise induced hearing loss.	<ul style="list-style-type: none"> Formal noise risk assessment by competent and trained person(s). Reduce noise levels as far as possible using soundproofing and engineering controls, supplemented by the provision of PPE.

Hazard	Control
Dermatitis or skin burns caused by substances used in the process, such as cutting oils, resins and acids.	<ul style="list-style-type: none"> Maximising opportunities to substitute or remove hazardous substances from the process and undertake appropriate COSHH assessments. Health surveillance may be required where there's a disease associated with the substance(s) in use as well as physical elements such as noise, vibration exposure, dermatitis etc.
Hand and arm vibration syndrome due to operation of hand-held vibrating tools.	<ul style="list-style-type: none"> Risk assessment of vibration potentials. Reducing exposure to such tools via sharing of tasks between employees as a very basic and immediate control.
Failure of product due to defects within the metal structure of a component.	<ul style="list-style-type: none"> Routine and robust quality control procedures with reference to safety critical or high potential liability components manufactured such as visual, batch and destructive testing plus other advanced processes.



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