

RISK CONTROL

Ireland

Risk Management Guide



Metals Manufacturing

BEST PRACTICES FOR METALS MANUFACTURERS

At Travelers we understand the wide and varied needs of metal goods manufacturers: from kitchen cookware and metal can manufacturing, right down to nuts and bolts. The following guidance document identifies some of the common risk exposures among metal goods manufacturers, as well as some of the higher hazard concerns. Supporting you, behind the document, is an experienced team that understands the risk issues faced by manufacturers in the metal working industry. Additional resources on specific hazards may be found on our website and the risk management guide companion to this document lists third-party websites and electronic resources that you may find useful.

Property protection

The metal working industry has a wide variety of processes involved in the forming, machining, fabrication and treatment of metals which present different fire and explosion hazards. This guide provides insight into some of the more common hazards and control measures that should be implemented.

Flammable liquids and gases

There are many processes in the metal working industry that present a fire and explosion risk from flammable liquids and gases. Examples include chemical surface treatments, solvent based paints use of hydraulic fluids under pressure and welding gases. It is important that fire and explosion hazards are identified and appropriate controls implemented, including maintenance and inspection procedures to ensure that controls remain effective. Loss control considerations should include but are not limited to:

- Appropriate flammable liquid storage, handling, spill response and disposal programmes, including use of appropriate containers, cabinets and storage rooms
- Compliance with manufacturers' instructions
- Substitution of less flammable liquids where available, for example minimising the use of solvent based paints

or substituting flammable hydraulic fluids with less hazardous fluids

- "No Smoking" signs in areas where flammable liquids are stored or handled
- Correct ventilation and electrical equipment where flammable liquids are stored and used
- Access to product Material Safety Data Sheets for flammability/explosive guidance
- Employee training on proper handling, storage and disposal of flammables/explosives

Molten metals

Whether melting or holding, furnaces are designed to provide constant heat to metal, and in doing so, they create the potential for fire and explosion. Molten metal may spill resulting in building or equipment damage and ignition of any combustibles in the vicinity. Electrical supply equipment is particularly vulnerable with relatively small spillages potentially resulting in power interruptions and subsequent losses. Good housekeeping procedures are necessary to keep the area clear. The facility should be designed with a suitable pit to collect molten metal. The constant use of the equipment increases the potential for equipment breakdown and a preventative maintenance programme should include regular rebuilding of furnace

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refractory linings. In the event of a power outage, a secondary power source is required to maintain the appropriate temperature in order to avoid problems with solidification. Alternatively a means to empty furnaces needs to be in place prior to solidification. Any suppression systems in the area should involve CO²—not water.

Water presents a serious explosion risk in the presence of molten metals and measures need to be taken to prevent rain water ingress to the building and avoidance of water services in the vicinity.

Heat treatment

Heat treatment ovens, whether electrical or gas fired, present potential fire hazards due to overheating or failures in the fuel supply. Special atmosphere furnaces may use gases which are flammable or highly flammable (e.g. hydrogen) and the fuel lines and supply tanks need to be suitably inspected and maintained.

Oil quench tanks contain oils with high flash points which typically will not ignite. However, if subject to regular use the temperature may rise if the cooling system is inadequate. Also problems may be experienced with loading failures so that hot metal is left suspended above the surface of the metal or partly in the oil. In the above circumstances there is an increased risk of the oil vapourising and igniting. Manual CO² fire suppression systems are required for oil quench units and for larger operations fixed automatic fire suppression systems involving CO² and foam may need to be considered.

Again, water presents a serious explosion hazard where heated oil quench tanks or salt baths are present.

Combustible metals and dusts

The presence of chips, files or dust (swarf) from metals such as aluminium, beryllium and other combustible metals present an extreme fire and explosion hazard. To address this exposure, business or property owners should utilise dust collection systems, explosion venting/suppression systems, and have suitable extinguishing agents for metals (Class D). In general, all critical areas should have an Automatic Fire Detection system with remote signaling and excellent housekeeping procedures.

More generally most swarf is relatively hot from the mechanical energy imparted in the machining process and the collection systems tend to dispose of this into a bin whilst still warm. Oily residues can ignite and the temperature can eventually rise to the point where the fine metal swarf begins to burn, particularly for more combustible metals. Care must be taken to ensure the swarf is cool enough not to cause a fire and the cooling solution should preferably be an oil/water emulsion that is not sufficiently flammable to allow a fire to develop.

Spark erosion/electrical discharge machining

It is best not to leave equipment, regardless of the type, to operate unattended. Spark erosion machines, in particular,

can present a serious fire hazard if left to operate unattended. Typically a flammable dielectric fluid is used. In the event of a malfunction, the fluid can ignite. Controls need to be in place to automatically shut down the machines in the event of failure conditions, and automatic extinguishing should be provided.

Hot work processes

There are a number of processes in metal working that generate sparks or hot metal with the potential to ignite combustible materials in the vicinity. Significant fires have occurred where slow smouldering fires have been allowed to develop unnoticed – often after cessation of the work activity. Depending on the frequency of the activity and the extent to which the hot work is an integral part of production, different levels of controls will need to be implemented. For infrequent hot work activities permit to work systems should be used.

Electro-plating

Electric immersion heaters are a heat source that can ignite plastic or plastic-lined tanks if the heater and the tank wall(s) are in close proximity. Most fires created by immersion heaters are the direct result of low liquid levels and lack of automatic over temperature shut-offs on the heating elements. Plating operations with immersion heaters should have over temperature limit cut-offs and low tank level alarms. Systems should not be programmed to start up automatically during idle periods. It is critically important to ensure that the area is occupied and the process is supervised when the immersion heaters are operational. Pre-treatment and post plating operations may present additional hazards from the use of flammable liquids or presence of combustible dusts.

Most modern ducts above plating tanks are constructed of rigid PVC. Older duct systems tend to be reinforced with fibreglass. The combustible nature of the ducts or duct lining can result in rapid fire spread outside of the area of origin, and the operation will need to be shut down until the exhaust system is fully restored.

Electrical systems

Electrical systems and equipment are installed in essentially all commercial and industrial buildings, making it imperative to control fire loss exposures through proper installation and system maintenance.

Fire protection devices/systems and fire teams

Due to some of the specialised fire and explosion hazards in the metals industry, it is important to install and maintain the correct fire protection systems. Options include automatic fire suppression systems, heat and/or smoke detectors with alarm functions and internal fire teams. Travelers risk control and/or installing companies certificated to third party certification schemes recognised by the National Standards Association of Ireland (NSAI) should be considered a resource in these decisions. A responsible person should supervise all matters relating to

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a fire alarm system. That person should ensure the system is tested and maintained in accordance with applicable standards and that records are kept.

Good housekeeping

Poor housekeeping, including clutter and debris on floors, in aisles, stairwells, corridors or near routes of entrances and exits, presents a fire hazard and also can impede the ability of occupants to readily exit and evacuate in the event of an emergency. Regular housekeeping audits should be performed and corrective actions taken.

Additional property considerations

Metal theft is becoming increasingly common, especially when precious metals are present. A security plan should be put in place to prevent access to metal goods, detect intruders and restrict the ease of removal. Protection measures to consider include, but are not limited to:

- Separate storage areas with restricted access for precious and other attractive metals
- Physical barriers—doors/locks to prevent unauthorised entry to storage areas
- Electronic monitoring of storage areas via intruder alarms and CCTV
- Guarding by on site guards or mobile patrols

Health and safety

The potential for occupational injury and disease in the metal working industry setting will vary depending on the operations undertaken. Each operation has its own set of exposures as well as common exposures shared by all. For example slip, trip and fall hazards are common to most every work environment, whereas working with molten metal is not. Summarised below are some exposures that are particularly relevant to the metal working industry.

Noise exposure

A full risk assessment should be completed to determine the level and location of exposure and to determine what controls should be put in place. For example, noise levels related to metal objects falling into bins can be between 85 and 95 dB(A), operation of a circular saw between 95 and 105 dB(A) and riveting between 100 and 110 dB(A). Noise related to metal objects falling into bins can be significantly reduced, for example, by lining the bin with carpet or another sound absorbing material.

Noise exposure calculators can assist employers in calculating their daily and weekly noise exposure levels along with estimating the performance of hearing protection.

To reduce employee noise exposures, an employer needs to first determine if noise reduction at source can be effected such as installing damping, e.g., anti-vibration mountings and/or using silencers on pneumatic exhausts.

Segregating noisy machines into a separate area or placing enclosures around, or baffles between, machines can have significant noise reduction effects.

Based on the noise levels, health surveillance may be needed in addition to hearing protection and other noise reduction measures. Health surveillance is audiometry, which means a method of hearing checks measuring the sensitivity of hearing over a range of sound frequencies. It will be required for those regularly exposed to above 85 dB(A) and susceptible individuals between 80 and 85 dB(A). The results of this can provide feedback as to how effective the employer's hearing conservation programme is and also help determine if hearing loss is being caused by non-occupational exposures, such as age-induced hearing loss or certain high noise level hobbies, such as shooting.

Hazardous substances

The process of working with metals brings the worker in contact with the inherent hazardous properties of some metals as well as the chemical binders, acids, solvents, cutting oils, etc., needed for processing. Many substances have the potential to cause both acute and chronic ill health exposures from inhalation of hazardous vapours or contact with the skin. For example, exposure to metalworking fluids can cause irritation of the skin/dermatitis, occupational asthma, bronchitis, irritation of the upper respiratory tract and breathing difficulties. More rarely following repeated exposure, a more serious lung disease called extrinsic allergic alveolitis can cause increasingly severe breathing difficulties in recurrent episodes.

Employers will need to carry out a suitable and sufficient risk assessment of exposures to hazardous substances. For example in respect of metal working fluids, maintaining fluid quality and control of bacterial contamination, minimising skin exposure to fluids, preventing or controlling airborne mists and carrying out health surveillance, e.g., regular skin inspections, where there is exposure to fluid or mist are all critical to preventing ill health. Best practices to control exposures and limit potential ill health affects are based on the specific processes involved. A partial list for consideration is below:

- Health screening and surveillance
- Biological monitoring
- Ventilation
- Regular filter changes
- Vacuum dust collection systems
- Air sampling
- Provide training and written guidelines to affected employees
- Personal protective equipment

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Use of heat

Heat is a common exposure in the metals industry from, for example, cutting, welding and hot work operations. Multiple sources of heat (steam, blast furnaces, molten metal, flying chips, welding, etc.) can affect workers and have the potential for burns. Welding face shields, either hand-held or head-mounted, protective sheets and curtains to prevent flying of molten metal or arc eye, wearing of heat-resistant personal protective equipment (PPE), etc., may all need to be provided by an employer. Thermal comfort should not be overlooked when PPE is being worn and regular rest and hydration breaks may be necessary. Another best practice may include provision of ventilation.

Workplace machinery and transport

Injuries related to machinery and transport can be acute and severe (dismemberment/amputation) or can be slow to develop with chronic consequences (musculoskeletal disorders). Minor injuries are often a warning that more severe injuries can occur and it is important to objectively evaluate not only the inherent risks of machinery and vehicles, but also the behaviour of the workers using that equipment.

Selection of suitable machinery, use by trained and competent employees and ensuring good maintenance procedures according to manufacturers' recommendations are key to protecting the health and safety of operators during use. This includes taking reasonable steps to ensure new work equipment complies with the relevant European Union requirements for safe design and construction. Some important control measures are as follows:

- Machine guarding and lock-out procedures need to be in place and followed by workers
- The production schedule should allow sufficient down time for the appropriate maintenance of equipment
- There should be a competency matrix for the operation of machinery
- Appropriate training and supervision is required in the use of fork lift trucks. According to HSE, forklift trucks are involved in 24% of all workplace transport accidents and these accidents are often due to poor supervision and lack of training

Work away

Working away from a centralised location, and perhaps on a customer's site, can expose workers to different hazards such as repair and service operations, work at height potential and environmental exposures. In these instances it is important to provide the appropriate personal protective equipment and monitor its use. A site assessment provided by the employer and/or customer can help determine these hazards so that an appropriate protective response can be effected before site work commences.

Risk assessments around the work an employee is expected to undertake away from their main location should be prepared in conjunction with the site assessment to ensure there is coordination and no unexpected hazards present themselves at the time of work. If work is likely to exceed the limit of the risk assessment then suitable arrangements need to be in place to ensure the employee does not endanger him or herself and potentially others.

Employees working on larger customer sites can be subject to site specific permits-to-work and customer induction/skills training before they are permitted to work on that site. Some companies even issuing site entry passports. Employers need to also consider the potential for working alone as such an employee should not be at more risk than others.

Environment/premises

Whilst there are many commonalities in the metals industry, each business will offer a different work environment. Facility design, work processes, and the specifics of the products made all influence the workplace environment and the potential health and safety hazards present. A full facility risk assessment should identify hazards — both the common and the unique. Best practice controls would be based on those hazards found during the risk assessment process and may include, but are not limited to:

- Provision of training and written guidelines to affected employees
- Health screening and surveillance
- Provision of mechanical lifting aids
- Ergonomically designed workstations
- Job rotation
- Non-slip surfaces
- Good housekeeping and a consistent cleaning regime
- Appropriate lighting for the task at hand

Hand tools

The use of hand tools offers the potential for injuries from cuts and punctures. In addition, powered hand tools increase the risk of vibration white finger due to excessive hand/arm vibration. To reduce these risks, a vibration risk assessment should be undertaken to assess the risks to hand-arm vibration throughout of working day, normally eight hours. The UK Health and Safety Executive (HSE) has a micro-site which provides a wealth of knowledge on hazards and controls. This site also contains a vibration calculator which can be used by employers to assist in their assessments.

The Ireland Vibration Regulations contain an exposure action value (EAV). This is the daily amount of vibration exposure above which employers are required to take

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action to control exposure. The greater the exposure level, the greater the risk and, therefore, the more action employers will need to take to reduce the risk. For hand-arm vibration the EAV is a daily exposure of 2.5 m/s² A(8).

The Vibration Regulations also contain an exposure limit value (ELV). This is the maximum amount of vibration an employee may be exposed to on any single day. For hand-arm vibration the ELV is a daily exposure of 5 m/s² A(8). It represents a high risk above which employees should not be exposed.

For example, employees who regularly operate hammer action tools for more than about one hour per day or some rotary and other action tools for more than about four hours per day are likely to be above the ELV set out in the Vibration Regulations. This ELV could be exceeded in a much shorter timescale especially where the tools are not the most suitable for the job and have not been properly maintained. Some employers may only need to roughly group their employees as in this example. Others may need to use available vibration data (from the manufacturer and/or the UK HSE indicated levels for some tools) or indeed measure vibration levels where vibratory tool use is more complex.

Where non-vibration alternative methods of work cannot be provided, the following control measures are recommended:

- having a tools/machinery procurement policy which recognises this hazard and seeks to purchase such with lower vibration levels
- properly maintaining tools (inspections, sharpening)
- improving work station design so as to, e.g., reduce the need to grip heavy tools too tightly
- providing employees with information, instruction and training
- offering personal protective equipment, e.g., gloves to keep hands warm and dry
- rotating schedules when working with vibrating equipment to reduce the length of time an employee is exposed
- providing health surveillance for employees at risk

Public liability

Many of the property-related exposures such as fire/explosion risks and pollution concerns can also have a public liability component. Work away is by nature taking a task out of a controlled environment and placing it elsewhere — often into a more public space. The responsibility to protect the worker and the public when the work is being done follows that worker into the public arena.

Visitors to the facilities should not be forgotten. Regardless of whether they are delivering office supplies or chemicals, an auditor, subcontractor or an educational tour group, visitors are exposed to the hazards of the space they enter and must be provided reasonable protection. Control measures to consider include:

- Areas of the facility may require restricted access
- Visitors should be required to sign in and out and should be escorted as appropriate
- Emergency procedures should take visitors into consideration
- Permits to work on the premises should be required of contractors and contracts should be reviewed for the appropriate hold harmless agreements and limits of indemnity

Issues such as workplace transport can impact both employees and visitors to site and both should be taken into consideration during risk assessment and controls. Unfamiliarity/familiarity with a site needs a double-edged approach to ensure all remain safe, and controls such as identified pedestrian walkways and vehicle travel routes along with appropriate signage and lighting may all require attention.

Where substances that are dangerous to the environment are on site, assessments relating to their effects on discharges to air, land and water may be required. If the site is next to a water course some method of bunding oil tanks will be required (e.g. double skinned storage vessel or secure and drainable bund wall underneath a tank). Extraction equipment from inside the building that discharges to the outside air may need some kind of extraction/scrubbing system in place to prevent hazardous discharges. Various enforcement bodies may be involved in this to ensure compliance with the appropriate environmental legislation. This is a fast moving and complex area and reference should be made to the relevant bodies.

Product liability

Defective and/or unsafe products have the potential to cause third party injury, property damage or financial loss, as well as potential loss of good will and reputation. Therefore, risk management arrangements are required to ensure that product quality during the design and manufacture of products, as well as warnings, labelling and instructions clearly communicate how the product should be used and that the requirements of relevant regulations are met.

For more information, visit our website at travelers.ie or contact your Risk Control consultant.

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