BREATHE FREELY IRELAND

Controlling exposures to prevent occupational lung disease in **CONSTRUCTION**

Plumbing/Gas/Heating Engineer

HAZARDS AND RISKS

There are significant health hazards associated with plumbing/heating installation, maintenance and refurbishment work. Drilling, breaking and fixing pipework and tanks; cutting, pulling and sawing insulation materials; soldering, brazing and welding pipework; and applying paints and sealants are all regular tasks which can generate airborne substances which are harmful if inhaled.

Asbestos fibres

When working in buildings, particularly those built before 2000, heating engineers may come into contact with or disturb a number of different asbestos containing materials (ACMs). Asbestos is classified as a category 1 carcinogen. In Ireland, over 50 cases of mesothelioma are reported annually. Inhalation of asbestos fibres can cause mesothelioma, asbestos-related lung cancer, asbestosis, and pleural thickening - which are fatal or serious and incurable diseases that take many years to manifest. The WHO* and the ILO* estimate that approximately 400 people die annually in Ireland from occupational exposure to asbestos.

Man Made Mineral Fibre (MMMF)

Glass and mineral wools found in pipe, tank and loft insulation contain fibres that can be released during application or removal. Inhaling the fibres can cause acute irritation of the respiratory system and possibly a higher risk of lung cancer for particular forms of MMMF such as refractory ceramic fibres and special purpose fibres (plumbers are unlikely to come across these specialist types of fibres in their line of work).

Solder rosin fume (colophony)

When soldering, the heating of fluxes containing rosin (or derivatives) produces fume, which if inhaled is one of the most significant causes of occupational asthma, which is an irreversible condition. The fumes can also act as an irritant to the upper respiratory tract.

Welding fume

The fume given off by welding is a mixture of airborne gases and very fine particles which can cause pneumonia, asthma, metal fume fever, throat and lung irritation and reduced lung function if inhaled. Exposure to some welding fume and gases can cause pulmonary oedema, and lung/nasal cancers.

Isocyanates

Inhaling isocyanates generated through spray foam and two- pack spray paint products can cause occupational asthma and severe respiratory irritation. Diisocyanates are chemicals commonly used in the production of polyurethane foams, coatings, adhesives, and elastomers. The use of diisocyanates in the EU is regulated under the REACH regulations.

Legionella bacteria

There is a risk of exposure to legionella bacteria in droplets of airborne water which, if inhaled, can cause Legionnaires' disease, a potentially fatal pneumonia. The biological agents regulations set down the minimum requirements for the protection of workers from the health risks associated with biological agents in the workplace. These regulations outline measures for risk assessment, classification, containment, monitoring, and preventive measures. The Regulations are supported by a Code of Practice which contains a non-exhaustive list of biological agents, their risk group classification, minimum containment measures and dispensations from minimum containment measures, where appropriate.

CONTROL OPTIONS

Asbestos

The aim is to avoid exposure completely. Information on the presence of asbestos should come from the premises' asbestos management plan and asbestos register. As with any work activity, the requirements of the Safety, Health, and Welfare at Work Act, 2005 (S.I. No. 10 of 2005) and the Safety, Health and Welfare at Work (General Application) Regulations, 2007 as amended (S.I. No. 299 of 2007 & S.I. No. 732 of 2007) apply and must be considered with respect to the protection of workers at the place of work. Regulation 11 of the Safety, Health and Welfare at Work and (Exposure to Asbestos) Regulations 2006 requires an employer to prepare a written notification to the Health & Safety Authority (HSA). It must be received by the Authority at least 14 days prior to the start of such activities. The Health and Safety Authority's Guidelines on Management and Abatement of Asbestos Containing Materials provides comprehensive practical guidance on dealing with ACMs.

MMF, Solder fume, and isocyanates

Use non-fibrous insulation in place of glass/mineral wools, or use bonded and covered MMMF insulation materials if possible. Use push fit pipe and tank fittings to avoid soldering. Use rosin-free or rosin reduced solder. Use safer alternative products to isocyante based spray foam insulation, isocyante paints or epoxy paints; avoid excessive foam packing.

Engineering controls

Use industrial Class H HEPA vacuums for cleaning up ACMs/ MMMF materials. Use local exhaust ventilation (LEV) systems, such as an extracted booth or cabinet, or tip extraction on the soldering iron, during soldering operations.

Safe working methods

Choose work methods that avoid or limit cutting, drilling and sawing of MMMF materials. Minimise dust creation e.g. use water suppression for dusty tasks; use vacuum or wet cleaning techniques, avoid dry sweeping or compressed air to remove dust; use hand tools in place of power tools if feasible. Ensure good general ventilation when painting and implement job rotation where feasible. Refer to the owner/landlord's legionella risk assessment where appropriate (refer to Exposure Levels table overleaf)

PPE

ACMs/MMMFs, disposable overalls (type-5 BS EN ISO 13982-1) and single-use disposable gloves should be worn and disposed of as asbestos waste. Non-laced boots are preferable to disposable overshoes. Use respiratory protective equipment (RPE) with an APF protection rating of at least 20. Disposable RPE (rated FFP3), or reusable half mask RPE with P3 filter or semi-disposable RPE with P3 filter are suitable. Tight fitting RPE users should be subject to face fit tests to ensure the RPE affords each individual the anticipated level of protection.

MANAGING THE RISK

Training & communication

Supervision, maintenance & testing of controls and air monitoring are all vital aspects of managing the risk, in addition to health surveillance which can be a requirement in certain circumstances.

Air monitoring

Air monitoring is a specialist activity. It may be needed as part of a chemical risk assessment, as a periodic check on control effectiveness and to assess compliance with relevant OELVs, or where there has been a failure in a control (for example if a worker reports respiratory symptoms). A qualified occupational hygienist can ensure it is carried out in a way that provides meaningful and helpful results.

The WHO is the World Health Organisation, and the ILO is the International Labour Organisation. They are both United Nations agencies.

See occupational exposure limits (OELs)

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OCCUPATIONAL EXPOSURE LIMITS (OELs) & EXPOSURE LEVELS

Agent or substance	Control/Exposure Limit	Exposure Levels
Asbestos (All types)	0.1 fibres/ml (8-hr reference period)	The aim should be to avoid any exposure. There is a high risk of exposure from particular ACMs, including sprayed asbestos coatings and asbestos insulation, which may be disturbed by workers when demolishing or renovating buildings built before 2000. An asbestos survey must be completed by a qualified independent asbestos consultant prior to any construction work taking place.
MMMFs - Machine Made Mineral Fibres excluding RCFS which are considered more hazardous	5mg/m^3 (8-hr reference period)	These materials have various applications, including insulation, soundproofing, and reinforcement in construction. It's important to note that handling and installation of these fibres should follow recommended safety guidelines, as inhalation of airborne fibres can pose health risks. Manufacturers and regulatory bodies typically provide guidelines for the safe use of man-made mineral fibres.
Rosin (colophony) based solder flux fume	0.05mg/m^3 (8-hr reference period) 0.15mg/m^3 (15-min reference period)	Manual soldering with a hand-held iron poses the greatest risk of exposure because the operator's head is likely to be near, or actually in the fume. Exposures will be significant if work is prolonged, frequent or in enclosed spaces.
Isocyanates	0.02mg/m^3 (8-hr reference period) 0.07mg/m^3 (15-min reference period)	Exposure levels are affected by the frequency and duration of the work and are likely to be higher in poorly ventilated spaces. Lower exposures occur from roller and brush application. For further information on the safe use of diisocyanates visit **https://www.safeusediisocyanates.eu/**
Legionella bacteria	NA	Domestic sites are usually at lower risk. Where the water is stagnant and at temperatures of between 20-45 °C, bacteria growth is promoted with increased risk of exposure. Risk is also higher when working near or with spray equipment, or in sprays from cooling towers, showers, spas and pools etc.
Welding Fume Iron oxide fume (as Fe): Chromium (VI) Compounds: Chromium (III) Compounds: Ozone: Carbon Monoxide: Nitrogen Monoxide: Nitrogen Dioxide: Manganese and its inorganic compounds (as Mn):	 5 mg/m^3 (8-hr reference period), 10 mg/m3 (15-min ref period) 0.025 mg/m^3 (Process generated welding fume) 2 mg/m^3 (8-hr reference period) 0.2 ppm to 0.05 ppm (heavy work) 20 ppm (8-hr reference period). 100 ppm (15-min ref period) 2 ppm (8-hr reference period) 0.5 ppm (8-hr TWA), 1 ppm (15-min ref period) 0.2 mg/m^3 (8-hr reference period) (inhalable fraction) 0.05 mg/m^3 (8-hr reference period) (respirable fraction)	There is no single welding fume exposure limit. As the composition of welding fume varies each of the constituents of welding fume would need to be identified and measured individually. The closest to a general welding fume OELV is the iron oxide OELV and the worst-case scenario (chromium OELV) is applied when welding stainless steel. Occupational exposure limits for known welding fume constituents are under constant review. Chromium (VI) OELV is decreasing from 0.025 mg/m^3 to 0.005mg/m^3 from 17th January 2025. Chromium (VI) compounds are capable of causing cancer and occupational asthma. The level of exposure and subsequent risks to health vary depending on what type of welding process is undertaken, the base metal, the composition of the filler rod (core) and flux, any surface contaminants, the work environment (indoors/outdoors, ventilated/enclosed space) as well as the exposure time (arcing time).

See Further Information

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Further Information:

Asbestos-Containing Materials (ACMs) in Workplaces - Practical Guidelines on ACM Management and Abatement, Health and Safety Authority (hsa.ie)

Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001 to 2021

Safety, Health and Welfare at Work (Carcinogens, Mutagens & Reprotoxic Substances) Regulations 2024

Current Chemical Agents Code of Practice 2024 – Health and Safety Authority (hsa.ie)

Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006 – 2010. S.I. No. 386/2006, as amended 2010.

HSA Guidance on Isocyanates

The Safety, Health and Welfare at Work (Biological Agents) Regulations 2013 and 2020 (S.I. No. 572 of 2013 as amended by S.I. No. 539 of 2020)

HSA Guidance on Biological Agents