Chemical Safety

February 2020

Working with Man Made Mineral Fibres

Code of Practice

Occupational Health and Safety Service
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UNIVERSITY OF CAMBRIDGE

Contents

This guidance has been produced to help meet the requirements of the relevant statutory instruments, and the Health and Safety at Work Act.

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Introduction

Man made mineral fibres (MMMFs) are synthetic mineral fibres and consist of several fibre types each having different characteristics and uses. The MMMFs are usually divided into the following categories:

1. Mineral wools – glass wool, rock wool
2. Ceramic fibres
3. Special purpose fibres
4. Continuous fibre

Use of MMMF

1. Mineral wool is a general name for MMMF of a woolly consistency normally made from molten glass, rock or slag. Individual types are known as glass wool (fibreglass), rock wool or slag wool. Fibre diameters are usually in the range 4-9 microns. This is the most common form of MMMF and within the University of Cambridge it is the most widely found – thermal and acoustic insulation of buildings, process plant and boiler rooms, structural fire protection, pipe work etc.

2. Ceramic fibres are generally smaller than mineral wools with fibre diameters in the range of 2-3 microns. They are mainly used in insulation boards and blankets and where refractory properties are required.

3. Special purpose fibre diameters range 0.1-3.0 microns, giving them properties useful for certain more sophisticated applications such as lightweight high temperature insulation and high acoustic performance insulation.

4. Continuous filament fibres are in the range of 8-10 microns. The fibres can be woven into cloth or used in the manufacture of electric insulators and in the reinforcement of plastic and cement products.

Health Effects

a) All types of MMMF can cause irritation to the skin and eyes. The irritation is caused by coarse fibres. This can happen to people working with glass wool insulation, and occurs particularly in folds of skin around wrists, collars and waistbands. While most people's skin becomes resistant after a period of adaption some will need to take precautions to protect their skin.

b) Excessively dusty working conditions may cause irritation to the upper respiratory tract – resulting in dry sore throat and cough. This is usually reversible when removed from the conditions.

c) Some types of MMMF contain fibres of respirable size, which gives rise to concern about the long term effects of inhalation, in particular – does it cause cancer? The Government Committee on Carcinogenicity (COC) has reviewed all the evidence from several major studies in Europe and North America and issued the statement 'despite the limitations of the evidence available the COC concludes that occupational exposure to rock/slag wool or glass wool has shown the *potential to increase the risk of lung cancer*.'

What the law says: Workplace Exposure Limits

The Control of Substances Hazardous to Health Regulations (COSHH) 2002 apply to all forms of MMMF. Hazardous substances include dusts and mineral fibres and substances assigned a workplace exposure limit (WEL).

The 8 hour TWA Workplace Exposure Limit (WEL) for MMMF published in EH40 2005 (reviewed 2020), is expressed in two ways:

i) as a gravimetric limit of 5mg/m^3
ii) as an airborne fibre limit of 2 fibre/ml

Similarly, the WEL for Refractory Ceramic Fibres and Special Purpose Fibres, is expressed in two ways:

i) as a gravimetric limit of 5mg/m^3 for total inhalable dust
ii) as an airborne fibre limit of 0.3 fibre/ml for the respirable fraction

The limits are expressed this way because the different forms of MMMF produce very different kinds of airborne dust.

As far as inhalation is concerned exposure to MMMF -

"Should always be reduced to a level as low as is reasonably practicable and in any event the WEL must not be exceeded".

Assessing the Risks

The COSHH regulations require the University to carry out a 'suitable and sufficient' assessment of the risks to health of any work which may expose employees, contractors, students and members of the public to any hazardous chemical including MMMFs before the work begins. The person making the assessment should

a) breakdown the work into its constituent tasks and identify the workers involved.
b) assess the level and duration of exposure
c) plan the control measures to be used and identify the level of control that is deemed to be reasonably practicable.

When making the assessment the following factors need to be carefully considered:

a) The location of the work will often be carried out in restricted areas; lofts, plant rooms, within ducts or in other areas having poor ventilation. This is likely to result in higher exposure than similar work carried out in open conditions. Working with MMMFs above head height in any location may increase personal exposure to fibres.

b) Some preformed slabs of MMMFs handled with care will generate less dust than other materials, but after long service exposed to high temperatures and possibly mechanical vibration, degradation of the MMMF may occur and this may increase personal exposures.

c) Prolonged work on MMMFs is more likely to produce excessive personal exposures than similar work carried out for short periods. Even where the work does not last long every effort should be made to reduce exposure further.

Activities involving MMMFs are varied and if there is any doubt about whether a material contains MMMF a risk assessment should be completed and a sample analysed. Some operations especially those which cannot be enclosed or which have to be done by hand can create relatively high levels which may exceed the limits.

Table 1 Some examples of typical workplace exposures.

	expressed as fibres/ml	*expressed as mg/m^3*
Loft insulation		
Hand laying of mineral wool	less than 1	30
Loose fill cavity wall insulation	less than 0.1	less than 1
Maintenance work		
Insulation of preformed mineral slabs to boilers and ducting.	less than 0.5	less than 5
Cutting mineral wool/ceramic products without dust suppressants.	2-4	10-20
Removing preformed sections intact.	less than 5	less than 20

Note: the table gives average concentrations for the time which the process is actually taking place – they are not 8-hour time-weighted average concentrations – but the figures are based on experience within the HSE.

Practical precautions when working with MMMFs

The COSHH Regulations require that the exposure to all hazardous substances is prevented or, if this is not reasonably practicable, adequately controlled. PPE should only be used to secure control if it is not reasonably practicable to use other measures. However in *practical* terms, for many jobs the use of local exhaust ventilation (LEV) and dust suppression may be totally *impractical* because of the nature of the work, its location and its duration. There the use of the recommended PPE becomes the only viable option.

a) Prevention

It may be possible to use a substitute, non-fibrous material for all new work, but for the bulk of work where there is existing material it may be practical to work with the material wet or dampened to reduce dust levels. However this may not always be possible because of adjoining electrical services etc – and the problems of the associated waste water.

All new MMMF materials should be sealed or coated to minimise the dust exposure.

b) Engineering Controls

The application of LEV will not be reasonably practicable for many maintenance jobs but where it is used and small portable units are available it must be ensured that the exhausted air is not re-circulated into a workplace. If LEV equipment is used it must be thoroughly examined and tested at least once every 14 months, in compliance with the COSHH Regulations. Natural ventilation may also be an option.

c) Housekeeping

Settling dusts, waste and offcuts of insulation materials are potential sources of airborne dusts which can be controlled with good housekeeping. Waste and offcuts should be cleared up frequently and must not be trampled on. After a dusty operation has finished, cleaning should take place immediately to reduce exposure to dust. Cleaning should be by a dustless method such as using a vacuum cleaner (H type) and dry material should be thoroughly wetted before being brushed or swept.

d) Personal Protective Equipment (PPE) must be worn where the MMMF materials have been identified in the risk assessment.

   (i) Eye protection (safety glasses or goggles) must be worn by all personnel involved with handling mineral wool, especially those working with MMMFs at and above head height or otherwise exposed to falling dusts and fibres.

   (ii) Skin protection (gloves) skin irritation can be minimised by good standards of personal hygiene. If contact with the skin is made do not rub the skin – but rinse with *lukewarm water* not hot.

   (iii) Respiratory protective Equipment (RPE) should be available where dust levels cause irritation or where the WEL is exceeded. The respiratory

protection should be of a type approved by the HSE or made to a HSE approved standard – for detailed guidance see HS53, 4th Ed 2013– *Respiratory Protective Equipment at Work*. Experience suggests that a half face mask will be adequate with a high efficiency (FFP3) dust filter. The Safety Office use Sundstrom SR100 respirator with a P3 filter. **The use of ANY face mask, disposable or reusable requires the wearer to have been face fit tested for the make and model of mask to be used**. Training in the use, maintenance and storage of the respirator must also be provided (monthly maintenance is a legal obligation for re-usable RPE). Alternatively an FFP3 disposable dust mask may be suitable, such as the 3M 8835, **which ALSO requires face fit testing**.

(iv) Protective clothing: a boiler suit open at the collar and loose at the wrists and ankles (note – tight restrictions at the neck, wrists and ankles may increase the problem of skin irritation), gloves and head coverings should be worn. Protective clothing when not in use should be stored in a suitable place (a locker) where it is not in direct contact with personal clothing and it should be washed separately from other clothing. A potentially more practical solution would be the use of a good quality **disposable overall** such as the 'Tyvex' coverall from DuPont.

(e) Health Surveillance: the COSHH Regulations require health surveillance where employees are exposed to MMMFs and an occupational health questionnaire should be completed.

(f) Information and Training: when working with or handling MMMFs employees need to be provided with adequate information on the hazards associated with MMMFs and training on the precautions to be taken, eg the correct use of a respirator.

(g) Waste disposal: to minimise the fibre release, MMMF wherever possible should not be broken up prior to disposal. Fibrous wastes can be dampened down and/or placed in bags. MMMF waste should be treated as hazardous waste and disposed of by a licensed contractor.

Summary

Working with MMMF can be a hazardous operation but the risks can be minimised if awareness is raised and the precautions identified in this guidance note are followed.

The guidance will be reviewed on a regular basis to take account of changing working practices and technical and scientific knowledge.

Notes and References

1. A micron (or micrometre) is one millionth (10^{-6}) of a metre.
2. Control of Substances Hazardous to Health Regulations 2005.
3. HSE Guidance Note HSG 53. The selection, use and maintenance of respiratory protective equipment.
4. IARC monograph No:81 2002

Appendix 1

The Role of the Project Manager

The project manager has a key role in ensuring that the risks arising from working with MMMF are minimised as far as reasonably practicable. In the real world – has the assessment fully addressed all aspects of the work? It could be that for prolonged work with expected high exposure levels written method statements are required and a permit to work system used (such as appendix 3).

Appendix 2

Summary of the Precautions required when working with MMMF.

- Carry out a risk assessment to identify the extent of the hazard and of exposure.

- If unsure if the material is MMMF, get a sample analysed.

- If practical, work with the material wet or dampened.

- Reduce the time and numbers of people exposed, as far as reasonably practicable.

- Use LEV where practical. Portable units are available. Natural ventilation may also be an option.

- Practice good housekeeping and as the work progresses clean up dusts and waste materials without making it airborne.

- Wear appropriate PPE when working with MMMFs,

  - eye protection
  - recommended respiratory protection (i.e. 3M 8835)
  - gloves
  - boiler suit (i.e. Tyvex coverall)
  - head cover

- Information and training: read the University and HSE Guidance and attend the relevant training course.

- All waste materials to be bagged, labelled and disposed of as hazardous waste.

Appendix 3

Permit to Work in a Hazardous Area
Maintenance Personnel & Contractors

1. This Permit to Work is designed to provide assurance to maintenance personnel & contractors who are invited to enter and to carry out maintenance work in potentially hazardous areas, e.g. fume cupboard exhaust areas, microbiological laboratories and any other areas about which the contractor may wish to be assured that it is safe to work on.		
2. Department		
3. Area of potential hazard		
4. Nature of work to be carried out		
5. Source of hazard in the area has been effectively isolated by: (general description of ways in which the danger has been isolated.		
6. Details of action taken/advised to render area safe		Initials of designated person in the Department
(a) The mechanical equipment has been shut down and isolated		
(b) All harmful materials have been removed		
(c) Warning notices have been placed - that the equipment is not to be used		
7. Neighbouring equipment, which might be harmful to working in the area, has been shut down. Harmful materials have been removed from the vicinity of the area in which work is to be carried out. Warning notices have been placed that the neighbouring equipment is not to be used.		
8. The area in the vicinity of the work to be carried out has been cleared of fumes, dust and other matter, which might be harmful to people working on it, and is safe to work upon provided the advice in 7 is followed.		
9. List of protective wear that should be used while working in the area.		
10. Other remarks (limitations on use of tools, flame and methods)		

AUTHORISING/ACCEPTANCE SIGNATURES RELEVANT TO THIS PERMIT TO WORK	
11. Signature of designated responsible person in the department. I declare that the apparatus/equipment at 3 above is safe to work on, all safety precautions have been implemented and safety notices displayed	
Signature: …… Date: ……	Position: …….. Time: ……..
12. Acceptance by EMBS Supervisor	
Signature: …… Date: ……	Position: …….. Time: ……..
Signature of person or contractor undertaking the work to confirm receipt of this Permit.	
Signature: …… Date: ……	Position: …….. Time: ……..
13. Signature of above person or contractor confirming job is complete	
Signature: …… Date: ……	Position: …….. Time: ……..
14. Signature of EMBS Supervisor to confirm that work has been completed satisfactorily by contractor and has been handed back to Department for normal use	
Signature: …… Date: ……	Position: …….. Time: ……..
15. Signature of Department personnel confirming acceptance of work done and that the area is being returned to normal use, i.e. that the permit to work is no longer valid	
Signature: …… Date: ……	Position: …….. Time: ……..

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