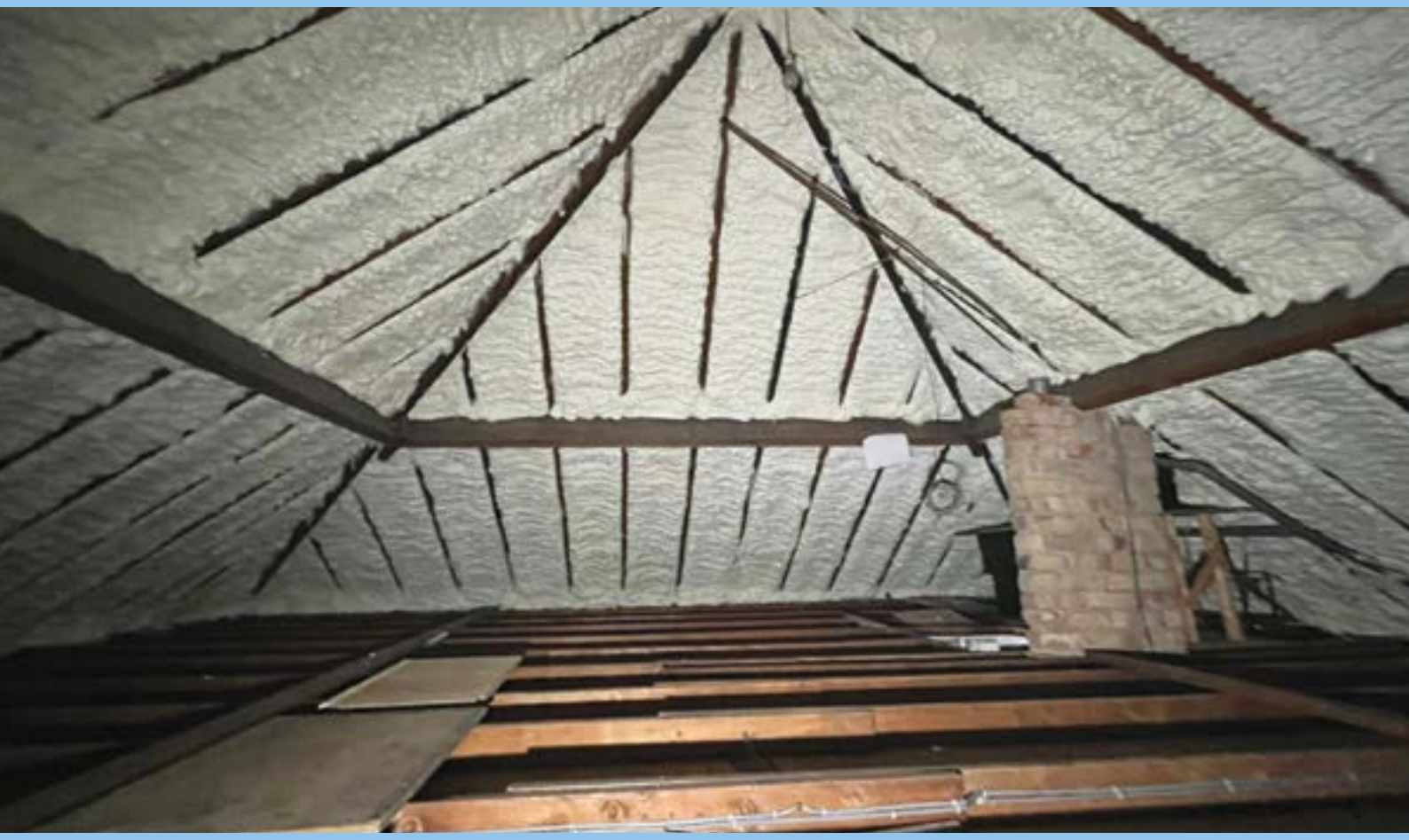
IMA
Insulation Manufacturers Association

Sprayed Foam Insulation

Code of practice for the installation of polyurethane spray foam (SPF) in domestic roofs



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Insulation Manufacturers Association (IMA) is the Trade Association that represents both the polyisocyanurate (PIR) and polyurethane (PUR) insulation industry in the UK. Its members manufacture rigid insulation that provides around 40 per cent of the total thermal insulation market into the UK. IMA's membership comprises all of the major companies in the industry, including manufacturers of finished PIR and PUR insulation products, as well as suppliers of raw materials and associated services.

IMA represents the industry's views across all government and industry stakeholders and decision makers and promotes a positive and dynamic business environment for the PIR and PUR insulation industry in the UK.

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1 Introduction

Polyurethane spray foam (SPF) has been used successfully in the UK, Europe and worldwide for more than 30 years and is a valuable addition to improving the energy efficiency of many buildings. It is estimated that more than 250,000 properties in the UK have been treated with SPF insulation improving thermal performance for building occupants as well as reducing fuel bills.

SPF can make an important contribution to the thermal performance of a building, especially when retrofitting existing buildings, although its uses and benefits are wide ranging and can also be used in new build applications.

It is widely accepted that insulation is the single most important energy efficient element in the specification of a building. Ensuring that the fabric of a building is insulated is the most cost effective and easiest way to improve its energy efficiency regardless of whether the building is old or new. Greater energy efficiency means that less energy is needed to either heat or cool a building. In turn this can lead to lower fuel consumption, lower energy bills, greater comfort for the consumer and fewer carbon emissions to damage the environment. The successful longevity of SPF applications has resulted in many properties being bought, sold and mortgaged over time to the satisfaction of lenders, insurers and homeowners and the products continue to perform as intended.

2 Scope of the document

This document sets out the requirements for the procedures involved when specifying and installing spray foam (commonly known as SPF) products to the inside of roofs of domestic properties.

It provides guidance to installers who apply professional grade high pressure spray polyurethane foam for retrofit applications. While other SPF products may be used at new build construction sites, they are not the primary focus of this document.

This Code of practice also addresses health and safety aspects of the typical SPF application into a UK domestic loft space, including initial site assessment, site preparation, SPF chemical storage and handling, SPF application, trimming and cutting, coating and priming of the foam surface, site clean-up, spill response, disposal of SPF chemicals, and re-occupation.

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3 Definitions and abbreviations used in this document

3.1 Definitions

3.1.1 Approved installer
An installer of SPF who is registered with a manufacturer (system designer) and has been trained in the installation of their product(s).

3.1.2 Blowing agent
Usually contained in the formulated polyol, it causes the foam to expand upon the reaction between the formulated polyol and the pMDI.

3.1.3 Catalyst
Usually contained in the formulated polyol, it promotes the reaction between it and the pMDI component.

3.1.4 Flame retardants
Usually contained in the formulated polyol, they modify the fire behaviour of the final foam.

3.1.5 Formulated polyol
Is a polyol resin system, which typically contains a blend of several classes of chemicals.

3.1.6 pMDI
Polymeric methylene diphenyl diisocyanate.

3.1.7 Polyurethane foam (PUR)
Rigid cellular insulation material or product with a structure based on polymers mainly of the polyurethane type.

3.1.8 Surfactants
Usually contained in the formulated polyol, they regulate the cell structure of the foam.

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3.2 Abbreviations

3.2.1 PPE
Personal Protective Equipment - intended to protect the worker from exposure to chemicals.

3.2.2 SAR
Supplied Air Respirator – breathing apparatus that supplies fresh air directly to the installer from an outside source.

3.2.3 SDS
Safety Data Sheet – contains important information on chemical products, such as potential risks and safety precautions.

3.2.4 SPF (spray foam)
A polyurethane foam system for spraying onto the underside of roofs.

3.2.5 System designer
The system designer is the manufacturer of the SPF system.

4 Benefits

SPF insulation provides a wide range of benefits when used as a retrofit application in existing buildings and when installed correctly can last the lifetime of the building.

Manufacturers' products will offer different benefits depending on the application. For full details users should refer to the manufacturers third party certification.

The use of SPF in roofs:

- Maintains an airtight seal so that insulation and air tightness can be provided in the one application delivering enhanced energy efficiency performance
- Expands to fill the full area that requires insulation, so is suitable for uneven surfaces
- Can be carried out with minimal disruption or mess to building occupants
- Can improve sound proofing and reduce noise transfer
- Does not sag, shrink or settle and expands and contracts with the natural movement of the building
- Is vapour permeable (see section 5) and does not support mould growth
- Adds roof racking strength (closed cell foams only) as well as being impact resistant
- Can now use recycled plastics as part of the raw material make up

5 Overview of the product

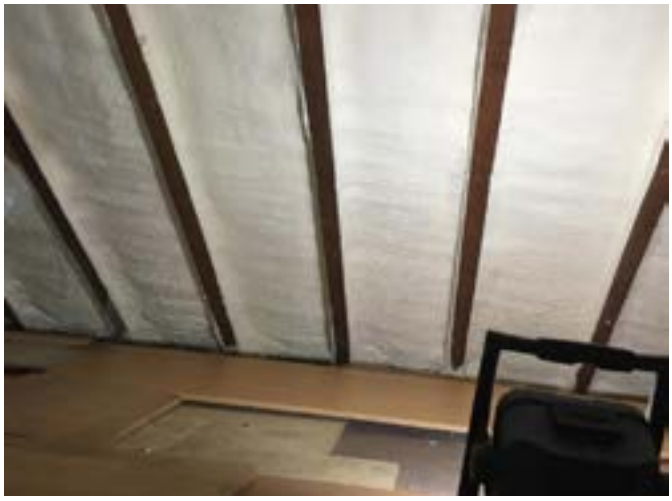
SPF is formed via an exothermic (heat-releasing) chemical reaction between generally equal amounts in volume of a formulated polyol blend and polymeric methylene diphenyl diisocyanate (pMDI). Within seconds of application, the foam achieves a tack-free state when the foam surface is no longer sticky.

The formulated polyol is a mixture of polyols and other chemicals that have specific roles in the reaction process or impart important characteristics to the finished foam insulation. These chemicals may include catalysts, blowing agents, fire retardants and/or surfactants.

The diisocyanate component reacts with the hydroxyl group in the formulated polyol to create the urethane bond, which when repeated creates a polyurethane.

More information on the chemicals can be found on the specific SDS provided by the supplier of the chemicals. This information should be available to SPF installers at all times.

There are two types of SPF:



Closed cell foams - Cells inside a closed cell foam do not allow air to pass through the foam thus maintaining an airtight barrier but do permit very low levels of water vapour to pass through so there is no build-up of moisture. Closed cell foam has a much higher density than open cell foam and is a more solid and stable in its structure.

Open cell foams – These are foams where the cells are not completely encapsulated but they still provide air tightness. The foam is a softer, more flexible material. Open cell foam is breathable and facilitates vapour diffusion and bi-directional drying.

6 Applications

SPF has third party certification to be used in roofs as shown in the table below:

	Open cell foam	Closed cell foam
Pitched tiled roof with breather membrane	✓	✓
Pitched tiled roof with sarking membrane	✓*	✓*
Pitched tiled roof with no felt or membrane	✓*	✗
Pitched roof above a loft space	✓	✓

*Check with manufacturer (system designer) for suitability and certification

7 Pre-installation survey of the roof

Prior to installation of any work a pre-installation survey will need to take place. This should be done by a suitably competent employee of an approved installer.

Pre-installation checks

Before carrying out an installation the approved installer must carry out a series of pre-installation checks which will include at least the following:

- Is the building suitable to receive SPF?
  - Details of condensation risk analysis
  - Moisture readings
  - Relative humidity readings
- Whether open or closed cell foam is to be used?
- Whether any pre-installation repairs are needed?
- Details of background ventilation checks (i.e. have fans been ducted out of the building correctly)
- What type of membranes are in place – high resistivity (HR) or low resistivity (LR)
- Photographic evidence of the roof space before installation

Example of a timber moisture reading gauge

The findings should be documented and made available to the homeowner in a suitable presentation pack.

The approved installer should return a copy to the manufacturer (system designer) for the purposes of record keeping/ property mortgage records etc.

8 Installation

SPF insulation cannot be carried out as a DIY project. It is important that it is carried out by a registered installer who has been approved and trained and is monitored by the manufacturer (system designer) of the product being installed.

The product being installed must have a third-party certificate of fitness for purpose such as a BBA certificate, or a Kiwa BDA Agrément®.Each certificate is individual to the product and its application.

9 Health and safety

Persons may be exposed to airborne concentrations of SPF chemicals during:

- Handling of SPF chemicals
- Application of SPF
- Trimming, cutting and shaping SPF after application
- Clean-up and equipment maintenance
- Dealing with a spillage

Access to the work area during these tasks should be appropriately restricted to personnel whose responsibilities require them to be in the work area, are trained in the hazards of exposure to SPF chemicals and are using the appropriate PPE correctly.

Due to the nature of works and materials being used in this application, health and safety has been broken down into three separate sections:

- Health and Safety Regulations (Appendix A)
- Health and Safety procedures when installing SPF insulation (Appendix B)
- Personal protective equipment (Appendix C)

SPF is regulated by the UK REACH regulation which applies to the majority of chemical substances that are manufactured in or imported into Great Britain. From August 2023 any user of pMDI will be required to undergo mandatory training before using these products. See appendix A (page 19 for more information)

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10 Worksite good practices

Due consideration should be given to the regulations in place to protect the workforce. These are shown in appendix A.

10.1 Site preparation

The following factors should be considered when planning an SPF installation:

- If the work will take place in an occupied building or a building under construction
- If the building is to be vacated
- If other trade workers will be present at the time of application?
- The size of the work area

When preparing the loft space for SPF application, consider the following good practice indications:

- Before beginning work, designate an area for wearing and removing PPE
- Determine in advance the potential for overspray damage. Have a plan in place to address overspray damage to adjacent property. Train all installers in overspray prevention
- Identify and protect surfaces that could be damaged such as windows, doors and equipment, in advance of application

10.2 Ventilation

Reoccupation should not take place into the roof space for 24 hours unless a forced ventilation system with at least 30 air changes per hour has been in operation during the SPF installation. If such a forced air ventilation system has been utilised then the reoccupation time can be reduced to two hours. These periods are manufacturer specific and due regard should be given to the manufacturers' installation procedures.

10.3 Chemical storage and handling

It is important that SPF chemicals are stored properly before and during use in the work area.

Chemical storage containers must be kept in a secure cool and ventilated area away from direct sunlight, rain and incompatible materials. Refer to the manufacturer's SDS for the storage temperature of the products, which are typically between 10 and 25 °C. Ventilate the storage space and locate it away from possible sources of ignition or risks of being damaged by moving vehicles such as forklifts or cranes.

pMDI should be stored far away from water, acids, caustics, alcohols, and strong oxidizing and reducing agents.

In addition to storing containers away from incompatible materials, it is important to maintain a tight seal on pMDI containers to help protect against moisture or direct contact with water. Contamination with water could result in the drum rupturing or exploding because water slowly reacts with pMDI to produce carbon dioxide gas.

Formulated polyol drums or containers should also be stored at an appropriate distance from acids, caustics, and strong oxidizing and reducing agents in order to avoid contact. When opening the formulated polyol drums or containers, the slow opening of the bung on top of the drum helps release built-up pressure so the drum can be opened safely. If heating drums with a blanket heater, loosening the bung on the top of the drum will allow for off-gassing. A temperature probe can be inserted into the material to monitor the material temperature to help prevent overheating. Gentle agitation of materials with a drum mixer helps to heat the contents evenly. Care should to be taken when inserting and taking out the drum content not to cause spillage. Chemically blown closed cell products should never be agitated.

10.4 Clean-up and equipment maintenance

After the application is completed, clean up the work area. Appropriate PPE should be worn while cleaning equipment and while handling any containers that have contained SPF chemicals, such as drums, buckets and spray guns.

Upon exiting the work area, remove PPE in a designated clean zone away from the areas where there is a potential risk of exposure to SPF chemicals. Remove and dispose of PPE according to applicable local or national regulations. Inspect and clean reusable PPE for continued effectiveness. Remove damaged PPE from service until repaired, or dispose of the damaged PPE and replace it.

It is good practice to keep work clothing at work. Note that leather items including shoes, belts and watch bands or clothing, that have been contaminated by exposure to SPF chemicals cannot be decontaminated and are therefore to be appropriately disposed of.

10.5 Spills and emergency procedures

A spill or release is the accidental discharge of a material to the soil, water, or air. It is advisable to have an emergency spill containment kit available that contains dry absorbent materials such as clay, pads, or socks to contain or minimise the affected area. Because formulated polyol can be extremely slippery, mark and clean up spills as soon as possible, particularly from smooth walkways or floors.

Although very infrequent, sizable spills and releases of formulated polyol and pMDI can occur. Should this happen, it is important to take immediate action to minimise environmental contamination by following the instructions in the SDS.

Depending on local or national regulations, you may be required to report spills and releases of SPF ingredients to local, and/or national authorities. For this reason, keep all containers of chemicals tightly sealed except when they are in use.

In the event of a large pMDI spill or release (i.e., more than a few kilograms or litres), consider the following:

- Evacuate all personnel away from the immediate area to avoid unnecessary exposure
- Call the emergency services
- Those involved in the clean-up should wear appropriate PPE as required by the SDS

- Prevent pMDI going into drains by sealing spill area with sandbags, rubber mats or wood chips/fibres
- Cover with fire extinguishing foam, sand or cat litter to prevent escape of pMDI vapours
- Put contaminated sand in steel drums (max 2/3 full) and leave open (for at least 48 hours or longer if temperature is below 10°C) to prevent pressure build up
- Wash the affected area with liquid decontaminant

Characterise waste as either hazardous or non-hazardous and dispose of waste in accordance with local regulations.

10.6 Disposal of SPF chemicals

SPF chemicals (both polyol and pMDI) are classified as hazardous waste materials and can only be disposed of following the national regulations. Small quantities of formulated polyol and pMDI can easily be transformed into cured polyurethane foam, which is non-hazardous waste. If large quantities of SPF chemicals are to be disposed of, the polyurethane system's manufacturer should be contacted for advice.

Drums that have contained pMDI and formulated polyols need to be properly prepared, decontaminated and disposed of in accordance with regulatory requirements. It is never acceptable to abandon or discard an empty drum or IBC. Consult the SDS for more information.

Always wear appropriate PPE when handling SPF chemicals and drums containing these materials.

10.7 Health and safety instructions for installers

The work area should be restricted to personnel who are required to be in the work area due to their job responsibilities, who have completed the required training and who are wearing the required PPE.

Suitable PPE is:

- Protective clothing
- Gloves
- Safety boots
- Respiratory, face and eye protection

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11 Installation procedure

Installation should be carried out in accordance with the product manufacture's stipulations. Only manufacturer trained and approved installers should apply products, or by trainees under the supervision of a trained installer. All installations should be in accordance with the relevant BBA or Kiwa certification.

All products used should be prepared (heated and mixed if necessary), to the manufacturer’s specific product parameters. Seasonal adjustment to advised temperatures is allowed within stipulated parameters.

Spraying of a product should be as defined by the manufacturer and as covered in the manufacturer training programme and installation manual. Never spray outside the manufacturers guidelines or to substrates not recommended by the manufacturer.

Failure to adhere to the product specification will void any warranty offered by the manufacturer.

12 Post-installation pack

A homeowner pack should be left after the installation. This should detail the installer, date of installation, product type and batch, certification details, photographs, pre-installation survey, condensation risk analysis and any warranty/guarantee.

An abbreviated version should be left in the loft space detailing the installer, date of installation, product type and batch and certification details and who to contact to gain details of photographs, the pre-installation survey, the condensation risk analysis and any warranty/guarantee information.

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Appendix A

Health and safety legislation and regulations (informative)

The following guidance applies to working on site in general. Certain aspects may therefore be more relevant to some trades than others. However, all operatives working on site should have an appreciation of all the legislation listed.

1. The Health and Safety at Work Act 1974

This is the main piece of health and safety legislation. It requires employers to provide safe places of work and safe systems of work. Provided for the establishment of the Health and Safety Commission (HSC) and Executive (HSE) and their powers, it also covers the penalties which can be imposed by courts if an offence is committed.

2. The Management of Health and Safety at Work Regulations 1999

These regulations, amongst other things, place a legal requirement on employers to assess the risks to health and safety which arise out of their work activities and to introduce measures which control the risks to an acceptable level.

Risk assessments explain:

- The hazards of the job
- The risks
- The controls needed to minimise the risk to a safe level
- The regulations indicate the General Principles of Prevention which must be adhered to when deciding upon risk control measures. For example:
  - Avoiding the risk, e.g. using floor-standing or bench mounted rather than hand-held equipment
  - Combating risks at source, e.g. suppressing dust by wet techniques rather than relying solely on PPE
  - Adapting to technical progress, e.g. buying new work equipment which is designed to produce a cleaner cut or which incorporates low vibration technology
- The regulations also put legal duties on employers with regard to:
  - Providing employees with comprehensive information of the risks identified by the assessment and the measures implemented to control those risks
  - Ensuring that employees are capable, in all aspects, of carrying out the work that they are required to do in a safe manner and without risks to health
  - Cooperating with other employers, where the employees of more than one employer share a workplace in the interests of health and safety.

3. The Construction (Design and Management) Regulations (CDM) 2015

These regulations, often referred to as CDM, place a clear emphasis on the need for everyone on site to be competent, for co-operation between all parties on site and for the co-ordination of work activities so as to avoid, or reduce, health and safety risks. The main contractor (or principal contractor if the project is notifiable) must ensure that these requirements are complied with.

Every construction project or building project no matter how small is a CDM job. The following parts of the CDM Regulations apply to all projects:

- General management duties
- Duties relating to health and safety on construction sites
- Welfare facilities
- Reports of inspections

Projects which are expected to last over 30 days, or 500 person days, must be notified to the HSE.

On these projects there are additional duties:

- The client must appoint a principal contractor and a CDM co-ordinator
- The principal contractor must compile a health and safety plan which contains the risk assessments for all of the work which will be taking place
- The site must have clear health and safety rules, and employees on site must have the opportunity to express their opinion, as regards safety provisions

The CDM Regulations are supported by an Approved Code of Practice and Guidance Notes.

4. The Control of Substances Hazardous to Health Regulations (COSHH) 2002

These regulations often referred to as COSHH, include the following requirements:

- Know the product or substance you are to work with, e.g. concrete
- Assess the health hazards, e.g. inhalation of dust, dermatitis, burns
- Eliminate the hazard or control the risks, e.g. prevent or reduce exposure, use effective control measures, use PPE as a last resort
- Provide information, instruction, training and supervision, e.g. the risk of dermatitis, controls, use of PPE

- Provide appropriate health surveillance, e.g. lung function tests, skin checks
- Monitor the effectiveness of controls, e.g. decrease in skin conditions when gloves are worn
- Keep records of monitoring and health surveillance
- Prepare accident, incident and emergency plans, e.g. first aid, fire procedures, contact with emergency services.

5. The Provision and Use of Work Equipment Regulations 1998

These regulations often referred to as PUWER, require that:

- Equipment is used for the purposes for which it was designed
- Consideration is given to the working conditions and the health and safety of the person(s) where the equipment is to be used
- Equipment is used only for operations and under conditions where it is suitable
- Equipment is maintained and inspected as is appropriate

Employers must always consider:

- The nature and condition of the equipment
- The place where it is to be used
- The purpose for which it is to be used
- Its suitability for the job in hand

Information, instruction, training and supervision must include:

- Conditions and methods in which the equipment will be used
- Any foreseeable abnormal conditions and appropriate action
- Any conclusions drawn from experience when using the equipment
- Safe working methods
- Possible risks that may be found and precautions to be taken

With particular regard to cutting, due attention must be paid to the requirement for competence in those workers who mount (fit) and/or use abrasive wheels due to the inherent risk of the wheels breaking up when rotating at high speed if these activities are not carried out safely. The HSE publication ‘Safety in the Use of Abrasive Wheels’ (HSG17) provides further details.

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6. The Manual Handling Operations Regulations 1992

These regulations place legal duties on both the employer and the employee. The employer must attempt to avoid the need for manual handling, which involves a risk of injury, by identifying other suitable ways of moving loads. Where this is not possible, the employer should assess all tasks that involve a risk of injury by:

- Undertaking a risk assessment of each task
- Implementing control measures to reduce the risks
- Providing suitable training and information to employees
- Reviewing risk assessments when necessary, e.g. when there is a change in task

The employee must cooperate with the employer by:

- Using appropriate equipment as they have been instructed
- Working according to the method statement or work instructions

When lifting, consider task, individual, load, environment.

7. The Control of Noise at Work Regulations 2005

These regulations require that employers assess the noise levels which employees are exposed to while they are working and then to prevent or reduce the risk to health from the exposure to noise by reducing the level of the noise where necessary. The main hazard to health is deafness which can be caused by very high noise levels over a short period of time, or lower noise levels over a longer period of time.

If the noise level exceeds certain figures, employers must provide employees with information on the levels and what they must do to protect their hearing. As a general rule, a noise level is too high if you have to raise your voice to have a conversation with someone who is about 2 metres away.

When employers have done everything that they can to reduce the noise, yet it is still above certain levels, they must provide hearing protection for employees. This may be ear plugs or ear muffs and employees must be trained in how to use and look after them properly.

At higher noise levels, employers must create ‘hearing protection zones’, identify them by signs and ensure that everyone entering the zones wears hearing protection.

8. The Electricity at Work Regulations

These regulations mainly deal with the safety of fixed electrical installations, but they do require that persons are competent, and that safe systems of work are implemented, if an electrical hazard exists. All necessary information, instruction, training and supervision must be given and written safe systems of work should form part of the ‘permit to work’ procedure.

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9. The Control of Vibration at Work Regulations 1999

The use of hand-held tools which cause vibration will expose the user to a risk of hand-arm vibration. This vibration damages the nerves and blood supply and can cause vibration white finger. This shows up as a loss of feeling in the fingers, pins and needles, numbness and blanching (going white) at the ends of fingers. It is usually worse in cold weather.

Employers have a duty to risk assess the use of vibrating tools, and then to either eliminate any risk they pose or to limit the use of vibrating tools so that limits set out in the regulations are not exceeded. One way of doing this is work sharing or job rotation on the tools.

Newer tools have been designed to produce a lot less vibration. 'Anti-vibration' gloves do not have much effect in reducing the harmful effects of vibration, although they may help a little by keeping the hands warm.

10. The Confined Spaces Regulations 1997

Work in confined spaces is always potentially hazardous.

A confined space is one which is substantially, though not always entirely, enclosed. It is a place where there is a reasonably foreseeable risk of serious injury resulting from exposure to hazardous or flammable atmospheres or other conditions, e.g. a loft, cellar or an inadequately ventilated basement room, manhole, ceiling void or duct.

There is a number of main dangers to operatives which are:

- Suffocation from lack of oxygen
- Injury from collisions with internal loft trusses or beams
- Inhalation of a toxic atmosphere
- Injury from combustion of a flammable atmosphere

There may be other dangers associated with the unexpected start-up of machinery or exposed electrical conductors, etc.

For working in confined spaces, employers must ensure a safe system of work. This will include proper procedures that are reviewed and updated regularly, risk assessments, method statements, a permit to work system, and details of adequate rescue facilities.

11. Personal Protective Equipment at Work Regulations 1992

Employers must provide, free of charge, any personal protective equipment or clothing (PPE), or any respiratory protective equipment (RPE) which the employer's risk assessment has identified as being necessary for employees to carry out their work safely and without risks to their health.

The use of PPE and RPE must only be resorted to when there are no other reasonably practicable ways of controlling the risks. PPE and RPE will protect the wearer, but only if it is the correct PPE or RPE for the job, in good condition and used properly. Where RPE is used, 'face-fit' testing should be carried out by a competent person to ensure that it forms a good seal around the face.

Two important factors that must be considered are:

- Eye protection, must be selected so that it is appropriate for the specific hazard, e.g. high speed impact of flying particles or fine dusts
- Filtering face masks or an appropriate respirator, must be selected by a competent person. 'Nuisance dust masks', as are available through DIY and other retail outlets, are not manufactured to the required standards and should not be regarded as RPE.

12. UK REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)

SPF is regulated by the UK REACH regulation which applies to the majority of chemical substances that are manufactured in or imported into Great Britain (GB) (England, Scotland, Wales).

UK REACH aims to:

- Provide a high level of protection of human health and the environment from the use of chemicals
- Make the people who place chemicals on the market (manufacturers and importers) responsible for understanding and managing the risks associated with their use

Downstream users of chemicals, i.e. those who use them at work, will need to comply with any conditions described in the SDS. Where an SDS has attached exposure scenarios that detail how chemicals may be used, then users should implement the required risk management measures or use equivalent measures. For more information see UK REACH CA Information Leaflet Number 4, What REACH Means for Users of Chemicals and the Agency's 'Guidance for Downstream Users'.

From August 2023 any user of pMDI will be required to undergo mandatory training.

For advice on the application of REACH obligations, you can contact the UK REACH Competent Authority's national helpdesk:

Email: **UKREACHCA@hse.gsi.gov.uk**; website: **www.hse.gov.uk/reach**

13. Control of Asbestos Regulations 2012

The duty to manage asbestos requires the preparation of a plan on how to manage the risks from asbestos on the premises, including how to assess the potential risks from asbestos. The condition of the asbestos will influence whether it should be removed or left in place. If it is in good condition and unlikely to be damaged or disturbed the best option is probably to leave it where it is.

If it is in poor condition, or likely to be damaged or disturbed, you may need to consult with a specialist contractor to decide what action to take. For more information go to **www.hse.gov.uk/asbestos/information.htm**

14. Health and safety guidance

The Health and Safety Executive publishes a wide variety of guidance materials in connection with the way in which employers should implement the regulations. These include the following.

- Noise at Work, Guidance for Employers Publication number INDG 362
- Protecting the Public, Your Next Move Publication number HSG 151

A catalogue of publications can be obtained, and orders placed with, HSE Books.

Telephone: **01787 881165**; website **www.hsebooks.co.uk**

15. Risk assessments

The Management of Health and Safety at Work Regulations require that a risk assessment is carried out for every work task to be undertaken. This assessment is intended to identify any risks to health and safety which may be inherent in the task, and to detail any control measures necessary to reduce the risks to an acceptable level. Risk assessments must be carried out by someone competent in the work activity being assessed to enable all the risks and hazards to health and/or safety to be identified.

Risk assessments must be suitable and sufficient, and take into account such factors as the complexity of the task and the competency of the person(s) undertaking the work. The findings of the assessment must be recorded so that any person with an interest in its content can check that statutory requirements have been met and potential problems identified. They should also be in a format so that the installer understands the risks and the necessary controls required to carry out the task safely. Written risk assessments may be stored in an electronic format, providing copies can be retrieved and printed if requested.

Ideally, the risk assessment process would identify methods of working which would not put anyone's health or safety at risk. It is obvious, however, that in practice this is not always possible, although a good knowledge of the work techniques available to those involved in installation can significantly reduce the risks.

The following list, which is not exhaustive, highlights areas that should be considered when carrying out a risk assessment:

- The competence and experience of the person(s) who will carry out and/or supervise the work
- The adoption of safe and healthy work procedures and practices, means of access and egress, availability of manufacturers' information, training that has been undertaken or is required
- The physical environment in which the work is to be carried out, e.g. occupied domestic property

- Fire precautions and procedures, availability of fire extinguishers, means of escape or alarms
- The possible need for health surveillance through exposure to hazardous substances, noise or vibration
- Manual handling, avoidance of potentially harmful manual handling but where manual handling is unavoidable, the use of correct lifting procedures
- The control and suppression of harmful dust and fibres or other materials
- The adoption of other control measures in preference to using personal protective equipment (PPE)
- Confined spaces, e.g. lack of ventilation, fire trap/risk
- Structural stability of floor/ceiling joists
- Falls from height
- Possible asbestos/disturbed asbestos from fire curtains, lagging
- Competence, knowledge, skills/training and experience

16. Method statements

A method statement details exactly how the work is to be carried out. The objective is to ensure that contract works are conducted safely and without risk to health. They form part of the management procedures in respect of the project and provide important information for contractors and operatives who will carry out the work. Two copies are normally provided: one for the client and one for the contractor. Method statements typically include the following information:

- Date
- Client and contractor contact details
- Who will supervise the work
- The qualifications of the operatives who will carry out the work
- Plant and equipment to be used
- Location where the work will be carried out
- Description of the work
- Sequence of works
- Instruction of operatives in safe systems of work
- Signature of supervisor

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Appendix B

Substances that may be encountered during SPF application and potential health hazards (informative)

It is imperative that all health and safety guidelines are followed when applying spray polyurethane foam (SPF) and all information contained in the Safety Data Sheet (SDS) for the SPF product being used is considered before work begins. The SDS is the primary source of extensive and specific information on polyurethane system ingredients so that appropriate protection can be afforded. Guidance on PPE and ventilation is given in appendix C.

While we cannot review all the potential health effects that could result from SPF chemicals here, it should be understood that an installer could be exposed to SPF chemicals by breathing chemical mists or vapours, skin or eye contact, or ingestion. A few key points are presented here.

1. Formulated polyol

The formulated polyol is a polyol resin system which typically contains a blend of several different classes of chemicals. These include the basic polyols – the principal ingredients – and smaller amounts of amine and/or metal catalysts, blowing agents, surfactants, flame retardants and any other additives to achieve the foam performance for which the SPF system is designed. There can be a large variation in the chemicals included in the formulated polyol.

Inhalation of the formulated polyol can cause irritation of the respiratory tract, causing a cough, sore throat and runny nose.

Skin or eye contact may occur throughout the work when there is a potential to come into contact with SPF chemicals or any items contaminated with SPF chemicals including supplies, tools, equipment and PPE. For most formulated polyol chemicals contact to the skin or eyes may cause irritation and some may lead to skin sensitisation.

2. Polyols

Polyols are the main components in the formulated polyol. Polyols are polyfunctional alcohols with low vapour pressure. They may be irritating to the eyes, skin and respiratory tract at high exposure levels, especially during spray applications. Polyols react with pMDI to form polyurethane foam.

3. Catalysts

Catalysts promote the reaction between the formulated polyol and the pMDI, helping polyurethane foam cells develop sufficient strength to maintain their structure to resist collapsing or becoming deformed and help with the completion of the reaction or “cure” in the finished foam. Most catalysts used in SPF are amine based, while some formulations may use metal catalysts.

Over-exposure to amine catalysts may result in irritation to the respiratory system, skin, and eyes. Inhalation exposure may cause a reversible effect known as “blue haze” in the eyes. Once removed from the exposure, vision is gradually

restored. If vision is not restored within a few hours seek medical attention. Amines are derived from ammonia and can have a characteristic ammonia/fishy odour.

If present, metal catalysts can be absorbed through the skin resulting in a headache and/or nausea. These compounds can also irritate the eyes, skin, and respiratory tract. Prolonged skin contact can cause dermatitis. Many metal catalysts used in the formulated polyol do not have occupational exposure limits.

4. Blowing agents

The formulated polyol may use chemical (reactive) blowing agents, physical blowing agents, or a combination of both types of blowing agents.

A chemical blowing agent reacts with another raw material to generate a gas. Water is often used as a chemical blowing agent in a formulation. It reacts with pMDI to generate carbon dioxide.

Physical blowing agents are vaporized by the heat of the polyurethane reaction. Hydrofluoroolefins (HFOs) are common physical blowing agents. Skin and eye contact with HFOs can result in contact irritation.

5. Flame retardants

Flame retardants help to improve the fire behaviour characteristics of the finished foam.

Exposure to flame retardants may be irritating to the respiratory tract and direct contact with flame retardants may be irritating to the eyes and skin. There are different classes of flame retardants and different toxicological profiles for these compounds, so the SDS must always be consulted.

6. Surfactants

Surfactants include silicone polymers which typically have low toxicity by all routes of entry into the body. Some surfactants can cause slight irritation to the eyes, skin and respiratory system. Occupational exposure limits have not been established for surfactants.

7. pMDI

pMDI is very reactive and will rapidly react with water, polyols, acids, inorganic bases (such as sodium hydroxide), ammonia, metal salts or oxidizing agents (such as bleach or chlorine).

Short term/one-off exposure above safe levels can cause following symptoms:

- Irritated mouth, throat, lungs
- Tight chest, coughing
- Difficulty in breathing
- Watering eyes

- Itching, red skin (immediately or delayed)

Be aware that symptoms can occur up to 24 hrs after exposure.

Long term/repeated over-exposure from breathing or skin contact leads to risk of sensitisation. Symptoms are:

- Occasional breathing difficulties similar to asthma, hay fever, sneezing
- Potentially severe asthma even at low pMDI exposure

Sensitisation to pMDI is a reaction of the immune system in which certain individuals may be more responsive to a chemical exposure at progressively lower concentrations, even below concentrations considered safe for most people. Early recognition of sensitisation and prompt and strict elimination of exposures is essential to reduce the risk of long-term or permanent respiratory problems for workers who have become sensitised. Individuals sensitised to SPF chemicals should not be assigned work tasks where there is potential for exposure to SPF chemicals.

pMDI chemicals have a musty odour, but because of the relatively high odour threshold, most people cannot smell pMDI chemicals when present in concentrations equal to applicable occupational exposure limits. As a practical matter, this means that if you smell pMDI (musty odour), you have probably exceeded the exposure limits. If a musty odour is recognised over the course of work, exit the work area and re-evaluate engineering controls and PPE to prevent over-exposure. Skin or eye contact may occur throughout the application when there is a potential to have contact with pMDI chemicals or any items contaminated with pMDI chemicals, such as supplies, tools, equipment, and PPE. Skin contact can cause irritation and sensitisation (allergy). Symptoms include reddening, itching, swelling and rash. Skin contact alone may lead to respiratory sensitisation (asthma). Eye contact can cause reddening, tearing, stinging and/or swelling of the eyes.

8. Dust

Dust may be generated during all phases of construction. Use good housekeeping throughout the project to prevent build-up of dust. In addition to the inhalation hazards associated with exposure to airborne dust, high levels of dust are also associated with reduced visibility and slip hazards.

Carefully evaluate the need to wear PPE appropriate for SPF chemicals if there is a potential for exposure to dust after the spray application has concluded but before the cure time has been reached. This includes respiratory protection to prevent inhalation exposure, protective clothing and gloves to reduce the risk of skin contact and eye and face protection to reduce the risk of eye contact. Although SPF typically reaches 90 % of its cure and will have obtained at least 90 % of its optimal physical properties within one hour of application, it can take an additional 23 to 72 hours for a complete cure, depending on the ambient temperatures. Refer to the SDS for specific information related to the SPF chemicals with which you are working.

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Appendix C

Personal Protective Equipment (PPE) (informative)

1. PPE

Even with effective engineering controls, personnel who work with SPF chemicals still need to wear appropriate PPE. Generally, PPE is required for installers and other adjacent workers who may enter a SPF application work area. Work area restrictions (signs or tape) should be applied to limit entry into the spray enclosure or spray area to personnel wearing proper PPE until the level of airborne concentrations of chemical substances is below the applicable occupational exposure limits.

It is critical to avoid inhalation of, and skin and eye contact with, SPF chemicals. A PPE evaluation prior to beginning work is useful to determine the appropriate PPE for the job. PPE to consider includes: protective clothing, gloves, eye and face protection and respiratory protection.

The effectiveness of PPE depends on both proper selection and proper use. It is important for workers to understand what PPE is needed, how to put on, operate, and take off the equipment and how to maintain and/or dispose of the equipment.

2. SPF application

When applying SPF, installers can be instrumental in helping to reduce the potential risk of exposure to SPF chemicals for occupants and other trade workers at the worksite. The work area should be appropriately restricted to personnel who are required to be in the work area due to their job responsibilities, have completed the required training and who are properly using the required PPE.

Generally, appropriate PPE for high pressure applications includes at a minimum chemical-resistant gloves, protective clothing, eye and face protection and respiratory protection. The specific types of PPE may vary depending on the conditions at the work area such as the amount of ventilation and the quantity of SPF chemicals applied.

3. PPE evaluation

PPE evaluations are conducted to determine the appropriate type of PPE needed for a job task, depending on the conditions at the worksite. Consider the following when selecting PPE for a job task:

- Location of the job tasks, whether the work will take place in an enclosed space, the type of ventilation available, and the ambient temperature and relative humidity and wind speed and direction if applicable
- Potential for inhalation exposure or eye or skin contact with SPF chemicals based on the job tasks
- The quality of SPF chemicals applied and the delivery method
- The type of work being conducted and the potential for wear and tear on the PPE

- Characteristics of the PPE that may affect the wearer's ability to complete a task such as gloves that permit dexterity and respiratory protection that allows adequate peripheral vision
- Wearer acceptance. PPE that does not fit the user may not provide sufficient protection. In addition, if an individual does not like the PPE he or she may be less likely to use it when needed

4. Air monitoring

Air monitoring is one way to evaluate the potential for inhalation exposure to SPF chemicals. Air samples may be collected at specific time intervals during application and after spray application has ceased. This data is helpful in determining when it is safe to enter the enclosure or spray area.

5. Protective clothing

The use of appropriate protective clothing is necessary whenever there is possibility of direct contact with SPF chemicals. The appropriate protective clothing varies depending upon the potential for exposure. Applicators and helpers typically wear disposable coveralls to keep spray and mist from contacting skin and clothing. To protect skin, wear PPE in such a manner as to protect all skin (in other words, there should be no exposed skin showing). When not wearing a hood respirator, select a coverall with an attached hood or spray head cover. For tasks where there is a potential for splash, consider a suit coated with an impermeable coating such as PVC and pMDI-resistant fitted boots/ booties.

6. Gloves

Gloves made of nitrile, neoprene, butyl or PVC generally provide adequate protection. A range of sizes should be available. A glove which is too large or small for the user may not provide proper protection. A fabric glove fully coated with nitrile, neoprene, butyl or PVC can provide good protection for SPF applicators when moving chemical drums or cleaning rig equipment.

7. Eye and face protection

Appropriate eye protection helps prevent eye contact from splashes of liquid SPF chemicals, accidental sprays of reacting foam, aerosols and vapours that are likely to be present during spraying and airborne particulate associated with sanding and grinding operations. The type of eye protection needed depends on the nature of the activity.

Persons handling liquid SPF chemicals in open containers can protect their eyes by wearing safety goggles or safety goggles in combination with face shields. The use of contact lenses is not appropriate.

During application of SPF, eye protection may be provided by virtue of wearing a full-face or hood respirator. As a minimum requirement, an eyewash or safety shower should be provided in the work area where the eyes or body may be exposed to "injurious corrosive materials." Consult the SDS for all materials to be used on the job in advance to help you understand whether such materials will be present and if so, how to comply with applicable COSHH requirements.

8. Respiratory protection

Engineering controls, such as local fan exhaust ventilation, should be used to control SPF chemical exposures. Administrative controls, such as work schedules and work practices are used concurrently to minimise exposure. Respirators are needed when air concentrations continue to exceed occupational exposure limits when engineering and administrative controls are implemented.

Supplied air respirators (SAR) and powered air-purifying respirators (PAPR) are appropriate and necessary for interior applications and may be used when spraying polyurethane foam in interior applications.

- Air-Purifying Respirators (APRs): Full-face APRs may be appropriate for interior applications of SPF. Air-purifying respirators are not appropriate in confined spaces or in atmospheres with less than 19.5% oxygen. Due to the potential for eye exposure during SPF application, full-face APRs are often selected when applying SPF. Full-face APRs may be used in the interior application of SPF when there is sufficient oxygen (19.5-23.5%) and air concentrations of pMDI are less than 0.250 parts per million (equal to 50 times the 8-hour occupational exposure limit).

- Supplied-Air Respirators (SARs): Supplied Air Respirators (SARs) are typically used in interior applications. SARs provide a supply of breathing air from an outside source such as a compressor, a bottle of compressed air or a low pressure pump attached to an air-line hose. SARs also are called “Type C” systems or “air-line” respirators. SARs, when used properly, can provide the greatest protection for the wearer.

9. Respiratory protection programme requirements

The COSHH UK Standard Assigned Protection Factor 4 (APF 4) requires employers to have a written respiratory protection programme for employees required to use respiratory protection. The Standard outlines requirements for respirator selection, respirator maintenance, annual fit testing, medical surveillance and annual training. Refer to your company’s policy for specific information regarding your respiratory protection programme.

To assist site managers in developing their own respiratory protection programs, the Health and Safety Executive has created Respiratory protective equipment at work A practical guide which can be found here:

www.hse.gov.uk/pubns/priced/hsg53.pdf

Employees must receive approval prior to fit testing and subsequent issuance of the respirator. Sometimes the medical approval has a limitation such as the use being restricted to a PAPR or for emergency only. Adhere to the limitations described by the examining medical provider.

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10. PPE for SPF high pressure interior application

When spraying SPF indoors, sprayers and helpers should wear:

- A NIOSH-approved full face or hood-type supplied air respirator (SAR) (as outlined in your company's respiratory protection program)
- pMDI-resistant chemical gloves (e.g. nitrile), or fabric gloves coated in nitrile, neoprene, butyl or PVC
- Chemically resistant long-sleeve coveralls or chemically resistant full body suit with hood
- pMDI-resistant fitted boots/booties

11. PPE for non-spraying tasks (e.g. cleaning equipment)

For tasks that do not involve spraying (such as cleaning equipment), but where you may have direct contact with pMDI liquid (at room temperature), use:

- NIOSH-approved air purifying respirator with combination organic vapour / particulate (P100) cartridges, if handling heated SPF chemicals
- Chemical safety glasses or goggles
- pMDI-resistant chemical gloves, (e.g. nitrile, neoprene, butyl or PVC)
- pMDI-resistant clothing, (e.g. apron or coveralls)
- Safety shoes or boots

12. Ventilation considerations during a SPF application

An installer should always refer to the training and installation manual provided for the product being installed.

For more details on the benefits of PIR insulation please visit: insulationmanufacturers.org.uk

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