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# Guidelines on the Selection, Use, Care and Maintenance of Respiratory Protective Equipment (RPE)

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## **GN004-V0615-Selection use & maintenance of Respiratory Protective Equipment**

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## **GUIDANCE ON THE SELECTION, USE, CARE AND MAINTENANCE OF RESPIRATORY PROTECTIVE EQUIPMENT (RPE) FOR USE DURING ASBESTOS REMOVAL OPERATIONS**

### **1. OBJECTIVE**

- 1.1. The objective of this Guideline is to provide practical advice on the selection, care and maintenance of Respiratory Protective Equipment (RPE) used in environments likely to give rise to asbestos exposure.
- 1.2. It is the employer's responsibility to provide adequate RPE for employees working with asbestos. Further guidance can be found in BS4275:1997 and the current edition of HSE publication HSG 53.

### **2. INTRODUCTION**

- 2.1. The hazard from asbestos arises from the inhalation of airborne fibre. The control limit for all types of asbestos is 0.1 fibres per cm<sup>3</sup>. If the control limit is likely to be exceeded then the wearing of RPE is mandatory.
- 2.2. There are many forms of RPE available but experience has shown that the most suitable equipment for the majority of asbestos removal operations is the power assisted respirator with a full face-mask. This equipment gives the best protection consistent with the convenience and mobility required. Positive pressure demand airline breathing apparatus may be appropriate for specific tasks; however this requires appropriate assessment, additional training and amended methods of work. It is not the intention of this guidance note to address the use of positive pressure demand airline breathing apparatus.

### **3. POWER ASSISTED RESPIRATORS**

- 3.1. Powered facemask respirators are specified in European Standard EN12942, or the earlier EN147. These standards have three classes of protection -TM1, TM2, TM3. For asbestos removal work, only power assisted respirators marked as approved to the highest class (EN12942 class TM3 or EN147 class TM3) should be used.
- 3.2. These respirators consist of a full face-mask to which filtered air is supplied by a battery driven fan and have the advantage of being totally self-contained.
- 3.3. There are two main designs of power assisted respirator mask, mounted and waist mounted. In the former the fan/motor assembly (usually with the filter) is mounted directly on the face-mask whereas in the latter, the fan/motor assembly is carried on the waist and air is delivered via a flexible hose to the wearer's face-mask.

The respirator has four basic components:

#### **3.3.1. Face-mask (and hose if fitted)**

The full face-mask may be manufactured from silicone, neoprene, thermo plastic

elastomer (TPE) or other types of rubber. Silicone and TPE have the advantage of being more comfortable to wear, easier to clean, and in use are considered easier to achieve an efficient face seal. The head straps should be readily adjustable and easily undone. Since the masks have to be decontaminated on each occasion of use, it is best to consider the ease of this when selecting equipment.

The performance of RPE with a tight fitting face piece depends on a good contact between the wearer's skin and the face seal of mask. A good face seal can only be achieved if the wearer is clean shaven in the region of the seal, and the face piece is of the correct size and shape to fit the wearer's face.

Normal spectacles should never be worn with full face-masks as they will prevent the mask from sealing properly on the face. Most manufacturers provide a special frame which can be attached to a fitting inside the face-mask. Users will need to have the frames fitted with their own prescription lenses.

It should be noted that use of head protection, i.e. hard hats is not compatible with full face RPE. Work should be planned to avoid the need for head protection.

### 3.3.2. Filter(s) and Pre-filters

All filters and pre-filters should be used in accordance with the manufacturer's instructions. There are three types of filters specified in the current standards and available from manufacturers. They provide protection against:

- a) Solids, solid and liquid aerosols of negligible volatility and decomposition
- b) Gases and vapours as specified by the manufacturer
- c) Combinations of solids and gases

For asbestos removal it is usually only necessary to use filters for solids (particulates) but occasionally when a gas or vapour hazard is also present (e.g. when using solvents), it may be necessary to use combination filters. Particulate filters are classified as low efficiency (P1), medium efficiency (P2), and high efficiency (P3). Only P3 filters (or combinations with P3) should be used with negative pressure respirators for asbestos work, and only TM3P SL filters should be used with power assisted respirators for asbestos removal.

#### Pre-filters

Some manufacturers supply pre-filters for use with their respirators. These are usually made from non-woven textile and are designed as a coarse filter to remove large particles from the airflow with the intention of prolonging the life of the main filter.

### 3.3.3. Fan/motor assembly (Blower)

When selecting the respirator the following points should be considered:

Waist mounted or mask mounted - when working in restricted spaces operatives may find the hose from a waist mounted blower to be cumbersome. Mask mounted blowers may be found heavy to wear, especially if the blower stands out a long way from the mask.

The blower should not have crevices or awkward corners which prevent easy

decontamination and should be capable of being worn in the decontamination shower.

#### 3.3.4. Battery

Batteries may be contained within the blower case, integral with the blower but in a separate case, or carried in a separate case but connected to the blower by a cable. If the batteries are contained within the blower case the blower will need to be taken out of use for recharging.

Four types of battery are in common use - lead acid gel, nickel cadmium, nickel metal hydride and lithium ion.

Lead acid gel batteries tend to be heavier and need to be stored in a charged condition. Failure to keep them charged in storage can result in permanent damage to the battery.

Nickel Cadmium, batteries are usually more expensive, last longer but have a reputation for developing a shallow memory effect which is caused by periods of short use and immediate recharge. This effect, which can shorten the duration of battery in use, is much less noticeable in newer batteries due to improvements in design.

Nickel Metal Hydride and Lithium Ion (Li-ion) batteries hold their charge for long periods, losing only around 5% per month. However, their service life depends entirely on their age and they will lose some capacity over time, regardless of how often they are used and recharged.

Some batteries cannot be left on charge for long periods of time without damage and therefore require 'smart' chargers, which contain electronic circuitry to prevent such damage. Only the charger specified by the RPE manufacturer should be used for the corresponding battery. N.B. Batteries should not be charged in the 'dirty end' of the decontamination unit.

**WARNING: Powered respirators are designed, tested and approved as complete assemblies which include the filters.**

Some manufacturers use similar threads for filter and hose connectors but these components from different manufacturers should never be mixed together to make complete equipment. Equipment assembled in this manner will invalidate the CE marking approval and may reduce the level of respiratory protection provided.

Replacement parts should only be used if they are issued by, or approved by, the respirator manufacturer.

#### Intrinsic Safety

Powered respirators are electrical equipment capable of generating sparks. Only powered respirators, which have been certified as intrinsically safe to EN50020, should be used in potentially explosive atmospheres.

#### **4. NEGATIVE PRESSURE RESPIRATORS**

- 4.1 While power assisted respirators are most suitable for asbestos removal work, a risk assessment may allow the use of non-powered, or 'Negative Pressure' respirators during support operations such as dismantling an enclosure, or taking sealed asbestos waste to the waste container.
- 4.2. Negative pressure respirators are available as:
- 4.2.1. Single use (disposable) half masks, described as 'Filtering Face pieces'.
- 4.2.2. Re-useable half masks and full facemasks where only the filter is discarded and replaced, and the mask is cleaned and maintained for re-use.
- 4.3. Negative pressure respirators and filters should be approved to one of the following standards:
- EN149 Filtering Face Pieces
- EN405 Maintenance Free Respirators
- EN140 Half Mask Respirators
- EN136 Full Face-mask Respirators EN143 Particle Filters EN14387 Combined Filters
- 4.4. As with power assisted respirators, only the most efficient filtration should be used, designated FFP3 for disposable respirators and P3 for filters on re-useable respirators (or P3 for the particle element of a combined filter).
- 4.5. Information in these guidelines which is not specifically related to power assisted respirators will apply equally to both powered and non-powered RPE.

#### **5. TRAINING BEFORE WEARING A RESPIRATOR**

- 5.1. Each user must, as a mandatory requirement, receive adequate instruction in the use, fitting, cleaning and daily maintenance and inspection procedures for each type of respirator that he will use. It is the employer's duty to ensure this is done and suitable and sufficient records are kept.
- 5.2. Users should be reminded on a regular basis that the correct use and maintenance of their respirator is essential if protection is to be continually provided.

#### **6. RECORDS**

- 6.1 Each major component part of a respirator should have an identification number and a record kept of all defects and repairs, etc. These should be kept for a minimum of five years, in accordance with Regulation 13 (3) of the Control of Asbestos Regulations 2012.

## 7. THE CLEANING OF RPE

- 7.1. Before leaving the work area, the operative will be required to go through a decontamination procedure. Preliminary decontamination should take place adjacent to and inside the 'dirty' end of the air lock. The RPE should be cleaned in the dirty end of the airlock as part of the preliminary decontamination process prior to moving to the main decontamination facilities. Decontamination within the main hygiene unit will involve taking a shower whilst still wearing their respirator, with the motor running. Wetting of the filter should be avoided and if this occurs then the filters should be discarded and replaced. The efficiency of powered respirators will be reduced if the filters are allowed to become wet; there is clearly a conflict between removing the contamination from the outside of the respirator and preventing the shower water entering the inlet of the filter. In general terms, the following procedures should be used.
- 7.1.1. Without switching the respirator off, remove any pre-filter(s) and discard, fit a new pre-filter(s) or a filter shower cap if available.  
NOTE: Pre-filters should not be removed if this action disturbs the main filter seal.
- 7.1.2. Remove all clothing, and with the respirator still switched on, enter the shower. With waist mounted blower systems, the blower can be held out of the shower stream during the initial removal of contamination from the face-mask and wearer's person. Contamination should then be washed off the outer surface of the remaining hose and blower without directing the shower stream into the inlet of the filter. With mask mounted systems, every effort should be made to shower with the air inlet pointing away from the shower stream to avoid wetting the filter.
- 7.1.3. With the blower still turned on, carefully remove the face-mask and place the complete respirator to one side away from the shower stream and complete showering.
- 7.1.4. A blank filter cap should then be placed over the filter inlet and then the blower should be turned off.  
  
NOTE: If the main filter seat is disturbed during the above procedure, the filter should be removed.
- 7.1.5. The face-mask (and hose assembly) can now be detached from the blower as described in the manufacturer's instructions. The mask should be thoroughly washed both inside and out.
- 7.2. Respirator face pieces must be cleaned inside and out every time they have been used. A suitable disinfectant should be used in accordance with the manufacturer's instructions. This should be rinsed off and the face pieces dried, inspected and stored away from contamination in a 'clean' area.
- 7.3. Respirator filters cannot be cleaned.
- 7.4. Used filters must not be removed from blowers or masks and stored for subsequent re-use unless the inlet can be sealed sufficiently to prevent the escape of fibres. Battery packs, if separate from blowers, should be wiped with a damp cloth or 'tack cloth'. They should not be immersed in water. Blowlers and masks with sealed filters attached, and all other component parts, should be cleaned in accordance with the manufacturer's instructions and stored away from contamination.

## 8. CARE, INSPECTION AND SERVICING OF RPE

- 8.1. The test procedures given in test instructions are usually for daily or pre-use checks to ensure minimum performance is being met. In addition it is a requirement to carry out a more comprehensive monthly inspection for which records must be kept, with a note of any parts replaced. If any major or safety critical parts require replacement, e.g. valves, batteries, visors, motors, the equipment may subsequently need a full performance test, depending on manufacturer's recommendations. The full performance test is recommended at a minimum of six monthly intervals.
- 8.2. The manufacturer or distributor must provide instructions on how to wear, adjust, clean and maintain equipment.
- 8.3. Proper procedures and records must be maintained to ensure that the respirator continues to provide adequate protection, see:
- Work with materials containing asbestos Control of Asbestos Regulations 2012 Approved Code of Practice and guidance L 143 paragraphs 215 -225,
  - Asbestos: The licensed contractors guide HSG 247 paragraphs 5.1 -5.29
  - Respiratory Protective Equipment at Work a practical guide HSG 53.
  - Asbestos: The analysts guide for sampling, analysis and clearance procedures HSG 248 paragraphs 8.1 -8.28

### 8.4. Pre-Use Examination

RPE should always be examined before it is put on to check that it is in good working order. This is sometimes referred to as the 'Daily Check'; and should be carried out each time the wearer dons the RPE. The pre-use examination should include checks on:

- The condition of the head harness and face piece including seal and visor and whether the RPE is complete and correctly assembled.
  - The condition of the inhalation and exhalation valves if fitted. For example, dirty, curled up or cracked valves will not perform properly and will severely compromise the protection provided.
  - The condition of any threaded connectors and seals.
  - The type and condition of the filter(s) and that they are 'in date' and fitted properly.
  - The battery charge and condition.
  - Air flow rate for power assisted and powered respirators compared with the manufacturers specification.
  - Any additional tests in accordance with the manufacturer's recommendations.
- 8.4.1. Maintenance of any sort, from replacing a filter to major parts replacement, should only be performed by personnel trained for the purpose. This may include the user.

8.4.2 Proprietary spare parts need to be used in maintaining RPE. The use of non-original parts may invalidate approvals and can compromise the health and safety of the wearer. A sufficient stock of spare filters, head harness straps, batteries etc, is needed so that the wearers can replace these parts as and when required. However, the complete kit should then be checked by a competent person.

8.4.3 RPE needs to be inspected and cleaned after each use and disinfected whenever the equipment is transferred from one person to another. Maintenance and cleaning procedures should be based on the manufacturer's instructions. Do not allow water to enter the inside of hoses, motor fans or filter manifolds as this will introduce contamination which may be difficult to remove.

#### 8.5. Thorough Examination and Test

8.5.1 This is often referred to as the "monthly check" and it should be carried out at least monthly.

8.5.2 All RPE should be thoroughly examined and tested to make sure that it is working properly to its designed specification. This should include measuring flow rates and battery duration etc. for powered respirators.

8.5.3 Those people carrying out examinations and tests on RPE should be competent and have adequate knowledge, training and experience in examination methods and techniques.

8.5.4 Powered respirators should be tested by fully charging the battery and then running the equipment for the maximum time specified by the manufacturers. The airflow rate should then be checked using equipment supplied by the manufacturers. If the output is not up to specification repeat the test using a new battery to determine if the equipment or battery is at fault, and take appropriate action.

#### 8.6 Record Keeping

8.6.1 Employers must keep a record of any examinations, tests, maintenance and defects remedied and these must be kept available for inspection by the enforcing authorities and others for at least 5 years. These include records of both the pre use checks every time the wearer dons the RPE, and the thorough examination and test carried out at least monthly.

### 9. FACE FIT TESTING

9.1. It is a requirement to incorporate a quantitative test into the RPE selection for asbestos work. This means that before any tight fitting respirator is issued to an operative a test must be carried out to confirm that the model and size of mask can provide an adequate seal to the face. The test may either be a full Total Inward Leakage test to the appropriate EN norm, or alternatively, an ambient particle portable device can be used. If the ambient particle counter type of fit test is used the following pass/fail levels apply.

- Disposable filtering face piece; 100.
- Half mask respirator; 100.

- Full face-mask respirator, including power assisted and air supplied types, 2000

It is good practice to have a system in place to ensure repeat fit testing of RPE is carried out on a regular basis, e.g. annual testing for workers involved in licensed asbestos removal.

- 9.2 Power assisted and airline face-masks should be tested power off, and new respirators should be used for testing.
- 9.3 A satisfactory fit test result means that the operative may use any well maintained example of the respirator model tested, provided it is the mask size tested, and there have been no significant facial changes since the test (e.g. weight loss, scarring or dental work).
- 9.4 Further details on fit testing should be obtained from the RPE manufacturer, supplier, or from the HSE. Records will need to be kept to show which employees have been successfully tested on each model/size.

There are two Fit Testing methods, these are known as Quantitative and Qualitative tests.

- Quantitative tests can be used to fit test all types of tight-fitting masks including disposable, half and full face-masks. Quantitative tests give an objective assessment of facial fit and provide a direct numerical result called a *Fit Factor*.

The most widely-used quantitative method for RPE fit testing is the Particle Counting Device method, a title ascribed to the TSI Portacount Plus. The Portacount Plus measures the number of ambient particles inside and outside a face piece and provides a numerical result which is the ratio of the two over a given test period. As in all other methods, the wearer should perform a series of exercises during the fit testing procedure (see HSE Operational Circular 282/28 Fit Testing of Respiratory Protective Equipment Face Pieces for more details on test exercises and pass levels)

- Qualitative tests rely on the wearer's subjective assessment of face seal leakage.

These methods, during a set of test exercises, use the wearer's sense of smell or taste to detect face seal leakage of a test agent. Qualitative tests are subject to problems with sensitivity, lack of objectiveness and inability to provide a numerical result. For these reasons Qualitative tests can only be employed for fit testing of filtering face pieces (disposable masks) and half masks, not full face-masks.

## 10. REFERENCES

- Asbestos: The analysts guide for sampling, analysis and clearance procedures HSG 248
- Asbestos: The licensed contractors guide HSG 247
- BS4275:1997 Guide to implementing an effective respiratory protective device programme

- European Standard EN136:1998 Respiratory protective devices. Full face masks. Requirements, testing, marking
- European Standard EN140:1999 Respiratory protective devices. Half masks and quarter masks. Requirements, testing, marking
- European Standard EN143:2000 Respiratory protective devices. Particle filters. Requirements, testing, marking
- European Standard EN147:1992 Respiratory protective devices. Specification for power assisted particle filtering devices incorporating full face masks, half masks or quarter masks
- European standard EN149:2001 Respiratory protective devices. Filtering half masks to protect against particles. Requirements, testing, marking
- European Standard EN405:2002 Respiratory protective devices. Valved filtering half masks to protect against gases or gases and particles. Requirements, testing, marking
- European Standard EN12942:1999 Respiratory protective devices. Power assisted filtering devices incorporating full face masks, half masks or quarter masks. Requirements, testing, marking
- European Standard EN14387:2004 Respiratory protective devices. Gas filter(s) and combined filter(s). Requirements, testing, marking
- European Standard EN50020:2002 Electrical apparatus for potentially explosive atmospheres. Intrinsic safety 'i'
- Work with materials containing asbestos Control of Asbestos Regulations 2012 Approved Code of Practice and guidance L 143
- Respiratory Protective Equipment at Work a practical guide HSG 53
- HSE Operational Circular 282/28 Fit Testing of Respiratory Protective Equipment Face Pieces

## APPENDIX 1

Filter Marking	Use
TM3 PS	High efficiency particulate filter for solid aerosols only
TM3 P SL	High efficiency particulate filters for solid and liquid aerosols
TM3 G(y) P SL	Where G = the type of gas and can be A,B, E, K, AX, SX, Hg or NO and (y) is the protection capacity and can be 1,2 or 3*
Type A	For use against certain inorganic gases and vapours with a boiling point higher than 65°C as specified by the manufacturer
Type B	For use against certain inorganic gases and vapours as specified by the manufacturer (excluding carbon monoxide)
Type E	For use against sulphur dioxide and other acidic gases and vapours as specified by the manufacturer
Type K	For use against ammonia and organic ammonia derivatives, as specified by the manufacturer
Type AX	For use against certain low boiling organic compounds (boiling point less than 65°C) as specified by the manufacturer
Type SX	For use against specific named compounds
Type Hg	For use against mercury
Type NO	For use against oxides of nitrogen, e.g. NO, NO <sub>2</sub> , NO <sub>x</sub>

\* Protection Capacity

1 = low capacity

2 = medium capacity

3 = high capacity