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To
All HSE Inspectors

FIT TESTING OF RESPIRATORY PROTECTIVE EQUIPMENT FACEPIECES

This updated Operational Circular (pages 1-6) gives practical advice on the inspection of the suitability of RPE fit testing methods and the meaning of the results generated. The accompanying information document (page 7 onwards) gives further more detailed information on fit testing.

INTRODUCTION

- 1 Where respiratory protective equipment (RPE) is used as a control measure under Health and Safety Legislation (see paragraph 6), it is vital that the selected RPE is adequate and suitable. RPE must reduce exposure to as low as reasonably practicable, and in any case to an acceptable level (e.g. below any applicable Workplace Exposure Limits or Control Limits). To ensure that the selected RPE has the potential to provide adequate protection for individual wearers, the ACoPs supporting COSHH, CAR and CLAW stipulate that tight-fitting RPE must be fit tested as part of the selection process. This will help to ensure that inadequately fitting facepieces are not selected for use. Ill-fitting facepieces can create inward leakages of airborne contaminants.

Note: A tight-fitting facepiece is a full face mask, a half mask, or a filtering facepiece (commonly referred to as a disposable mask). The performance of these types of facepieces, irrespective of whether they are used in negative pressure respirators, power assisted respirators or compressed air supplied breathing apparatus, relies heavily on the quality of fit of the facepiece to the wearer's face. An inadequate fit will significantly reduce the protection provided to the wearer. The presence of facial hair in the region of the facepiece will significantly reduce the protection provided. ¹

- 2 General advice on selection is covered in HSE guidance HSG53. ² This OC provides supplementary information for inspectors.
- 3 For RPE to be suitable it must be matched to the job, the environment, the anticipated airborne contaminant exposure level, and the wearer. As people come in all sorts of shapes and sizes it is unlikely that one particular type, or size of RPE facepiece, will fit everyone. Fit testing will help ensure that the equipment selected is suitable for the wearer.

- 4 RPE fit testing should be conducted by a competent person. Competence can be demonstrated through achieving accreditation under the 'Fit2Fit RPE Fit Test Providers Accreditation Scheme'. This Scheme has been developed by the British Safety Industry Federation (BSIF) together with industry stakeholders and is supported by HSE. The scheme is not compulsory and employers are free to take other action to comply with the law. One way employers can demonstrate good practice is by ensuring that the fit tester is appropriately accredited, for the type of service they offer, by the Fit2Fit scheme. Further details on the scheme can be found at the web site: <http://www.fif2fit.org>

LEGAL REQUIREMENTS

- 5 The Approved Codes of Practice (ACoPs) supporting the Control of Substances Hazardous to Health Regulations 2002 (COSHH)³, the Control of Lead at Work Regulations 2002 (CLAW)⁴, the Control of Asbestos Regulations 2006 (CAR)⁵ and the Ionising Radiation Regulations 1999 require that all reasonable steps be taken to prevent exposure to substances hazardous to health, or where prevention is not possible, to reduce exposure to the lowest level reasonably practicable.
- 6 If, despite the use of suitable control measures (i.e. other than RPE) adequate control of exposure cannot be achieved, employers must provide suitable RPE (COSHH Regulations reg.7(3)(c), CLAW Regulations reg.6(3)(c), CAR Regulations reg.11(4)). The RPE provided must reduce the exposure to a concentration that is as low as reasonably practicable, and in any case below any applicable exposure or control limits.
- 7 The ACoPs^{3, 4, 5}, supporting the COSHH, CLAW and CAR Regulations recommend that the initial selection of tight-fitting facepieces should include a fit test. This is to ensure that the selected RPE has the potential to provide adequate protection for the wearer (L5 paragraph 150, L143 paragraph 196 and L132 paragraph 133). The circumstances where repeat fit testing is needed are referred to in L5 paragraph 151, L143 paragraph 197 and L132 paragraph 134.
- 8 The employer must have documented evidence of the characteristics of the RPE to be used (CAR reg.7(4)(d)). Similar requirements are described in COSHH reg.6(4)(b), and CLAW reg.5(4)(b). These requirements are there to ensure that the RPE provided is suitable. The evidence to support the suitability will include fit test reports for facepieces with tight-fitting face seals.
- 9 Fit test reports should be available for all employees who wear RPE incorporating tight-fitting facepieces. Fit test records should be retained by the employer. These records must be kept available for inspection on request.

INSPECTION BY HSE

- 10 Inspectors should first ensure that suitable control measures including engineering controls are in use to minimise exposure to hazardous substances. In relation to the use of RPE Inspectors should ensure that:
- 1) a management system exists for correct selection, use, storage and maintenance;
 - 2) for tight-fitting facepieces the selection process has included an appropriate fit test. Where necessary, the results of the fit test report should be examined by the inspector for details, which should include the following:
 - a) name of the person fit tested;
 - b) make, model, and size of the facepiece;
 - c) whether the wearer's own mask, company pool mask or a fit test service provider's test mask was used;
 - d) the test exercises performed during the test;
 - e) fit test method employed;
 - Qualitative for filtering facepieces (FFPs, disposable masks) and half masks
 - Quantitative for FFPs (disposable masks), half and full face masks
 - f) Measured fit factor values for each exercise (if applicable);
 - g) pass level used;
 - h) date of the test;
 - i) the details of the person carrying out the fit test.
 - 3) the fit test certificate is valid and does relate to the correct RPE and the wearer. Checks should be carried out to establish the authenticity of the fit test certificate. This can be achieved by:
 - a) comparing the facepiece in use to the details recorded on the fit test certificate;
 - b) cross-checking the details on the fit test certificate with those retained by the fit test provider;

- 4) the RPE in use is the same make, type and size as the face mask that was worn for the fit test;
 - 5) the RPE issued to users is clean and well maintained (refer to L5 paragraphs 178-186, L143 paragraphs 215 - 225 and L132 paragraphs 191 – 197).
- 11 Selection of equipment and risk assessments must be based on the assigned protection factors (APFs), and not on fit factor results. HSE Guidance HSG53, HSG247 (chapter 5), ⁶ and BS EN529, ⁷ provide details on APFs and RPE selection, use and maintenance.

ACTION BY INSPECTORS

- 12 The enforcement issues referred to below are concerned with the fit testing of tight-fitting facepieces, and whilst each case should be judged on its own merits, inspectors are advised to consider formal enforcement actions where the RPE is considered to be unsuitable which include the following situations: (obviously the suitability must be weighed against the risks involved):
- 1) where persons are wearing tight-fitting facepieces and have not undergone and passed an appropriate fit test (see paragraph 14);
 - 2) where fit test results are not readily available;
 - 3) where the results show that a particular mask did not fit the wearer and the wearer is continuing to use that type and size of facemask. Steps should have been taken to select a more appropriate facepiece and/or carry out retraining.

Support from SGs/CSD3/HSL should be sought where appropriate. The suitability, use and maintenance aspects of personal protective equipment (PPE)/RPE should also be considered.

POINTS TO NOTE

- 13 It is not necessary for employers to issue RPE to the wearers on a personal basis following fit testing. However, employers need to ensure that the make, model, type and size of facepiece that their employees wore, when successfully fit tested, is made available for use.
- 14 If an employee wears more than one type of tight-fitting facepiece then each type of facepiece should be subjected to fit testing.

INTERPRETATION OF THE FIT TEST RESULTS

- 15 When quantitative fit testing devices, e.g. the Portacount, are used, these generate fit factor numbers. The minimum fit factor number recommended by

HSE, which should be achieved in each of the test exercises when carrying out a quantitative fit test is:

- 1) 2000 for a full face mask;
- 2) 100 for a half mask;
- 3) 100 for a FFP3, FFP2 ^(a) and FFP1 ^(b) filtering facepieces.

(a) A fit factor of 25 is applied if the TSI Portacount is used without the N95 Companion;

(b) FFP1 filtering facepiece can only be fit tested using the TSI Portacount Pro+ or if the N95 Companion is employed.

- 16 Very high fit factors, i.e. figures over 100,000, could indicate a problem with the application of the fit test and the validity of the result should be checked.

FURTHER GUIDANCE

- 17 Further information on RPE fit testing is given in the Information Document (page 7 onwards).
- 18 Assistance can also be obtained from FOD specialist group's occupational hygiene sections who will consult CSD3/HSL PPE Section if necessary.

REFERENCES

- 19 Numbered as referred to in text:
1. Bolsover S.M., *Leakage Measurements on Wearers of Respiratory Protective Equipment with Facial hair/Beards/Spectacles: Summary of a Literature Search*. J. Int. Soc. Resp. Prot. pp.15-22, Fall 1992.
 2. HSG53 *The selection, use and maintenance of respiratory protective equipment - a practical guide*. HSE Books ISBN 978 0 7176 2904 6
 3. L5 *The Control of Substances Hazardous to Health Regulations 2002 (as amended) Approved Code of Practice and guidance*, Fifth edition. HSE Books 2005 ISBN 0 71762981-3
 4. L132 *The Control of Lead at Work Regulations 2002 - Approved Code of Practice and guidance*, Third edition. HSE Books 2002 ISBN 0 7176 2565 6
 5. L143 *Work with materials containing asbestos. Control of Asbestos Regulations 2006. Approved Code of Practice and guidance*. HSE Books 2006 ISBN 0 7176 6206 3

6. HSG247 *Asbestos: The licensed contractors' guide*. HSE Books (2006)
ISBN 0 7176 2874 4
7. BSEN529: 2005: *Respiratory protective devices – Recommendations for selection, use, care and maintenance – Guidance document*
BSI, London.

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FIT TESTING OF RESPIRATORY PROTECTIVE EQUIPMENT FACEPIECES**CONTENTS**

Paragraph	Heading
	Part 1
1-5	Introduction
1	Who is this guidance aimed at?
2	What is the purpose of this guidance
4	Do I have to follow the recommendations in this guidance?
6-37	Facepiece fit testing
6	What is facepiece fit testing?
7	What is the reason for facepiece fit testing?
10	What is a tight-fitting facepiece?
11	Do loose fitting facepieces require fit testing?
12	When should a fit test be carried out?
13	When should a repeat fit test be conducted?
14	Which facepiece should be used for a fit test?
15	What should be done if a wearer uses more than one tight-fitting facepiece?
16	How is fit testing carried out?
19	What is a Fit Factor?
20	What is the recommended minimum fit factor?
Table 1	Recommended minimum fit factors for quantitative fit testing
21	Which fit test method should be used?
Table 2	Fit test method selection
22	Does HSE recommend or approve a particular fit testing method or device?
23	What is the output of a fit test?
24	Who can conduct respirator fit testing?
26	Frequently asked questions
	Part 2
39-47	Respiratory protective equipment in the workplace - Information for the employer - relevant legislation and Approved Codes of Practice (ACoPs) and Guidance
	Part 3
48-120	Fit test methods
48	Qualitative fit test methods
55	Quantitative fit test methods
80	Fit test exercises
84	Fit test report
86	Information for the person conducting the fit test
108	Information for the facepiece wearer
References	List of publications referred to in this document
Appendix 1	Troubleshooting
Appendix 2	Calculation of fit factors
Appendix 3	Specification for the Qualitative Fit Testing equipment

PART 1

INTRODUCTION

Who is this guidance aimed at?

1 Parts 1 and 2 of this guidance are aimed primarily at employers. Part 3 is specially prepared for respiratory protective equipment (RPE) facepiece fit testing providers and manufacturers and suppliers of RPE.

What is the purpose of this guidance?

2 The requirement for RPE facepiece fit testing is described in the Approved Code of Practices (ACoPs) supporting:

- The Control of Substances Hazardous to Health Regulations 2002 (COSHH);¹
- The Control of Lead at Work Regulations 2002 (CLAW);² and
- The Control of Asbestos Regulations 2006 (CAR).³

3 This guide provides:

- an overview of the practical aspects of RPE facepiece fit testing;
- information on fit test methods, techniques and protocols for carrying out fit testing;
- information on what can be achieved from a fit test; and
- the core information to be included in a fit test report.

Do I have to follow the recommendations in this guidance?

4 Following this guidance is not compulsory and you are free to take other actions to comply with the requirements of the law. But, if you do follow the guidance, you will normally be doing enough to comply with the law. Health and Safety inspectors seek to secure compliance with the law and may refer to this guidance as illustration of good practice.

5 Fit test equipment, and test procedures in this guidance should be used. Other equipment and procedures may be used providing that their suitability has been evaluated and can be demonstrated. Refer to Note 1.

Note 1. As there is no British Standard for fit testing, the following standards are recommended as suitable references:

- European Standards covering inward leakage testing BS EN 136,⁴ BS EN 140,⁵ BS EN 149⁶
- Occupational Safety and Health Administration Standard (OSHA) 1910.134 Appendix A⁷

– American National Standard ANSI Z88.10⁸

The fit test equipment used should comply with that specified in the relevant section of the European standards or OSHA 1910.134. Alternative equipment may be used, provided that it has been evaluated: suitable evaluation criteria are described in ANSI Z88.10.

Appendix 3 (of this document) provides more information on the main OSHA requirements for the qualitative fit test equipment.

FACEPIECE FIT TESTING

What is facepiece fit testing?

6 It is a method for checking that a tight-fitting facepiece matches the person's facial features and seals adequately to the wearer's face. It will also help to identify unsuitable facepieces which should not be used.

What is the reason for facepiece fit testing?

7 The performance of tight-fitting facepieces depends on achieving a good contact between the wearer's skin and the face seal of the facepiece. Peoples' faces vary significantly in shape and size so it is unlikely that one particular type, or size of RPE facepiece, will fit everyone. **Inadequate fit will significantly reduce the protection provided to the wearer.** Any reduction in protection can put the RPE wearer's life in danger or may lead to immediate or long-term ill health.

8 It is also useful for checking that a wearer can put on a respirator facepiece correctly. Correct fitting of the facepiece at all times is vital to prevent exposure.

9 A fit test does not remove the need for correct and careful day-to-day fitting of the facepiece, which should always include a pre-use fit check. (See paragraph 32).

What is a tight-fitting facepiece?

10 These are three types of tight-fitting facepieces, filtering facepieces, half masks and full face masks (see figs 1, 2 & 3).



Fig. 1 Filtering facepiece (FFP)
(tight-fitting)



Fig. 2 Half mask
(tight-fitting)



Fig.3 Full face mask
(tight-fitting)

Do loose fitting facepieces require fit testing?

11 The performance of loose fitting facepieces relies on sufficient airflow through the facepiece and is less dependent on a tight fit to the wearer's face and therefore does not require fit testing. Nevertheless, a loose fitting facepiece requires the correct size to ensure the wearer achieves adequate protection. Loose fitting facepieces are better suited to those wearing spectacles with side arms and people with facial hair in the region of the face seal of a tight-fitting mask. In the vast majority of scenarios loose fitting alternatives to tight-fitting masks are available and should be selected where necessary.

When should a fit test be carried out?

12 A fit test should be carried out:

- as part of the initial selection of the RPE;
- where an untested facepiece is already in use.

When should a repeat fit test be conducted?

13 It is good practice to have a system in place to ensure repeat fit testing of RPE is carried out on a regular basis. This is especially important when RPE is used frequently as a primary means of exposure control, e.g. annual testing for workers involved in licensed asbestos removal (L143 paragraph 198).

A repeat fit test should in any case be conducted in the following circumstances:

- 1) where the wearer:
 - a) loses or gains weight;

- b) undergoes any substantial dental work;
 - c) develops any facial changes (scars, moles, etc) around the face seal area;
- 2) where the employer's health and safety policy requires it.

Which facepiece should be used for a fit test?

14 Where facepieces are issued on an individual basis it is recommended that the wearer is fit tested using their 'own' facepiece. Where this is not practicable or pooled equipment is used then a test facepiece that exactly matches the wearer's 'own' facepiece (model, size & material) should be used.

What should be done if a wearer uses more than one type of tight-fitting facepiece?

15 If an employee wears more than one type of tight-fitting facepiece then each type of facepiece should be subjected to fit testing.

How is fit testing carried out?

16 There are two basic types of RPE fit testing - qualitative and quantitative.

Qualitative fit testing:

17 Qualitative fit testing is a simple pass/fail test based on the wearer's subjective assessment of the leakage, via the face seal region, of a test agent. These tests are relatively simple to perform and are suitable for half masks and filtering facepieces. They are not suitable for full face masks. Examples of qualitative fit testing methods:

- 1) method based on bitter or sweet tasting aerosol;
- 2) method based odour compounds.

Quantitative fit testing:

18 Quantitative fit testing provides a numerical measure of the fit that is called a fit factor. These tests give an objective measure of face fit. They require specialised equipment and are more complicated to carry out than qualitative methods. Quantitative methods are required for full face masks (but can also be used for half masks and FFP – see paragraph 21). Examples of quantitative fit testing methods:

- 1) laboratory test chamber;
- 2) portable fit test devices:
 - a) particle counting device (see paragraphs 65-73);
 - b) controlled negative pressure device (see paragraphs 74-79).

What is a Fit Factor?

19 A quantitative fit test gives a number that is referred to as the fit factor (FF). The fit factor is a measure of how well a particular facepiece seals against the wearer's face. A higher fit factor number means the facepiece achieved a good contact between the face seal and the face during the test. (FF should not be confused with APFs - see paragraph 33)

What is the recommended minimum pass fit factor?

20 The recommended minimum fit factor, which should be achieved to pass a fit test, will depend on the type of facepiece being tested. Table 1 shows the HSE recommended minimum fit factor that should be achieved in each of the fit test exercises used with a particular type of testing device. Your fit test service provider will tell you whether the wearer has passed the test or not.

Table 1: Recommended minimum fit factors for quantitative fit testing

Facepiece Type	Quantitative fit test methods		
	Ambient Particle Counting	Test chamber	Controlled Negative Pressure
Filtering facepiece			
FFP1	100*	n/a	n/a
FFP2	100*	n/a [†]	n/a
FFP3	100	100	n/a
Half face mask	100	100	100
Full face mask	2000	2000	2000

* FFP1 filtering facepiece can only be fit tested using the TSI Portacount Pro+ or if the N95 Companion is employed

** if used in conjunction with the TSI N95 Companion or the TSI Portacount Pro+, if not a fit factor of 25 should be applied

[†] method not suitable unless penetration of the challenge aerosol through the filtering facepiece can be eliminated

Which fit test method should be used?

21 Table 2 shows the range of fit testing methods applicable to various types of facepieces and classes of RPE. Your fit test service provider should be able to help you select the most appropriate method.

Table 2: Fit test method selection

RPE (Type and Class)		Fit Testing Method				
		Ambient Particle Counting	Quantitative		Qualitative ^a	
			Test chamber	Controlled Negative Pressure ^b	Taste	Smell ^c
	Filtering facepiece					
	FFP1	Yes ^d	No	No	Yes	No
	FFP2	Yes ^d	No ^e	No	Yes	No
	FFP3	Yes	Yes	No	Yes	No
	Half mask respirator	Yes	Yes	Yes	Yes	Yes
	Full face mask respirator	Yes	Yes	Yes	No	No
	Power assisted respirator with full face mask or half mask ^g	Yes ^f	Yes ^f	Yes	No	No
	Air fed breathing apparatus with full face mask or half mask ^g	Yes ^f	Yes ^f	Yes	No	No
	Self-contained breathing apparatus with full face mask	Yes ^f	Yes ^f	Yes	No	No



Escape breathing apparatus with full face mask

Yes^f

Yes^f

Yes

No

No

^a irritant smoke test method not recommended by HSE

^b any leakage through the exhalation valve has to be eliminated

^c only those devices with type A gas/vapour filters

^d may require modification to the respirator or a device such as the TSI N95 Companion or the TSI Portacount Pro+ to eliminate penetration of the test challenge through the filter material

^e method not suitable unless penetration of the challenge aerosol through the filtering facepiece can be eliminated

^f mask is fit tested under negative pressure mode

^g qualitative test may be employed on devices fitted with a half mask

Does HSE recommend or approve a particular fit testing device?

22 HSE does not approve nor recommend a particular fit testing device. Fit testing devices are included in this guidance to provide information and choice.

What is the output of a fit test?

23 The main output of a fit test is a report which will state whether the fit test was a pass or a fail. Some service providers may call this a 'certificate'. Details of the information that should be in the report are covered in Part 2. The report may also include other details such as the condition of the facepiece used by the wearer, their knowledge about correct wearing and use of RPE.

Who can conduct respirator fit testing?

24 RPE fit testing should be conducted by a competent person. To be competent the person should have adequate knowledge, and have received adequate instruction and training in the following areas:

- 1) selection of adequate and suitable RPE;
- 2) examination of RPE and the ability to identify poorly maintained facepieces;
- 3) ability to correctly fit a facepiece and perform pre-use fit checks;
- 4) ability to recognise a poor fitting facepiece;
- 5) the purpose and applicability of fit testing; the differences between, and the appropriate use of, quantitative and qualitative fit testing methods;
- 6) the purpose of the fit test exercises;

- 7) preparation of facepieces for fit testing;
- 8) how to carry out diagnostic checks on the facepiece and the fit test equipment;
- 9) capabilities and limitations of the fit test equipment;
- 10) how to perform a correct fit test with the chosen method;
- 11) be aware of and know how to prevent and correct problems during fit testing;
- 12) interpretation of fit test results;
- 13) an understanding of the differences between fit factor, workplace protection factor, assigned protection factor and nominal protection factors; and
- 14) HSE Regulations and the Approved Codes of Practice relating to fit testing.

The British Safety Industry Federation (BSIF) together with industry stakeholders and supported by HSE has developed a fit tester accreditation scheme covering the areas of competency listed above. The '*Fit2Fit RPE Fit Test Providers Accreditation Scheme*' is intended to improve the competency of fit testing in the UK. Following this scheme is not compulsory and employers are free to take other action to comply with the law. One way employers can demonstrate good practice is by ensuring that the fit tester is appropriately accredited, for the type of service they offer, by the Fit2Fit scheme. Further details on the scheme can be found at the web site: <http://www.fit2fit.org>

25 Manufacturers of fit testing equipment may offer suitable training. Records of any training should be retained.

FREQUENTLY ASKED QUESTIONS

Where can I find information on RPE and its use in the workplace?

26 A brief summary is given in Part 2 to this guidance. Detailed information is given in ACoPs listed in the reference section, HSG53⁹ and HSG247¹⁰.

Is there any information on the responsibilities of a fit test provider?

27 Yes. It is provided in Part 3 to this guidance.

Is there any information on fit testing for employees?

28 Yes. It is provided in Part 3 to this guidance.

Does fit testing mean that each employee now has to have their own facepiece?

29 No. However, you need to ensure that the make, model, type, and size of facepiece that your employees wear are the same as those worn when successfully fit tested.

Who 'owns' the fit test results?

30 You as the employer are responsible for meeting the cost of fit testing, but the results should be made available to the employee as well.

Does fit testing replace maintenance, examination and testing of the RPE?

31 No. Fit testing does not assess the quality of maintenance of the RPE and its component parts. Further guidance on the examination and testing of RPE is covered in ACoPs listed in the reference section of this guidance and HSG53

Is a pre-use fit check the same as the facepiece fit test?

32 No. A pre-use fit check is required each time the facepiece is worn and before entering the hazardous environment. It is needed to determine if the facepiece has been correctly fitted before a contaminated work area is entered. The RPE manufacturer will provide instructions on how to carry out a pre-use fit check. Some users may use other pre-use fit check methods that are more stringent.

Is there a difference between a fit factor and the assigned protection factor (APF) quoted by the RPE supplier?

33 A fit factor is the result of a fit test and only relates to a specific facepiece/wearer combination. The assigned protection factor for a specific type and class of RPE is published in BS EN 529 ¹¹ and HSG53. It relates to the likely performance of the whole device when worn correctly and used in accordance with the manufacturer's instruction (which includes the need for a satisfactory fit testing). When selecting an adequate and suitable RPE, for use at work, the assigned protection factor should be used. For more details consult HSG53 or talk to a reputable RPE supplier or manufacturer.

What can be done if an employee has trouble passing the fit test for a facepiece?

34 Some manufacturers make different sizes of facepieces. They also vary in size from manufacturer to manufacturer. The wearer may obtain a better fit by trying a respirator of a different size or model, or made by another manufacturer. If it is still not possible to obtain an adequate face fit then another type of respirator that doesn't rely on a tight face seal, such as a hood type, should be selected.

35 If the facepiece has already been worn for protection against hazardous substances, (e.g. asbestos fibres), by a person failing the fit test, then there is the possibility that exposure has occurred. In such cases the employer may wish to seek medical advice and an annotation to the individual's personal health record should be made.

Why do facepieces used with positive pressure breathing apparatus require fit testing? Isn't the leakage always outwards?

36 Fit testing a full face mask, which is used with a positive pressure breathing apparatus, is necessary because the consequences of facepiece leakage can be

extremely serious since these types of devices are more likely to be used in extremely hazardous environments; even brief leaks can cause serious exposure. Studies have shown that during heavy exertion, it is possible for the pressure inside the facepiece to momentarily become negative in relation to the outside atmosphere. If the faceseal is not good this could result in inward leakage of extremely hazardous air.

37 Wearers also may believe that they can afford to take less care when donning their facepiece when using a breathing apparatus that appears to be highly protective; they may ignore pre-use fit checks and correct strap tensioning because they are relying on airflow to overcome any leaks. Fit testing demonstrates to wearers the need to don the facepiece properly. Unnecessary leaks will reduce the useful working duration of the device. This can have serious consequences for the wearer, and in cases of rescue work, for those being rescued.

Do I need to fit test disposable facepieces that are worn for 'comfort' purposes?

38 No. If the employer's risk assessment clearly demonstrates that the respirator is being used for 'comfort' rather than as a control measure, then fit testing is not required.

PART 2

RESPIRATORY PROTECTIVE EQUIPMENT IN THE WORKPLACE

Information for the employer - relevant legislation and Approved Codes of Practice (ACoPs) and Guidance

39 The law ^{1, 2, 3} requires that RPE supplied for use at work must be 'CE' marked.

40 The law (COSHH Regulations reg.7, CLAW Regulations reg.6, and CA Regulations reg.11) places the duty on you, the employer, (a self-employed person is considered as both an employer and an employee) to prevent employees being exposed to hazardous substances. If you do not first consider this, you will be failing to comply with the fundamental requirements of the law. Where prevention of exposure is not possible or practicable, you should consider whether it is possible to significantly reduce inhalation exposure by means other than RPE. RPE should only be used if no other method can be used or other methods do not completely control inhalation exposure. The reason for using RPE and its suitability for the purpose needs to be documented in your risk assessment.

41 RPE you provide must be suitable to make sure that your employees can receive adequate protection. For RPE to be suitable it must be matched to the job, the environment, the anticipated exposure level and the wearer. As people come in all sorts of shapes and sizes it is unlikely that one particular type, or size of RPE facepiece, will fit everyone. RPE manufacturers produce facepieces that are different in shape and size. Consulting several suppliers of potentially suitable RPE in order to include a number of facepiece sizes and shapes can assist the selection process. It is important that the wearer is involved in the selection process. This will help to identify facepieces that are suitable for the wearer. Wearers are more likely to wear RPE, and wear it correctly if they have been involved in the selection process.

42 The ACoPs ^{1, 2, 3} supporting the COSHH, CLAW and CA regulations recommend that the initial selection of tight-fitting facepieces should include a fit test. This is to ensure that the selected RPE has the potential to provide adequate protection for the wearer. The ACoPs have a meaning in law; if you follow the advice you will be doing enough to comply with the law in respect of those specific matters on which the ACoPs give advice.

43 Facepiece fit testing will result in a personalised fit test report and this report should be available to the employee and accessible to others such as enforcement authorities. Collective reports should be available to safety representatives. The employer will have to keep the record of facepiece fit testing for at least five years from the date of testing.

44 The circumstances where repeat fit testing will be necessary are explained in paragraph 13 of this guidance.

45 If your employee is to be fit tested in the facepiece normally used at work then you should ensure that it is clean and in good working condition. A faulty or dirty facepiece can be the cause of a failed fit test. The fit tester may charge an additional fee if the fit test has to be repeated for this reason.

46 RPE wearers should receive adequate initial and refresher training. This needs to be given at regular intervals covering the correct use, cleaning, maintenance and safe storage, with specific attention to ensuring that the RPE is working correctly in accordance with the manufacturer's instructions. The interval period should be commensurate to the risk present. Before a fit test can be carried out wearers should have received training in the correct donning of the facepiece.

47 The law (COSHH Regulations reg.9, CLAW Regulations reg.8 and CA Regulations reg.10) requires that RPE is thoroughly examined and tested at suitable intervals. The relevant ACoPs recommend thorough examination and testing of the RPE at least once every month to make sure that it is working properly to its design specification. Where RPE is used infrequently an examination and test should be made prior to next use, however the interval should not exceed three months.

General advice on selection of suitable RPE is covered in HSG53

PART 3

FIT TEST METHODS

Qualitative fit test methods

General

Precautions

48 The wearer should not eat, drink (except plain water), smoke, or chew gum for at least 15 minutes before the test.

49 Before carrying out a qualitative fit test using a distinctive taste or smell, the taste or smell threshold of the wearer must be established. This is often referred to as a 'sensitivity test'. This screening test is carried out to check that the wearer can detect the taste of the test aerosol or detect the banana like smell employed in the odour test. If the wearer cannot detect the taste or smell during the screening test then the fit test method cannot be used and a different method should be chosen. The fit test should be carried out in accordance with the manufacturer's instructions.

50 Ensure that the sensitivity solution is used during the sensitivity test and that the more concentrated fit test solution is used during the actual fit test.

51 The nebuliser may clog during use and stop delivering the test aerosol; the test operator should make periodic checks of the nebuliser to ensure that it is not clogged. If clogging is found at the end of the test session, the test is invalid. Regular cleaning of the nebuliser should help to prevent clogging.

Test procedure

52 The fit test procedure should be carried out in accordance with the manufacturer's documented instructions, but following the test exercises given in paragraph 81.

Bitter/sweet tasting aerosol fit test method

53 The person is fit tested while wearing the respirator inside a hood (as shown in Fig. 7) while the test solution (either bitter or sweet) is sprayed into the hood. If the wearer detects the taste of the aerosol during the test then the fit is unsatisfactory and the fit test is failed. During this test the wearer will carry out a number of specified exercises. It is less costly when compared to quantitative fit testing methods.

Types of respirators that can be fit tested with this method include:

- Filtering facepieces FFP1, FFP2, FFP3;
- Half facemask respirators fitted with a particulate or combined filter.



Fig. 7 Example of a qualitative fit test method

Odour fit test method (isoamyl acetate)

54 The person is fit tested while wearing the respirator inside an enclosure, which contains a known concentration of isoamyl acetate (also known as banana oil). If the wearer detects the smell of the isoamyl acetate during the test then the fit is unsatisfactory and the fit test is failed. During this test the wearer will carry out a number of specified exercises.

Types of respirators that can be fit tested with this method include:

- Half mask respirators fitted with a type A organic vapour filter.

Quantitative fit test methods

General

Preparation of the facepiece

(a sample probe and P3 filter are not required for the controlled negative pressure method.)

55 The facepiece should be equipped with a sample probe positioned within the breathing zone of the wearer and at a position near to the wearer's lips. The open end of the sampling tube should be positioned close to the wearer's face (<10mm) and approximately mid way between the nose and mouth. Taking an air sample from inside the facepiece that is representative of the in-facepiece concentration may be improved with the use of a suitable multiple-hole sampling probe. The 'ball' sample probe, as described in BS EN 12942 ¹², is recommended for half and full face masks and the 'disc' probe, as described in BS EN 149 ⁶, is suitable for filtering facepieces. The sample probe should not be positioned flush with the inside surface of the facepiece.

56 When fitting the sample probes to half and full face masks use suitable sampling adapters to avoid puncturing the facepiece. RPE manufacturers and fit test equipment suppliers are able to provide suitable fit test adapters to fit most facepiece types. These adapters should enable fit testing on users' own facepieces. When fitting the sampling adapter to the facepiece, take care not to block off the sampling tube. Facepieces that have been permanently modified for the purpose of fit testing are not suitable for use in the workplace.

57 The positioning and the combined weight of the adapter, sample probe and sample tubes should not interfere with the fit of the facepieces. This is particularly important when fit testing filtering facepieces or lightweight half facepieces. Sample probes should be lightweight and the sample tubes must be supported to avoid any drag on the fit of the facepiece.

58 Half and full face masks should be fit tested as negative pressure facepiece respirators by attaching a P3 filter(s), or combined filter(s) which incorporates a P3 filter, directly to the facepiece. Where practicable, the filter (or facepiece adapter) should be identical to, or similar to, the type of filter normally used with the respirator, i.e. of similar breathing resistance and weight. Facepieces used with compressed air supplied breathing apparatus and power-assisted respirators will need to be temporarily converted to negative pressure respirators. Alternatively, an identical negative pressure respirator facepiece with the same sealing surface (i.e. same mould of face blank and material) may be used if available.

Precautions

59 The facepiece being fit tested should be in good condition. The exhalation valve should be in good operating condition and free from debris (hairs, etc) that might degrade its performance.

60 The reliability of the controlled negative pressure (CNP) fit test method depends on the facepiece's exhalation valve being leaktight. Some designs of exhalation valves, when operating correctly, may permit small inward leakage of ambient air into the facepiece during this fit test. This leakage would result in a falsely low fit factor. Exhalation valve leakage must be eliminated in order to have confidence that the fit factor is derived from face seal leakage only.

61 All quantitative fit testing devices should be used, maintained and calibrated in accordance with the manufacturer's recommendations. Before use, the stability of the equipment should be checked as instructed by the manufacturer. Records of maintenance, calibration and pre-use checks should be retained.

Test procedure

62 The fit test procedure should be carried out in accordance with the manufacturer's documented instructions, but following the test exercises given in paragraphs 81-83.

63 In the case of laboratory test chamber method the test should be carried out in accordance with the appropriate British Standards.

Laboratory test chamber method

64 This method employs a test that is based on European Standard inward leakage test for product certification under the Personal Protective Equipment Directive. The details of the principle of the test methodology are described in BS EN 136, BS EN 140 and BS EN 149. The test can be carried out in a chamber (see Fig. 8) into which a standard challenge of either sodium chloride (NaCl) aerosol, or sulphur hexafluoride (SF₆) gas can be delivered. The leakage of the test challenge into the facepiece under test is measured while the wearer walks on a treadmill and performs a series of exercises. The extent of the test agent leakage is expressed as percentage inward leakage and then converted to fit factors, (see Appendix 2 equations 1 and 2). This is a very versatile, sensitive and established test method, but costly to perform.



Fig. 8 Laboratory test chamber method

Types of RPE that can be fit tested with this method include:

- Filtering facepieces FFP3 (NaCl aerosol only);
- Half mask respirators;
- Full face mask respirators;
- Power assisted respirators with full face mask or half mask;
- Breathing apparatus (including air supplied, self-contained and escape types) with full face mask or half mask.

Particle counting device (TSI Portacount Plus Respirator Fit Tester)

65 A particle counting device counts the number of ambient particles leaking into the facepiece and compares this with the particle number challenging the facepiece while the wearer carries out a number of specified exercises. This method can either use particles in the ambient air (normal room air contains a significant number of particles which are too small to be seen by the naked eye) or generated aerosols as the test challenge.

Types of RPE that can be fit tested with this method include:

- Filtering facepieces FFP1*, FFP2*†, FFP3† types;
- Half mask respirators†;
- Full face mask respirators;
- Power assisted respirators with full face mask or half mask;
- Breathing apparatus (including air supplied, self-contained and escape types) with full face mask or half mask.

* may require the use of the TSI Portacount Pro+ or the TSI N95 Companion, a tightly specified particulate challenge, or a device to separate the particles that penetrate through the filter material from those that leak around the face seal.

† some complete devices contain carbon filtering material which may release particles during the test. These will be counted as face seal leakage which may lead to a 'false' fail. A qualitative method may be more suitable for such devices, if the particle release cannot be eliminated (consult the RPE manufacturer).



Fig. 9 Portacount fit tester

66 The procedure for using the Portacount requires that the facepiece is fitted with a high efficiency particulate filter (P3). It is then assumed that all particles sampled from inside the facepiece have entered through a leak at the face seal.

Precautions

67 The wearer should refrain from smoking for at least 60 minutes prior to the fit test. Smoke particles can continue to be breathed out for at least 60 minutes after smoking and these can lead to false fit test results and the fit test will have to be repeated. This will incur more time, effort and possibly costs.

68 The wearer should wear the facepiece for at least a couple of minutes before the fit test is started. This ensures that the ambient particles trapped inside the facepiece, when fitted, are flushed out.

69 The experience of HSE and others shows that during the talking exercise the wearer's exhaled breath can contain particles that can be sampled by the particle counting device. These subject-generated particles can result in a falsely low fit test result. If the ambient (challenge) particle concentration is at or above 10,000 particles/cm³ then the subject-generated particles are unlikely to cause fit test failure at a fit factor level of 2,000. A typical office or laboratory environment should be able to meet this condition. An ambient particle count that varies significantly over the duration of the test can give rise to errors in the fit factor. Excessively dusty and smoky environments should be avoided. Further advice should be sought from the equipment supplier if necessary.

70 Excessive moisture in the facepiece or sample tube can cause moisture droplets to be sampled by the particle counting device. This can result in a falsely low fit test result. The facepiece and sample tube should be dried out or replaced between tests where appropriate.

71 If, when fit testing P2 filtering facepieces, the ambient particle counting device is used with a device to separate the particles that penetrate through the filter material from those that leak around the face seal, the challenge particle concentration may have to be increased with the use of a supplementary aerosol generator.

72 The Portacount fit testing software may report an overall 'Pass' based on the average fit factor even when a fit factor of less than the minimum pass level has been achieved in one or more test exercises. In such cases the test should be repeated to assess whether the wearer is able to achieve the recommended pass level for each of the test exercises.

73 The fit test device should be used, maintained and calibrated in accordance with the manufacturer's recommendations. Before use, the stability of the equipment should be checked as instructed by the manufacturer. Records of maintenance, calibration and pre-use checks should be retained. The manufacturer recommends that the equipment should be factory calibrated on an annual basis.

Controlled negative pressure device (OHD Fit Tester 3000)

74 The Controlled Negative Pressure (CNP) fit test method is based on exhausting air from a facepiece correctly fitted on the wearer's face to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. When the in-facepiece pressure is constant, the airflow out of the facepiece is equal to the air leaking into the facepiece. Therefore, measurement of the exhaust air that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage airflow into the facepiece. The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit.

Types of RPE facepiece combination that can be fit tested with this method include:

- Half mask respirators;
- Full face mask respirators;
- Power assisted respirators with full face mask or half mask;
- Breathing apparatus with full-face mask or half mask.



Fig. 10 Controlled negative pressure fit testing device

75 The person being tested must hold their breath during the measurement and remain absolutely motionless, otherwise, the leak rate measurement cannot be made reliably. Since measurements cannot be made while the wearer performs the fit test exercises, the wearer must also stop moving and breathing between exercises while the measurement is made. This test procedure is substantially different to the dynamic exercise protocol used in most other fit testing methods - refer to paragraph 83.

76 CNP systems cannot fit test filtering facepiece respirators and half facepiece respirators that may comprise substantially of filtering material unless there is a reliable means of preventing air from entering through the filter material.

77 The negative test pressure for the test should be set in accordance to the manufacturers guidance, i.e. 0.95" H₂O (25mmH₂O) for a full face mask and 0.58" H₂O (15mmH₂O) for a half mask.

Preparation of the facepiece

78 In order to carry out a fit test, the facepiece's filter is replaced by a facepiece adapter that contains a squeeze-bulb actuated valve. Two tubes connect the facepiece adapter to the CNP device - one tube enables the pressure inside the facepiece to be measured and the second is used to exhaust air from the facepiece. In order for air to

be withdrawn from the facepiece the inhalation valve has to be propped open or removed. To start a test the wearer 'takes a breath' and squeezes the bulb to close the adapter valve. When initiated by the tester, the device then creates a vacuum inside the facepiece and measures the airflow required to maintain the vacuum.

Precautions

79 It is important that during the measurement part of the fit test the wearer remains still and does not breathe or make any mouth or facial movements. The slightest of pressure changes inside the facepiece caused by movement can affect the fit test result and invalidate the test. During the test the wearer should also keep their mouth closed. The wearer should be given time to practice the breath-hold procedure.

FIT TEST EXERCISES

80 For test chamber methods, the test protocol in the relevant European Standard (e.g. EN136, EN149) should be followed.

81 For other quantitative and qualitative methods the test protocol should comprise of a minimum of 7 exercises; each test exercise should be performed for at least one minute. During the quantitative fit tests the exercises should allow for an in-facepiece sample period of at least 60 seconds. The exercises are:

Exercise

Description

(i) Normal breathing	The wearer should breathe normally with no head movements or talking.
(ii) Deep breathing	The wearer should breathe slowly and deeply, taking care so as not to hyperventilate.
(iii) Turning head side to side	The wearer should slowly turn their head from side to side between the extreme positions on each side (approximately 15-20 times per minute). The head shall be held at each extreme momentarily so the wearer can inhale at each side.
(iv) Moving head up and down	The wearer should slowly move their head up and down (approximately 15-20 times per minute). The wearer should be instructed to inhale in the up position (i.e. when looking toward the ceiling).
(v) Talking	The wearer should talk out loud slowly and loud enough so as to be heard clearly by the fit tester. The wearer should read from a prepared text such as the Rainbow Passage or count down from 100.
(vi) Bending over	The wearer should stand and bend at the waist as if to touch their toes.
(vii) Normal breathing	Same as exercise (i).

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colours. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

82 During quantitative fit testing the fit test exercises (with the exception of the bending exercise), should be performed whilst the subject is either:

- 1) cycling on an exercise bike;
- 2) walking on a treadmill; or
- 3) carrying out a stepping exercise.

Note:

- 1) During fit testing the exercise regime should induce a physical workload on the wearer, which simulates working activities and work rate. Preferably therefore, the fit test exercises should be conducted using a treadmill, exercise bike or step. Portable treadmills and exercise bikes are commercially available.
- 2) Caution must be taken when asking people to exercise - be aware of slips and trips when carrying out any of the exercises.
- 3) When conducting a qualitative test inside a test hood care should be taken to avoid catching the facepiece on the test hood.

83 When conducting a fit test using the controlled negative pressure method, measurement of fit cannot be done during the exercises and therefore static fit factors are measured at the end of each exercise. The procedure below should be followed:

Exercise	Description
(i) Normal breathing	In a normal standing position, without talking, the subject shall breathe normally for one minute. After the normal breathing exercise, the subject should face forward and hold their breath for approximately 10 seconds during the test measurement.
(ii) Deep breathing	In a normal standing position, the subject shall breathe deeply for one minute. After the deep breathing exercise, the subject shall hold their head straight ahead and hold their breath for approximately 10 seconds during test measurement.
(iii) Turning head side to side	Standing in place, the subject shall slowly turn their head from side to side between the extreme positions on each side for one minute. After the turning head side to side exercise, the subject shall face to the left and hold their breath for approximately 10 seconds during test measurement. Next, the subject needs to hold head full right and hold their breath for 10 seconds during test measurement.
(iv) Moving head up and down	Standing in place, the subject shall slowly move their head up and down (approximately 15-20 times) for one minute. After the moving head up and down exercise, the subject shall hold their head full up and hold their breath for approximately 10 seconds during test measurement. Next, the subject shall hold their head full down and hold their breath for approximately 10 seconds during test measurement.
(v) Talking	The wearer should talk out loud slowly and loud enough so as to be heard clearly by the fit tester. The wearer should read from a prepared text such as the Rainbow Passage or count down from 100. After the talking exercise, the subject shall hold their head straight ahead and hold their breath for approximately 10 seconds during the test measurement.
(vi) Bending over	The wearer should stand and bend at the waist as if to touch their toes. After the bending exercise, the subject shall hold their head straight ahead and hold their breath for approximately 10 seconds during the test measurement.
(vii) Normal breathing	Same as exercise (i).

FIT TEST REPORT

84 A record of the fit test shall be produced. The fit test report should clearly identify the following (where applicable):

- 1) the name of person fit tested;
- 2) the make, model, material and size of the face-piece;
- 3) whether the subject's own facepiece, company pool facepiece or a test facepiece was used;
- 4) the test exercises performed during the fit test;
- 5) the fit test method employed, i.e. test chamber, ambient particle counting device, controlled negative pressure or qualitative taste test agents;
- 6) the measured fit factor for each individual test exercise and the overall fit factor;
- 7) the pass level used in the test;
- 8) the result of the fit test in terms of a pass or fail;
- 9) the date of the test;
- 10) the details of who performed the test, name of firm, address, etc;
and also where possible:
- 11) the condition of the wearer's own facepiece;
- 12) whether the wearer required assistance donning and fit checking the facepiece before the fit test;
- 13) how many repeat tests were needed to obtain a pass and the reasons why; and
- 14) the serial number or other means of identifying the equipment employed in the fit test.

85 Fit test records should be stored for at least five years by the employer. These records must be kept available for inspection on request and a copy given to the employee.

INFORMATION FOR THE PERSON CONDUCTING THE FIT TEST

86 You should explain to the wearer the purpose of the test, what they will have to do, and the meaning of the fit test results.

87 You should check that the fit testing equipment is properly set up and checked prior to conducting the fit test. Quantitative fit test equipment should be within calibration.

88 You should ensure that any sampling adapters and probes are working properly and fitted correctly, and that any sampling lines, nebulisers, etc where applicable, are not blocked.

89 You should use the wearer's own facepiece. Where this is not practicable then a test facepiece that exactly matches the wearer's facepiece should be used. Some customers may ask you to provide a suitable facepiece. If you agree to offer this service you should carry a range of facepieces. This will help users to select the most comfortable facepiece.

90 You should visually examine the facepiece (used for fit testing) prior to carrying out a fit test. The examination should include the condition of the facepiece, especially around the face seal and facepiece connectors, the exhalation valve(s) and the head harness. Test facepieces should be properly inspected and maintained in accordance with the manufacturer's instructions.

91 You should ensure that test facepieces are cleaned and disinfected before being used by different individuals. Test facepieces that cannot be adequately disinfected, (e.g. filtering facepieces), should not be used by more than one individual.

92 You should instruct the wearer in the test exercises.

93 You are advised to ascertain that the wearer is medically fit to wear RPE and, where appropriate, be able to undertake the recommended test exercises (as described in paragraphs 98-100). You should seek confirmation (preferably in writing) from the employer.

94 The wearer should don the facepiece in accordance with their received training and the manufacturer's instructions. If it is necessary for you to help (or intervene) this should be noted and recommendations should be made for further training. The use of a mirror will assist the wearer to fit the facepiece correctly.

95 The wearer should be instructed to wear the facepiece for at least five minutes before the start of the fit test. This allows time for the wearer to determine if the facepiece is comfortable and to make any adjustments to the fit before commencing the fit test.

96 The wearer should have received training in correct donning of the facepiece before the fit test. However, if you are helping in the facepiece selection process, you should show the wearer how to put on a facepiece, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror should be available to assist the wearer in evaluating the fit and positioning of the facepiece.

97 If the wearer will need to use in-facepiece spectacles then these (or unglazed frames) should be worn during the fit test. If other types of personal protection are worn with the RPE, (e.g. hard hat, goggles, etc), and have the potential to interfere with the seal of the facepiece then they should be worn during the fit test. However, if the other items of PPE prevent the RPE from being fitted correctly, a proper fit test cannot be carried out. Personal protective equipment should be compatible with the RPE.

98 You should not conduct the fit test if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, moustache, sideburns or low hairline which cross the respirator sealing surface. You should ensure that any type of non-PPE apparel or adornment (e.g. piercing) does not interfere with the fit of the facepiece.

99 You should observe the wearer throughout the fit test to watch for facial/head movements that may cause face seal leakage and also to ensure the safety of the wearer - this is important if the wearer is walking on a treadmill or stepping during the fit test. If the wearer sneezes or coughs during the fit test this can have an effect on the fit test result and the fit test may have to be repeated.

100 If the test fails, you must determine the appropriate action to take. This is where the fit test operator's experience is important. Further guidance on "troubleshooting" is given in appendix 1. In any case, the fit test should be repeated in its entirety.

101 You should inform the wearer of the fit test result, i.e. a pass or fail. You should be cautious if providing information on numerical fit factor results. Informing a wearer that a high fit factor has been achieved may give the wearer false confidence in the RPE and may cause the wearer to be less careful when donning and using the RPE in the workplace. It should be stressed to the users that practical experience in the workplace has shown that the protection level obtained can be less than that achieved in the fit test.

102 You should also be aware of the sensitive nature of a fit test failure especially on a wearer who may have been wearing the particular type of respirator in the asbestos or similar hazardous industry for a period of time. A procedure for consultation with the employer should be developed in advance to deal with such cases. Where the failure results from a type of facepiece already worn for a period of time in the workplace, you should inform the employer. They in turn should note this fact on the individual's health record and may wish to make arrangements for medical advice.

103 As part of the fit test, it is encouraged, where possible, that you check the condition of the wearer's own RPE. This is vital if the fit test is going to be performed on the wearer's own facepiece. The condition of the RPE can form part of the test report.

General Questions

How is a power assisted respirator or a breathing apparatus facepiece fit tested?

104 Fit testing a power assisted respirator or a breathing apparatus facepiece is carried out with the respirator temporarily converted into a negative pressure respirator by adapting the facepiece to use a high efficiency filter (P3) instead of the usual air supply. Respirator manufacturers can supply special facepiece adapters specifically for this purpose. Alternatively an identical negative pressure respirator facepiece with the same sealing surfaces as the power assisted respirator or the breathing apparatus facepiece can be used.

Should a fit test be carried out if the wearer's facepiece is contaminated?

105 A fit test on the wearer's facepiece should only be carried out if it is clean and in good condition. Debris in the facepiece can interfere with the fit of the facepiece, cause the exhalation valve to leak and affect the fit test device - all of which may result in a falsely low fit factor. A contaminated facepiece may also expose the fit tester to hazardous substances, e.g. asbestos fibres. If possible the wearer's employer should be informed about faulty or contaminated facepieces.

Why is it necessary for the wearer to exercise during the fit test?

106 The purpose of the test exercises is to generate a physical workload on the wearer that simulates working activities and work rate. This will test the fit of the facepiece better than if the wearer was sat down or stood still during the fit test.

What actions should be taken if the wearer is not able to put on the facepiece correctly?

107 If a poor fit is due to inadequate training then a refresher course should be undertaken; the fit tester may give this training, if competent to do so. The wearer's employer should also be informed.

INFORMATION FOR THE FACEPIECE WEARER

What is a fit test?

108 The person carrying out the fit test will explain to you what a fit test is and why it is carried out.

What will be required from me when I have a fit test?

109 Depending on the fit test method used, you may be asked to refrain from smoking for at least one hour prior to the fit test. You may also be asked not to drink or eat immediately (15 minutes) before the fit test.

110 A fit test should not be conducted if you have any facial hair growth in the area where the facepiece seal meets your face. This is because a reliable face seal can only be achieved if you are clean-shaven in the area where the facepiece seal touches your face. You will therefore be asked to be suitably clean-shaven for the fit test. ***You should remember that the same rule applies when you wear your facepiece on a day-to-day basis at work.*** If you are unable to be suitably clean-shaven for an unavoidable reason (e.g. where a beard is worn for religious reasons), then your employer should provide you with a suitable loose fitting facepiece that does not require you to be clean-shaven, or make alternative arrangements so that the risk to your health is either prevented or adequately controlled. Care should be taken to ensure that any facial hair within the facepiece does not interfere with the proper functioning of the facepiece components such as exhalations valves. Loose fitting facepieces do not require fit testing described in this document. If you wear spectacles with side arms you will not be able to wear a tight-fitting full face mask. In this circumstance, your employer should provide you with a suitable loose fitting device.

111 You should be able to fit the facepiece in the manner in which you have been trained, and without assistance from the fit tester. You should know how to carry out a pre-use fit check of the facepiece.

112 During the fit test you will be asked to perform simple exercises. You may also be asked to carry out these exercises whilst cycling on an exercise bike, walking on a treadmill or stepping. The person conducting the fit test should explain the reasons for carrying out these exercises. If you have any medical condition that may prevent you from performing these exercises then you should bring this to the attention of the fit tester and your employer.

113 If you normally wear protective goggles or hard hat, etc when you wear your facepiece you may be asked to wear these also during the fit test.

Can I be fit tested in the facepiece I usually wear?

114 The fit test will be carried out with using the facepiece you normally wear or one identical to it. If you are to be fit tested in your own facepiece then you or your employer should make sure that the facepiece is clean and maintained in accordance with the manufacturer's instruction. *Note:* It is not the job of the fit test provider. They have been

advised by HSE not to carry out a fit testing on a facepiece that is not maintained in accordance with the manufacturer's instructions.

What if I normally wear more than one type of respirator?

115 If you need to wear more than one type of tight-fitting facepiece for your job, e.g. a filtering facepiece and a full face mask respirator, then you should be fit tested for each type of facepiece.

What will I be told at the end of the fit test?

116 When you have completed the fit test you will be told if you have obtained a pass or a fail. A pass means that the facepiece is suitable for you. You or your employer will be issued with a fit test report, which should be retained. If you have not been given a copy of the report, you can ask for a copy from your employer. A failed fit test may indicate that the facepiece does not fit you properly.

What will happen if I fail a fit test?

117 The fit tester should ask you to refit the facepiece and repeat the fit test. If a better fit is not obtained you may be asked to try on a different size or type of facepiece and repeat the fit test. ***You should not use a facepiece that does not fit you properly.*** The fit tester should inform your employer. Your employer should ensure that you are provided with a facepiece that fits you properly.

How often should I have a fit test?

118 If you need to change to another type of facepiece; you lose or gain weight; undergo any substantial dental work or develop facial imperfections (scars, moles, etc) around the faceseal area. Your employer may also have a policy that you have a fit test every year or two years for example.

Will I be able to move employment without having to have another fit test?

119 If you change your employer but still continue to wear the same facepiece or same facepiece model and size you should not have to be retested, your new employer, however, may wish for you to have another fit test.

Who should pay for the fit test?

120 Your employer is responsible for your health and safety whilst at work and therefore they are responsible for the cost of the fit test.

REFERENCES

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- 4 BS EN136:1998 *Respiratory protective devices: Full face facepiece - Requirements, testing, markings*.
- 5 BS EN 140:1998 *Respiratory protective devices: Half facepieces and quarter facepieces - Requirements, testing, markings*.
- 6 BS EN149:2001 + A1:2009 *Respiratory protective devices - Filtering half masks to protect against particles - Requirements, testing, marking*
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http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9780&p_table=STANDARDS
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- 9 HSG53 *The selection, use and maintenance of respiratory protective equipment - a practical guide*. HSE Books ISBN 978 0 7176 2904 6.
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- 11 BS EN 529:2005 *Respiratory protective devices – Recommendations for selection, use, care and maintenance – Guidance document*.
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June 2010

APPENDIX 1

TROUBLESHOOTING

Further information to help address fit testing problems

1.1 Fit testing methods are based on simple principles but practical application may not be straightforward. There are problems that can be encountered by the fit tester.

1.2 Part 3 of this document (paragraphs 48-120) provides advice and information on different fit test methods. The information includes hints and tips on how to prevent problems.

1.3 This appendix provides additional information on problems that may be encountered and how they might be addressed.

Inadequate wearer training in correct donning of the facepiece

1.4 Information from established fit test providers suggests that incorrect donning of the facepiece is one of the most commonly encountered problems. It is essential that wearers are adequately trained in how to correctly put on the facepiece, before a fit test is carried out.

1.5 Although training in donning is not a part of the fit test, the fit tester should be able to recognise poor donning. It would make sense for the fit tester to be capable of providing training in donning, as well as providing fit testing.

1.6 Filtering facepieces can be the most difficult facepieces to don correctly as they often require the wearer to shape the facepiece to their face, particularly over the nose. However once the wearer has been adequately trained this type of device is easy to don correctly.

1.7 Manufacturers are required to provide instructions on how to fit their facepiece; some general pointers to correct donning are given below:

- Are the straps positioned and adjusted evenly?
- Are the straps tightened sufficiently, but not over-tightened?
- Is there any hair caught between the facepiece and the wearers face?
- For filtering facepieces, if there is a mouldable nose strip is this firmly shaped to the wearer?

1.8 When using the Portacount method there is a 'real-time function' which can be used to give an indication of the fit before commencing a full test. This can be a useful tool for training the wearer in correctly donning the facepiece.

Failures - wearer factors

1.9 The most obvious reason for a fit test failure is that the facepiece is unsuitable for the wearer and is not capable of fitting their face. Certain facial features may lead to poor fit. Watch out for:

- Cleft chins
- Scars on the face sealing area
- Depressions around the temple/cheekbones
- Unusual chin profiles (chisel feature)
- Unusual nose shapes
- Very large/small or angular faces

1.10 The fit tester should inspect the fit of the facepiece before beginning the fit test. Ask the wearer to move their head to look down whilst you check the fit around their nose or forehead. Similarly ask them to move their head to look up, then to each side to check the fit all around the facepiece. Obvious gaps indicate a poor fit and an alternative facepiece may be needed.

1.11 A fit check should be successfully carried out before beginning the fit test.

1.12 It is possible that the fit test exercises will result in the facepiece moving on the face creating a leak. Note at what stage in the test the failure occurred. If it was during the head movement exercises, this could mean that the facepiece could have moved on the face. Inspect the fit again for changes since the beginning of the test. Changes may be because the facepiece is unsuitable for the wearer's face or could be due to other factors. Watch out for:

- Sweating which can cause the facepiece to slip
- Make-up, face-creams etc these can create sealing problems
- Jewellery such as nose studs interfering with the fit

The facepiece may need redonning and the straps tightening to prevent slippage, however they should not be so tight as to make the facepiece uncomfortable. Retest, if the problem can be rectified or try a different facepiece.

Failures - facepiece problems

1.13 If there is no obvious reason for the fit test failure it is worth examining the facepiece closely to check for defects. With reusable facepieces inspect generally and ensure that the exhalation valve is in good condition and clean.

Qualitative method

1.14 Always check your fit test equipment before use:

- The nebulisers should be checked during each test for correct functioning;
- Make sure you use the correct solution for the fit test;

- Is the wearer trying to smell the aerosol, rather than taste it? You may have to keep reminding the wearer to breathe through their mouth, not their nose;
- Make sure the wearer does not eat, drink or smoke for at least 15 minutes before the test, otherwise their sense of taste may be affected.

Quantitative method

1.16 Always check your fit test equipment before use:

- Ensure the Portacount 'daily checks' are completed
- Are the sample tubes and probes correctly positioned?
- Are the sample tubes open and not blocked or twisted?

1.18 There are minimum requirements for ambient particle count when using the Portacount. You should have at least 3000 particles/cc for fit testing filtering facepieces and half masks, and 10,000 particles/cc for fit testing full face masks. Air conditioned offices may not be a suitable location for fit testing, unless the system can readily be turned off and the windows opened. Particles can be generated artificially but this may result in varying concentrations during the test with an affect on the accuracy of the result. The best type of environment is where the particle count is naturally high.

1.19 It is important to ensure that there is sufficient alcohol within the Portacount otherwise a lower particle count will be measured even though there may be plenty of particles in the air. Remember to re-soak the wick frequently (every 2-4 hours).

1.20 When testing a half or full face mask, a particulate P3 filter fitted should always be fitted. If the filter is correct, could it be faulty?

1.21 Is there condensation in the sample tubes? This can also cause a false negative. If you are doing a lot of fit tests, it is worth having two sets of tubes and alternating them between tests to reduce the moisture build-up.

1.22 Is the wearer a smoker? Have they smoked in the last hour? This can cause a false negative result. The wearer should be retested at a time when they have not smoked for at least 60 minutes.

APPENDIX 2
(paragraph 64)

CALCULATION OF FIT FACTORS

Equation 1

e.g. an inward leakage result of 0.05% would equate to a fit factor of 2000

$$FF = \frac{100}{\% \text{ inward leakage}} = \frac{100}{0.05\%} = 2000$$

The overall FF resulting from a series of exercises (see paragraphs 80-82) can be calculated using equation 2.

Equation 2

$$\text{Overall FF} = \frac{\text{Number of exercises.....}}{(1/ff1+1/ff2+1/ff3+\dots\dots\dots+1/ffn)}$$

(where ff1, ff2, ff3 , etc are the fit factors for exercises 1, 2, 3, etc)

APPENDIX 3

SPECIFICATIONS FOR THE QUALITATIVE FIT TEST EQUIPMENT OSHA 1910.134 APP A (2004): FIT TESTING PROCEDURES

Item	Properties
Sensitivity solution (sweet)	0.83 g Sodium Saccharin in 100 ml distilled water
Fit test solution (sweet)	83 g Sodium Saccharin in 100 ml distilled water
Sensitivity solution (bitter)	13.5 mg denatonium benzoate (Bitrex™) in 100 ml of 5% salt (NaCl) solution made with distilled water
Fit test solution (bitter)	337.5 mg denatonium benzoate (Bitrex™) in 200 ml 5% salt solution made with distilled water
Hood	12" diameter 14" tall Front part clear 3/4" hole in front of breathing zone
Nebuliser	Produces 1 ml of aerosol with each full squeeze