INTRODUCTION
Checking that a respirator, with a tight fitting facepiece, provides an adequate seal to the wearer's face has long been considered best practice as part of a general Respiratory Protective Equipment (RPE) programme. Fit testing has been a mandatory requirement under the UK Asbestos Regulations and now with the introduction of the Control of Substances Hazardous to Health Regulations 2002 (COSHH) and the supporting Approved Codes of Practice, fit testing is an industry wide mandatory requirement. Respirators with tight fitting facepieces include disposable respirators, half masks and full face masks, including those that form part of a powered or airfed respirator.

This technical bulletin contains information on some methods of fit testing and details the products 3M offer to support a fit testing regime.

WHEN TO FIT TEST
Fit testing should be carried out:
- On all wearers of RPE with tight fitting facepieces where fit testing has previously not been performed
- During initial selection of RPE

Fit testing should be repeated at appropriate times such as:
- If the RPE wearer significantly loses or gains weight, has major dental work or sustains a major facial injury
- If a different size or model of RPE is specified
- If specified by the company policy eg. repeated with annual health surveillance check.

Fit testing is in addition to the requirement to perform a pre-use fit check or airflow check.

FIT TEST METHODS
Two main methods of fit testing are available:
- Qualitative fit testing
- Quantitative fit testing

During both methods of testing, as per the normal guidance given for RPE wear, it is essential that the wearer is free from facial hair and other items that may interfere with the face seal. All tests require a series of exercises to be performed during the fit test. Manufacturers' instructions for the test equipment should be followed at all times. A record of the result of the test should be generated and retained for at least 5 years. Some schools of thought believe that as these records are identifiable to an individual, records may need to be kept for 40 years. The 3M RPE Programme Guide sets out a system for keeping records.

QUALITATIVE FIT TESTING
Qualitative fit tests provide a pass or fail result based upon the wearer detecting a test agent. They provide a subjective measure of the quality of the seal of the facepiece to the wearer's face. These tests are suitable for disposable respirators and half masks.

The test agent can be detected either by taste or by smell.
3.1.1 TASTE TEST METHOD
This method introduces a controlled aerosol concentration into a hood fitted over the wearer. This test is suitable for all disposable respirators and half masks fitted with particulate or combination gas/vapour and particulate filters. 3M offer two test kits in this category 3M™ FT-10 kit that includes a sweet tasting substance (saccharin) and FT-30 that includes a bitter tasting substance. Further details will be found on page 3 of this bulletin.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
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<tbody>
<tr>
<td>Inexpensive</td>
<td>Subjective – relies on wearer’s response</td>
</tr>
<tr>
<td>Simple to use</td>
<td>Unable to test full face masks</td>
</tr>
<tr>
<td>No calibration of equipment required</td>
<td></td>
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<tr>
<td>Detection makes wearer feel more involved in the test</td>
<td></td>
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<tr>
<td>No modification of facepiece required</td>
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<tr>
<td>Test operator can be self-taught</td>
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</table>

3.1.2 ODOUR TEST METHOD
This test involves the wearer detecting the smell of isoamyl acetate (banana oil). It may be used for half masks fitted with an organic vapour filter.

3.2 QUANTITATIVE FIT TESTING
Quantitative fit tests give an objective measure of the quality of the seal between the wearer’s face and the facepiece. A fit factor number is produced.

3.2.1 TEST CHAMBER
This method is usually conducted in a laboratory due to the nature of the equipment involved. The test follows the methods used for the inward leakage test described in the European Standards for respirators. The wearer is fitted with a probed respirator and exercises on a treadmill within a test chamber into which a test agent of sodium chloride aerosol or sulphur hexafluoride gas is introduced. Through a comparative measurement of the level within the facepiece to that in the test chamber the face seal leakage can be derived.

The sodium chloride test method measures total inward leakage and is suitable for disposable respirators, half masks and full face masks. When the respirator is fitted with P3 filters, this is equivalent to face seal leakage and the fit factor can be calculated.

The sulphur hexafluoride test method can only be used with air fed respirators.

3.2.2 PORTABLE PARTICLE COUNTING DEVICE
These devices usually depend on naturally occurring particles circulating within ambient air. The test involves connecting a probed facepiece, via plastic tubing, to the counting device. Particles of a certain size identified within the facepiece are counted. This number is compared with the number of particles counted outside the respirator in the ambient air. In certain cases, it may be necessary to increase the ambient air particle concentration by means of a particle generator.

The result of this test is expressed as the ratio between the particle counts inside and outside of the respirator and called a fit factor. These fit factors can often be high and should not be confused or used as the basis to select a respirator. The Assigned Protection Factors for a device must always be used as the basis to select a respirator, i.e. its maximum use concentration.

This test method is suitable for disposable respirators, half face masks and full face masks.
RESPIRATOR
FACEPIECE
FIT
TESTING

Advantages  Disadvantages
• Objective numerical result  • Expensive
• Wearer cannot influence result  • Modification of facepiece required
• Most have computer compatible software  • Test operator training is recommended
  to allow print-outs of records  • Requires an additional adaptor to test
  FFP1 and FFP2 respirators

CONTROLLED NEGATIVE PRESSURE DEVICE
This test method uses a device to remove air from the facepiece then maintain a constant negative
pressure inside the facepiece while the wearer holds his breath and remains motionless. The rate
at which air needs to be drawn from the facepiece to maintain the negative pressure is measured
to give the rate of leakage into the facepiece. This method can only be used with facepieces with
detachable filters or supplied air connectors.

3M QUALITATIVE FIT TEST HELP
3M™ FT-10 and FT-30 Fit Test Kits
3M offer two qualitative fit test kits FT-10 (sweet) and FT-30 (bitter); FT-10 uses a test solution of
sodium saccharin that produces a sweet tasting aerosol and FT-30 uses denatonium benzoate to
produce a very bitter taste. Each kit contains a hood and collar assembly, two nebulisers,
sensitivity solution, test solution and detailed user instructions.

3M Part Number  3M Description
FT10     Fit Test Kit – Sweet (includes hood, collar, 2 nebulisers, sensitivity solution, fit test solution and laminated user instructions)
FT30     Fit Test Kit – Bitter (includes hood, collar, 2 nebulisers, sensitivity solution, fit test solution and laminated user instructions)

Spare Parts
FT11     Sensitivity solution 55ml bottle (sweet)
FT12     Fit test solution 55ml bottle (sweet)
FT31     Sensitivity solution 55ml bottle (bitter)
FT32     Fit test solution 55ml bottle (bitter)
FT13     Nebuliser (1/box)
FT14     Hoods (2 hoods/box)
FT15     Collar (1 collar/box)

The choice between the bitter and sweet test kit is a personal one, however a small percentage of
the population are unable to detect saccharin in which case the bitter test must be used.

The test procedure involves the hood being fitted to the RPE user without their respirator fitted.
Using one nebuliser, an aerosol of the sensitivity solution is introduced into the hood to establish
the wearer’s ability to detect the solution. The sensitivity solution is a very dilute version of the fit
test solution. After a few minutes break, to allow the taste of the sensitivity solution to clear, the
wearer dons their respirator and the hood is re-fitted.

The test solution is now sprayed into the hood to the concentration level established by the
sensitivity test. This level is maintained throughout the test by introducing more solution in at
stated intervals. The wearer then performs a series of exercises involving breathing, head
movements and talking.

3M Health & Safety Helpline Telephone: 0870 40 800 60.  For callers within the Republic of Ireland: 1 800 320 500.
www.3M.com/safety
If the entire test is completed without the wearer tasting the aerosol it is deemed a pass. If the
taste of the aerosol is detected at any point during the test, the test is terminated. After allowing
at least 15 minutes for the taste of the aerosol to clear, the test may be repeated. If repeated
failures are experienced an alternative size or model of RPE should be tried.

Spare hoods, nebulisers and solutions are available for the fit test kits.

3M QUANTITATIVE FIT TEST HELP

3M Maintenance Free respirators and 4000 series respirators can be quantitatively fit tested with
a portable counting device. This type of equipment includes adaptors which pierce the respirator
filter material or the mask body to allow a probe to be fitted. If the 3M range of half or full face
masks require quantitatively fit testing, then the following 3M adaptor should be used.

3M 601 Quantitative Fit Test Sampling Adaptor

The 601 adaptor allows the following 3M bayonet half face masks and full face masks to be
adapted for a quantitative fit test device.

<table>
<thead>
<tr>
<th>3M Product Code</th>
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<tbody>
<tr>
<td>3M 6100S</td>
<td>Half Mask – small</td>
<td>3M 7002</td>
<td>Half Mask (Rubber) – medium</td>
</tr>
<tr>
<td>3M 6200M</td>
<td>Half Mask – medium</td>
<td>3M 7003</td>
<td>Half Mask (Rubber) – large</td>
</tr>
<tr>
<td>3M 6300L</td>
<td>Half Mask – large</td>
<td>3M 7501</td>
<td>Half Mask (Silicone) – small</td>
</tr>
<tr>
<td>3M 6700S</td>
<td>Full Face Mask (Silicone) – small</td>
<td>3M 7502</td>
<td>Half Mask (Silicone) – medium</td>
</tr>
<tr>
<td>3M 6800S</td>
<td>Full Face Mask (Silicone) – medium</td>
<td>3M 7503</td>
<td>Half Mask (Silicone) – large</td>
</tr>
<tr>
<td>3M 6900S</td>
<td>Full Face Mask (Silicone) – large</td>
<td>3M 7907</td>
<td>Full Face Mask (Silicone) – one size</td>
</tr>
</tbody>
</table>

3M Product 3M Product Publication
Code Description Code Description
3M 8710 QLFT 3M 8812 QLFT
3M 8712 QLFT 3M 9310 QLFT
3M 8712 QLFT 3M 9312 QLFT
3M 8722 QLFT or QNFT 3M 9320 QLFT or QNFT
3M 8722 QLFT or QNFT 3M 9322 QLFT or QNFT
3M 9332 QLFT or QNFT 3M 9907 QLFT
3M 9505 QLFT or QNFT 3M 9907 QNFT
3M 8835 QLFT or QNFT 3M 9906 QLFT
3M 9928 QLFT or QNFT 3M 9928 QLFT or QNFT
3M 9906 QLFT 3M 9928 QLFT or QNFT

QLFT = Qualitative Fit test - taste method  QNFT = Quantitative Fit test - particle counting method