

# Respirator Fit Testing



*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 Protection Programme. Respirators with tight fitting facepieces include disposable respirators, half masks and full-face masks, including those that form part of a powered or air-fed respirator. This tech update contains information on some methods of fit testing and some solutions from 3M to support a fit testing regime.*

## When to Fit Test

Fit testing should be carried out:

- Before the respirator is issued
- On all wearers of respirators with tight fitting facepieces where fit testing has previously not been performed

Fit testing should be repeated at appropriate time such as:

- If the wearer significantly loses or gains weight, has major dental work or sustains a major facial injury
- If a different size or model of PPE is specified
- At least annually or when specified by the company policy e.g., at time of health surveillance check.

Fit testing is in addition to the requirement to perform a fit check prior to each use as a gross determination of suitable fit.

## Fit Test Methods

There are two (2) main methods of fit testing available:

- Qualitative fit testing
- Quantitative fit testing

During both methods of testing, it is essential that the subject is free from facial hair and other items that may interfere with the face seal. Wearers with facial hair or stubble (even a few days' growth) must not wear a respirator which has a tight fitting facepiece.

## Respirator Fit Testing

All tests require a series of exercises to be performed under 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 five (5) years. Some schools of thought consider these records to be identifiable to an individual and related to health controls; in which case records may need to be kept for 40 years. Check with your local regulatory authorities to determine their requirements.

### Qualitative Fit Testing

Qualitative fit tests provide a pass or fail result based upon the wearer detecting a test agent. The test agent can be detected either by taste or by smell. They provide a subjective measure of the quality of the seal of the facepiece to the wearer's face. Generally they are easy to perform and require no specialised equipment or highly trained persons.

### Taste Test Method

This method introduces a controlled aerosol concentration into a hood fitted over the wearer. This test is suitable for all respirators fitted with particulate or combination gas/vapour and particulate filters.

### Advantages

- Inexpensive
- Simple to use
- No calibration of equipment required
- No modification of facepiece required
- Test operator can be self-taught
- Detection makes wearer feel more involved in the test

### Disadvantages

- Subjective – relies on wearers response
- Unable to test full face masks

### Odour Test Method

This test involves the wearer detecting the smell of isoamyl acetate (banana oil). This test is suitable only for respirators fitted with an organic vapour (Class A) filter.

### 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 calculated. These tests are much more complicated to perform than qualitative tests and require specialised equipment.

### Laboratory Test Chambers

## Respirator Fit Testing

This method is usually conducted in a laboratory due to the nature of the equipment involved. The test follows the methods used for the Total Inward Leakage test described in Australian /New Zealand Standard AS/NZS 1716 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, oil mist 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 or oil mist test methods measure total inward leakage and are 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.

### 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 Required Minimum Protection Factors for a device must always be used as guidance to select a respirator. These are listed in Tables 6.1, 6.2 and 6.3 of AS/NZS 1715:1994

### Advantages

- Objective numerical result
- Wearer cannot influence result
- Most have computer compatible software to allow print-outs of records

### Disadvantages

- Expensive
- Modification of facepiece required
- Test operator training is recommended
- 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 can only be used with facepieces with detachable filters or supplied air connections.



## Respirator Fit Testing

### 3M Qualitative Fit Test Help

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 (Bitrex) to produce a very bitter taste. Each kit contains a hood and collar assembly, two nebulisers, sensitivity solution, test solution and detailed user instructions. The choice between the bitter and sweet test kit is a personal one, however a small percentage of the population are unable to detect the taste of 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 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. 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 respirator should be tried.

### 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. Once fitted with a probe, test facepieces may not be worn in the workplace. If the 3M range of half or full face masks require quantitatively fit testing, then the 3M™ 601 Quantitative Fit Test Sampling Adaptor should be used. The 601 adaptor allows 3M half face masks and full face masks with bayonet filter attachments to be adapted for a quantitative fit test device.

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