CleanSpace®
R E S P I R A T O R S
Free the way you breathe™

Respiratory Protection
for Workers with Facial Hair
- The United Kingdom
October 2024

Powered Respirators and Facial Hair

CleanSpace Technology designs and manufactures breath-responsive Powered Air Purifying Respirators (PAPRs). These devices are powered and operate using positive pressure to maintain air quality for the worker. CleanSpace PAPRs, unlike most other powered respirators currently on the market, have a low-profile mask design rather than a hood. They are internationally certified to provide the highest level of respiratory protection[1]. This certification has been completed against the requirements for a "tight fitting" PAPR, because all PAPRs with low-profile masks are regarded as "tight fitting" regardless of their mode of operation.

HSE guideline document HSG53 recommends the use of loose-fitting facepieces (which do not rely on a tight seal) by workers with facial hair. Concern is expressed that facial hair will affect where a face mask seals to the face and will cause leakage. However, our Workplace Protection Factor studies and fit test data (see below) have shown that CleanSpace PAPRs are very effective for workers with facial hair. This is because they maintain positive mask pressure to very high flows at variable rates and do not rely on a facial seal.

Will a CleanSpace respirator protect a worker with facial hair?

CleanSpace respirators provide high level protection for workers with facial hair. CleanSpace has conducted Workplace Protection Factor Studies and has a database of power-on fit test results. To date, CleanSpace has amassed more than 2000 individual measurements of Total Inward Leakage on workers with facial hair. These measurements show that

- · 95% of the time the protection was over 1250
- · 99% of the time the protection was over 550

This evidence demonstrates that CleanSpace Respirators provide protection that is well above the United Kingdom's assigned protection factor for a TM3 PAPR of 40[2].

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[1] Highest level protection for a filtering device. UK & Europe EN 12942 TM3; Australia and New Zealand AS / NZS1716 PAPR P3 (P2 with half mask); USA (NIOSH) 42 CFR Part 84 HE.

[2] The assigned protection factor for a TM3 PAPR in the UK is 40. See HSG53 page 34. When a hygienist is assessing what RPE to use in a workplace, they cannot assume a protection factor higher than this for any PAPR.

Fit Test Data

CleanSpace has access to a substantial sample of power-on fit testing conducted on its devices (kindly provided by external testers as well as our own). To date (September 2024) 395 industrial workers with facial hair have completed fit testing. The average fit factor recorded was 8,116, with a 5th percentile result of 1,343 and a lowest recorded result of 105.

Click here to view Fit Testing data.

Workplace Protection Factor Studies

In workplace protection factor (WPF) studies, fit factors are measured while workers perform their normal work in their normal environment. In 2022, CleanSpace conducted a WPF study in the UK which included 20 workers with facial hair. The average fit factor recorded during each minute of the work sessions was 9,505, a 5th percentile of 1,285 and a lowest recorded minute (out of 1,015 minutes of data recorded) of 262. An earlier Australian WPF study of 9 workers with facial hair showed an average fit factor recorded during each minute of the work sessions was 6,480, a 5th percentile of 1,309 and a lowest recorded minute of 186.
Click here to view the Work Place Protection Studies data.

Measured Protection Factors – Workers with Facial Hair – All Sources to April 2024			
	WPF Study Australia 2019	WPF Study UK 2022	Fit Testing in Industry
Average	6,480	9,505	8,116
5th Percentile	**1,309**	**1,285**	**1,343**
Minimum	186	262	105

The main conclusion that can be drawn from these tests is that 95% of the time, an individual with facial hair, wearing a CleanSpace Respirator, should expect a measurement of Total Inward Leakage of over 1250.

Maximum Flow Rate Limitations

It is important that all end users of RPE understand the limitations of their respiratory protective equipment in relation to tasks that require extreme exertion. It is unusual for a worker in a well-organised workplace to over-breathe the fan of their PAPR; however, it may happen in cases where extreme exertion is required.

If the worker breathes in more air than the fan can supply, a hood cannot be relied upon for protection. For this reason, hoods (TH accredited devices) are only recommended in the UK for work levels up to medium, whereas TM devices with masks are suitable for both medium and heavy work rates (see HSG53 4th ed, 2013).

Under the same circumstances of over breathing, a CleanSpace PAPR on a worker with facial hair will provide reduced protection. Thus, the worker whose job involves extreme exertion and who may over-breathe the fan, has no choice but to use a PAPR with half or full-face mask (for instance a CleanSpace) and to be clean-shaven.

Fit Testing

Fit testing is a way of seeking to evidence compliance with UK regulations. The testing is helpful in establishing that a worker has been provided with effective respiratory protection. There are two types of tests:

- Fit Test (Fit2Fit official) – This is a fit test conducted with the device in power-off mode. It measures the ability of the mask to protect via seal against the user's face. All participants must be cleanshaven.
- Protection Factor Test* – This testing mirrors the Fit2Fit fit test, but with the device in power-on mode. This method measures the entire device's ability to protect an end user (both mask seal and positive pressure).

*This form of testing (power-on) is not recognised by Fit2Fit

For users with facial hair, CleanSpace recommends conducting a power-on Protection Factor Test. This method is recommended as all CleanSpace PAPRs are intended to be used in power-on mode only.

For cleanshaven end users, CleanSpace recommends conducting fit tests in power-off mode, as per Fit2Fit guidance.

As discussed above, users whose tasks involve extreme levels of exertion and who may over-breathe their PAPR, must wear a TM-rated PAPR, must be fit tested power-off and must remain clean-shaven.

Demonstrating Compliance in the United Kingdom – An Employer's Legal Obligations

A UK employer's legal responsibilities in relation to respiratory protective equipment (RPE) stem from *COSHH 2002* and *The PPE Regulations of 2002.*

The key requirements are:

a) that the equipment provides effective protection against the hazards present;

b) that it is a suitable size and comfortable fit;

c) that upon pressure drop on inspiration (inhalation) the equipment provides effective protection;

c) that it is maintained; and

d) that efforts are made to ensure it is worn when required.

A common method of demonstrating compliance is to conform to the guidelines in HSG53. Under these guidelines, wearers of CleanSpace tight-fitting PAPRs should be clean shaven and fit tested.

However, HSG53 also accepts that the law can be complied with in other ways (with the burden of proving 'effectiveness' resting on the relevant duty holder).

As per HSG53, the assigned protection factor for a TM3 PAPR is 40. It is our position that this informs what is to be regarded as 'effective' protection, albeit we note that a protection factor of 100 is recommended for the purpose of a fit test pass mark.

To further demonstrate compliance, we recommend the following steps:

- Fitment by a suitably trained and experienced person, to ensure comfort and suitable sizing.
- Fit testing of each worker before issuing the respirator is recommended. See the discussion of the different types of tests, above.
- Annual servicing of the respirator by a competent service organisation.

An additional step that has been effective in other regions, is to utilise the CleanSpace CST ULTRA's capability to maintain a record of each time it is used. This provides assurance that the PPE, as well as being effective, is actually being used, which can otherwise be questioned.

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