

## Fit Factors vs Protection Factors

Application Note ITI-023

The term "Protection Factor" is ambiguous. Different people often have different definitions for it. Sometimes it is used to refer to the result of a fit test, sometimes the person using the term is referring to the level of protection an individual experiences when wearing a respirator, and in other instances it can allude to the level of protection provided by a particular type of respirator. In order to standardize the terminology used in the respiratory protection field, the term Protection Factor (PF) has been replaced by three other terms; Fit Factor (FF), Workplace Protection Factor (WPF), and Assigned Protection Factor (APF). If you want to be certain that others understand what you mean, do not use the term Protection Factor by itself. Here are the definitions of FF, WPF and APF:

### Fit Factor (FF)

A Fit Factor is a number that is the direct result of a quantitative respirator fit test. It is a measurement made by an instrument during a simulation of workplace activities (the exercises). It is expressed as the challenge aerosol concentration outside the respirator divided by the challenge aerosol concentration that leaks inside the respirator DURING A FIT TEST.

### Workplace Protection Factor (WPF)

A Workplace Protection Factor is the level of protection actually experienced by an individual while working in a hazardous environment. It is expressed as the concentration of REAL ambient hazard outside the respirator divided by the concentration of REAL ambient hazard that leaks into the respirator. WPF's are usually measured by attaching personal sampling pumps to individuals while they go about their normal work activities. This technique is often used for conducting respirator research.

### Assigned Protection Factors (APF)

An Assigned Protection Factor is the level of protection that a particular type of respirator can be expected to provide 95% of the time. An APF of 10 means that type of respirator (if used properly) can be safely used in an atmosphere that has a hazardous concentration of up to 10 times the Permissible Exposure Limit (PEL) for that hazard. APF's are determined by the government or a standards organization. In the United States, the National Institute of Occupational Safety and Health (NIOSH) and the American National Standards Institute (ANSI) both establish APF's for various types of respirators. For example, a half face negative pressure air purifying respirator typically has an APF of 10. Most full face negative pressure air purifying respirators typically have an APF of 50. APF's may vary depending on who publishes them, so be careful.



While not well documented, the accepted practice in the United States is to use ten times the APF as the Fit Factor Pass Level for quantitative fit testing. Therefore, unless the regulation or standard you intend to comply with specifies a different value, a Fit Factor Pass Level of 100 and 500 respectively should be used for half and full face negative pressure air purifying respirators.

The reasoning for this is that if you can demonstrate a Fit Factor during a simulation of the workplace (the fit test) that is much higher than the APF, then you can be optimistic about achieving at least the APF in the actual workplace. In other words, a safety factor is used to recognize the fact that the fit test is only a simulation of the workplace.

**REFER TO THE REGULATION OR STANDARD THAT APPLIES TO YOUR INDUSTRY. SEVERAL OSHA REGULATIONS CALL FOR HIGHER FIT FACTOR PASS LEVELS THAN YOU WOULD GET BY MULTIPLYING THE APF TIMES 10.**

When calculating an individual's theoretical exposure to a particular hazard, you use the APF, not the Fit Factor. For example, if the Fit Factor measured on an individual was 5000, and he is using a respirator with an APF of 10, you must use 1/10th the ambient concentration as the exposure level, not 1/5000th. Remember that the fit test was only a simulation of the workplace, not an actual measurement. The Fit Factor should never be used as if it was a Workplace Protection Factor.

---

**TSI Incorporated** – 500 Cardigan Road, Shoreview, MN 55126 U.S.A

**USA** Tel: +1 800 874 2811

**UK** Tel: +44 149 4 459200

**France** Tel: +33 491 95 21 90

**Germany** Tel: +49 241 523030

**India** Tel: +91 80 41132470

**China** Tel: +86 10 8260 1595

**E-mail:** [info@tsi.com](mailto:info@tsi.com)

**E-mail:** [tsiuk@tsi.com](mailto:tsiuk@tsi.com)

**E-mail:** [tsifrance@tsi.com](mailto:tsifrance@tsi.com)

**E-mail:** [tsigmbh@tsi.com](mailto:tsigmbh@tsi.com)

**E-mail:** [tsi-india@tsi.com](mailto:tsi-india@tsi.com)

**E-mail:** [tsibeijing@tsi.com](mailto:tsibeijing@tsi.com)

**Website:** [www.tsi.com](http://www.tsi.com)

**Website:** [www.tsiinc.co.uk](http://www.tsiinc.co.uk)

**Website:** [www.tsiinc.fr](http://www.tsiinc.fr)

**Website:** [www.tsiinc.de](http://www.tsiinc.de)



TRUST. SCIENCE. INNOVATION.

Contact your local TSI Distributor or visit our website [www.tsi.com](http://www.tsi.com) for more detailed specifications.