Respirator Fit Test Protocol Comparison - Summary

OSHA 1910.134, HSE INDG 479 and ISO 16975-3

Application Note RFT-037 (A4)

The PortaCount™ Respirator Fit Tester and the FitPro™ Ultra Software provide support for many fit test protocols. In this application note we will compare the three most common standards and protocols – the US OSHA protocol, the British Fit2Fit protocol (HSE INDG 479 and the corresponding Fit2Fit companion) and the ISO 16975-3 protocol. This document is a summary of some similarities and differences of the protocols. A more detailed comparison is presented in Application Note RFT-038 "Respirator Fit Test Standard Comparison (extended version)".

Fit Testing According to the Different Standards

Fit testing must be performed for all tight-fitting respirators. According to ISO 16975-3, however, this does not apply to escape-only respiratory protective devices (RPD). There are two general fit testing methods accepted by the compared standards. The first is the qualitative method (QLFT), which is based on the subjective perception of odors or tastes and can only be used for half-face respirators whose required minimum fit factor is less than or equal to 100. The second method is quantitative fit testing (QNFT), where measurements that result in data determine a numerical fit factor. With QNFT, there is more than one procedure approved by the standards. In the UK Fit2Fit protocol, a choice can be made between Ambient Particle Counting (APC) and Controlled Negative Pressure (CNP). The ISO and OSHA protocols present the Condensation Nuclei Counting (CNC) method, which is equivalent to the APC method and the CNP method. In addition, both protocols list the Generated Aerosol (GA) method, but this is not normally performed by the consumer. HSE INDG 479 states that only the APC method can be used for disposables.

A fit test must be performed prior to first use and when changes occur in the respirator type or the wearer's physical conditions. In addition, the test must or should be repeated periodically. OSHA mandates annual repetition, while ISO and HSE recommend repetition annually and every two years, respectively. The details of the fit test must be documented in a report. The report must include the name of the person fit tested, the respirator used (make, model, material and size), the fit test method, the test date and the test result. ISO and HSE also require further information such as details of other PPE worn.

Preparation of Fit Testing

Prior to the fit test, according to all three standards, a medical clearance to use the respirator must be obtained. Preparation for the fit test, according to the British Fit2Fit program, involves creating a safe and clean environment with privacy to some degree. In addition, the likelihood of false fit test failure would be reduced with an ambient challenge concentration of 3000 particles/cm^3 for disposable and reusable half-face masks or 10,000 particles/cm^3 for full -face respirators. According to all three standards, respirators must be prepared, provided with sampling close to the face, centered between the nose and mouth, and tested in negative pressure mode regardless of the mode of operation. The person being tested and the fit test operator must meet several conditions beforehand. For example, the wearer must not have any facial hair growth in the area of the seal and must be clean-shaven. Clean-shaven is defined in the Fit2Fit companion as within 8 hours before the start of the work shift and in the ISO protocol as within 24 hours, preferably 12 hours.

Fit Testing

For conducting the fit test, the protocols differ in the number of exercises (see Table 1) and their durations. The HSE and ISO protocols specify that each exercise should be performed for at least one minute. However, for QNFT, since the in-mask sample period should be at least one minute, the total exercise time becomes longer due to additional time for ambient sampling and purging[1]. For OSHA protocols, the exercises must be performed for 60 seconds for the full-length QNFT protocol, and for as little as 30 seconds for the modified CNC protocols. For the modified CNC protocols, however, it should be noted that there are extensions due to ambient sampling for the first and last exercise in each case. For the Talking Out Loud exercise, OSHA and HSE recommend the Rainbow Passage, while ISO does not comment on this. A major difference between INDG 479 and all other protocols is that the HSE protocol involves riding an exercise bike, running on a treadmill, or performing a stepping exercise while performing the exercises.

To evaluate the fit test result, the required minimum fit factor (RFF) must be used. OSHA sets the RFF for half-face respirators (disposable and reusable) at 100, just like HSE and ISO. However, the minimum fit factor for full-face respirators differs, as it must be 500 for OSHA and 2,000 for Fit2Fit. ISO differentiates between using the CNC method, where the pass level is 2,000, and using the CNP method, where RFF is 500. Another major difference in the evaluation of the fit test result is that INDG 479 specifies that in each exercise, the achieved fit factor must be equal to or greater than the RFF in order to pass the fit test. According to OSHA and ISO, the test is passed when the weighted average, the overall fit factor, is equal to or greater than the RFF. If the fit test is failed twice or three times, then the test should not be repeated according to the HSE or ISO.

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[1] A purge is necessary during sampling for technical measurement reasons to ensure that no particles from the previous sample are left in the measuring device. This purging is performed between each change from ambient sample to mask sample and vice versa.

Table 1: Fit Test Exercises

	US – OSHA Protocol			UK – Fit2Fit Protocol (HSE INDG 479)	ISO 16975-3 Protocol
	Normal (OSHA 29CFR1910.134)	**Modified for half/full-face respirators**	**Modified for filtering facepieces**		
Number of exercises	8	4	4	7	7
1. Exercise	Normal breathing in a standing position	Bending over at the waist	Bending over at the waist	Normal breathing	Normal breathing in a standing position
2. Exercise	Deep breathing in a normal standing position	Jogging-in-place	Talking out loud by reading from a prepared text, counting backward from 100, reciting a poem/song	Deep breathing	Deep breathing in a normal standing position
3. Exercise	Standing in place, turning head side to side	Stand in place, turn head side-to-side	Stand in place, turn head side-to-side	Turning head side to side	Standing or sitting, turning head side to side
4. Exercise	Standing in place, moving head up and down	Stand in place, head up-and-down	Stand in place, head up-and-down	Moving head up and down	Standing in place, moving head up and down
5. Exercise	Talking out loud by reading from a prepared text, counting backward from 100, or reciting (poem/song)	/	/	Talking by reading from a standard passage or counting down from 100	Talking by reading from a prepared text, counting backward from 100 or reciting (poem)
6. Exercise	Grimace by smiling or frowning	/	/	/	/
7. Exercise	Bending over at the waist or if, bending over is prevented, jogging in place	/	/	Bending over at the waist	Bending over at the waist or, if equipment prevents bending over, jogging in place
8. Exercise	Normal breathing	/	/	Normal breathing	Normal breathing