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Technical Bulletin

February 2025

Fit testing 3M Scott Vision C5 Facepieces for use by First Responders

Introduction

The following document summarizes information pertaining to quantitative fit testing 3M Scott Vision C5 facepieces:

- Fit Testing
- Fit Testing Protocols
- Vision C5 Facepieces
- Quantitative Fit Testing using a Condensation Nuclei Counter
- Quantitative Fit Testing using Controlled Negative Pressure

Respirator selection, use and care must meet the requirements of local legislation, including the requirement for a written Respiratory Protection Program.

Fit Testing

Respirator fit testing is required throughout the United States and Canada whenever respirators are used in first responder, firefighting and industrial applications. In the US, the Occupational Safety and Health Administration (OSHA) specifies when and how fit testing is to be done[1]. In Canada, respirator fit testing requirements are prescribed by federal, provincial, or territorial law with jurisdiction determined by the industry, application, or location in which the respirator is used. Details regarding test protocols and interpretation of results may be stated within these laws, or through reference to non-regulatory documents such as government authored guidelines, consensus standards and/or the user instructions provided by the respirator manufacturer. In the latter case, the requirement to follow the protocol becomes enforceable through the responsibilities of the employer that are prescribed in health and safety legislation. Fire departments may also be required to comply with, or choose to comply with, standards from the National Fire Protection Association (NFPA). For example, OSHA allows an SCBA full facepiece to be qualitatively fit tested (QLFT)[2] . Other jurisdictions that refer to standards such as NFPA 1500 require the facepiece to be quantitatively fit tested (QNFT)[3].

Fit Testing Protocols

Quantitative fit tests generate a numerical fit factor that is comparable to a specific protocol criterion. The fit factor therefore indicates (on a pass/fail basis) whether the individual can expect to achieve the reduction in exposure represented by the Assigned Protection Factor (APF) of a class of respirators for which the facepiece is a component.

Consider the example provided by OSHA 1910.134 for a full facepiece that is intended to be worn as a component of an SCBA with APF of 10,000, or as a component of a negative pressure, air purifying respirator (APR) in circumstances requiring an APF of 50. A quantitative fit test (QNFT) must be selected to support the required APF of 50. OSHA's 1910.134 Appendix A - Fit Testing Procedures (Mandatory) prescribes a strict fit testing protocol that includes elements such as:

- Wearing the facepiece for five (5) minutes before conducting the fit test
- Exercises that must be performed for a specified period of time

The facepiece may be used, and the respirator class APF applied, only if the fit factor exceeds the criterion. To conclude this example, having passed the QN FT, the wearer would utilize an APF of 50 when wearing the facepiece as a component of the negative pressure, air purifying respirator, or utilize an APF of 10,000 when wearing the facepiece as a component of an SCBA. Note, SCBA are designed to be used in atmospheres that are considered Immediately Dangerous to Life or Health (IDLH) or oxygen-deficient.

Studies have been published regarding the advantages and disadvantages of QNFT[4-7]. It should be noted that little to no correlation was found between quantitative fit factors and respirator performance unless poor-fitting respirators were included in the analysis[4-8]. In other words, those subjects who failed a quantitative fit test also showed lower respirator performance. But higher fit

factors above the minimum requirement did not necessarily translate to higher respirator performance. Rather, wearers who pass either a qualitative or quantitative fit test and are part of complete respirator program that meets all local regulatory requirements can expect their respirator to reduce inhalation exposure according to the Assigned Protection Factor[9].

Valid fit tests are generated when:

- The respirator is complete and functioning properly. The respirator must be inspected before each fit test, following the guidance in the User Instructions.
- The correct fit test adapters are used and functioning properly. Adapters should be inspected before each use to ensure that:
    - Valves and gaskets are present in good condition
    - The assembly is clean and dry
- The correct filters are used if/when required. When filters are required, use P100 filters suitable for the facepiece assembly.
- The correct fit testing protocol is selected. The required protocol is specified by local law. In the United States, fit testing must be conducted in accordance with OSHA 1910.134 Appendix A. In Canada, protocols (including pass/fail criterion) are determined by the industry, application, or location in which the respirator is used.
- The fit testing protocol is followed accurately and completely. Pass criterion are established based on a specific protocol. The entire protocol must be conducted in order to generate a fit factor that may be compared to the pass criterion.
- Fit testing equipment is used and maintained according to the manufacturer's requirements, including:
    - Following all steps for equipment set up, including pre-use checks
    - Periodically ensuring that the equipment and the test environment remain within the protocol parameters. For example, when tubing is moved repeatedly between facepieces, the ends may become loose and introduce a leak; the tubing may need to be trimmed, cleaned or replaced to prevent errors
- The person being fit tested:
    - Is trained and competent regarding facepiece donning and use, and in performing the fit test procedure
    - Follows the entire protocol such as all pre-test steps, wear time, performing a User Seal Check, etc.
    - Has nothing interfering with the face to facepiece seal. All jurisdictions require that facial hair not interfere with the seal. Typically, if shaving is required, then the fit test subject should have shaved within the previous 24 hours and preferably, within the last 12 hours. Some jurisdictions require that the facepiece wearer shave as often as required to prevent facial hair from interfering with the faceseal[10]
- The fit tester is trained and competent in all required aspects of conducting a fit test including:
    - The protocol
    - Operating the fit testing equipment
    - Respirator pre-use inspection, donning and User Seal Check

While we often focus on things that negatively impact a fit test, it is also good to review things that do not. When fit testing the 3M Scott Vision C5 series full facepieces, the fit test is not affected by:

- Spectacle kits
- The size of nose cup

Fit tests must be updated under conditions such as:

- Changing to an alternate head harness material or configuration
- Changing to a different faceseal size
- When a user changes in a way that may affect fit (large increase or decrease in weight, use of dentures, new facial scars, etc.)

Fit Testing 3M™ Scott™ Vision CS Facepiece

Before use, the wearer must read, understand, and follow the User Instructions provided as a part of the product packaging. A written respiratory protection program must be implemented meeting all the requirements applicable in the employer's location, including training, fit testing, and medical evaluation; in the United States, follow the requirements of OSHA Respiratory Protection Standard, 29 CFR 1910.134.

To properly don the facepiece:

1. Fully loosen each of the head harness straps.
2. Hold the facepiece in one hand and hold the head harness at its base while positioning it at the top of the facepiece.

3. Place the facepiece on the face with the chin properly located in the chin cup (Figure 1). While rotating the facepiece up so the nose enters the center of the nose cup and the face seal is pressed firmly against the face (forehead and chin), pull the head harness over the top of the head. Verify that no hair or clothing is interfering with the face to facepiece seal.
4. While holding the facepiece firmly against the face (forehead and chin), smooth and then pull the back of the head harness down the back of the head. (Figure 2) Verify that the head harness is lying flat against the back of the head.
5. While holding the facepiece firmly against the face, moderately tighten the two neck straps (one at a time) by pulling the strap ends toward the back of the head. (Figure 3) Be careful not to over tighten, tighten both sides equally and keep the facepiece centered on the face.
6. Firmly tighten the two temple straps by pulling the strap ends toward the back of the head. (Figure 4) Be careful to tighten both sides equally and keep the facepiece centered on the face.
7. If the facepiece is equipped with the optional 5th adjustment point at the forehead, firmly tighten the forehead strap by pulling the strap end toward the back of the head. You should feel the facepiece lift up into position on your face as the strap is tightened. (Figure 5)
8. Firmly retighten the two neck straps by pulling the strap ends toward the back of the head. (Figure 5) Be careful to tighten both sides equally and keep the facepiece centered on the face.
9. Perform a User Seal Check.
10. If air leakage is detected, refer to the Donning Problems section of the User Instruction and then repeat steps 4, 5, 6 ,7 and 8 above. Ensure that the straps are evenly tensioned, and the head harness is centered at the back of the head. Overtightening may cause discomfort and possibly face seal leakage.
11. Again, perform a User Seal Check. If air leakage is still detected, do not use facepiece and contact your supervisor.

QNFT with Ambient Aerosol Condensation Nuclei Counter (TSI PortaCount)

TSI, Incorporated currently offers a variety of quantitative fit test devices. Any TSI PortaCount® respirator fit tester model may be used to QNFT a full facepiece. While following a selected fit testing protocol, these instruments measure particles inside and outside the respirator to calculate a fit factor.

In addition to the earlier list of requirements for a valid fit test, successful fit testing using a TSI PortaCount® requires that the operator manage the test environment. Follow current recommendations from TSI regarding:

- Equipment maintenance during extended fit testing, such as ensuring the wick remains soaked in reagent grade (99.5%) isopropyl alcohol (IPA).
- Positioning of equipment relative to room ventilation ducts because air diffusers and air return ducts may affect the ambient particle concentration.
- Positioning of the particle generator in the room including the required minimum distance from the fit testing equipment.
- Monitoring the background particle count to ensure it remains within the specified range

Please see the manufacturer's user instructions for more information.

Follow all requirements of the fit testing protocol and ensure the fit test subject has not smoked or vaped for thirty (30) minutes prior to the fit test.

QNFT with Controlled Negative Pressure (OHD QuantiFit)

Quantitative fit test devices utilizing a controlled negative pressure protocol are made by OHD. Facepiece model-specific adapters must be attached to the facepiece in order to use these devices. Adapters are listed on the OHD website (ohdusa.com). No particle filters or cartridges are required. The facepiece inhalation valves must be either removed or propped open. While the subject remains still and holds their breath, these devices pull a partial vacuum in the facepiece to create a specified negative pressure. Any

air flowing into the respirator is noted as the leak rate. The fit factor is determined by dividing a predetermined inhalation flow rate by the leak rate. Please see the manufacturer's user instructions for more information.

In addition to the earlier list of requirements for a valid fit test, successful fit testing using an OHD Quantifit® requires that the operator be aware of and manage certain conditions including:

- Having the fit test subject hold their breath properly. Significant pressure variation can take place inside the facepiece if the fit test subject leaves their airway open and attempts to hold their breath by controlling their lung position. A best practice is, after taking a breath, then swallow and hold the tongue in position at the end of the swallowing action and throughout that brief portion of the fit test protocol.
- Determining whether the fit test subject has a damaged eardrum, which can enable sufficient leak via the eustachian tube. If poor test results are experienced, and after ensuring a good face to face piece seal, then attempt the fit test while the subject is wearing properly fitted ear plugs.
- Ensuring that the respirator exhalation valve and valve seat are clean and in good condition.

Please see the manufacturer's user instructions for more information.

References

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