

Modified Ambient Aerosol CNC Quantitative Fit Testing Protocols

Background – Respirator Fit Testing per U.S. OSHA

In the U.S., fit testing is a required component of any Occupational Safety and Health Administration (OSHA) written respiratory protection program in which workers are required to wear tight-fitting respirators. Acceptable fit test methods are listed in [Appendix A](#) of OSHA's [Respiratory Protection Standard, 29 CFR 1910.134](#).

Qualitative fit test (QLFT) methods rely on a taste, smell, or irritation from the test and yield a qualitative “pass” or “fail” result. Quantitative fit test (QNFT) methods are conducted with instruments equipped with detection technology and computing capabilities and calculate a numerical test result – which is then categorized as either a “pass” or a “fail.”

New Quantitative Fit Testing Protocols Added

On September 25, 2019, OSHA announced the addition of two new fit testing protocols to Appendix A – shorter versions of the previously existing QNFT method which is performed with the PortaCount® instrument and which is listed in the appendix as the “Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol.” The PortaCount®, which has been used for occupational respirator fit testing for several decades, measures particles inside and outside the respirator in order to calculate a fit factor.

The original PortaCount® method includes the full set of 8 fit test exercises which are specified in Section I.A.14 of the appendix. The two new methods require the same equipment and procedures as the original method but include only 4 exercises instead of the original 8. All 4 exercises in the modified methods are performed for less time than 60 seconds, whereas all 8 exercises in the original PortaCount® method were 60 seconds long (except the 15-second grimace). The exercises that are included in the two modified methods are described very precisely in the standard, and several of them shall be performed slightly differently in the two new protocols than similar exercises included in other, previously existing, protocols:

- Bending over – while bending, the subject shall inhale twice at the bottom of each bend. The original exercise did not specify a breathing pattern or frequency.
- Head side to side – the subject shall breathe twice at each extreme instead of only the one time specified in the original exercise.
- Head up and down - the subject shall breathe twice at each extreme instead of only the one time specified in the original exercise.

The new methods are listed in the appendix as Modified Ambient Aerosol CNC methods—one for full facepieces and half facepieces, the other for filtering facepiece respirators. The exercises included in all three PortaCount® protocols, including the original method and the two modified methods, are outlined in the tables below.

Modified Ambient Aerosol CNC Quantitative Fit Testing Protocols

Original PortaCount® Protocol

I.C.3. Ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol
(29 CFR 1910.134 Appendix A)

Exercise ¹	Description	Duration (s)
Normal breathing	In a normal standing position, without talking, the subject shall breathe normally.	60
Deep breathing	In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.	60
Turning head side to side	Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.	60
Moving head up and down	Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).	60
Talking	The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.	60
Grimace	The test subject shall grimace by smiling or frowning.	15
Bending over	The test subject shall bend at the waist as if he/she were to touch his/her toes.	60
Normal breathing	Same as exercise 1.	60

¹Exercises are listed in the order in which they are to be administered.

**Total Duration: 7 min,
15 sec**

Full Facepiece and Half-Mask Modified PortaCount® Protocol

I.C.4. Modified ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol
for full-facepiece and half-mask elastomeric respirators.
(29 CFR 1910.134 Appendix A)

Exercise ¹	Description	Duration (s)
Bending over	The test subject shall bend at the waist, as if going to touch his/her toes for 50 seconds and inhale 2 times at the bottom ² .	50
Jogging in place	The test subject shall jog in place comfortably for 30 seconds.	30
Head side to side	The test subject shall stand in place, slowly turning his/her head from side to side for 30 seconds and inhale 2 times at each extreme ² .	30
Head up and down	The test subject shall stand in place, slowly moving his/her head up and down for 39 seconds and inhale 2 times at each extreme ² .	39

¹Exercises are listed in the order in which they are to be administered.

²It is optional for test subjects to take additional breaths at other times during this exercise.

**Total Duration: 2 min,
29 sec**

Filtering Facepiece Modified PortaCount® Protocol

I.C.5. Modified ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol for filtering facepiece respirators.
(29 CFR 1910.134 Appendix A)

Exercise ¹	Description	Duration (s)
Bending over	The test subject shall bend at the waist, as if going to touch his/her toes for 50 seconds and inhale 2 times at the bottom ² .	50
Talking	The test subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor for 30 seconds. He/she will either read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.	30
Head side to side	The test subject shall stand in place, slowly turning his/her head from side to side for 30 seconds and inhale 2 times at each extreme ² .	30
Head up and down	The test subject shall stand in place, slowly moving his/her head up and down for 39 seconds and inhale 2 times at each extreme ² .	39

¹Exercises are listed in the order in which they are to be administered.

²It is optional for test subjects to take additional breaths at other times during this exercise.

**Total Duration: 2 min,
29 sec**

Additional Information

For additional information about respirator fit testing, see the [Fit Testing](#) page on 3M's Center for Respiratory Protection.

For more information on quantitative fit testing of respirators, refer to the 3M Technical Bulletin [Quantitative Fit Testing of Respirators](#).

Find the full OSHA respiratory protection standard, [29 CFR 1910.134](#), on [OSHA's website](#).

The rest of the OSHA-accepted fit test protocols, both QNFT and QLFT, can also be found on OSHA's website, in [Appendix A](#) of the respiratory protection standard.

For more information, contact Technical Services at 1 (800) 243-4630