By Standard Number / 1910.134 App A - Fit Testing Procedures (Mandatory).

- **Part Number:** 1910
- **Part Number Title:** Occupational Safety and Health Standards
- **Subpart:** 1910 Subpart I
- **Subpart Title:** Personal Protective Equipment
- **Standard Number:** 1910.134 App A
- **Title:** Fit Testing Procedures (Mandatory).
- **GPO Source:** e-CFR

Appendix A to §1910.134—Fit Testing Procedures (M

Part I. OSHA-Accepted Fit Test Protocols

A. Fit Testing Procedures—General Requireme

The employer shall conduct fit testing using the following procedures. The requirements in this appendix apply to a

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator m correctly fits, the user.

2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positi an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirat training on respirator use, because it is only a review.

3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acce and if fitted and used properly, will provide adequate protection.

4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviou

5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable comfort. Assistance in assessing comfort can be given by discussing the points in the following item A.6. If the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at sett

6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test s

(a) Position of the mask on the nose

(b) Room for eye protection

(c) Room to talk

(d) Position of mask on face and cheeks

7. The following criteria shall be used to help determine the adequacy of the respirator fit:

(a) Chin properly placed;

(b) Adequate strap tension, not overly tightened;

(c) Fit across nose bridge;

(d) Respirator of proper size to span distance from nose to chin;

(e) Tendency of respirator to slip;

(f) Self-observation in mirror to evaluate fit and respirator position.

8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks describe respirator manufacturer which provide equivalent protection to the procedures in appendix B-1. Before conducting told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a f retested if the test subject fails the user seal check tests.

9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, s which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altere

10. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician or othe whether the test subject can wear a respirator while performing her or his duties.

11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to sel

12. Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the procedure. The description of the process shall include a description of the test exercises that the subject will be p minutes before the start of the fit test.

13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be w respirator fit.

14. Test Exercises.

(a) Employers must perform the following test exercises for all fit testing methods prescribed in this appendix, exce testing protocols, the CNP quantitative fit testing protocol, and the CNP REDON quantitative fit testing protocol. Fo protocols, employers shall ensure that the test subjects (*i.e.*, employees) perform the exercise procedure specified elastomeric respirators, or the exercise procedure specified in Part I.C.5(b) for filtering facepiece respirators. Emplo the exercise procedure specified in Part I.C.6(b) of this appendix for the CNP quantitative fit testing protocol, or the for the CNP REDON quantitative fit testing protocol. For the remaining fit testing methods, employers shall ensure t environment in the following manner:

(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as

(3) Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side betwee each extreme momentarily so the subject can inhale at each side.

(4) Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The sub

looking toward the ceiling).

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. T Passage, count backward from 100, or recite a memorized poem or song.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to le ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the

(6) Grimace. The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not perfo

(7) Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place s such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

(8) Normal breathing. Same as exercise (1).

(b) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

B. Qualitative Fit Test (QLFT) Protocols

1. General

(a) The employer shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipme ensure that test equipment is in proper working order.

(b) The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the pa

2. Isoamyl Acetate Protocol

Note: This protocol is not appropriate to use for the fit testing of particulate respirators. If used to fit test particulate vapor filter.

(a) Odor Threshold Screening

Odor threshold screening, performed without wearing a respirator, is intended to determine if the individual tested c

(1) Three 1 liter glass jars with metal lids are required.

(2) Odor-free water (e.g., distilled or spring water) at approximately 25 °C (77 °F) shall be used for the solutions.

(3) The isoamyl acetate (IAA) (also known at isopentyl acetate) stock solution is prepared by adding 1 ml of pure IA shaking for 30 seconds. A new solution shall be prepared at least weekly.

(4) The screening test shall be conducted in a room separate from the room used for actual fit testing. The two roor becoming evident in the general room air where testing takes place.

(5) The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 ml of odor-free shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquic day.

(6) A test blank shall be prepared in a third jar by adding 500 cc of odor-free water.

(7) The odor test and test blank jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed o switched to maintain the integrity of the test.

(8) The following instruction shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the banana oil."

(9) The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is pe

(10) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit te

(11) If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to r

(b) Isoamyl Acetate Fit Test

(1) The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so th subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The insic

(2) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protec

(3) After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. threshold screening and respirator selection, and shall be well-ventilated, as by an exhaust fan or lab hood, to prev

(4) A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside

(5) Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other with 0.75 ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA te towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with method.

(6) Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be test, the importance of his/her cooperation, and the purpose for the test exercises; or to demonstrate some of the

(7) If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject shall avoid olfactory fatigue.

(8) If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shal respirator, return to the test area and again begin the fit test procedure described in (b) (1) through (7) above. The p Should the odor sensitivity test be failed, the subject shall wait at least 5 minutes before retesting. Odor sensitivity

(9) If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject b chamber.

(10) When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the per concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plas

concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plas

3. Saccharin Solution Aerosol Protocol

The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screeni

(a) Taste threshold screening. The saccharin taste threshold screening, performed without wearing a respirator, is ir detect the taste of saccharin.

(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and sh tall with at least the front portion clear and that allows free movements of the head when a respirator is worn. An er FT 14 and # FT 15 combined, is adequate.

(2) The test enclosure shall have a 3⁄4 -inch (1.9 cm) hole in front of the test subject's nose and mouth area to acco

(3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall brea The subject is instructed to report when he/she detects a sweet taste.

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the thr away from the nose and mouth of the person. This nebulizer shall be clearly marked to distinguish it from the fit tes

(5) The threshold check solution is prepared by dissolving 0.83 gram of sodium saccharin USP in 100 ml of warm w (see (b)(5) below) in 100 ml of distilled water.

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and

(7) Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted. If the squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeeze

(8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whe sweet taste during the second ten squeezes, the screening test is completed. The taste threshold is noted as twen

(9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked the sweet taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted a completed.

(10) The test conductor will take note of the number of squeezes required to solicit a taste response.

(11) If the saccharin is not tasted after 30 squeezes (step 10), the test subject is unable to taste saccharin and may

Note to paragraph 3(a): If the test subject eats or drinks something sweet before the screening test, he/she may be

(12) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit tes

(13) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(14) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon

(b) Saccharin solution aerosol fit test procedure.

(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure described in 3. (a) above.

(3) The test subject shall don the enclosure while wearing the respirator selected in section I. A. of this appendix. Tl particulate filter(s).

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution i distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 ml of warm water.

(6) As before, the test subject shall breathe through the slightly open mouth with tongue extended, and report if he/

(7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of saccharin fit tes of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as required.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of th

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the original number of squeezes

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is de the test is passed.

(11) If the taste of saccharin is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator threshold screening and fit testing).

(12) Since the nebulizer has a tendency to clog during use, the test operator must make periodic checks of the neb end of the test session, the test is invalid.

4. Bitrex™ (Denatonium Benzoate) Solution Aerosol Qualitativ

The Bitrex™ (Denatonium benzoate) solution aerosol QLFT protocol uses the published saccharin test protocol be as a taste aversion agent in household liquids which children should not be drinking and is endorsed by the Americ American Association of Poison Control Centers. The entire screening and testing procedure shall be explained to

(a) Taste Threshold Screening.

The Bitrex taste threshold screening, performed without wearing a respirator, is intended to determine whether the

(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and sh 14 inches (35.6 cm) tall. The front portion of the enclosure shall be clear from the respirator and allow free moveme substantially similar to the 3M hood assembly, parts # FT 14 and # FT 15 combined, is adequate.

(2) The test enclosure shall have a 3⁄4 inch (1.9 cm) hole in front of the test subject's nose and mouth area to accor

(3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall bre extended. The subject is instructed to report when he/she detects a bitter taste.

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the Thr be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The Threshold Check Solution is prepared by adding 13.5 milligrams of Bitrex to 100 ml of 5% salt (NaCl) soluti

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely, and is then

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely, and is then

(7) An initial ten squeezes are repeated rapidly and then the test subject is asked whether the Bitrex can be tasted. squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeeze

(8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whe bitter taste during the second ten squeezes, the screening test is completed. The taste threshold is noted as twent

(9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked v bitter taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted as thi

(10) The test conductor will take note of the number of squeezes required to solicit a taste response.

(11) If the Bitrex is not tasted after 30 squeezes (step 10), the test subject is unable to taste Bitrex and may not per

(12) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit tes

(13) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(14) The nebulizer shall be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoo

(b) Bitrex Solution Aerosol Fit Test Procedure.

(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure as that described in 4. (a) above.

(3) The test subject shall don the enclosure while wearing the respirator selected according to section I. A. of this a with any type particulate filter(s).

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution i distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 337.5 mg of Bitrex to 200 ml of a 5% salt (NaCl) solution in warm wat

(6) As before, the test subject shall breathe through his or her slightly open mouth with tongue extended, and be ins

(7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of the fit test solut squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as no

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of th

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the number of squeezes used in

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of Bitrex is detect is passed.

(11) If the taste of Bitrex is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator sha threshold screening and fit testing).

5. Irritant Smoke (Stannic Chloride) Protocol

This qualitative fit test uses a person's response to the irritating chemicals released in the “smoke” produced by a s the respirator.

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(a) General Requirements and Precautions

(1) The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

(2) Only stannic chloride smoke tubes shall be used for this protocol.

(3) No form of test enclosure or hood for the test subject shall be used.

(4) The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to
Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken wh
whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a r

(5) The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting
atmosphere.

(b) Sensitivity Screening Check

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

(1) The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one
milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube w
jagged end of the smoke tube.

(2) The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal pass
the test is performed.

(3) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is don
determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small
determine that he/she can detect it.

(c) Irritant Smoke Fit Test Procedure

(1) The person being fit tested shall don the respirator without assistance, and perform the required user seal check

(2) The test subject shall be instructed to keep his/her eyes closed.

(3) The test operator shall direct the stream of irritant smoke from the smoke tube toward the faceseal area of the te
test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perim
passes around the perimeter of the mask, moving to within six inches of the respirator.

(4) If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with

(5) The exercises identified in section I.A. 14. of this appendix shall be performed by the test subject while the respi
around the perimeter of the respirator at a distance of six inches.

(6) If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being
procedure.

(7) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) sh
smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whe
response shall void the fit test.

(8) If a response is produced during this second sensitivity check, then the fit test is passed.

C. Quantitative Fit Test (QNFT) Protocols

The following quantitative fit testing procedures have been demonstrated to be acceptable: Quantitative fit testing polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test cham respirator; Quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (conden testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a

1. General

(a) The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests p ensure that test equipment is in proper working order.

(b) The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to th for which it was designed.

2. Generated Aerosol Quantitative Fit Testing Pro

(a) Apparatus.

(1) Instrumentation. Aerosol generation, dilution, and measurement systems using particulates (corn oil, polyethyler sodium chloride) as test aerosols shall be used for quantitative fit testing.

(2) Test chamber. The test chamber shall be large enough to permit all test subjects to perform freely all required ex measurement apparatus. The test chamber shall be equipped and constructed so that the test agent is effectively i throughout the chamber.

(3) When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high efficien same manufacturer.

(4) The sampling instrument shall be selected so that a computer record or strip chart record may be made of the t each inspiration and expiration at fit factors of at least 2,000. Integrators or computers that integrate the amount of exercise may be used provided a record of the readings is made.

(5) The combination of substitute air-purifying elements, test agent and test agent concentration shall be such that exposure limit for the test agent at any time during the testing process, based upon the length of the exposure and

(6) The sampling port on the test specimen respirator shall be placed and constructed so that no leakage occurs ar flow is allowed into the sampling line at all times, and there is no interference with the fit or performance of the resp and used so that the air sample is drawn from the breathing zone of the test subject, midway between the nose an at least 1⁄4 inch.

(7) The test setup shall permit the person administering the test to observe the test subject inside the chamber duri

(8) The equipment generating the test atmosphere shall maintain the concentration of test agent constant to within

(9) The time lag (interval between an event and the recording of the event on the strip chart or computer or integrat between the occurrence of an event and its being recorded.

between the occurrence of an event and its being recorded.

(10) The sampling line tubing for the test chamber atmosphere and for the respirator sampling port shall be of equa shall be equal.

(11) The exhaust flow from the test chamber shall pass through an appropriate filter (i.e., high efficiency particulate

(12) When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed 50 perce

(13) The limitations of instrument detection shall be taken into account when determining the fit factor.

(14) Test respirators shall be maintained in proper working order and be inspected regularly for deficiencies such as

(b) Procedural Requirements.

(1) When performing the initial user seal check using a positive or negative pressure check, the sampling line shall b either of these pressure checks.

(2) The use of an abbreviated screening QLFT test is optional. Such a test may be utilized in order to quickly identif pressure test and reduce the amount of QNFT time. The use of the CNC QNFT instrument in the count mode is and eliminate poor fitting respirators before going on to perform a full QNFT.

(3) A reasonably stable test agent concentration shall be measured in the test chamber prior to testing. For canopy test agent's stability may be established after the test subject has entered the test environment.

(4) Immediately after the subject enters the test chamber, the test agent concentration inside the respirator shall be 5 percent for a half mask or 1 percent for a full facepiece respirator.

(5) A stable test agent concentration shall be obtained prior to the actual start of testing.

(6) Respirator restraining straps shall not be over-tightened for testing. The straps shall be adjusted by the wearer v comfortable fit typical of normal use. The respirator shall not be adjusted once the fit test exercises begin.

(7) The test shall be terminated whenever any single peak penetration exceeds 5 percent for half masks and 1 perc refitted and retested.

(8) Calculation of fit factors.

(i) The fit factor shall be determined for the quantitative fit test by taking the ratio of the average chamber concentra each test exercise except the grimace exercise.

(ii) The average test chamber concentration shall be calculated as the arithmetic average of the concentration meas arithmetic average of the concentration measured before and after each exercise or the true average measured cor

(iii) The concentration of the challenge agent inside the respirator shall be determined by one of the following meth

(A) Average peak penetration method means the method of determining test agent penetration into the respirator u penetration is determined by an average of the peak heights on the graph or by computer integration, for each exe calculate the actual test agent penetration into the respirator for each exercise will also be considered to meet the

(B) Maximum peak penetration method means the method of determining test agent penetration in the respirator as peak penetration for a given exercise is taken to be representative of average penetration into the respirator for tha

(C) Integration by calculation of the area under the individual peak for each exercise except the grimace exercise. T

(C) Integration by calculation of the area under the individual peak for each exercise except the grimace exercise. T

(D) The calculation of the overall fit factor using individual exercise fit factors involves first converting the exercise fi then converting that result back to a fit factor. This procedure is described in the following equation:

$$\text{Overall Fit Factor} = \frac{\text{Number of exercises}}{1/ff_1 + 1/ff_2 + 1/ff_3 + 1/ff_4 + 1/ff_5 + 1/ff_6 + 1/ff_7 + 1/ff_8}$$

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Where ff1, ff2, ff3, etc. are the fit factors for exercises 1, 2, 3, etc.

(9) The test subject shall not be permitted to wear a half mask or quarter facepiece respirator unless a minimum fit minimum fit factor of 500 is obtained.

(10) Filters used for quantitative fit testing shall be replaced whenever increased breathing resistance is encountere media.

3. Ambient aerosol condensation nuclei counter (CNC) quantitati

The ambient aerosol condensation nuclei counter (CNC) quantitative fit testing (PortaCount®) protocol quantitative respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the r mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obt CNC instrument manufacturer, TSI Incorporated, also provides probe attachments (TSI mask sampling adapters) th fit factor pass level of at least 100 is necessary for a half-mask respirator (elastomeric or filtering facepiece), and a facepiece elastomeric respirator. The entire screening and testing procedure shall be explained to the test subject p

(a) PortaCount® Fit Test Requirements. (1) Check the respirator to make sure the sampling probe and line are prop with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e. particulate filter) per manufacturer's instruction.

(2) Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ar wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wea

(3) Check the following conditions for the adequacy of the respirator fit: Chin properly placed; Adequate strap tensi proper size to span distance from nose to chin; Tendency of the respirator to slip; Self-observation in a mirror to ev

(4) Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leak same model respirator, or another model of respirator.

(5) Follow the manufacturer's instructions for operating the PortaCount® and proceed with the test.

(6) The test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(7) After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the r unacceptable, another model of respirator shall be tried.

(b) PortaCount® Test Instrument.

(1) The PortaCount® will automatically stop and calculate the overall fit factor for the entire set of exercises. The ov indicate whether or not the test was successful. If the test was a Pass, the fit test is over.

(2) Since the pass or fail criterion of the PortaCount® is user programmable, the test operator shall ensure that the respirator performance in this Appendix.

(3) A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the t size of respirator used; and date tested.

4. Modified ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol fo

(a) When administering this protocol to test subjects, employers shall comply with the requirements specified in Pa counter (CNC) quantitative fit testing protocol), except they shall use the test exercises described below in paragra section I.C.3(a)(6) of this appendix.

(b) Employers shall ensure that each test subject being fit tested using this protocol follows the exercise and durati in Table A-1 of this appendix.

Table A-1-- Modified Ambient Aerosal CNC Quantitative Fit Testing Protocol for Full Face

Exercises[1]	Exercise procedure
Bending Over	The test subject shall bend at the waist, as if going to touch his/her toes for 5 seconds and inhale 2 times at the bottom[2].
Jogging-in-Place	The test subject shall jog in place comfortably for 30 seconds .....
Head Side-to-Side	The test subject shall stand in place, slowly turning his/her head from side to 30 seconds and inhale 2 times at each extreme[2].
Head Up-and-Down	The test subject shall stand in place, slowly moving his/her head up and dow seconds and inhale 2 times at each extreme[2].

[1]Exercises are listed in the order in which they are to be administered.
[2]It is optional for test subjects to take additional breaths at other times during this exercise.

5. Modified ambient aerosol condensation nuclei counter (CNC) quantitative fit testing

(a) When administering this protocol to test subjects, employers shall comply with the requirements specified in Pa counter (CNC) quantitative fit testing protocol), except they shall use the test exercises described below in paragra section I.C.3(a)(6) of this appendix.

(b) Employers shall ensure that each test subject being fit tested using this protocol follows the exercise and durati in Table A–2 of this appendix

TABLE A–2— MODIFIED AMBIENT AEROSAL CNC QUANTITATIVE FIT TESTING PROTOC

Exercises[1]	Exercise

	procedure
Bending Over	The test subject shall bend at the waist, as if going to touch his/her toes for 5 seconds and inhale 2 times at the bottom[2].
Talking	The test subject shall talk out loud slowly and loud enough so as to be heard the test conductor for 30 seconds. He/she will either read from a prepared tex as the Rainbow Passage, count backward from 100, or recite a memorized po song.
Head Side-to-Side	The test subject shall stand in place, slowly turning his/her head from side to 30 seconds and inhale 2 times at each extreme[2].
Head Up-and-Down	The test subject shall stand in place, slowly moving his/her head up and dow seconds and inhale 2 times at each extreme[2].

[1]Exercises are listed in the order in which they are to be administered.
[2]It is optional for test subjects to take additional breaths at other times during this exercise.

6. Controlled negative pressure (CNP) quantitative fit test

The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlle respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit tes method for determining the facepiece fit for negative pressure respirators. The CNP instrument manufacturer Occu provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's ov her mouth and holds his/her breath, after which an air pump removes air from the respirator facepiece at a pre-sele leak rate through the facepiece, expressed as milliliters per minute. The quality and validity of the CNP fit tests are the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in tl provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a h required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test sub

(a) CNP Fit Test Requirements.

(1) The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.

(2) The CNP system defaults selected for test pressure shall be set at –15 mm of water (-0.58 inches of water) and for performing fit tests.

Note: CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and ger system default values, which were selected to represent respirator wear with medium cartridge resistance at a low- respirator fit.)

(3) The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.

(4) The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstrea propped open.

(5) The employer must train the test subject to hold his or her breath for at least 10 seconds.

(6) The test subject must don the test respirator without any assistance from the test administrator who is conducti the fit-test exercises begin. Any adjustment voids the test, and the test subject must repeat the fit test.

(7) The QNFT protocol shall be followed according to section I. C. 1. of this appendix with an exception for the CNP

(b) CNP Test Exercises.

(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally for 1 minute. head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being ca the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during test measurer

(3) Turning head side to side. Standing in place, the subject shall slowly turn his or her head from side to side betwe shall be held at each extreme momentarily so the subject can inhale at each side. After the turning head side to sid or her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his

(4) Moving head up and down. Standing in place, the subject shall slowly move his or her head up and down for 1 m position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold during test measurement. Next, the subject shall hold his or her head full down and hold his or her breath for 10 se

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. T Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, th or her breath for 10 seconds during the test measurement.

(6) Grimace. The test subject shall grimace by smiling or frowning for 15 seconds.

(7) Bending Over. The test subject shall bend at the waist as if he or she were to touch his or her toes for 1 minute. test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exerci hold his or her breath for 10 seconds during the test measurement.

(8) Normal Breathing. The test subject shall remove and re-don the respirator within a one-minute period. Then, in a breathe normally for 1 minute. After the normal breathing exercise, the subject shall hold his or her head straight ah measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the cor become unacceptable, another model of a respirator shall be tried.

(c) CNP Test Instrument.

(1) The test instrument must have an effective audio-warning device, or a visual-warning device in the form of a scr or her breath during the test. The test must be terminated and restarted from the beginning when the test subject fa then may be refitted and retested.

(2) A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test s respirator used; and date tested.

7. Controlled negative pressure (CNP) REDON quantitative fit

(a) When administering this protocol to test subjects, employers must comply with the requirements specified in pa negative pressure (CNP) quantitative fit testing protocol,'') as well as use the test exercises described below in para in paragraph (b) of part I.C.6 of this appendix.

(b) Employers must ensure that each test subject being fit tested using this protocol follows the exercise and meas described in Table A-3 of this appendix.

Table A-3—CNP REDON Quantitative Fit Testing Pro

Exercises[1]	Exercise procedure
Facing Forward	Stand and breathe normally, without talking, for 30 seconds
Bending Over	Bend at the waist, as if going to touch his or her toes, for 30 seconds
Head Shaking	For about three seconds, shake head back and forth vigorously several times shouting
REDON 1	Remove the respirator mask, loosen all facepiece straps, and then redon the mask
REDON 2	Remove the respirator mask, loosen all facepiece straps, and then redon the mask again

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

(c) After completing the test exercises, the test administrator must question each test subject regarding the comfor is unacceptable, the employer must ensure that the test administrator repeats the protocol using another respirator

(d) Employers must determine the overall fit factor for each test subject by calculating the harmonic mean of the fit

$$\text{Overall Fit Factor} = \frac{N}{\left[1/FF_1 + 1/FF_2 + \ldots\ 1/FF_N\right]}$$

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Where:

N = The number of exercises;

FF1 = The fit factor for the first exercise;

FF2 = The fit factor for the second exercise; and

FFN = The fit factor for the nth exercise.

Part II. New Fit Test Protocols

Part II. New Fit Test Protocols

A. Any person may submit to OSHA an application for approval of a new fit test protocol. If the application meets th
under section 6(b)(7) of the OSH Act to determine whether to list the new protocol as an approved protocol in this a

B. The application must include a detailed description of the proposed new fit test protocol. This application must i

1. A test report prepared by an independent government research laboratory (e.g., Lawrence Livermore National La
for Standards and Technology) stating that the laboratory has tested the protocol and had found it to be accurate a

2. An article that has been published in a peer-reviewed industrial hygiene journal describing the protocol and expla
reliability.

C. If OSHA determines that additional information is required before the Agency commences a rulemaking proceed
afford the applicant the opportunity to submit the supplemental information. Initiation of a rulemaking proceeding w
supplemental information.

[63 FR 20098, April 23, 1998; 69 FR 46993, August 4, 2004]