

Version 2.0

Emergency Response Fit Testing Protocol for Respirators

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LIST OF ACRONYMS

APR	air-purifying respirator
CBRN	chemical, biological, radiological, and nuclear
CNC	condensation nuclei counter
EMP	Emergency Management Portal
FF	fit factor
FRM	Field Readiness Module
HEPA	high-efficiency particulate arresting
mm	millimeter
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAPR	powered air-purifying respirator
PPE	personal protective equipment
psig	pounds per square in gauge
PVC	polyvinyl chloride
SCBA	self-contained breathing apparatus

Introduction

EPA has developed this fit testing protocol to provide consistency in fit testing across all EPA regions. EPA's intended use of full-facepiece respirators frequently differs from uses by general industry. The procedures in this document are designed specifically for full-facepiece elastomeric respirators and filtering facepiece respirators worn in the field for emergency response and other site work. These procedures comply with the Occupational Safety and Health Administration's (OSHA) Respiratory Protection Standard, [29 CFR 1910.134](#), and the American National Standards Institute Guideline Z88.10, *Respiratory Fit Test Methods*. Users of this protocol should also refer to the [Respiratory Protection Program](#) chapter of EPA's Emergency Responder Health and Safety Manual.

Our goal is to improve safety and to increase worker and management confidence that fit testing is conducted appropriately and uniformly. The purpose of respirator fit testing is to verify that a respirator of a particular make, model, and size fits its user adequately. Fit testing provides reasonable assurance that the user fits their mask, has learned to don the full face elastomeric respirator properly, and can achieve an assigned protection factor of 1,000.

Qualifications of Fit Test Operators

Fit test operators must be properly trained and demonstrate proficiency with the TSI PortaCount model 8020, 8030, 8038, or a newer fit test apparatus model.

Fit test operators must:

- Understand and implement the requirements of EPA's Emergency Responder Health and Safety Manual.
- Comply with this fit testing protocol.

Fit test operators must also meet the following training requirements:

1. Fit test operators must demonstrate to the Safety, Health and Environmental Management Program (SHEMP) Manager or their designee a general knowledge of respirators to be used for fit testing by:
 - Recognizing and identifying individual respirator components and their functions.
 - Identifying different makes, models, styles, and sizes of respirators being used.
 - Understanding respirator capabilities and limitations.
 - Demonstrating and evaluating proper donning and doffing procedures.
 - Demonstrating and evaluating proper user seal checks.
 - Explaining required inspection, cleaning, and maintenance procedures.
2. Fit test operators must demonstrate to SHEMP Manager or their designee the ability to set up all applicable fit testing equipment by:
 - Choosing the proper canisters/cartridges.
 - Preparing, inspecting, and performing operational checks of the fit testing equipment.

- Properly assembling and using the sampling adapter.
3. Fit test operators must demonstrate to SHEMP Manager or their designee the ability to conduct respirator fit testing properly, by:
 - Recognizing when fit testing is required and understanding when to refuse to conduct a fit test due to facial characteristics, facial hair, or other problems that may interfere with respirator fit.
 - Explaining the fit test's purpose and procedures to persons being tested.
 - Observing that the correct donning procedure is used without physically assisting the user.
 - Observing that user seal checks are performed according to the procedures recommended by the respirator manufacturer.
 - Observing the user throughout the entire fit test procedure to ensure that it is performed correctly.
 - Evaluating and recording the results of the fit test.
 - Recognizing and correcting the causes of fit test failures, such as:
 - An improperly donned or adjusted respirator
 - An incorrectly assembled or damaged respirator
 - An incorrect size, shape, or style of respirator
 - Identifying sources of erroneous fit test results (e.g., quantitative fit factors that are unusually low or high) and implementing corrective actions.
 - Cleaning and sanitizing respirators according to manufacturer instructions.
 4. Fit test operators must demonstrate to SHEMP Manager or their designee the ability to use the TSI Porta-Count and/or Qualitative Fit-test Kit.
 - The instruction manuals for the TSI Porta-Count can be found at www.tsi.com.
 - Enter the model number and PortaCount in the Search Box and
 - Scroll down and click on the PortaCount
 - Click on Resources
 - Click on the Manual or Software
 - See Appendix 4 for details on Qualitative Fit-Test Kits.

Medical Evaluations

Fit test operators are responsible for confirming that the person to be fit tested is currently cleared medically for respirator use and comply with EPA's Emergency Responder Health and Safety Manual.

Training for Respirator Users

Employees must receive training on respirator use before their first fit test. This training may occur immediately before the fit test or earlier. Users must be able to:

1. Inspect the respirator properly and recognize conditions that may compromise mask integrity, such as missing components or deformities.

2. Don the respirator properly without assistance.
3. Perform a seal check.
4. Clean and store the respirator properly following the manufacturer's recommendations.

Interference Concerns

No foreign material or substance is permitted between the sealing surface of the respirator and the face. Some common concerns are:

1. Facial hair

A person cannot be fit tested if:

- Facial hair (beard, mustache, stubble, low hairline, etc.) comes between the sealing surface of the respirator and the face.
- Hair interferes with valve and/or respirator function.
 - Any hair growth that contacts the sealing surfaces must be shaved clean within 12 hours of testing.
 - To evaluate contact between the face and sealing surface of the respirator, it may be necessary to hold the facepiece against the face and remove it repeatedly to evaluate the sealing surfaces on a given individual. Potential interference with the sealing surface cannot be judged by simply looking for visible hair outside the respirator.

2. Eyeglasses and other eyewear

- Eyeglasses or any other eyewear with conventional temple bars or straps that cross the sealing surface of the respirator are not permitted. Corrective lens inserts approved by the respirator manufacturer may be used for vision correction, when needed.
- Contact lenses may be worn, if preferred by the user.

3. Personal protective equipment (PPE) and other items that may interfere with fit.

- When any PPE and/or respirator accessory has the potential to interfere with the seal, it must be worn at the time of fit testing to ascertain compatibility with the respirator. For example, face shields, head protection, voice amplifiers, skull caps, hearing protection, welding helmets, or other protective devices can interfere with the seal of the respirator. Document the PPE worn on the fit-test documentation form.

4. Dentures

Respirator fit can vary when dentures are worn or removed. Consequently:

- Users who wear dentures in the workplace must be fit tested while wearing them.
- Users who do not wear their dentures in the workplace must be fit tested without them.
- If dentures are worn inconsistently, fit testing must be conducted both ways.

5. Cosmetics

Excessive use of cosmetics—including moisturizers, make-up, aftershave, or anything else that interferes with the face-to-facepiece seal—can adversely affect fit.

6. Other conditions that can adversely affect fit

- The user may not smoke within 30 minutes of the fit test.
- Face piercings and/or jewelry must be removed before respirator use.
- Generally, the fit test should always be conducted with the respirator worn in the manner in which it is used. This should be considered with certain hairstyles, head coverings, facial jewelry, etc.
- Some users may not be able to obtain a satisfactory fit in a selected respirator. For example, certain facial characteristics may interfere with respirator fit, like hollow temples, excessively protruding cheekbones, deep skin creases, an absence of teeth or dentures, injury to the face, swelling of the mouth or face, and other factors.

Respirators Used for Fit Testing

When an EPA employee is assigned their own mask, they must be fit tested using it.

If the employee does not currently have an assigned respirator, then a National Institute of Occupational Safety and Health (NIOSH) chemical, biological, radiological, and nuclear (CBRN)–approved and fully functional respirator available from stock supplies will be used for fit testing. If this respirator meets the acceptance criteria, the fit test adapter will be removed, and the respirator will be issued to the employee whenever possible.

A surrogate respirator of the same size, model, and make that is to be assigned or used by the user may be used only when the first two conditions cannot be met.

An employee should ensure that they use the same respirator (i.e., the same size, model, and make) as the one they were fit tested with initially.

Respirators used for fit testing must use P100 filtration media with a TSI fit test adapter from the model 8025-20 kit fitted with a MSA inhalation valve (804813 inlet disc and 805011 valve spider).

The weight of cartridges, filters, and/or fit test adapters used for fit testing can affect fit. Where possible, the respirator assembly used during the fit test should be representative of the respirator used in the workplace. For example, a combination chemical/particulate cartridge may weigh significantly more than a particulate filter alone. A weight may be added to the filter cartridge to represent the added weight of a different filter.

All fit testing for tight-fitting positive-pressure respirators must be in the negative-pressure mode regardless of the mode of operation used for respiratory protection. This is accomplished by either:

1. Following the manufacturer's instructions for temporarily converting the user's individually assigned respirator into a negative-pressure respirator with appropriate filters, cartridges, and/or adapters.

2. Using a surrogate negative-pressure respirator with sealing surfaces and materials that are the same as the respirator to be assigned to the user. For example, a negative-pressure air-purifying facepiece may be used as a surrogate for a powered air-purifying respirator (PAPR) or self-contained breathing apparatus (SCBA) facepiece made by the same manufacturer if the sealing surfaces and materials are identical. This approach is used only when the employee cannot be fit tested to his/her facepiece or an in-stock facepiece cannot be located at the time of testing.

Respirator modifications made to accommodate fit testing must be made in a manner that does not alter the fit of the respirator.

Respirators Temporarily Modified with Adapters

Sampling adapters used for fit testing must be removed completely by the fit test operator and the respirator restored to its NIOSH CBRN-approved configuration before that respirator is used for respiratory protection.

Sample Probe Location

The sample probe must be inside the nose cup at a point midway between the nose and mouth. The sample probe must extend into the respirator cavity but not so far that the inlet can be blocked by the nose or face. Some users might inadvertently or intentionally block the inlet to the sample probe with their tongue; if this occurs, the fit test is voided and must be repeated. Fit test operators must use their own judgment as to when, and if, users should be warned of blocking the sampling inlet with their tongue.

Maintenance of Equipment and Respirators Used for Fit Testing

Fit testing equipment must be kept in a clean and sanitary condition consistent with manufacturer recommendations. Respirators used for fit testing must be cleaned, inspected, and maintained according to the respirator manufacturer's recommendations. See Appendices 1 and 2.

Sample tubing may accumulate visible condensation when more than one fit test is conducted. Whenever this happens, the tubing must be switched out to ensure accurate sampling of test aerosol. For hygiene reasons, tubing inside the facepiece must be replaced before each person is tested.

Moisture may collect on the alcohol wick inside the TSI PortaCount when fit testing is conducted in locations with high humidity. Particle counts may be reduced when water vapor interferes with the alcohol's ability to vaporize in the condensation chamber. Fortunately, the effect is similar for outside and inside samples, so the resulting fit factor measurements are still valid. However, moisture buildup may reduce ambient counts below the desired level. This is prevented by replacing the wick with a dry wick.

Respirator Selection for Fit Testing

No one size or model of respirator can be expected to fit all faces. EPA response personnel are required to use NIOSH CBRN-approved full-facepiece respirators. These respirators may be used in a variety of operating modes, ranging from negative pressure air-purifying to positive pressure SCBA. Every EPA responder must be fit tested initially in the Scott AV-3000 SureSeal mask. If the user cannot obtain an acceptable fit with this mask, they must try being fitted into the MSA Ultra Elite mask. If that mask does not produce an acceptable fit, different masks must be chosen until an acceptable fit is obtained. Annual fit testing is required after the first year and can be completed with the respirator initially issued to the user.



The *Scott AV-3000 SureSeal* is the primary mask selected by the Emergency Response Technical Group and is the only mask that can be used as an air-purifying respirator (APR), PAPR, or SCBA.



The *MSA Ultra Elite* must be provided in two configurations, one for SCBA and one for PAPR/APR.

As part of the selection process, new and inexperienced users must be shown how to don, doff and inspect the respirator (Appendix 2), how to properly position the respirator on the face, how to adjust strap tension, and how to determine an acceptable fit. A mirror must be available to help the user evaluate the fit and positioning of the respirator. This instruction is not a substitute for the user's formal training on respirator use. The user must be informed that he/she is being asked to select the respirator size that provides the most acceptable fit and has a satisfactory/adequate comfort level; the choice must not be based on preference for a specific make or model. Keep in mind that respirators are not comfortable to wear, though they must be comfortable enough not to keep users from wearing them.

The selection process requires the user to hold the facepiece in their chosen size up to their face and perform a negative pressure face seal check. If the face seal check fails, the same process must be tried with another size until a satisfactory negative pressure face seal is obtained. The user must don the facepiece and examine the fit for interior characteristics such as suitability of nose cup fit. The fit test operator will allow the employee to select the nose cup of the most comfortable size. When nose cup fit is acceptable, the user must adjust head harness straps for fit and satisfactory comfort, then perform positive and negative pressure seal checks. See Appendix 2.

The fit of the nose cup does not affect the results of the fit test; it is a comfort issue. A more comfortable and better-fitting nose cup may minimize fogging of the facepiece, resulting in a more comfortable wear time.

Adequate time must be allotted to assess the comfort and adequacy of the respirator. The user and the fit test operator must review the following:

1. Proper placement of the chin
2. Fit across the forehead and nose bridge
3. Position of the respirator on the face and cheeks
4. Position and comfort of the nose cup
5. Adequacy of strap tension (not too tight or too loose)
6. Tendency of respirator to slip with head movements or talking
7. Whether facial hair interferes with the respirator
8. Whether the respirator interferes with other equipment to be worn
9. Whether the respirator is the right size to span the distance from nose to chin
10. Fit and respirator position, as evaluated through self-observation in the mirror

If the user is not experienced with wearing respiratory protection or is unfamiliar with the respirator selected for fit testing, they should don and doff the mask several times to familiarize themselves with respirator positioning and strap adjustment.

Experienced respirator users previously fit tested with the same respirator may eliminate most assessment steps.

In the presence of the fit test operator, the user must conduct negative and positive pressure seal checks. Before these checks, the user must seal the mask on the face by moving the head from side to side and up and down slowly while taking in a few slow deep breaths. To conduct the checks, the user should follow these instructions:

1. *Positive pressure check.* Close off the exhalation valve with the palm of your hand and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal.
2. *Negative pressure check.* Close off the inlet opening of the canister or cartridge(s) by covering with the palm of your hand(s), inhale gently so that the facepiece collapses slightly, and hold your breath for 10 seconds. The test can also be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

If leakage of air is detected during either of the above procedures, the user must remove the facepiece, repeat the donning process, and repeat the negative and positive pressure seal checks.

Before starting the fit test, the user must be given a description of the fit test and the user's responsibilities during the test procedure. The description of the process must include a description of the test exercises that the user will be performing. The respirator to be tested must be worn for at least 5 minutes before the start of the fit test.

The fit test must be performed while the user is wearing any safety equipment that may be worn during actual respirator use that could interfere with respirator fit.

After configuring the mask, the fit test operator must install a P100 filter onto a TSI fit test adapter from the model 8025-20 kit fitted with an MSA inhalation valve (804813 inlet disc and 805011 valve spider) and allow the user to don the facepiece. If the user has never worn respiratory protection before this event, they must be allowed to become used to the sensation of wearing the facepiece before fit testing commences.

It is critical that the user don and adjust their respirator just as they would when wearing it for respiratory protection.

To help fit the mask, the fit test operator may attach it to the TSI PortaCount and put it in count/real-time mode. The count/real time mode allows a user to experiment with strap tension and other adjustments while watching the results in real time. The user learns how each adjustment affects the fit and learns how to achieve a fit that is comfortable and protective. This is highly recommended for the first few times a user is fit tested or to assess issues with a fit test passing. Experienced users should also consider this approach as a way to assess how they don their mask.

Fit Test Adapters

The procedure to fit test a Scott AV-3000 SureSeal full-facepiece respirator is a two-step process. The first step is to convert the facepiece into a negative pressure NIOSH-approved CBRN APR by attaching the employee's 40-millimeter (mm) CBRN adapter (Scott PN 200423-01). The second step is to attach a P100 filter to the TSI fit test adapter from the TSI model 8025-20 kit fitted with an MSA inhalation valve (804813 inlet disc and 805011 valve spider). Using the employee's cartridge adapter has the advantage of testing the sealing gasket and other components for leakage during the fit test.



40mm CBRN adapter

TSI 40mm fit test adapter

Inhalation valve

Inhalation valve in adapter

The MSA CBRN Ultra Elite facepiece seal used on an SCBA and the Ultra Elite APR mask seal are made from the same mold. The sealing surfaces are identical. Therefore, passing a fit test for one mask covers a user for the other. This eliminates the need for multiple fit tests that would be required if the facepieces were not designed from a common platform.

The procedure to fit test an MSA CBRN Ultra Elite facepiece respirator is the same as the procedure for the Scott AV-3000 SureSeal.

The procedures for connecting the fit test adapter and positioning the sample port inside the nose cup are essentially the same for the Scott and MSA masks:

1. For the Scott mask, connect the 40-mm CBRN adapter to the mask.
2. For the MSA mask, insert the inhalation valve (804813 inlet disc and 805011 valve spider) into the opening of the TSI 40-mm fit test adapter end that accepts the P100 filter.
3. Screw a P100 filter canister onto the fit test adapter. (For the MSA mask, make sure the filter does not twist the inhalation valve.) Note that over-tightening the filter will cause the inlet disk to twist and not lay flat on the valve spider. Look down the other end of the adapter to determine if the disk is lying flat.

4. Attach a length of flexible tubing to the fitting on the front of the adapter. The appropriate length is different for each type of mask. Use enough tubing to reach the breathing zone (inside the nose cup) without stretching or pinching the tubing. For a full-face mask, try using about 10 inches of tubing the first time. Excess tubing will be trimmed off the end inside the mask in a later step. Measure and cut the correct length of tubing for subsequent fit tests.



5. Thread the flexible tubing through the inhalation valve and into the breathing zone inside of the mask nose cup. Do *not* remove the mask's inhalation valve. Failure to use a tube running into the nose cup of the mask will result in fit factors that are artificially high.



6. Screw the adapter onto the mask by spinning the outer ring. Do *not* allow the adapter body to rotate and twist the flexible tubing. It is very important for the end of the tube to be located at a point midway between the nose and mouth to allow air to be sampled from the breathing zone.
7. Trim any excess from the end of the tubing that is inside the mask nose cup, so that there is no unnecessary slack.
8. As an option, the fit test operator can attach a clip and a suction cup to the end of the tube that is inside the nose cup. The neck of the clip is hollow so that air can pass through it. The purpose of the clip and suction cup is to anchor the end of the tube inside the nose cup so that it cannot be inadvertently blocked due to contact with the skin, lips, or nose.



- The suction cup, clip, and tube will be contaminated by the user's breath. These parts should be discarded and replaced with new (clean) parts for each person

tested. (For new parts, purchase a TSI refill kit, part no. 800553, which contains 200 additional clips, 200 suction cups, and 50 feet of tubing.)

9. Attach the suction cup to a smooth surface inside the mask nose cup near the nose and mouth. Make sure the tubing inlet cannot be accidentally blocked. The suction cup may stick better if the mating surfaces are wetted or wiped with an alcohol swab first. If the suction cup does not stick, remove it and position the tubing the best you can.
10. Attach the clear TSI PortaCount mask sample tube to the fitting on the side of the fit test adapter. You are now ready to proceed with the fit test.

Precautions

Make certain that the sample probe tube inlet is inside the mask nose cup. This ensures that air is sampled from the breathing zone near the nose and mouth. If there is no tube used to draw air from the breathing zone, only clean filtered air will be sampled, and all fit test results will be extremely high (over 100,000). These fit factors will not be correct.

Make certain that the flexible tube inside the mask is not blocked, twisted, or pinched. A blocked tube will result in high fit factors that are not correct.

Make certain that the filter canister is a P100 filter. Using the wrong type of filter will result in very low fit factors because ambient air particles can pass through it. A combination high-efficiency particulate arrest (HEPA)/gas filter is not recommended because they sometimes shed carbon particles. This will result in low fit factors because the shed particles will be interpreted as a face seal leakage by the TSI PortaCount.

The flexible tubing used inside the mask should be 1/8 inch (3 mm) inside diameter by 3/16 inch (4.5 mm) outside diameter PVC tubing. Do *not* use Teflon or silicone tubing, because particles do not pass through them properly due to static charge issues.

1. To test the fit test adapter, create a large leak by placing an object like a pencil between the user's face and the mask. The resulting fit factor should be very low.

Fit Test Equipment

The fit test must be administered by a trained EPA fit test operator with a TSI PortaCount model 8020, 8030, 8038, or a newer model. (TSI Inc. can be reached at 800-926-8378, www.tsi.com). The difference between the Model 8030 and the Model 8038 is the built-in N95 filter testing capabilities of the Model 8083.

The TSI PortaCount measures the ambient concentration of particles in a given aerosol sample using particle counting technology. The particle concentration of the aerosol outside the respirator (C_{out}) and the particle concentration inside the respirator (C_{in}) are both measured while the user performs a series of exercises designed to stress the face seal in ways that approximate anticipated workplace conditions.

$$\text{Fit Factor} = (C_{\text{out}} / C_{\text{in}})$$

TSI PortaCount users may conduct fit testing with the included fit test software or in the stand-alone mode. The software makes the fit test process easy and provides documentation and recordkeeping functions. When used, it controls all PortaCount functions, making it unnecessary to use the instrument's keypad controls other than the ON/OFF key.

Fit test operators must only conduct one fit test at a time.

The fit test operator must continuously monitor the user to ensure that the user does not inadvertently or intentionally alter the positioning or seal of the facepiece; the operator must also monitor the fit test apparatus to ensure that it is operating appropriately. The test is stopped and restarted if the operator identifies a problem or deviation in the procedure.

The user must don the respirator without physical or verbal assistance and perform user seal checks. If assistance is requested or needed, the fit test operator must provide assistance, but consider this as additional training—meaning that the user must repeat the donning and user seal checks again without assistance before proceeding to the fit test itself.

To achieve the pass-fail criterion for fit testing full-facepiece respirators, the ambient particle concentration must be maintained between:

1. 5,000 and 15,000 particles per milliliter when using the TSI model 8020 (Fit Plus)
2. 3,000 and 8,000 particles per milliliter when using the TSI model 8030 (Pro) or the 8038 (Pro+)



While the TSI PortaCount will operate as long as the ambient particle count is maintained above 1,000 particles per milliliter, the potential for lung particle generation may contribute enough particles to falsely lower the reported fit factor when below EPA-stipulated ambient particle concentrations. This may result in the possible rejection of an adequately fitting facepiece. If this occurs, the ambient particle count has to be supplemented.



To supplement the ambient particle count, a portable ultrasonic humidifier must be used. Evaporative-style humidifiers will not generate particles and cannot be used. To ensure the appropriate size particles are generated, only purified drinking water such as Dasani (Coca Cola) or Aquafina (Pepsi) products should be used. Do not add additional salt, as this will alter the particle size and not improve the ambient count. Do not use distilled water. Avoid using tap water, whenever possible. The ultrasonic humidifier should be kept at least 4 feet away from the sampling probe. Failure to maintain an appropriate distance, adding salt, and/or using different water simply increases the chance that the instrument manufacturer will need to repair or clean the humidifier. An example of a recommended ultrasonic humidifier is the Kaz 5520B Personal Ultrasonic Humidifier.

Avoid excessive room humidity, since too much water vapor can saturate the TSI PortaCount alcohol cartridge and decrease particle counts.

TSI PortaCount Startup and Operation

Follow the manufacturer-recommended startup, daily checks, and operation. Three checks must be performed once on each day the TSI PortaCount is used, and whenever a problem is encountered. The daily checks must be performed in this order:

1. The Particle Check is performed to determine if the PortaCount is working at all and if the concentration of particles in the ambient air is sufficient for fit testing. If the number shown is within the minimal range for the PortaCount model, the particle check passes.
2. The Zero Check must be performed each time the PortaCount Plus is turned on. Passing this test provides assurance that there are no leaks in the system. If the particle count goes to zero, the Zero Check passes. Leave the Zero Check filter on the sample hose and proceed to the Max FF Check.
3. The Max FF Check determines if the PortaCount can measure high fit factors and test whether the internal switching valve is functioning properly. This test is essentially a fit test on a HEPA filter that simulates a perfectly fitting respirator. At the completion of one test cycle (exercise), a fit factor of at least 50,000 should be displayed. If the fit factor is below this number, allow the test to continue for another cycle. If the fit factor remains too low, consult the applicable manual for the troubleshooting section for that PortaCount model. TSI recommends that the Zero Check filter be left attached to the sample line whenever the PortaCount is turned on but not in use. This prevents lint and debris from being drawn into the instrument and blocking the air flow.

Preparing to Fit Test

1. Instruct the user to don the respirator as trained.
2. Connect the instrument sample hose to the respirator to be tested.
 - If assistance is provided or the user uses a mirror to assist with donning, the user must completely remove the respirator and don it again without assistance and without a mirror.
 - Allow 5 minutes of breathing to purge ambient particles trapped inside the respirator during donning.

Conducting the Fit Test with the TSI Porta Count

1. Follow the manufacturer's operations manual to conduct the fit test. Have the user perform each exercise when indicated by the instrument. The instrument automatically performs the fit test and calculates all of the fit factors. After each exercise is completed,

review the results and assess the next step. PortaCount models 8030, 8038, 8040, and 8048 upgrades are available at <https://tsi.com/support/tsi-software-and-firmware-wizard/>.

2. Conduct Modified Ambient Aerosol Quantitative Fit Testing Protocol for Full Facepiece and Half-Mask Elastomeric Respirators

Exercises ¹	Exercise procedure	Measurement procedure
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 .	A 20 second ambient sample, followed by a 30 second mask sample.
Jogging-in-Place	The test subject shall jog in place comfortably for 30 seconds.	A 30 second mask sample.
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 .	A 30 second mask sample.
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 .	A 30 second mask sample followed by a 9 second ambient sample.

Notes:

- 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.

3. The user must be informed of the results. If the user does not pass, the mask must be inspected, issues must be corrected, and the test must be repeated. If the mask fails again, the test may be repeated, or the user will be fit tested in the MSA Ultra Elite.
4. On passing a fit test -- if one is available and necessary -- the user must be issued a respirator identical to the one used for the test.

Interpreting Results

The TSI PortaCount provides a fit factor for each exercise maneuver as well as an average (overall) fit factor at the conclusion of the test. The overall fit factor is not an arithmetic average but is weighted toward the lower values.

EPA requires a passing full-facepiece respirator to achieve a fit factor of at least 1,000 for every exercise. If any single exercise fit factor is less than 1,000, the respirator fit is deemed unacceptable. For full-facepiece CBRN respirators worn by EPA emergency responders, the overall fit factor will not be used to satisfy the pass/fail criterion. However, by definition, the minimum overall fit factor cannot be less than 1,000.

If a respirator fails (at least one exercise fit factor was less than 1,000), check the ambient particulate count. If the count is less than the ideal minimum concentration (5,000 particles per milliliter for the TSI model 8020 or 3,000 particles per milliliter for the TSI model 8030), repeat the fit test after supplementing the ambient atmosphere with a particle generator. Relatively low ambient counts (i.e., less than ideal), while acceptable for routine fit testing for general industry, may be uniquely sensitive to lung particle generation when a higher pass/fail criterion is required.

If coughing is suspected to be the cause of a failing fit factor ($< 1,000$) for a single exercise maneuver, the operator may stop the test and return to the first normal breathing maneuver without re-donning of the facepiece.

Examples of passing and failing fit test results are provided in Appendix 3, “Interpretation of Results.”

If the user fails the first fit test with no procedural errors and with appropriate ambient particle levels, the operator should investigate and address why the mask is not fitting and failed the fit test. Check that the mask seal is unobstructed and sealing against the face. Check that the mask is secured properly with the appropriate strap tension. To get a passing seal, it may be necessary to use a Scott mask seal kit (part number 805655-01), a NIOSH-approved kit to enhance the fit of the facepiece. If a seal kit is used, the only mask that the user may use is the mask specifically fitted with the seal kit for them. If more than one mask is issued to a person who uses a seal kit, each mask must be fit tested before use.

The masks are tight-fitting but should not be overly tightened. The operator should make sure that all filters, valves, and adapters are installed and functioning correctly. The user should doff and don the mask, then repeat this procedure. Once assured that the mask is fitted and functioning correctly but is still failing the fit test, the operator should attempt to fit the user to an alternative facepiece (the second choice is the MSA Ultra Elite).

Fit test operators must *not* force-fit the respirator being fit tested. Force-fitting is the practice of repeating a failed fit by over-tightening the straps until a passing fit test is finally achieved. (Of course, the straps must be adequately tightened to pass the fit test.)

Common Problems Resulting in Low Fit Factors

Some of the most common problems that result in lower-than-expected fit factors are described below. *Assuming the TSI PortaCount fit tester passes the daily checks*, explore the following possibilities:

1. *Not using high-efficiency filters.* If you are not using a P100 filter on the respirator, you may never get a high fit factor.
2. *Alcohol cartridge is not tightly inserted, or an O-ring is missing.* Make sure the alcohol cartridge is installed properly and all O-rings are in position.

3. *Starting fit test too soon after mask is donned.* When the mask is first donned, ambient air particles are trapped inside. These particles clear out as the person breathes. Do not start the fit test too soon.
4. *Sample tube is too long.* No more than the few inches should be added to the sample tube (use a tube adapter). Longer sample tubes prevent proper purging between the ambient and mask sample.
5. *Leaking respirator probe or fit test adapter.* Make certain the respirator probe (if used) or fit test adapter does not leak around the outside.
6. *PortaCount fit tester sample tube leaks where attached to probe or adapter due to wear.* Cut a short piece off the end of the tube to expose a fresh end.
7. *Hair interfering with face seal.* Make sure there is no hair between the face seal and the user's skin.
8. *Hair or foreign material in exhalation valve.* Make sure the exhalation valve is clear. A single hair can make a big difference.
9. *Cigarette smoker.* Do not allow the user to smoke for at least 30 minutes before the fit test.

Recordkeeping

Fit test records must be kept in a manner consistent with current requirements, the applicable *Emergency Responder Health and Safety Manual* requirements, and the following:

1. Name and/or identification number of respirator user.
2. Test date.
3. Name of the person who conducted the test.
4. Name of the fit test method used.
5. Ambient particle count level when testing was commenced.
6. The fit factor and indication of pass or fail.
7. Make, model, style, size, and other pertinent information (e.g., facepiece material, type of straps, etc.) of mask tested.
8. Fit test expiration date or next test due date.

9. Other factors such as safety or other equipment worn during the tests (e.g., hard hat, lens inserts).
10. If fit test certification cards are issued, they must contain at least the user's name; make, model, style, and size of facepiece(s) permitted to be used; and the fit test expiration date.
11. Upload the EPA Employees fit test record to the Field Readiness Module (emp.epa.gov/fr)

Equipment Records

The equipment records should include the following:

1. Test equipment and instrumentation used.
2. The equipment model and serial number.
3. Test equipment maintenance, repair, and calibration records.
4. A copy of the equipment manual(s).

APPENDICES

Appendix 1: Cleaning the Scott AV-3000 SureSeal Full-Facepiece

Appendix 2: Procedures for Inspecting and Donning the Scott AV-3000 SureSeal Respirator

Appendix 3: Interpretation of the TSI PortaCount Results for Elastomeric Respirators

Appendix 4: Special Procedures for the Use of and Fit Testing an N-95 Filtering Facepiece Respirator

Appendix 5: Procedures for Inspecting and Donning an N-95 Filtering Facepiece Respirator

Appendix 6: Example Fit Test Documentation

Appendix 1

Cleaning the Scott AV-3000 SureSeal Full-Facepiece

CLEANING AND STORAGE

NOTE: THE NOSE CUP IS DESIGNED TO BE AN INTEGRAL PART OF THE FACEPIECE AND DOES NOT NEED TO BE REMOVED FOR CLEANING AND DISINFECTING. IF THE NOSE CUP IS REMOVED FOR INSPECTION, MAKE CERTAIN IT IS REINSTALLED PROPERLY AS SPECIFIED IN THIS INSTRUCTION

- 1) Carefully wash the facepiece assembly with a solution of mild soap or detergent in warm water (1100 F /440 C maximum).

NOTE: FOLLOW ALL THE INSTRUCTIONS AND THE MATERIAL SAFETY DATA SHEET (MSDS) PROVIDED WITH THE SANITIZING OR DISINFECTING CLEANER.

- 2) To sanitize or disinfect the facepiece, use the SCOTT recommended sanitizing or disinfecting cleaner according to the instructions provided with the cleaner. Sanitizing or disinfecting may require a specific contact time of the cleaner prior to rinsing.

NOTE: THE SCOTT RECOMMENDED CLEANER MAY NOT BE EFFECTIVE ON HEAD HARNESES MADE OF POROUS MATERIAL SUCH AS KEVLAR OR POLYESTER.

- 3) Rinse with drinking water using a spray bottle or running water.
- 4) Shake excess water off of facepiece and then dry with a clean, lint free cloth or gently blow dry with clean, dry breathing air of 30 psig or less pressure. DO NOT use shop air or any other air containing lubricants or moisture.
- 5) Dry thoroughly before storage.
- 6) Do not store the facepiece with the regulator/adaptor attached.
- 7) Store the facepiece with nothing on top of it that could cause deformation or distortion of the facepiece lens, seals, or other parts.

DO NOT use abrasive cleaners.

DO NOT use bleach.

DO NOT use cleaners that contain quaternary ammonium compounds.

DO NOT use solvents such as acetone paint and lacquer thinner, benzene or dry cleaning fluid.

DO NOT polish with paper towels as most paper contains abrasives.

DO NOT autoclave or wash in an automatic washer.

DO NOT use a vapor degreaser/polisher.

CAUTION: THE LENS IN THIS FACEPIECE ASSEMBLY IS MOLDED OF POLYCARBONATE PLASTIC AND HARD-COATED TO RESIST ABRASION, BUT CARE IN HANDLING AND CLEANING IS STILL REQUIRED. THE LENS CAN BE DAMAGED

BY ABRASIVE OR HARSH CLEANERS AND SOFTENED BY SOME SOLVENTS. WHILE MANY HOUSEHOLD CLEANERS, DISINFECTANTS AND PLASTIC CLEANERS ARE ACCEPTABLE, FIRST TEST THE CLEANER ON THE EDGE OF A LENS OUTSIDE THE VIEWING AREA. IF THE CLEANER CAUSES ANY SCRATCHES OR ANY CHANGE IN THE APPEARANCE OF THE LENS, DO NOT USE THE CLEANER AS IT MAY CAUSE IRREPARABLE DAMAGE TO THE FACEPIECE

IF YOU HAVE ANY QUESTIONS REGARDING USE OR MAINTENANCE OF THIS PRODUCT, CONTACT SCOTT HEALTH AND SAFETY AT 1-800-247-7257

Appendix 2
Procedures for Inspecting and Donning the Scott AV-3000
SureSeal Respirator

WARNING

THIS SCOTT AV-3000 FULL-FACEPIECE ASSEMBLY IS INTENDED FOR USE AS PART OF A COMPLETE RESPIRATOR WHICH MAY SUPPORT HUMAN LIFE IN HAZARDOUS ATMOSPHERES. ADDITIONAL COMPONENTS ARE REQUIRED TO MAKE A COMPLETE RESPIRATOR TRAINING IS REQUIRED BEFORE USE. REFER TO THE DONNING, USE, DOFFING, AND MAINTENANCE INSTRUCTIONS SUPPLIED WITH THE COMPLETE RESPIRATOR.

INSPECT THIS FACEPIECE AND HEAD HARNESS BEFORE EVERY USE. DO NOT USE WITH WORN, LOOSE, OR DAMAGED COMPONENTS. FAILURE TO READ, UNDERSTAND, AND CAREFULLY FOLLOW THESE INSTRUCTIONS WHEN USING AND/OR CLEANING THE FACEPIECE ASSEMBLY MAY RESULT IN SERIOUS INJURY OR DEATH

REGULAR OPERATIONAL INSPECTION

Always inspect and clean a new facepiece before the first use. Remove and keep the label attached to the lens of a new facepiece. See the **CLEANING AND STORAGE** (Appendix 2).

Before each use of the respirator, perform the following **INSPECTION** of the facepiece as part of the **REGULAR OPERATIONAL INSPECTION** of the complete respirator as defined in the **USER INSTRUCTIONS** supplied with the respirator:

- 1) Inspect the facepiece seal and other rubber components for deformation, wear, damage, or cracks.
- 2) Check that all harness anchors are present, firmly attached, and do not rotate.
- 3) Inspect the lens for cracks, gouges, scratches, or any condition that could impair the operation of the facepiece or the user's vision.
- 4) Inspect the facepiece port for damage where the regulator/adaptor attaches. Inspect the two (2) support tabs and the facepiece around the mount for cracks or other signs of damage.
- 5) Inspect the lens frame bezel for damage such as cracks or distortion.
- 6) Check that both lens frame bezel screws are present and installed correctly.
- 7) Inspect the head harness for correct installation with all straps oriented correctly.
- 8) Inspect the head harness for damage or worn components.
- 9) Inspect the nose cup for cuts or damage.
- 10) Examine the facepiece assembly to be certain the nose cup inhalation valves are installed, Check that the nose cup is properly seated between the flanges of the voicemitter ducts. See Figure 1.



Figure 1 Check Voicemitter Ducts

- 11) Verify that the nose cup is properly installed for the style of nose cup being used. The NIOSH CBRN approved facepiece must be fitted with the GRAY nose cup. The GRAY nose cup must be fitted IN FRONT OF the Face Seal as shown in Figure 2



Figure 2

- 12) The facepiece must be complete and in serviceable condition with no worn, loose, or damaged components. If any damage is found, remove the facepiece from service and tag, for repair by authorized personnel.

WARNING

TO MAINTAIN NIOSH APPROVAL AND NFPA COMPLIANCE, AN AV-3000 FACEPIECE EQUIPPED WITH A SURESEAL FACESEAL *PIN* 31001738 (SMALL), *PIN* 31001739 (MEDIUM), OR *PIN* 31001740 (LARGE) MUST BE USED *ONLY* WITH GREY NOSE CUP *PIN* 31001043 (SMALL), *PIN* 31001044 (MEDIUM), OR *PIN* 31001045 (LARGE). USE OF A NON-COMPLIANT CONFIGURATION IN A HAZARDOUS ATMOSPHERE MAY RESULT IN SERIOUS INJURY OR DEATH.

DONNING THE AV-3000 SURESEAL FACEPIECE

- 1) Adjust the head straps to the full outward position.
- 2) Hold the facepiece in one hand while holding the head harness up and out of the way with other hand. Use the Head Harness Pull Tab on the bottom rear of the head harness.
- 3) Place the facepiece centered on the face with the chin properly positioned in the chin cup. Verify that no hair or clothing is interfering with the face to facepiece seal. Hold the facepiece in place with the chin properly located in the chin cup throughout the donning process.

NOTE: ENSURE THAT THE CHIN IS PROPERLY LOCATED IN THE CHIN POCKET OF THE FACEPIECE THROUGHOUT THE DONNING PROCESS.

- 4) Stroke the head harness over the head and ensure that straps are lying smooth and flat against the head and neck with no twists. Use the Head Harness Pull Tab to verify the head harness is centered and properly located at the back and base of the head. Maintain the head harness in this position.

NOTE: VERIFY THAT THE TOP CENTER PORTION OF THE HEAD HARNESS IS POSITIONED OVER THE CROWN OF THE HEAD. CENTER HEAD HARNESS ON THE CROWN OF THE HEAD



CENTER HEAD HARNESS ON THE CROWN OF THE HEAD

- 5) While holding the facepiece in place with one hand, tighten the neck straps evenly one at a time by pulling each neck strap end toward the rear of the head. Alternate hands to maintain the facepiece position on the face.
- 6) Verify the proper location of the face in the facepiece and the chin in the chin cup. While still holding the facepiece in place with one hand, tighten the temple straps evenly one at a time by pulling each temple strap end toward the rear of the head. Alternate hands to maintain the facepiece position on the face.
- 7) Verify the proper location of the face in the facepiece and the chin in the chin cup. Tighten the forehead strap last by pulling the forehead strap toward the back of the head. Do not over tighten the forehead strap.
- 8) Verify that the head harness is centered on the crown of the head and lying flat against the back of the head. Verify the proper location of the face in the facepiece and the chin in the chin cup and retighten all straps as needed.
- 9) Stroke the head harness down the back of the head and make sure the net is centered on your head. If necessary, adjust the head harness net to the center of the crown of the head.
- 10) Verify the proper location of the face in the facepiece and the chin in the chin cup. Retighten the straps if required. All straps must be snug and the facepiece should feel secure.
- 11) Perform the positive and negative user seal check to ensure that an adequate seal is achieved each time the respirator is put on.
 - a. Positive pressure check. Close off the exhalation valve with the palm of your hand and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal.

- b. Negative pressure check. Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s), inhale gently so that the facepiece collapses slightly, and hold the breath for ten seconds. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.
- c. If leakage of air is detected during either of the above procedures, remove the facepiece and repeat donning steps 1 through 11.

If either a user seal check is unsatisfactory per the user instructions above or the OSHA fit testing process, the use of Mask Seal Kit P/N 805655-01 is required. The Mask Seal Kit is a NIOSH approved kit to enhance the fit of the facepiece. If leakage persists, do not use the respirator.

REPORTING PROBLEMS

If a separation or other damage occurs, do not use the facepiece. Remove the facepiece from service in accordance with your respiratory protection program. If you have experienced a problem with the AV-3000 Facepiece and need replacement information, contact your respirator issuing authority

Appendix 3

Interpretation of the TSI PortaCount Results

Example: First Donning Results

Bending Over	< 1,000
Jogging In-Place	< 1,000
Turning head side to side	< 1,000
Moving head up and down	< 1,000

- 1) Check the ambient particulate count. If it is less than the ideal minimum concentration (5,000 particles per milliliter for the TSI model 8020 or 3,000 particles per milliliter for the TSI model 8030), repeat the fit test after supplementing the ambient atmosphere with a particle generator.
- 2) If the user is a smoker and/or was coughing during the test, redo the test 30 minutes later. Do not allow the user to smoke for 30 minutes before the test. If the user was coughing because of illness or cannot refrain from coughing during the fit test, perform the test later when the user is not sick.
- 3) Check that the mask seal is unobstructed and seals against the face. Check that the mask is secured properly with the appropriate strap tension. A Scott mask seal kit (part number 805655-01) may need to be used to get a passing seal. The masks are tight-fitting but should not be overly tightened.
- 4) Make sure that all filters, valves, and adapters are installed and functioning correctly.
- 5) Have the user doff and don the mask again and repeat this procedure.

Example: Second Donning Results

Bending Over	> 1,000
Jogging In-Place	> 1,000
Turning head side to side	< 1,000
Moving head up and down	< 1,000

- 1) Check the ambient particulate count. If it is less than the ideal minimum concentration (5,000 particles per milliliter for the TSI model 8020 or 3,000 particles per milliliter for the TSI model 8030), repeat the fit test after supplementing the ambient atmosphere with a particle generator.
- 2) If the user is a smoker and/or was coughing during the test, redo the test 30 minutes later. Do not allow the user to smoke for 30 minutes before the test. If the user was coughing because of illness or cannot refrain from coughing during the fit test, perform the test later when the user is not sick.

- 3) Check that the mask seal is unobstructed and seals against the face. Check that the mask is secured properly with the appropriate strap tension. A Scott mask seal kit (part number 805655-01) may need to be used to get a passing seal. The masks are tight-fitting but should not be overly tightened.
- 4) Make sure that all filters, valves, and adapters are installed and functioning correctly.
- 5) Have the user doff and don the mask again and repeat this procedure.

Example: Third Donning Results

Bending Over	> 1,000
Jogging In-Place	> 1,000
Turning head side to side	> 1,000
Moving head up and down	> 1,000

Decision: Respirator has acceptable fit and can be assigned.

If the user fails the fit test with the mask, the operator must ensure that the mask is fitted and functioning correctly before attempting to fit the user into an alternative facepiece. The mask may be attached to the TSI PortaCount and put in the count/real-time mode to assist with fitting the mask. The count/real-time mode allows a user to experiment with strap tension and other adjustments while watching the effect these efforts have in real time. The user learns how each adjustment affects the fit, and learns how to achieve a fit that is comfortable and protective. This is highly recommended for the first few times a user is fit tested or to assess issues with a fit test passing. If additional issues are identified with the fit and can be corrected or adjusted, additional fit testing may continue.

Appendix 4

Special Procedures for the Use of and Fit Testing an N-95 Filtering Facepiece Respirator

Overview and Introduction

N-95 filtering facepiece respirators are *air-purifying* respirators certified by the National Institute of Occupational Safety and Health (NIOSH) to have filter efficiency level of 95% or greater against particulate aerosols free of oil and greater than 0.3 microns in size. Examples of airborne contaminants that N-95 respirators filter out include dusts, fumes, mists and microbial agents.

Personnel who are required by their employer to wear respirators (identified on a hazard assessment), shall be approved after completing the following:

- *Medical Evaluation/ Clearance:* to determine if users are physically fit to wear a respirator.
- *Training:* to ensure users are familiar with N95 respirators, their proper use and protective limitations and is required on an **annual** basis.
- *Fit-Testing:* to determine which respirator model/ size provides the proper fit for the user. Such fit test is required on an **annual** basis.

N-95 respirators **ONLY** filter out particulate contaminants. N95 respirators do not protect from:

- Chemical vapors/ gases
- Oxygen deficient atmosphere
- High risk exposures such as those created by aerosol-generating work activities and asbestos handling.
- N95 respirators are disposable – one time use only.

The effectiveness of N95 respirators relies on how well the respirator seals to the user's face. To ensure N95 respirators work effectively:

- **ONLY** use the respirator model and size for which the user has been fit-tested by trained and competent personnel. N-95 respirators vary by model and size. Improper fit will likely result in inadequate protection.
- **DO NOT** use the respirator with beards or other facial hair, which may interfere with the direct contact between your face and the sealing surface of the respirator.
- Conduct an inspection and a seal-check **every time** you put the respirator on (before entering area of concern).

Fit Testing Procedures

Qualitative Fit Testing

There are several commercially available qualitative fit test kits available on the market. Currently kits use a bitter (Bitrex) tasting or a sweet (saccharin) tasting solution. Avoid using Amylacetate (banana oil) or Stannic Chloride (irritant smoke) due to the hazardous nature of these chemicals. Follow the instructions closely. It may be necessary to maintain both the sweet solution and the bitter solution fit. Some workers may have difficulty detecting the sweet taste during the sensitivity test and the use of the bitter test may be necessary. The test subject should not eat, drink (except water), smoke or chew gum for 15 minutes before the test.

A qualitative fit test generally consists of the following steps:

1. Review the Safety Data Sheets (SDS) for the fit testing solutions with the worker.
2. Conduct a sensitivity test - This test is done to assure that the person being fit tested can detect the sweet and/or bitter taste of the test solution at very low levels. A sensitivity test solution should be dilute version of the fit test solution.
3. Conduct the fit test:
 - a. Worker dons the respirator and perform a user seal check per the instructions provided on the respirator package.
 - b. Place the test hood/fit test enclosure over the worker.
 - c. Using the kit provided nebulizer with the chosen fit test solution, inject the fit test aerosol using the same number of squeezes as required in the Sensitivity Test. A minimum of ten squeezes is often required. To maintain an adequate concentration of aerosol during this test, inject one-half the number of squeezes every 30 seconds for the duration of the fit test procedure.
 - d. After the initial injection of aerosol, direct the worker to perform the following test exercises for 60 seconds each:
 - i. Normal breathing – In a normal standing position, without talking, the subject shall breath normally.
 - ii. Deep breathing – In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
 - iii. 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.
 - iv. 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 (when looking toward the ceiling).
 - v. 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, count backward from 100, or recite a memorized poem or song.

- vi. Bending over – The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place may be substituted for the exercise.
 - vii. Normal breathing
- e. The test is terminated at any time the sweet or bitter taste of aerosol is detected by the subject because this indicates an inadequate fit. If the worker detects the fit test solution, wait 15 minutes and perform the sensitivity test again. Repeat the fit test after redonning and readjusting the respirator. A second failure may indicate that a different size or model respirator is needed.
- f. If the entire test is completed without the subject detecting the bitter taste of the aerosol, the test is successful and respirator fit has been demonstrated.
- 4. Rinse out all nebulizers used for the test and allow to complete dry prior to storage
- 5. Document the completion of the fit test. See Appendix 6 for an example qualitative fit test documentation form. Upload the completed fit test form into the FRM Program.

3M Qualitative Fit Test Resources

- [3M Qualitative Fit Test Apparatus, FT-10, Sweet](#)
- [3M Qualitative Fit Test Apparatus, FT-30, Bitter](#)
- [3M Quick Reference Guide for Qualitative Fit Testing](#)
- [3M Qualitative Respirator Fit Testing Video](#)

Honeywell Qualitative Fit Test Resources

- [Honeywell Qualitative Fit Test Equipment](#)
 - Bitrex Kit – Model Number 193170
 - Saccharin Kit – Model Number 193120
- [Honeywell Qualitative Respirator Fit Testing Video](#)

Moldex Qualitative Fit Test Resources

- [Moldex Bitter Qualitative Fit Test Kit](#)
- [Moldex Qualitative Respirator Fit Testing Video](#)

Allegro Qualitative Fit Test Resources

- [Allegro Sweet Qualitative Fit Test Kit](#)
- [Allegro Bitter Qualitative Fit Test Kit](#)

Quantitative Fit Testing

The fit test must be administered by a trained EPA fit test operator with a TSI PortaCount model 8020, 8030, 8038, or a newer model. (TSI Inc. can be reached at 800-926-8378, www.tsi.com). If using TSI PortaCount Models 8020 or 8030, you will need to use the Portacount Model 8095 N95-Companion. The Model 8038 has built in N-95 quantitative fit test capabilities. You will need to purchase and use the TSI Model 8025-N95 Fit Test

Adaptor in order to conduct the test on Model 8038 (<https://tsi.com/product-accessories/fit-test-probe-kit-for-disposable-facepieces-8025-n95/>)

In general, follow the procedures outlined in Section M through Section T of this Protocol with the following modifications:

Follow the manufacturer's operations manual to conduct the fit test. Have the user perform each exercise when indicated by the instrument. The instrument automatically performs the fit test and calculates the fit factors. After each exercise is completed, review the results and assess the next step.

1. Each fit test exercise must be at least 60 seconds in duration (except the grimace maneuver, which lasts 15 seconds). The exercises are described below, in the order in which they must be performed.
 - a. *Normal breathing.* In a relaxed standing or sitting position, without talking, look straight ahead and breathe normally in and out of the respirator for one minute.
 - b. *Deep breathing.* In a relaxed position, without talking, look straight ahead in the standing or sitting position and, at a normal rate, breathe deeply in and out of the respirator for one minute. Do not hyperventilate. If you begin to feel lightheaded, return to normal breathing until you feel it is safe to return to deep breathing.
 - c. *Turning head side to side.* In the standing or sitting position, slowly turn your head and breathe normally while looking over your shoulder. Then, turn your head and breathe normally while looking over the opposite shoulder. Repeat turning your head for one full minute. Avoid bumping your respirator on your shoulder during this exercise. If you accidentally dislodge the facepiece during this maneuver, notify the fit test operator.
 - d. *Moving head up and down.* In the standing or sitting position, slowly look up toward the ceiling and breathe normally. Then look down toward the floor and breathe in again. Repeat looking up and down for one full minute. When looking down, be careful not to bump your respirator on your chest. If you do, notify the fit test operator.
 - e. *Talking.* In the standing or sitting position, read the passage below. Be sure to speak loud enough to be clearly heard by your fit test operator; speak as if you were communicating with a coworker while wearing your respirator. The passage (called the "Rainbow Passage") is:

"When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."

If you finish before the exercise time expires, simply repeat the talking maneuver. Remember to speak loud enough so the test operator can clearly hear you.

- f. *Grimace*. In the standing or sitting position, smile, frown, and move your cheeks for 15 seconds.
 - g. *Bending over*. In the standing position, bend at the waist and look down towards the floor. Breathe in two times while looking down, then return to the standing position and breathe in twice while looking straight ahead. Repeat the bending maneuver for one full minute.
 - h. *Normal breathing*. In a relaxed standing or sitting position, without talking, look straight ahead and breathe normally in and out of the respirator for one minute.
2. The user must be informed of the results. If the user does not pass, the mask must be inspected, issues must be corrected, and the test must be repeated. If the mask fails again, the test may be repeated again, or the user will be fit tested in a smaller, larger or different brand N-95 respirator.
 3. On passing a fit test—if one is available and necessary—the user must be issued a respirator identical to the one used for the test.
 4. Example of a passing test:

Normal breathing	>200
Deep breathing	> 200
Turning head side to side	> 200
Moving head up and down	> 200
Talking	> 200
Bending over	> 200
Normal breathing	> 200
Overall fit factor	> 200

5. Document the completion of the fit test. See Appendix 6 for an example qualitative fit test documentation form. Upload the completed fit test form into the FRM Program (<https://emp.epa.gov/fr>).

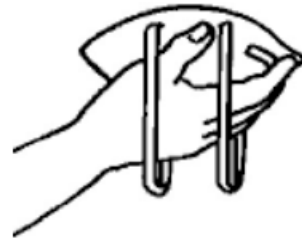
Appendix 5

Procedures for Inspecting and Donning an N-95 Filtering Facepiece Respirator

NOTE: Only use the specific N-95 respirator make, model and size that you have been fittest with and trained on.

Remove the respirator from the packaging and inspect for damage. Verify that the straps and nose piece are attached and in good condition. Look for any degradation of the rubber parts, including the exhalation valve, if present.

Hold the respirator in one hand, with the nose piece at the fingertips and let the head straps hang loosely in front of the respirator



Place respirator under the chin, with the nosepiece up. While holding the respirator with one hand, pull the top strap over your head, resting it at the top back of your head.

Pull the bottom strap over your head, and place it around your neck, below your ears.



Using both hands, mold the nose piece to the shape of your nose by pushing inward with your fingertips.

Note that pinching the molding piece with 1 hand will likely result in less effective respirator fit.



Seal-check: cover respirator completely w/ both hands, and exhale sharply.

If air blows on your face or eyes, readjust the respirator according to Steps 3 & 4. Do not use respirator until you pass the seal-check (no leakage).



Appendix 6: Example Fit Test Documentation
Quantitative Fit-Test Form

Name: _____, Org./Div./Branch: _____

Respirator Information:

Manufacturer: _____ Model: _____ Size: _____

PPE or Respirator Accessories Worn: _____

TSI PortaCount Information:

Model: _____ Serial Number: _____ Calibration Due Date: _____

Daily Instrument Checks Completed (Particle Check, Zero Check and Max Fit Factor Check)

Completed: Yes No

Seal Check:

Positive-pressure test: Yes No

Negative-pressure test: Yes No

Test Exercises:

	Results (Fit Factor)
Fit Factor Need for Each Test?	
Bending Over	
Jogging In-Place	
Head Side-To-Side	
Head Up-and-Down	
Overall Fit Factor (sum of 4 tests/4):	

Overall Test Results:	Pass	Fail
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I certify that the above-named individual has been trained and qualitatively fit-tested in accordance with the guidelines established in the EPA Respiratory Protection Order 1440.3 and OSHA 29 CFR 1910.134.

Fit Test Operator/Examiner Name: _____

Signature: _____ Date: _____

Quantitative Fit-Test Form Example

Name: Joe Smith, Org./Div./Branch: Region 4/SEMD/ERRPPB

Respirator Information:

Manufacturer: SCOTT Model: AV3000 Sure Seal Size: Medium

PPE or Respirator Accessories Worn: Prescription Glass Insert and Voice Amplifier

TSI PortaCount Information:

Model: 8038+ Serial Number: SN 12345678 Calibration Due Date: 06/2020

Daily Instrument Checks Completed (Particle Check, Zero Check and Max Fit Factor Check)

Completed: X-Yes No

Seal Check:

Positive-pressure test: X-Yes No

Negative-pressure test: X-Yes No

Test Exercises:

	Results (Fit Factor)
Fit Factor Needed for Each Test	>1000
Bending Over	1206
Jogging In-Place	1406
Head Side-To-Side	4000
Head Up-and-Down	3010
Overall Fit Factor (sum of 4 tests/4):	2405.5

Overall Test Results:	X Pass	Fail
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I certify that the above-named individual has been trained and qualitatively fit-tested in accordance with the guidelines established in the EPA Respiratory Protection Order 1440.3 and OSHA 29 CFR 1910.134.

Fit Test Operator/Examiner Name: Jill Fit-Tester

Signature: _____ Date: 05/18/2020

Qualitative Fit-Test Form

Name: _____, Org./Div./Branch: _____

Respirator Information:

Manufacturer: _____ Model: _____ Size: _____

Seal Check: Positive-pressure test: Yes No
Negative-pressure test: Yes No

PPE or Respirator Accessories Worn: _____

Sensitivity Screening Check:

Sweet properties detected: Yes No
Bitter properties detected: Yes No

Test Atmosphere:

Enclosure used: Yes No

Rainbow Passage for Vocalizing Exercise: “When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.”

Test Exercises:

	Sweet Solution		Bitter Solution	
Normal breathing	Pass	Fail	Pass	Fail
Deep breathing	Pass	Fail	Pass	Fail
Side-to-side head movement	Pass	Fail	Pass	Fail
Up-and-down head movement	Pass	Fail	Pass	Fail
Vocalizing	Pass	Fail	Pass	Fail
Bending over/jogging	Pass	Fail	Pass	Fail
Normal breathing	Pass	Fail	Pass	Fail

Overall Test Results: Pass Fail

I certify that the above-named individual has been trained and qualitatively fit-tested in accordance with the guidelines established in the EPA Respiratory Protection Order 1440.3 and OSHA 29 CFR 1910.134.

Fit Test Operator/Examiner Name: _____, Date: _____

Signature: _____

Qualitative Fit-Test Form Example

Name: Smith, Joe, Org./Div./Branch: Region 4/SEMD/ERRPPB

Respirator Information:

Manufacturer: 3M

Model: 8210 N-95

Size: Medium

PPE or Respirator Accessories Worn: Safety glasses

Seal Check:

Positive-pressure test: x-Yes No

Negative-pressure test: x-Yes No

Sensitivity Screening Check:

Sweet properties detected: Yes x-No

Bitter properties detected: x-Yes No

Test Atmosphere:

Enclosure used: x-Yes No

Rainbow Passage for Talking Exercise: “When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.”

Test Exercises:

	Sweet Solution		Bitter Solution	
Normal breathing	Pass	Fail	x-Pass	Fail
Deep breathing	Pass	Fail	x-Pass	Fail
Side-to-side head movement	Pass	Fail	x-Pass	Fail
Up-and-down head movement	Pass	Fail	x-Pass	Fail
Vocalizing	Pass	Fail	x-Pass	Fail
Bending over/jogging	Pass	Fail	x-Pass	Fail
Normal breathing	Pass	Fail	x-Pass	Fail

Overall Test Results

x- Pass

Fail

I certify that the above-named individual has been trained and qualitatively fit-tested in accordance with the guidelines established in the EPA Respiratory Protection Order 1440.3 and OSHA 29 CFR 1910.134.

Examiner Name: Frank Fit-Tester

Examiner Signature: _____ Date: 08/07/2020