

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 stannic chloride ventilation smoke tube to detect leakage into the respirator (N95 or KN95 mask).

(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 minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.
- (5) The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

(b) Sensitivity Screening Check – Pre-Fit Test [STEP ONE]

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 end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb (3x slow steady pumps / min). The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the 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 passages and instruct the subject to keep his/her eyes closed while the test is performed.
- (3) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

(c) Irritant Smoke Fit Test Procedure [STEP TWO]

- (1) The person being fit tested shall don the respirator without assistance and perform the required user seal check(s).
- (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 face seal area of the test subject, using the low flow pump or the squeeze bulb (3x slow steady pumps / min) . The test operator shall **begin at least 12 inches** from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more 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 the test exercises.
- (5) The exercises identified (BELOW) shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

Test Exercises.

- (a) Employers must perform the following test exercises for all fit testing methods prescribed
- (b) Ensure that test subjects perform exercise procedure specified 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 not to hyperventilate.
 - (3) **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.
 - (4) **Moving head up and down.** Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
 - (5) **Talking.** The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

Rainbow Passage (Candidate to Read)

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.

- (6) **Grimace.** The test subject shall grimace by smiling or frowning.
- (7) **Bending over.** The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test that do not permit bending over at the waist.
- (8) **Normal breathing.** Same as exercise (1).

(c) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

- (6) If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

(d) Sensitivity Screening Check – Post Fit Test [STEP THREE]

- (1) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.
- (2) If a response is produced during this second sensitivity check, then the fit test is passed. **PASS FAIL (Tester to Circle One)**
- (3) Would you like to talk to the health care professional who will review this questionnaire about your answers? **YES NO (Candidate to Answer)**

NAME of Candidate: _____

Make & Model of Mask: _____

Date: _____

Three steps are required to address DOSH directive 1.70 – this is only one of the three steps required to be in compliance

1 Medical Evaluation

- https://www.3m.com/3M/en_US/safety-centers-of-expertise-us/respiratory-protection/respirator-medical-evaluations/
- Two Free Tests per email sign up

2 Initial Fit Test of Respirator (N95 or KN95 Mask)

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(b) Sensitivity Screening Check – Pre-Fit Test [STEP ONE]

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(c) Irritant Smoke Fit Test Procedure [STEP TWO]

- (1) The person being fit tested shall don the respirator without assistance and perform the required user seal check(s).
- (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 face seal area of the test subject, using the low flow pump or the squeeze bulb (3x slow steady pumps / min) . The test operator shall **begin at least 12 inches** from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more 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 the test exercises.
- (5) The exercises identified (BELOW) shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

Test Exercises.

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- (1) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.
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- (5) The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

(b) Sensitivity Screening Check – Pre-Fit Test [STEP ONE]

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(c) Irritant Smoke Fit Test Procedure [STEP TWO]

- (1) The person being fit tested shall don the respirator without assistance and perform the required user seal check(s).
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* Appendix A to §1910.134—Fit Testing Procedures (Mandatory) - Part I. OSHA-Accepted Fit Test Protocols

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(c) Irritant Smoke Fit Test Procedure [STEP TWO]

- (1) The person being fit tested shall don the respirator without assistance and perform the required user seal check(s).
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- (5) The exercises identified (BELOW) shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

Test Exercises.

- (a) Employers must perform the following test exercises for all fit testing methods prescribed
- (b) Ensure that test subjects perform exercise procedure specified 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 not to hyperventilate.
 - (3) **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.
 - (4) **Moving head up and down.** Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
 - (5) **Talking.** The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

Rainbow Passage (Candidate to Read)

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.

- (6) **Grimace.** The test subject shall grimace by smiling or frowning.
- (7) **Bending over.** The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test that do not permit bending over at the waist.
- (8) **Normal breathing.** Same as exercise (1).

(c) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

- (6) If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

(d) Sensitivity Screening Check – Post Fit Test [STEP THREE]

- (1) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.
- (2) If a response is produced during this second sensitivity check, then the fit test is passed. **PASS FAIL (Tester to Circle One)**
- (3) Would you like to talk to the health care professional who will review this questionnaire about your answers? **YES NO (Candidate to Answer)**

NAME of Candidate: _____

Make & Model of Mask: _____

Date: _____

Three steps are required to address DOSH directive 1.70 – this is only one of the three steps required to be in compliance

1 Medical Evaluation

- https://www.3m.com/3M/en_US/safety-centers-of-expertise-us/respiratory-protection/respirator-medical-evaluations/
- Two Free Tests per email sign up

2 Initial Fit Test of Respirator (N95 or KN95 Mask)

- Service Provided by outside agency or owner

3 Respiratory Protection Program

- <https://www.wsda.org/member-center/covid-19/dosh-directive-information>
- Note: Access requires organized dentistry member log in w/ Credentials

* Appendix A to §1910.134—Fit Testing Procedures (Mandatory) - Part I. OSHA-Accepted Fit Test Protocols