



Lusail Real Estate Development Company

Health, Safety, Security, Environment, Logistics & Quality Department

Lusail Construction Safety Procedural Forms/Checklists – Respirator Fit Testing

Document No LUS-HSE-FM4-446-017.01 Rev 1
Uncontrolled Copy Controlled Copy Date 01-Apr-2015

COMPANY PROPRIETARY INFORMATION

Prior to use, ensure this document is the most recent revision by checking the Master Document List. To request a change, submit a Document Change Request to the Document Control Representative. Master copy of this document will be maintained by the LREDC QA/QC Manager. Not controlled if printed.



Qualitative Fit Test Procedures

Irritant Smoke (Particulate) Test

1. Apply irritant smoke only to respirators equipped with high-efficiency particulate air (HEPA) filters.
2. Irritant smoke testing is particularly useful when communication is difficult, such as with a language barrier.
3. Ventilation should be provided when carrying out a test to prevent contaminating the room where the test is carried out with smoke. The respirator wearer should keep his/her eyes closed during the test, even if the respirator offers eye protection.
4. After subject dons the respirator, the tester visually inspects facepiece-to-face seal. If employee is uncomfortable, the test ends.
5. Place a hood designed for fit testing or large clear plastic bag over the subject's head.
6. Break both ends of the specified ventilation smoke tube (or equivalent). Insert one end into the tube connected to the positive-pressure end of a two-way aspirator bulb and cover the end with a 1- to 2-inch length of Tygon, surgical, or rubber tubing. Squeeze the aspirator bulb to generate the test aerosol (smoke).
7. Instruct the wearer to breathe normally during a short period (30 to 60 seconds). If no leakage is detected, instruct the wearer to perform various exercises that simulate work conditions (e.g., moving head side to side, moving head up and down, talking, breathing deeply, jogging in place, bending over and touching toes, grimacing).
8. If the wearer detects the penetration of smoke during the test, the wearer should be permitted to readjust the seal and be retested.
9. Each test subject passing the irritant smoke test (i.e. without detecting the smoke) is given a sensitivity check of smoke from the same tube to determine if the test subject reacts to the smoke. Failure to evoke a response from the wearer voids/fails the fit test.
10. If the wearer does not detect smoke penetration, the test is ended and a satisfactory seal is documented.
11. If the wearer again detects the penetration of smoke into the respirator, the test is ended and an unsatisfactory seal is documented.

Isoamyl Acetate (Banana Oil) Test

1. As a test agent, the use of isoamyl acetate vapor has the following major drawbacks:
 - a. The odor threshold varies widely among persons, although most persons can detect an odor concentration of isoamyl acetate vapor in air as low as 0.1 ppmv.
 - b. Olfactory fatigue may cause a person to fail to detect the odor of a low concentration of isoamyl acetate vapor in the air.
2. Before performing this test, all persons are tested to determine their ability to sense the odor of isoamyl acetate vapor in the air. Because the odorous vapor test is subjective, the validity of the test result depends on the respirator wearer's honest indication as to whether an odor was detected during the test.
3. Before testing, expose the respirator wearer to a very low concentration of the isoamyl acetate to ensure that he can detect the odor. If the wearer smells the isoamyl acetate, instruct him to take note of this odor. If he does not smell the isoamyl acetate, this fit test cannot be performed.
4. Use respirators equipped with organic vapor cartridges or canister.
5. After the wearer dons and fit-checks the respirator, the tester visually inspects the facepiece-to-face seal. If the seal obviously leaks, the tester ends the test and documents it as an unsatisfactory fit. In addition, if the subject is uncomfortable, the test ends. If the seal is satisfactory, the test continues.
6. Instruct/assist the wearer to put his head into the fit test chamber (plastic bag or hood) and breathe normally for a short period (30 to 60 seconds), while the tester holds an isoamyl acetate ampoule near the facepiece seal. If no leakage is detected, instruct the employee to perform various exercises simulating, as nearly as possible, work conditions (i.e., deep breathing, moving head side to side, moving head up and down, talking, jogging in place, bending over and touching toes, grimacing).
7. If the wearer smells the isoamyl acetate at any time during this test, the tester ends the test and documents an unsatisfactory seal. The respirator may be readjusted, visually inspected for defects/worn cartridges, or another size selected, and a new fit test can be restarted.
8. If the wearer cannot smell the isoamyl acetate vapor during the test, the tester documents a satisfactory fit with the respirator.

Saccharin Test

1. Use respirators equipped with standard dust/mist filters or high-efficiency filters.
2. Fit test subjects may not eat, drink (except for plain water), or chew gum for 15 minutes before the fit test.
3. Because saccharin is a substance that is tasted, the tester instructs the wearer to breathe through his mouth, not his nose, during the elements of this fit testing session. If the wearer tastes saccharin at any time during the fit test, the wearer notifies the tester.
4. Perform a taste threshold screening exercise in a fit test hood or bag without wearing the respirator. The tester sprays the threshold check (weak) solution into the enclosure, directed at the subject's open mouth. If the wearer tastes the saccharin, the tester asks him to take note of that taste, exit the hood/bag, and prepare for the actual fit test. If the wearer does not taste the saccharin, the saccharin fit test cannot be performed on this individual.
5. The wearer dons and fit-checks the selected respirator. The tester visually inspects the facepiece-to-face seal for deficiencies. If the wearer is uncomfortable, the test ends.
6. The tester instructs/assists the wearer in putting his head into the hood/bag and breathing normally during a short period (30 to 60 seconds) while the tester sprays the saccharin fit test solution (stronger) into the hole/opening towards the face seal of the respirator.
7. If the wearer does not taste or detect saccharin, the tester instructs the wearer to perform various exercises simulating work conditions (e.g., breathing deeply, moving head side to side, moving head up and down, talking, jogging in place, bending over and touching toes, grimacing).
8. If the wearer tastes or detects saccharin at any time, the tester ends the test and documents an unsatisfactory seal. The respirator may be readjusted, visually inspected for defects, or another size selected, and the fit test can be restarted.
9. If the wearer cannot taste/detect the saccharin during the fit test, the tester documents a satisfactory fit with the respirator.

Quantitative Fit Test Procedures

Initial Selection of Respirators

Respirators are selected as described for irritant smoke testing in LCSMP 08-00.

Fit Test Procedure

When tested as an air-purifying device, the respirator is equipped with filters or cartridges for removing the test agent. The employee then puts on the probed respirator facepiece. With sampling probe sealed off from outside air, the employee performs both positive and negative pressure fit checks per instructions in LCSMP 08-02.

Failure to pass either fit check, even after repositioning the facepiece and adjusting the strap tension, is cause to select a different respirator facepiece.

If the respirator passes the fit check, the employee wears it for at least five minutes to ensure that the fit remains comfortable. Then the employee wears it while entering the test chamber and connects the sampling probe to the instrument that measures the test agent level inside the respirator.

The following exercises are performed by the employee for at least 30 seconds each while the respirator seal is being challenged by the test agent:

- ◆ normal breathing
- ◆ deep breathing at a regular rate
- ◆ turning head from side to side, inhaling when head is at either side
- ◆ nodding head down and back, inhaling when head is in back position
- ◆ bending forward to touch toes, inhaling when head is in down position
- ◆ raising arms above head and looking upward, inhaling when head is in up position
- ◆ talking and reciting Rainbow Passage
- ◆ resuming normal breathing

Fit Factor Calculation

The instrument measuring penetration of the test agent into the respirator is connected to a fast-response recorder that measures penetration values. During each exercise, the average percentage of the penetration peaks of the test agent is calculated by the following equation:

$$\text{FIT FACTOR} = 100/S/N$$

S = sum of the average peak concentration penetrations for all exercises, in %

N = total number of exercises

Test Chambers

The design of the chamber and equipment used to generate the test atmosphere and disperse the test agent into that atmosphere should ensure that the test agent concentration does not vary more than +5% during a test, and that the test agent is uniformly distributed throughout the chamber atmosphere.

When an air supplying continuous-flow type of respirator is being tested, the test chamber must be of sufficient volume to prevent excessive dilution of the test agent concentration during the testing.

The size of the chamber should be large enough for carrying out all the required exercises. Chamber design should also permit the person conducting the test to visually observe the employee inside the chamber.