

What is the Difference Between a Qualitative and a Quantitative Fit Test?

There is significant science behind evaluating the fit of respiratory protection. Have you ever heard of qualitative fit testing and quantitative fit testing? No? Let's learn more.

Most provincial and federal Canadian occupation health and safety regulations specify to follow the CSAZ94.4 standard, selection, use and care of respirators. It is this standard that specifies the approved procedures for both qualitative fit testing (QLFT) and quantitative fit testing (QNFT). There are several methods of QNFT – some involve measuring the concentration of an aerosol challenge agent both inside and outside the facepiece; others involve measuring the seal of the respirator by creating a vacuum inside the facepiece. Approved QNFT methods yield a numerical value called a Fit Factor, which is meant to represent the ratio of the concentration outside the facepiece to the concentration inside the facepiece – i.e., the reduction in the airborne concentration of the relevant contaminant. QLFT, on the other hand, yields either a pass or fail result, depending on whether the subject reports detecting the challenge agent during the fit test.

Regulatorily, either QNFT or QLFT can be used for most classes of respiratory protection including filtering facepiece respirators (FFRs), also known as disposable respirators (DRs). However, quantitative fit testing is required for full facepieces used in negative-pressure configurations if the assigned protection factor (APF) of 50 is required (i.e., if airborne concentrations of contaminants exceed 50 times the occupational exposure limit).


Table 1 summarizes some of the differences between [QLFT](#) and [QNFT](#).

	Qualitative Fit Testing (QLFT)	Quantitative Fit Testing (QNFT)
Test Exercises	One minute each: normal breathing, deep breathing, turning head side to side, moving head up and down, talking, bending over (or jogging) and breathing.	Same as QLFT. An alternate shortened exercise regimen "Redon" is allowed for Controlled Negative Pressures (CNP).
Subject Participation	Tester must verify that subject can detect challenge agent (sensitivity test). Subject must indicate if he/she detects challenge during the fit test.	Machine calculates result. CNP: subject or administrator pushes button for 8 seconds while measurement taken.
Pass/Fail Criteria	Pass if subject does not detect challenge agent.	Minimum fit factor of 100 for half facepieces and 500 for full facepieces.
Acceptable Challenges	Aerosol: Denatonium benzoate (bitter), sodium saccharin (sweet), stannic chloride (irritant smoke); OR Vapour: isoamyl acetate (banana oil)	Aerosol: Sodium chloride, corn oil, etc. OR CNP (air)
Number of Simultaneous Tests	Potential to fit test up to 5 individuals at once	Must fit test one person at a time per machine
Type of Respirator or Filter Required	Particulate respirator or filters are required for methods using aerosol challenges; organic vapour respirators or cartridges are required for the isoamyl acetate method. 100 efficiency filter required for irritant smoke.	Particulate respirator or filters are required for aerosol challenges; adapters (no filters) are required for CNP.
Probed Facepiece or Adapter Required	No	Yes

When is qualitative fit testing an acceptable fit test method? When is quantitative fit testing required?

According to CSA Z94.4, qualitative fit testing is an acceptable method for tight-fitting facepieces used in negative-pressure and positive-pressure configurations, with a few exceptions:

- The assigned protection factor of 50 is needed while using a full facepiece in negative-pressure air-purifying mode
- A supplied-air respirator (SAR) or self-contained breathing apparatus (SCBA) is used in demand mode (currently very uncommon and distinct from pressure-demand mode)
- Facepieces used in SCBAs for structural firefighting must be quantitatively fit tested, per the National Fire Protection Association



Achieving a proper fit and seal is a crucial part of getting the most protection out of your respirator. For more information about fit testing, [please review this technical bulletin](#), and do not hesitate to contact our respiratory protection specialists for assistance.