

# Introduction to FIT TESTING



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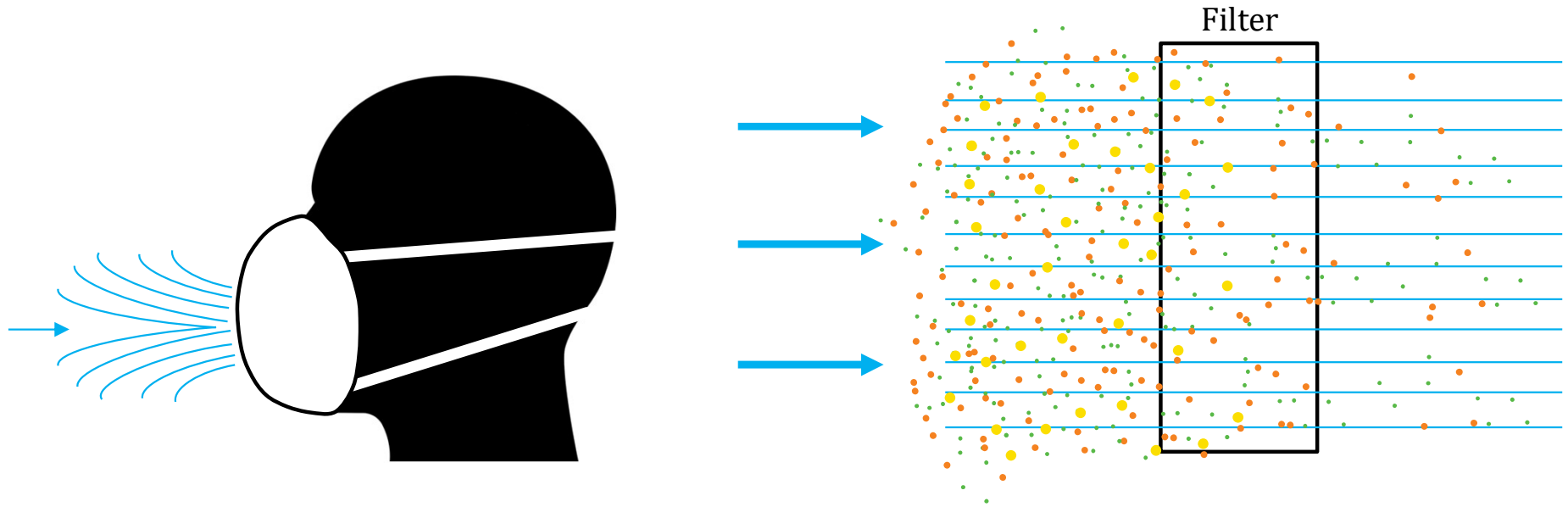
# WHAT is Respirator Fit Testing?

+ Practice of determining if a specific mask (respirator) fits to a persons face



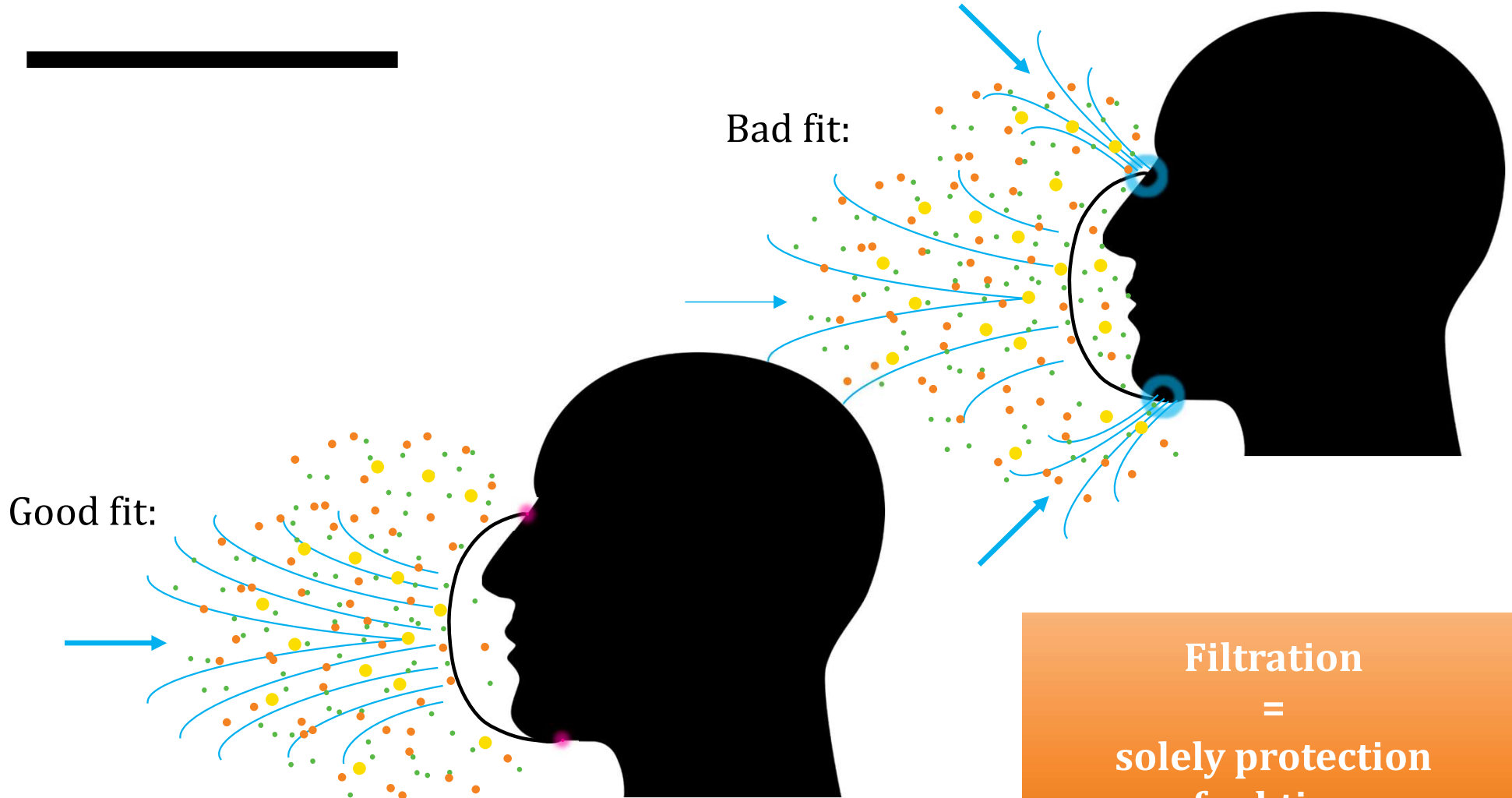
# WHAT is Respirator Fit Testing?

## How Respirators Work – Tight Fitting Respirators



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## How Respirators Work – Tight Fitting Respirators



Filtration  
=  
solely protection  
funktion  
→  
Mask fit + Filterquality

# WHAT is Respirator Fit Testing?

## Why you need to **fit test** respirators?

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- + **All** respirators leak
  - Even the very best respirators leak
- + Total inward leakage consists of three components:
  - Facial leakage
  - Valve slippage
  - Filter flow

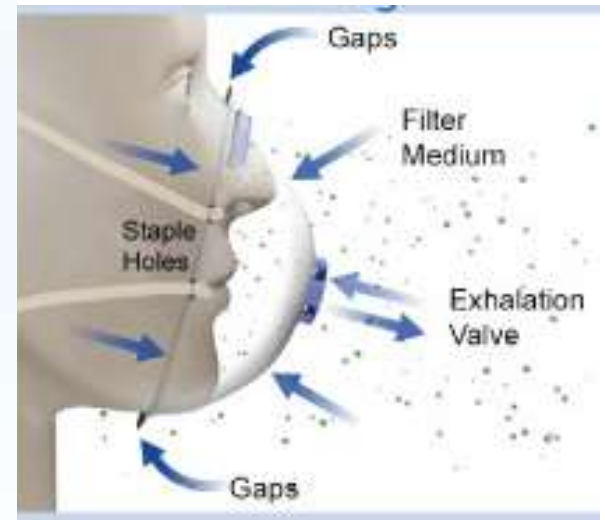
*Total threshold according to standards (e.g. EN 149 for FFP masks)*
- + If the respirator is undamaged:

**Leakage mainly through the face seal**



# WHAT is Respirator Fit Testing?

Good fit to the face is essential - and required



Small



Medium



Large



Long/Narrow



Short/Wide



# WHICH Respirators need Fit Testing?

All **tight-fitting** respirators

- Industrial full and half masks
- Breathing Apparatus (SCBA)
- Disposable masks



Loose  
Fitting  
Hoods



ACADEMY



# WHY should we fit test?

## Safety

- Confirm a satisfactory seal or barrier between wearer and environment

## Comfort

- Verify comfort, and that wearer can perform their work duties

## Training

- Ensure wearer knows how to properly **don/doff** and use the respirator

## Sensitizing

- Create sensibility of wearer why and how wearing a mask properly protects his health





# WHY should we fit test?

The challenge for fit testers...

	Donned Correctly	Donned Incorrectly
Good Fit	<b>Fits</b>	Does Not Fit
Bad Fit	Does Not Fit	Does Not Fit

**Fit Test = FINAL EXAM!**



# WHO needs to be Fit Tested?

“...before an employee may be required to use any respirator with a... tight-fitting facepiece, the employee must be fit tested with the **same make, model, style, and size** of respirator that will be used.”

\*OSHA 29CFR1910.134 (f), refer to CSA Z94.4-11 sections 9.1.2 & 9.1.3 for comparative statements



# WHEN do we fit test?

\*OSHA 29CFR1910.134 (f)(2 & 3), refer to CSA Z94.4-11 sections 9.1.6 for comparative statement

Prior to initial use of the respirator, and annually (biennially for CSA)

If a different respirator is used

- Size, style, model or make

If there are changes in the employee's physical condition that could effect respirator fit

- Facial scarring
- Dental changes
- Cosmetic Surgery
- Obvious change in weight, etc.



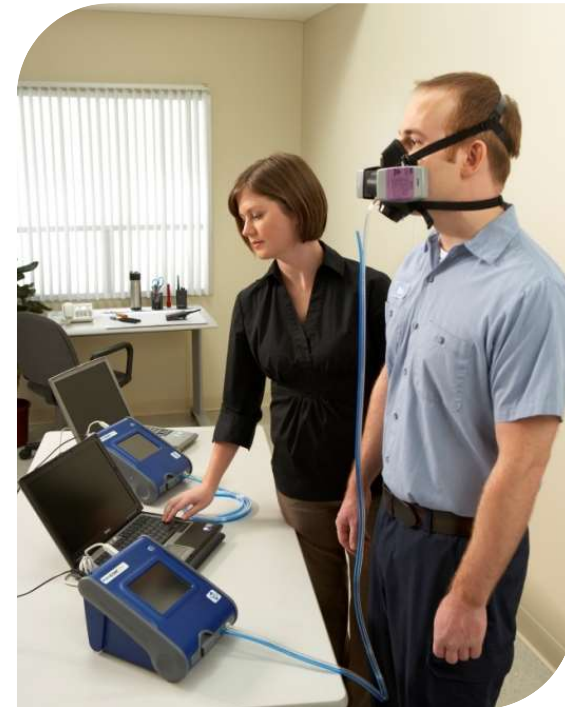
# HOW do we fit test?

## Qualitative QLFT



Subjective

## Quantitative QNFT



Objective



# Quantitative Fit Testing (QNFT)

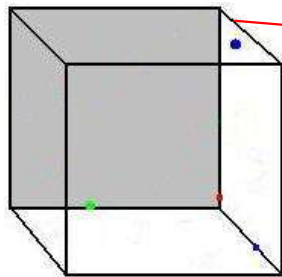
“...an assessment of the adequacy of respirator fit by **numerically measuring** the amount of leakage into the respirator.”

OSHA 29CFR1910.134 (b), refer to CSA Z94.4-11 Annex C section C.4.1 for comparative statement



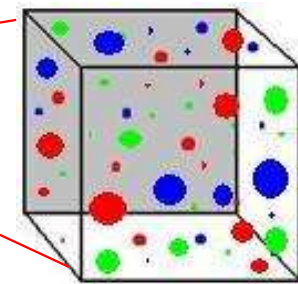
# What is a Fit Factor?

$$\text{Fit Factor} = \frac{C_{out}}{C_{in}}$$



Mask Particle Concentration

$C_{in}$



Ambient Particle Concentration

$C_{out}$



# Minimum Fit Factors



## Approved Minimum Fit Factors OSHA (HSE, ISO)

Full Face Respirators	500 (2000)
Half Face Respirators	100 (100)
Filtering Facepieces - N95, N99, P100, etc. - P1, P2, P3, etc.	100 (100)



**Your Minimum Fit Factors may be different...**

**refer to your governing protocol for more information**



# Fit Factor vs.

# Assigned Protection Factor (APF)

Two separate functions of the same respirator...



**Fit Factor:** Measured value achieved by the wearer during the Fit Test



**Assigned Protection Factor:** The realistic level of respiratory protection that can be achieved by 95% of properly trained workers (at national level, can vary greatly amongst countries)





# Standards/Guidelines for Fit Testing

EUROPEAN STANDARD	<b>EN 529</b>
NORME EUROPÉENNE	
EUROPÄISCHE NORM	October 2005
ICS 13.340.30	Supersedes CR 529:1
English Version	
Respiratory protective devices - Recommendations for selection, use, care and maintenance - Guidance document	
Appareils de protection respiratoire - Recommandations pour le choix, l'utilisation, l'entretien et la maintenance - Guide	

INTERNATIONAL STANDARD **ISO 16975-3**

First edition 2017-09

**Respiratory protective devices — Selection, use and maintenance — Part 3: Fit-testing procedures**

**112-190**

**DGUV Regel 112-190**

**Benutzung von Atemschutzgeräten**

DGUV  
Deutsche Gesetzliche Unfallversicherung  
Spitzenverband



# OSHA

## Fit Testing Procedure



Same logic as other protocols...

# OSHA

Occupational Safety and Health Administration

# ISO

International Standard

# ANSI

American National Standards Institute

# HSE

Health & Safety Executive

# CSA

CANADIAN STANDARDS ASSOCIATION



\* Logos from OSHA, ANSI, HSE, and CSA websites

# CSA, HSE (UK), & ANSI QNFT Protocols

7 exercises...

*to simulate common workplace motions*

1. Normal breathing
2. Deep breathing
3. Turning head side to side
4. Moving head up and down
5. Talking
6. Bending over
7. Normal breathing

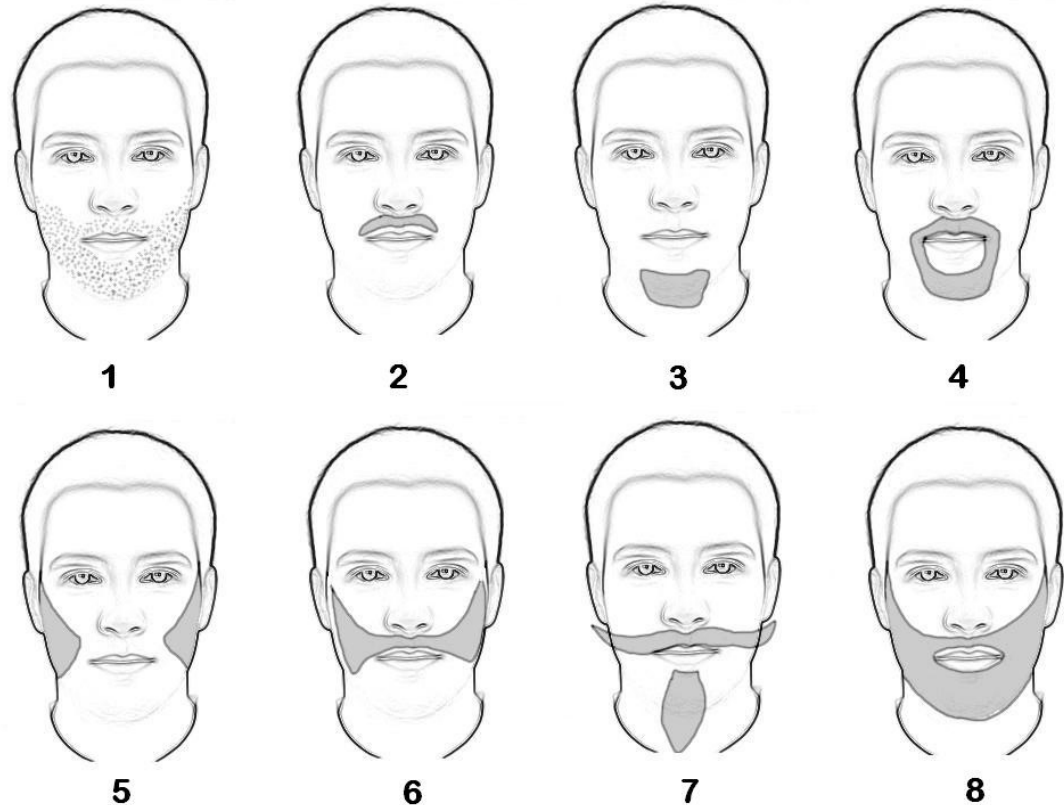
CSA & ANSI are only concerned with the Overall Fit Factor  
(weighted average of each exercise)

**\*HSE requires a passing fit factor for each exercise**



# Fit Testing Procedures

## Facial Hair – what's still ok ?



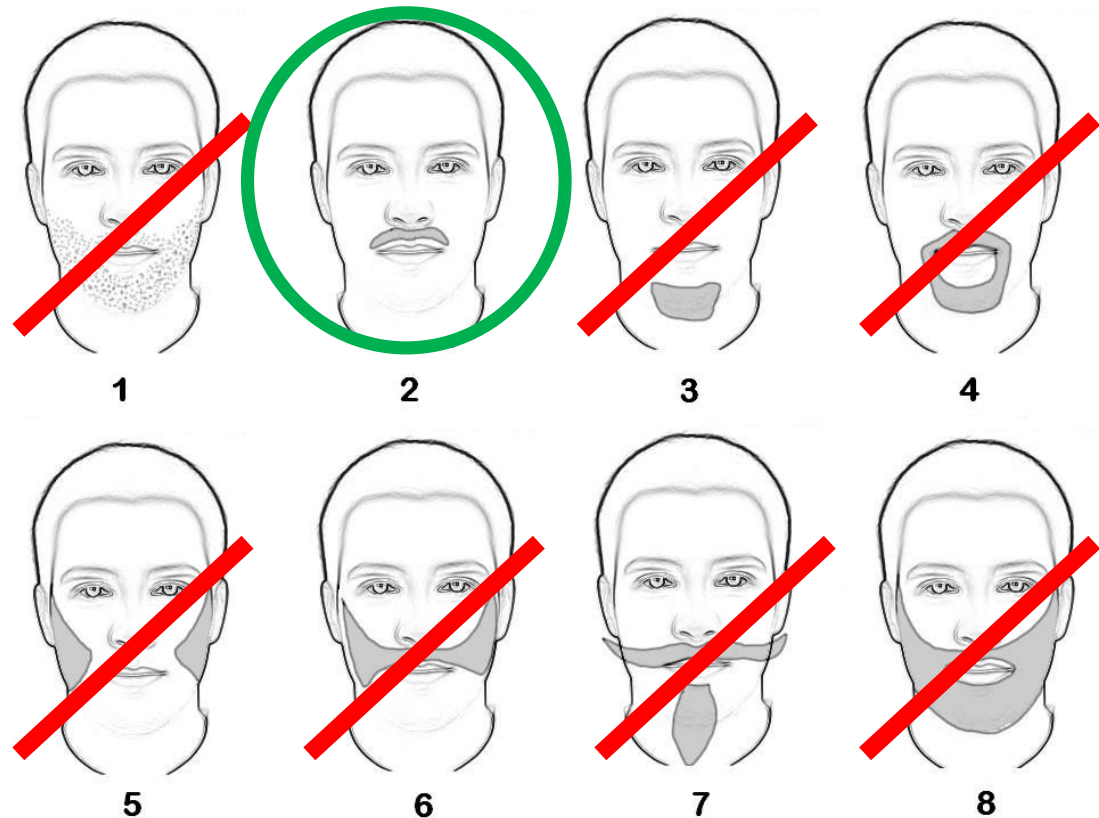
# Fit Testing Procedures

## Facial Hair – what's still ok ?

OSHA 1910.134 (g)

The employer shall not permit respirators with tight-fitting facepieces to be worn by employees who have:

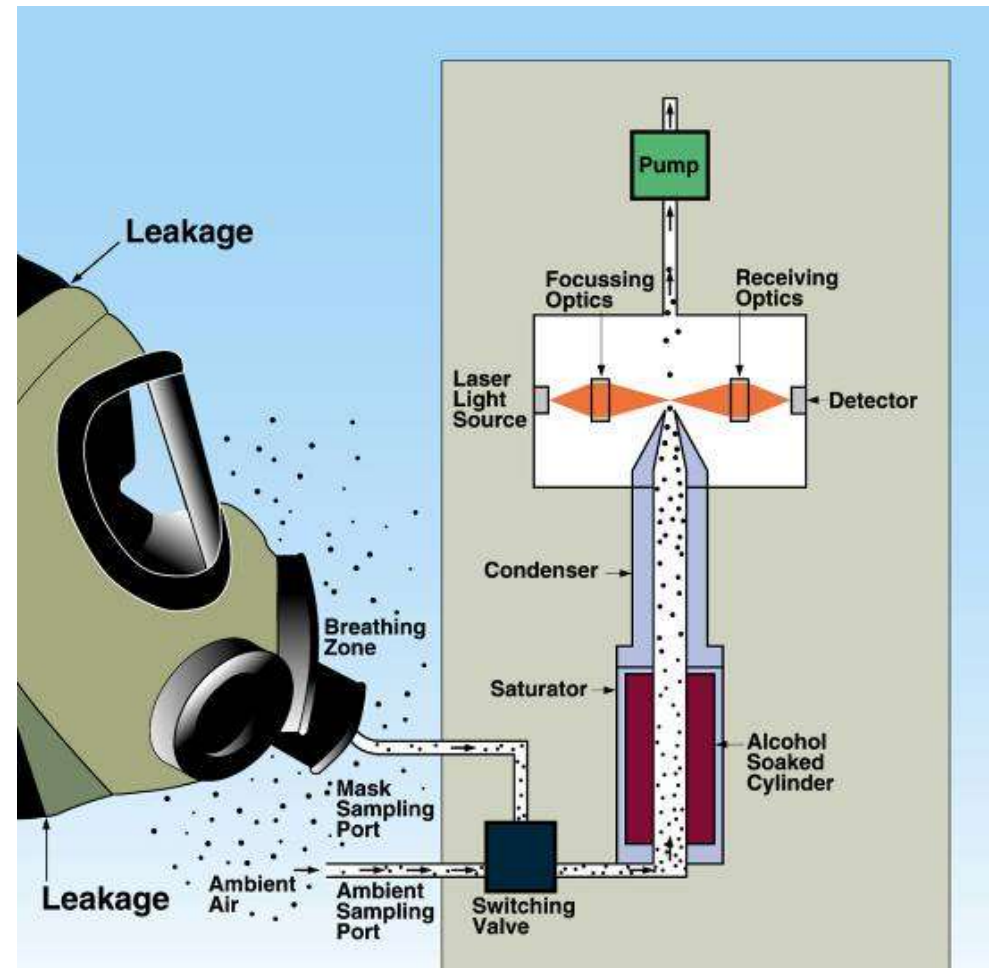
Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function



# Quantitative Fit Testing with the PortaCount

PortaCount Pro/Pro+  
Technology

N95 Companion (8038)  
Technology

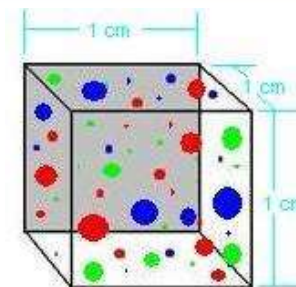




# PortaCount Challenge Agent

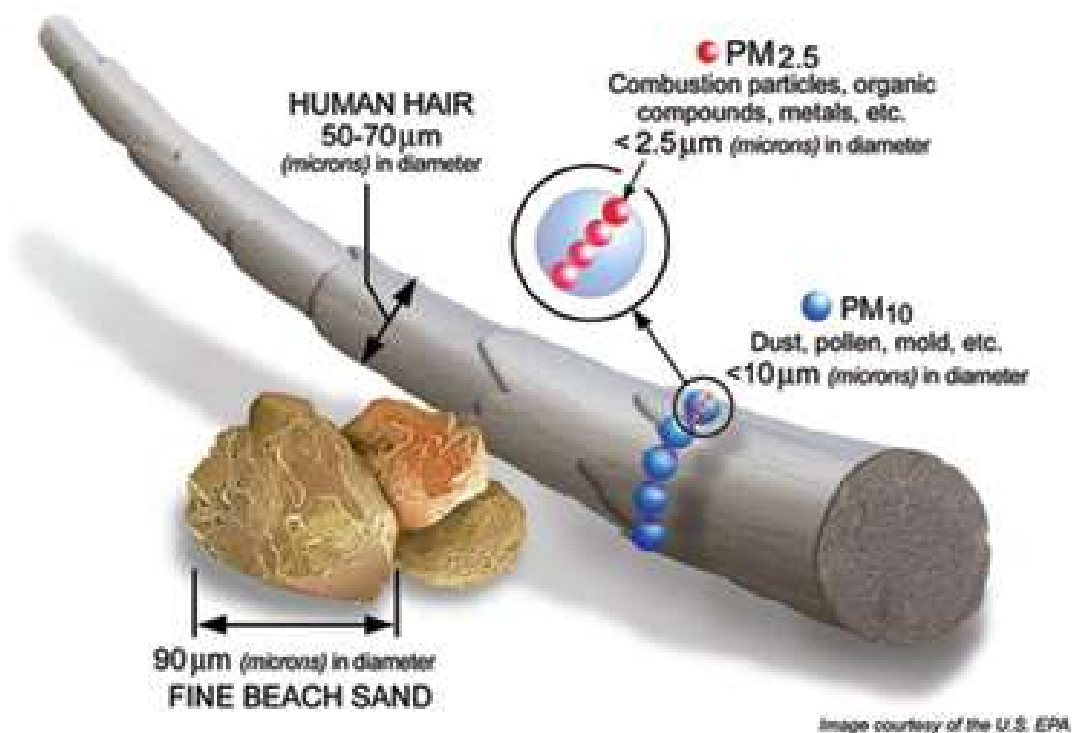
## Particle Concentration

- Also called: *ambient aerosol* or *particle count*
- # of particles per cubic centimeter (pt/cc)





# PortaCount Challenge Agent



**PortaCount**  
**Particle Size Range**  
**~0.02  $\mu\text{m}$  to 1.0  $\mu\text{m}$**

© EPA, Office of Research and Development  
(<http://www.epa.gov/pm/basic.html>)

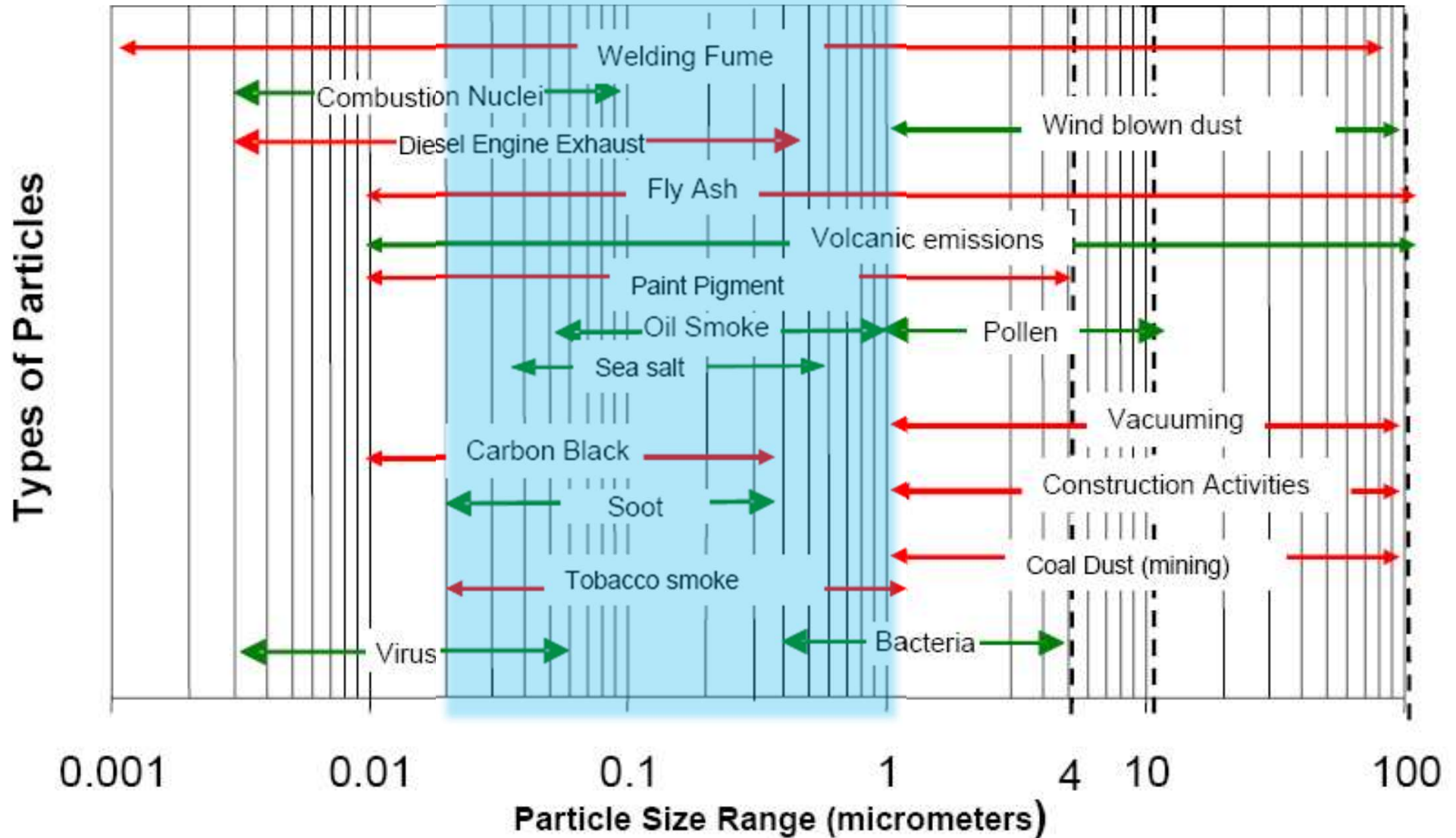




# Particles in the Real World



PortaCount Particle Size Range



# PortaCount Basics

## Condensation Particle Counter (CPC)



- Scientific term describing WHAT the PortaCount does and HOW
  - Counts particles
  - Via the method of condensation, enlarging the particles



= CPC

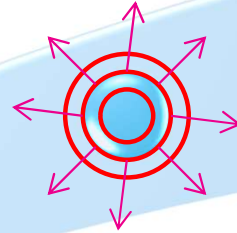


# CPC Basics

Alcohol vapors  
*condense* on the  
particles



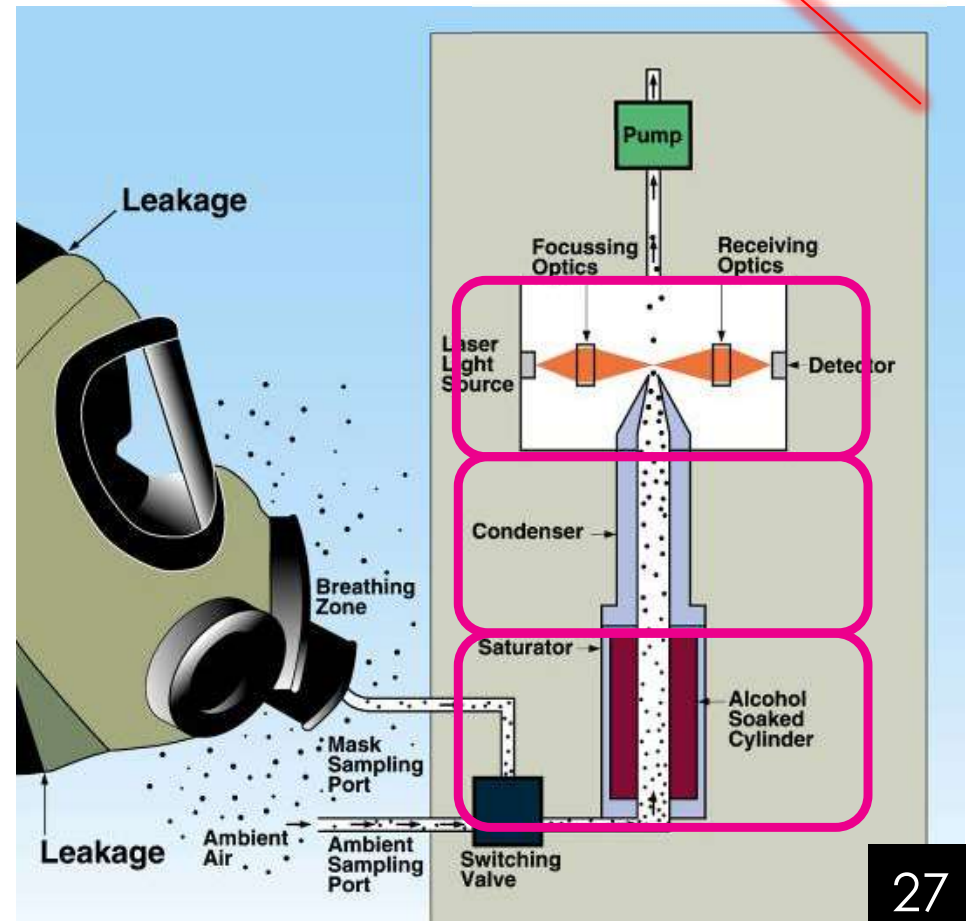
Particles grow in size



Particles are  
counted



Particles mixed with  
alcohol vapors



# Questions ?

