

# Objectives of the training

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History of Respiratory Protection

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Types of Respirators

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N95, KN95 and KF94

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Pathogens Requiring Respiratory Protection

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Hierarchy of Controls

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How to Know a Respirator is Legitimate

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Respiratory Medical Clearance

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Donning and Doffing a Respirator

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Risk Communication

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Fit testing

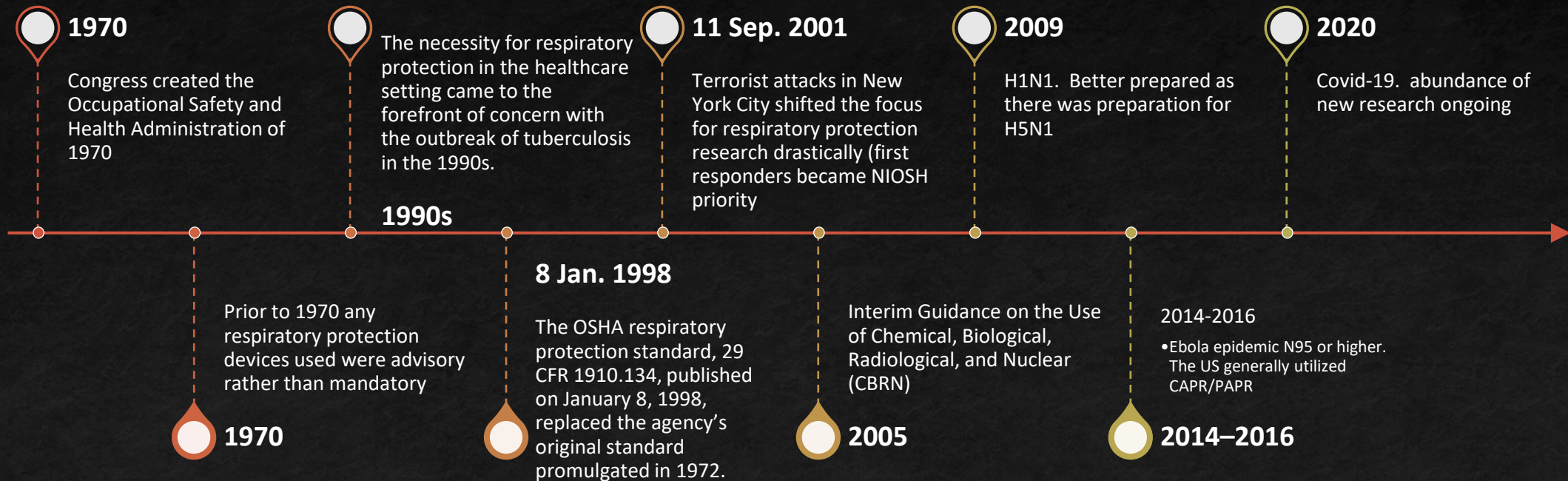
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# History of Respiratory Protection



# History of Respiratory Protection





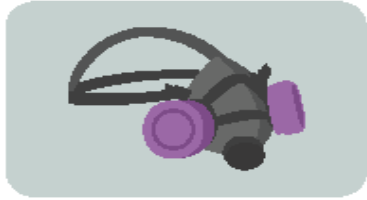




# Types of Respirators



# TYPES OF RESPIRATORY PROTECTION



**Elastomeric Half Facepiece Respirators** are reusable and have replaceable cartridges or filters. They cover the nose and mouth and provide protection against gases, vapors, or particles when equipped with the appropriate cartridge or filter.



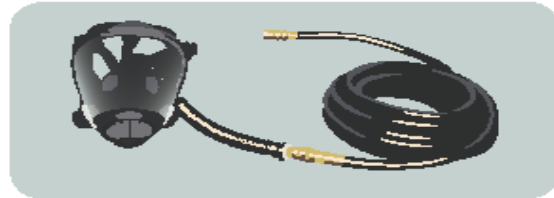
**Elastomeric Full Facepiece Respirators** are reusable and have replaceable canisters, cartridges, or filters. The facepiece covers the face and eyes, which offers eye protection.



**Filtering Facepiece Respirators** are disposable half facepiece respirators that filter out particles such as dusts, mists, and fumes. They do NOT provide protection against gases and vapors.



**Powered Air-Purifying Respirators (PAPRs)** have a battery-powered blower that pulls air through attached filters, canisters, or cartridges. They provide protection against gases, vapors, or particles, when equipped with the appropriate cartridge, canister, or filter. Loose-fitting PAPRs do not require fit testing and can be used with facial hair.



**Supplied-Air Respirators** are connected to a separate source that supplies clean compressed air through a hose. They can be lightweight and used while working for long hours in environments not immediately dangerous to life and health (IDLH).



**Self-Contained Breathing Apparatus (SCBAs)** are used for entry into or escape from environments considered to be IDLH. They contain their own breathing air supply and can be either open circuit or closed circuit.



**Combination Respirators** can be either a supplied-air/SCBA respirator or supplied-air/air-purifying respirator. The SCBA type has a self-contained air supply if primary airline fails and can be used in IDLH environments. The air-purifying type offers protection using both a supplied-air hose & an air-purifying component and cannot be used for entry into IDLH environments.



Centers for Disease Control  
and Prevention  
National Institute for Occupational  
Safety and Health

September 2019

[https://www.cdc.gov/niosh/nppt/topics/respirators/disp\\_part/respsource.html](https://www.cdc.gov/niosh/nppt/topics/respirators/disp_part/respsource.html)

# Time to Upgrade Your Mask?



**GOOD**



**SURGICAL MASK**

**BETTER**



**KN95/KF94**  
Surgical Mask  
+ Cloth

**BEST**



**N95**

**FAIR**



**CLOTH MASK**

One that fits well and has at least 3 layers.  
**A cloth mask is better than no mask.**

## Appropriate Levels of Respiratory Protection





# N95

United States  
(NIOSH  
approved)



# KN95

China (not  
NIOSH  
approved)



# KF94

Korea (not  
NIOSH  
approved)

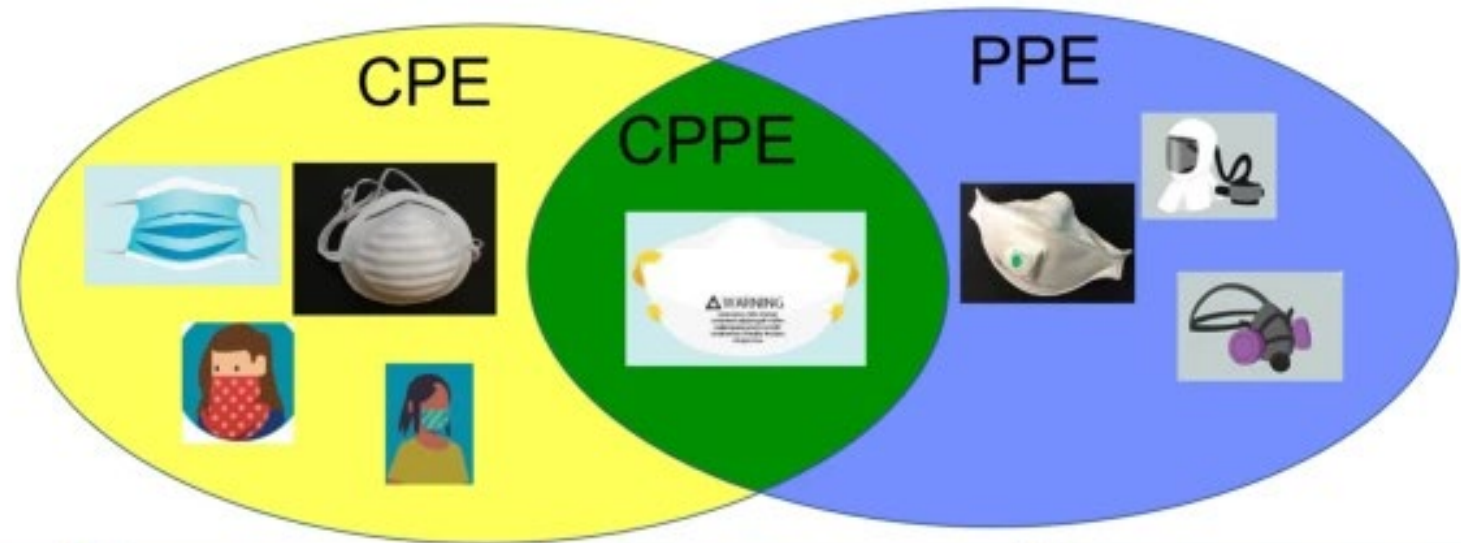
N

## Filtering Face Piece Respirators



# Masks Vs Respirator Protection

Journal of Exposure Science & Environmental Epidemiology (*J Expo Sci Environ Epidemiol*) ISSN 1559-064X (online) ISSN 1559-0631 (print)



	CPE	CPPE	PPE
<b>Examples</b>	Surgical, cloth, and dust masks	Unvented FFR (N95 or better)	Vented FFR, PAPR, elastomeric respirators
<b>Protection for Wearer</b>			
Droplets	Provides some protection	At least 95% removal*	At least 95% removal
Aerosols	Provides very limited protection	At least 95% removal*	At least 95% removal
<b>Protection for Community</b>			
Droplets	Provides some protection	At least 95% removal*	Use with caution because of unfiltered exhaled breath
Aerosols	Provides very limited protection	At least 95% removal*	Use with caution because of unfiltered exhaled breath
<b>Appropriate Use</b>	For community use while CPPE not available	Prioritized for medical personnel during shortages; ultimately for everyone	Prioritized for medical personnel during shortages; use with caution because of unfiltered exhaled breath
<b>Additional Protections</b>	Maintain social distancing	Training for proper fit*	Training required; fit testing may be required; maintain social distancing

\*Proposed requirements for CPPE

## Results of Study re: KF94

**Results:** All fit factors (FFs) measured by the QNFT were significantly higher for tight-fitting method with the clip in all KF94 masks ( $P < 0.001$ ). However, the total FFs were very low, with a median (interquartile range) of 6 (3-23) and 29 (9-116) for general-fitting and tight-fitting, respectively. When wearing tightly, the horizontal 3-fold type mask with adjustable ear-loop length had the highest FF, with a median of 125, and the QNFT pass rate (FF  $\geq 100$ ) increased significantly from 4 (13%) to 18 (60%).



**Conclusion:** Even with sufficient filter efficiency, ear-loop-type-KF94 masks do not provide adequate protection. However, in relatively low-risk environments, wearing a face-seal adjustable KF94 mask and tight wearing with a clip can improve respiratory protection for healthcare workers.



# Particle Size

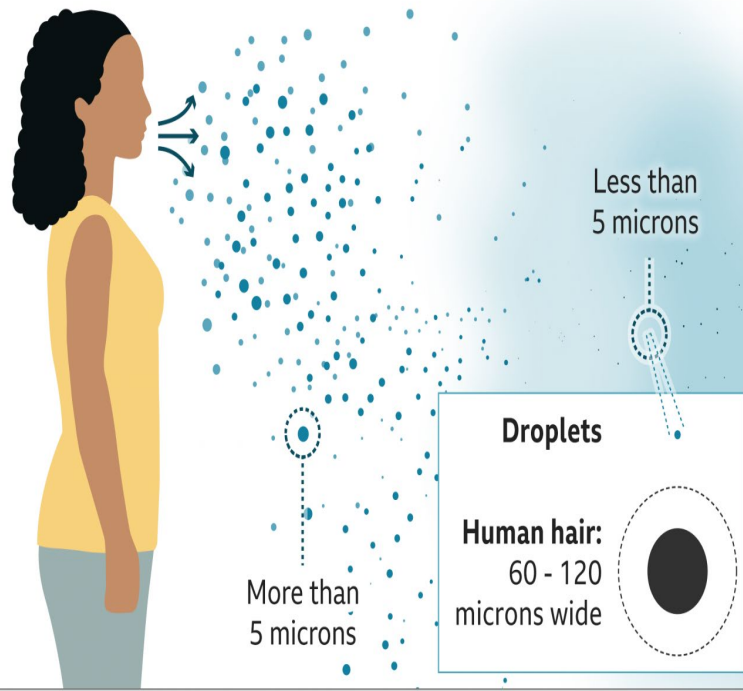
## The difference between droplet and airborne transmission

### Droplet transmission

Coughs and sneezes can spread droplets of saliva and mucus

### Airborne transmission

Tiny particles, possibly produced by talking, are suspended in the air for longer and travel further



Source: WHO

BBC

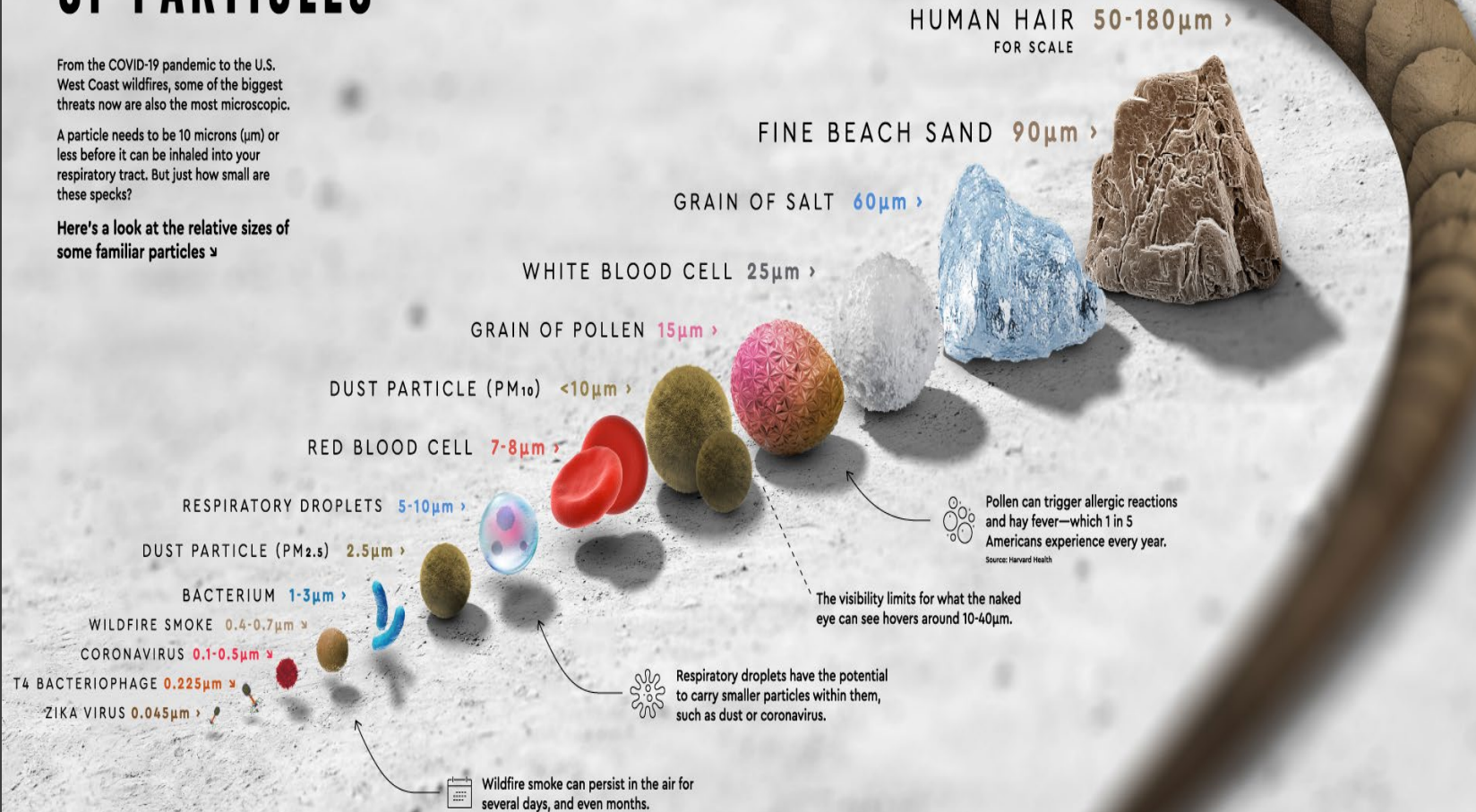
<https://covid.ri.gov/covid-19-prevention/indoor-air-circulation>

## THE RELATIVE SIZE OF PARTICLES

From the COVID-19 pandemic to the U.S. West Coast wildfires, some of the biggest threats now are also the most microscopic.

A particle needs to be 10 microns ( $\mu\text{m}$ ) or less before it can be inhaled into your respiratory tract. But just how small are these specks?

Here's a look at the relative sizes of some familiar particles >



SOURCES: Clearstream, Daniel Loverbey, EPA, Finance Times, News Medical, Science Direct, SCMP, Susan Sokolowski, Petrockler, U.S. Dept. of Energy  
COLLABORATORS: RESEARCH • WRITING: Carmen Ang, Imran Ghosh | DESIGN • ART DIRECTION: Harrison Schell

VISUAL  
CAPITALIST

f /visualcapitalist @visualcap visualcapitalist.com

[HTTPS://WWW.VISUALCAPITALIST.COM/VISUALIZING-RELATIVE-SIZE-OF-PARTICLES/](https://www.visualcapitalist.com/visualizing-relative-size-of-particles/)

PAGE 11

Anthrax	Aspergillosis	Blastomycosis	Chickenpox	Adenovirus	Rotavirus
Influenza	Rhinovirus	Neisseria meningitidis	Streptococcus pneumonia	Legionellosis	Measles
Mumps	Smallpox	Cryptococcosis	Tuberculosis	Bordetella pertussis	SARS
		MERS	SARS Cov-2		

# Pathogens Spread via Airborne Transmission



Common  
Pathogens  
Requiring  
Respirators

TB

Covid-19

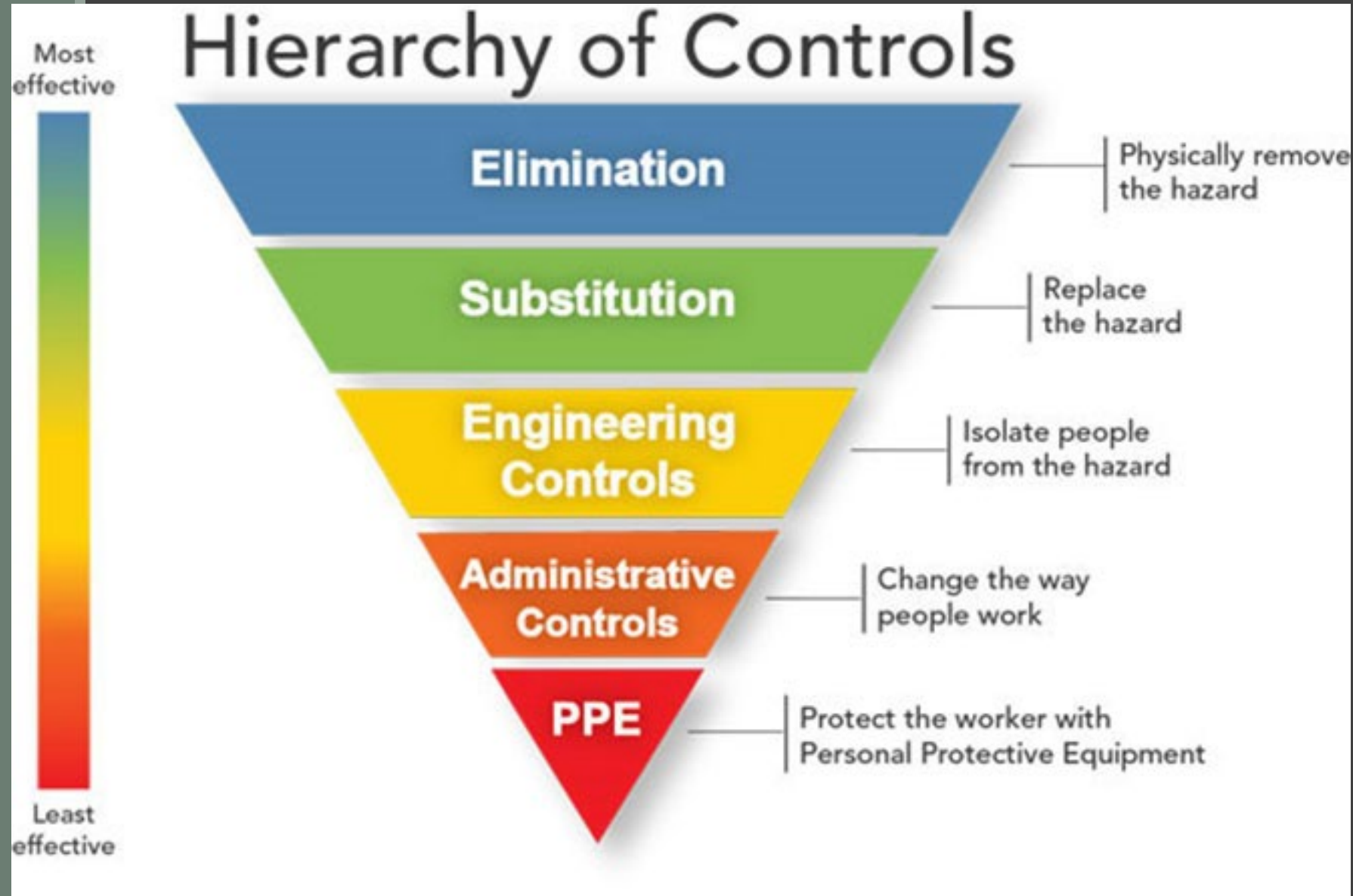
Chickenpox (Varicella)

Measles

# Hierarchy of Controls

Workplaces must always look at the hierarchy of controls

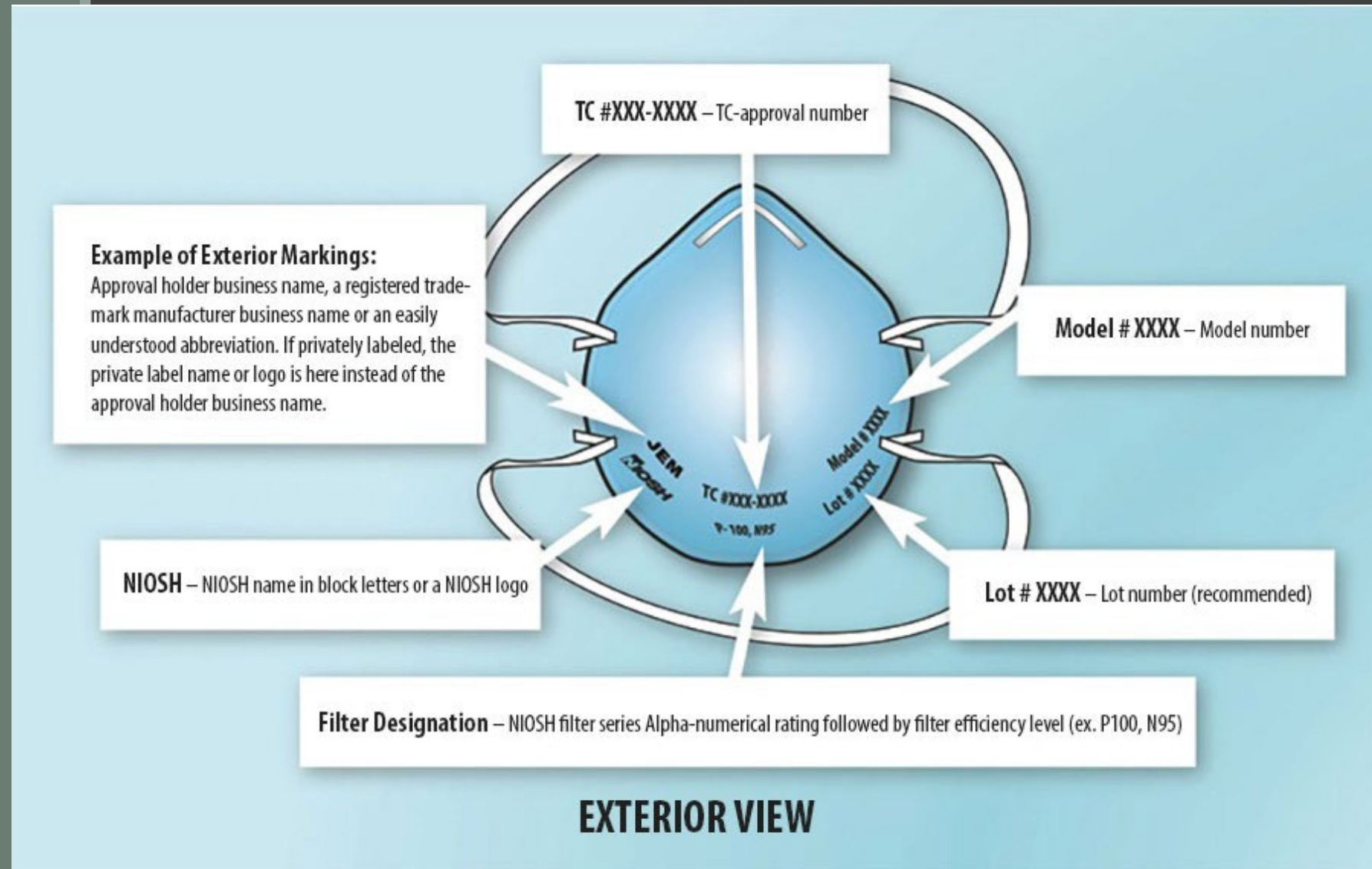
Eliminating the risk is always priority and utilizing personal protective equipment (PPE) should be the last





# How to Know if a N95 is Legitimate

Great website is  
located [here](https://www.cdc.gov/niosh/docs/2021-124/pdfs/2021-124.pdf)



<https://www.cdc.gov/niosh/docs/2021-124/pdfs/2021-124.pdf>

# Extended Use/Reuse of N95

- **Extended use or reuse of N95s:**

In the event extended use or reuse of N95 FFRs becomes necessary, the same worker is permitted to extend use of or reuse the respirator, as long as the respirator maintains its structural and functional integrity and the filter material is not physically damaged, soiled, or contaminated (e.g., with blood, oil, paint).[7] Employers must address in their written RPPs the circumstances under which a disposable respirator will be considered contaminated and not available for extended use or reuse. Extended use is preferred over reuse due to contact transmission risk associated with donning/doffing during reuse. When respirators are being re-used, employers should pay particular attention to workers' proper storage of the FFRs in between periods of reuse.

- Users should perform a user seal check each time they don a respirator and should not use a respirator on which they cannot perform a successful user seal check. See 29 CFR § 1910.134, Appendix B-1, User Seal Check Procedures. [8]
- Employers should train workers to understand that if the structural and functional integrity of any part of the respirator is compromised, it should be discarded, and that if a successful user seal check cannot be performed, another respirator should be tried to achieve a successful user seal check.
- If reuse of respirators is necessary, an appropriate sequence for donning/doffing procedures should be used to prevent contamination, and training needs to address appropriate donning/doffing procedures. See [www.cdc.gov/niosh/npptl/pdfs/PPE-Sequence-508.pdf](https://www.cdc.gov/niosh/npptl/pdfs/PPE-Sequence-508.pdf).



# Use of Expired N95s

## *Use of expired N95s:*

In the event that N95s are not available, and the employer has shown a good faith effort to acquire the respirators or to use alternative options, as outlined below, CSHOs should exercise enforcement discretion for the use of N95 FFRs beyond the manufacturer's recommended shelf life, including surgical N95s.<sup>[9]</sup>

- Employers may use only previously NIOSH-certified expired N95 FFRs found at [www.cdc.gov/coronavirus/2019-ncov/release-stockpiled-N95.html](https://www.cdc.gov/coronavirus/2019-ncov/release-stockpiled-N95.html). Workers should be notified that they are using expired N95s.
- Purchasers and users of personal protective equipment should not co-mingle products that are past their manufacturer's recommended shelf life (i.e., expired) with items that are within their shelf life.
- Employers should visually inspect, or ensure that workers visually inspect, the N95 FFRs to determine if the structural and functional integrity of the respirator has been compromised. Over time, components such as the straps, nose bridge, and nose foam material may degrade, which can affect the quality of the fit and seal.
- Where an employer has expired N95s available from their own stored cache (i.e., not from the U.S. Strategic National Stockpile), the employer should seek assistance from the respirator manufacturer or independent lab regarding testing of those stored respirators prior to use.

# Respirator Medical Clearance

Required by OSHA when employee is enrolled  
in the respiratory protection program (before  
the use of N95)



Not required to repeat the respiratory  
medical eval unless:

Change in status  
medical/physical  
hampering ability to  
use respirator

Provider or licensed  
HCW , supervisor,  
respiratory program  
administrator feels it  
is necessary

Information from  
respiratory program

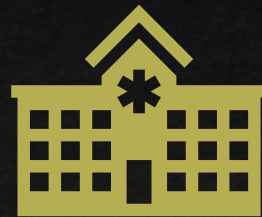
Change occurs in  
workplace conditions  
that increase burden



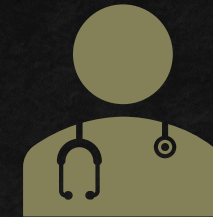
# Where Can Companies Secure a Respiratory Medical Clearance?



Online Respiratory Medical  
Clearance



Mankato Clinic Occupational  
Health 507-385-4075



Mayo Clinic 507-594-7370



# OSHA Respiratory Medical Clearance Video





# How to Don an N95 respirator

1



Cup the respirator in your hand with the nosepiece at fingertips, allowing the head straps to hang freely below hand.

2



Position the respirator under your chin with the nosepiece up.

3



While holding the respirator in place, pull the top strap over your head so it rests high on the back of your head.

4



While continuing to hold the respirator firmly in place, pull the bottom strap over your head and position it around your neck, below your ears. Untwist the straps. Position the respirator low on your nose.

5



Using both hands, mold the nosepiece to the shape of your nose by pushing inward while moving your fingertips down both sides of the nosepiece.

**Note: Always use two hands when molding nosepiece. Pinching with one hand may result in improper fit and less effective respirator performance.**

# Helping You Wear it Right

Wearing Your 3M™ Aura™ Health Care Particulate Respirator and Surgical Mask 1870+

## Application

1



Remove the respirator from its packaging and hold with straps facing upward. Place the bottom strap under the center flaps next to the "ATTENTION" statement.

2



Fully open the top and bottom panels, bending the nosepiece around your thumb at center of the foam. Straps should separate when panels are opened. Make certain the bottom panel is unfolded and completely opened.

3



Place the respirator on your face so that the foam rests on your nose and the bottom panel is securely under your chin.

4



Pull the top strap over your head and position it high on the back of the head. Then, pull the bottom strap over your head and position it around your neck and below your ears.

5



Adjust for a comfortable fit by pulling the top panel toward the bridge of your nose and the bottom panel under your chin. Make certain hair, facial hair, jewelry and clothing are not between your face and the respirator as they will interfere with fit.

6



Place your fingertips from both hands at the top of the metal nosepiece. Using two hands, mold the nose area to the shape of your nose by pushing inward while moving your fingertips down both sides of the nosepiece. **Note: Always use two hands when molding the nosepiece. Pinching the nosepiece with one hand may result in improper fit and less effective respirator performance.**

7



Place one or both hands completely over the middle panel. Inhale and exhale sharply. Be careful not to disturb the position of the respirator. If air leaks around respirator edges, adjust panels and position of straps and make certain respirator edges fit snugly against the face. If you cannot achieve a proper seal, do not enter the contaminated area. See your supervisor.

**Perform a User Seal Check**

**Check the seal of your respirator each time you use the respirator.**

## Removal

Can be performed using one or both hands

1



Without touching the respirator facepiece, slowly lift the bottom strap from around your neck up over your head.

2



Lift off the top strap. Do not touch the respirator.

3



Store or discard according to your facility's infection control policy.



### Respiratory Products

This respirator helps protect against certain particulate contaminants but does not eliminate exposure to or the risk of contracting any disease or infection. Misuse may result in sickness or death. For proper use, see supervisor, or User Instructions, or call 3M Health Care Helpline at 1-800-228-3957. In Canada, call 3M Helpline at 1-800-563-2921.

### WARNING

3M  
Infection Prevention Division  
3M Health Care  
2510 Conway Avenue  
St. Paul, MN 55144-1000  
U.S.A.  
1-800-228-3957  
3M.com/infectionprevention

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70-2010-9153-8



Donning and  
Doffing the  
1870+



# Donning and Doffing the 1870+

1



Remove the respirator from its packaging and hold with straps facing upward. Place the bottom strap under the center flaps next to the "ATTENTION" statement.

2



Fully open the top and bottom panels, bending the nosepiece around your thumb at center of the foam. Straps should separate when panels are opened. Make certain the bottom panel is unfolded and completely opened.

# Donning and Doffing the 1870+

## 3



Place the respirator on your face so that the foam rests on your nose and the bottom panel is securely under your chin.

## 4



Pull the top strap over your head and position it high on the back of the head. Then, pull the bottom strap over your head and position it around your neck and below your ears.

# Donning and Doffing the 1870+

5



Adjust for a comfortable fit by pulling the top panel toward the bridge of your nose and the bottom panel under your chin.

Make certain hair, facial hair, jewelry and clothing are not between your face and the respirator as they will interfere with fit.

6



Place your fingertips from both hands at the top of the metal nosepiece. Using two hands, mold the nose area to the shape of your nose by pushing inward while moving your fingertips down both sides of the nosepiece.

**Note:** Always use two hands when molding the nosepiece. Pinching the nosepiece with one hand may result in improper fit and less effective respirator performance.



# Donning and Doffing the 1870+

7

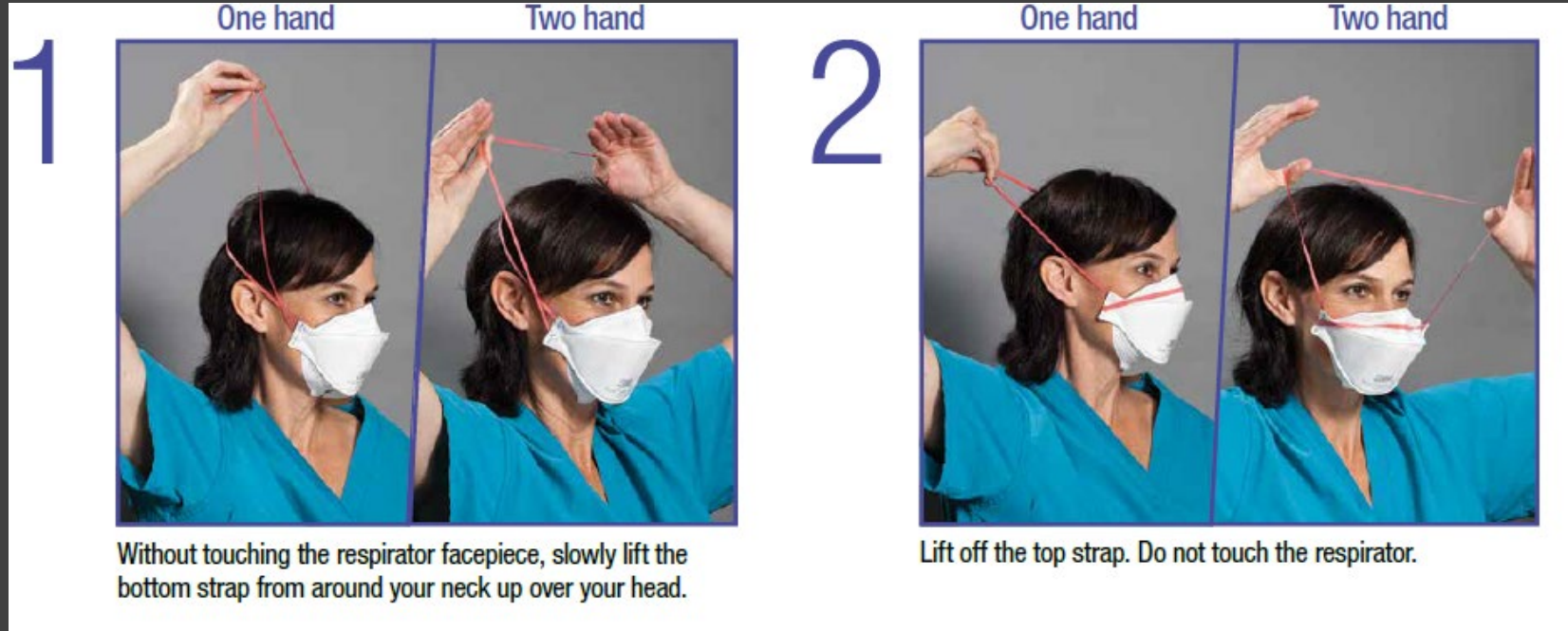


## Perform a User Seal Check

**Check the seal of your respirator each time you use the respirator.**

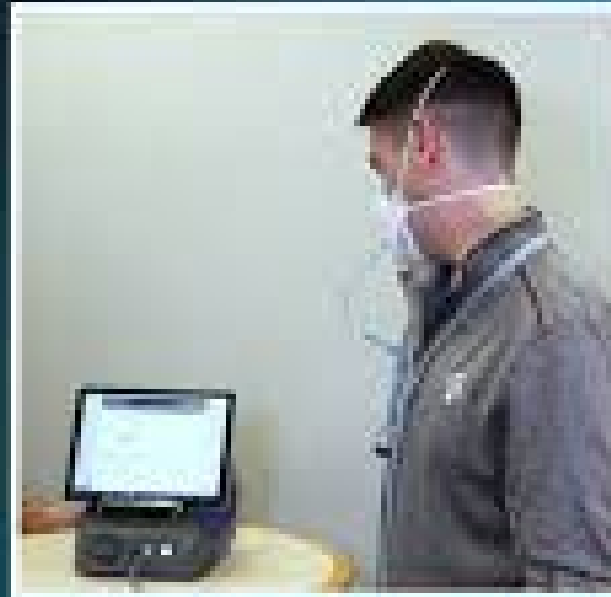
Place one or both hands completely over the middle panel. Inhale and exhale sharply. Be careful not to disturb the position of the respirator. If air leaks around your nose, re-adjust the nosepiece as described in Step 6. If air leaks around respirator edges, adjust panels and position of straps and make certain respirator edges fit snugly against the face. **If you cannot achieve a proper seal, do not enter the contaminated area. See your supervisor.**

# Donning and Doffing the 1870+



# Quantitative vs Qualitative Fit Testing

QUANTITATIVE



QUALITATIVE





## Fit Testing Kit (3M)

<https://www.industrialsafetyproducts.com/3m-ft-30-respiration-training-and-fit-testing-kit/>



# USER SEAL CHECK

## Place

Place both hands completely over the respirator, being careful not to disturb the position

## Exhale

Exhale sharply. If air leaks around your nose, adjust the nosepiece as described in step 5. If air leaks at respirator edges, adjust the straps back along the sides of your head

## Perform

Perform seal check again if an adjustment is made. If you cannot achieve a proper fit, see your supervisor.

## Check

Check the seal of your respirator each time you use the respirator.

# Forms For Fit Testing

[MDH Qualitative Fit Testing Form](#)

[OSHA Accepted Fit Testing Protocols](#)

[MDH Fit Testing Procedure Template](#)

[OSHA 1910.134](#)



## Communication Recommendations Relevant to COVID

- Don't over-reassure – error on the alarming side
- Acknowledge (even proclaim) uncertainty
- Share dilemmas
- Don't fake consensus -- respectfully acknowledge opinion diversity
- Be willing to speculate
- Validate people's fear, misery, and other emotions
- Establish your own humanity, including your fear and misery

Generic Crisis  
Communication  
Recommendations  
Relevant to COVID  
(p. 2)

- Tell people what to expect (anticipatory guidance)
- Offer people things to do – and choices of things to do
- Acknowledge and apologize (often!) for errors, deficiencies, and misbehaviors
- Be explicit about changes in official prediction, opinion, or policy
- Don't lie, and don't tell half-truths – aim for total candor

[HTTP://WWW.PSA  
NDMAN.COM/MED  
IA.HTM#AIHAVID](http://www.psa<br/>ndman.com/media.htm#aihavid)

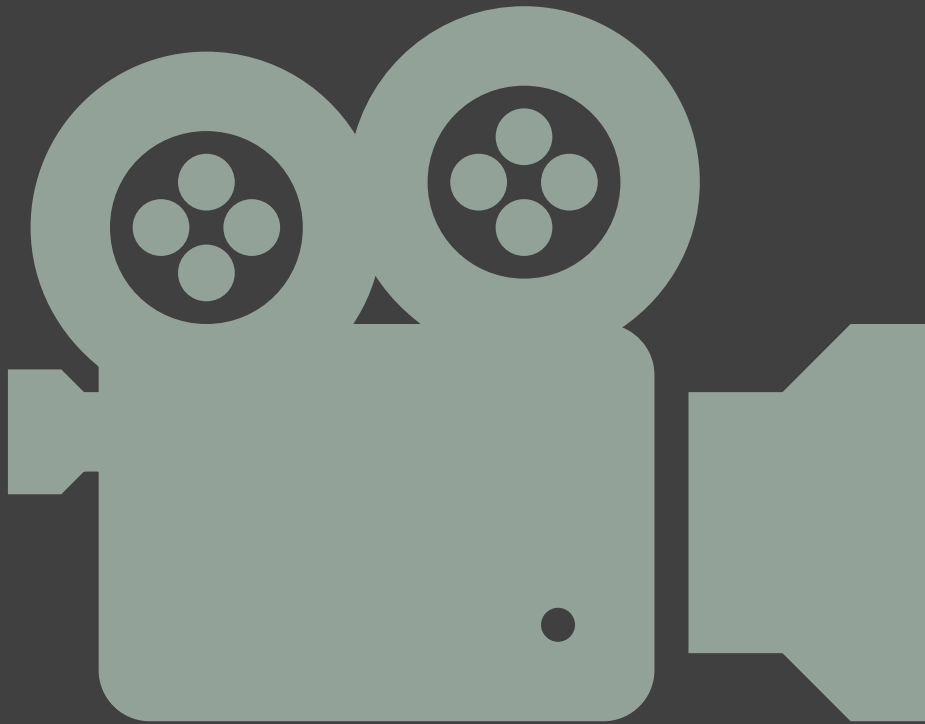
# Risk Communication Website



# 3M Fit Testing Instructional Video

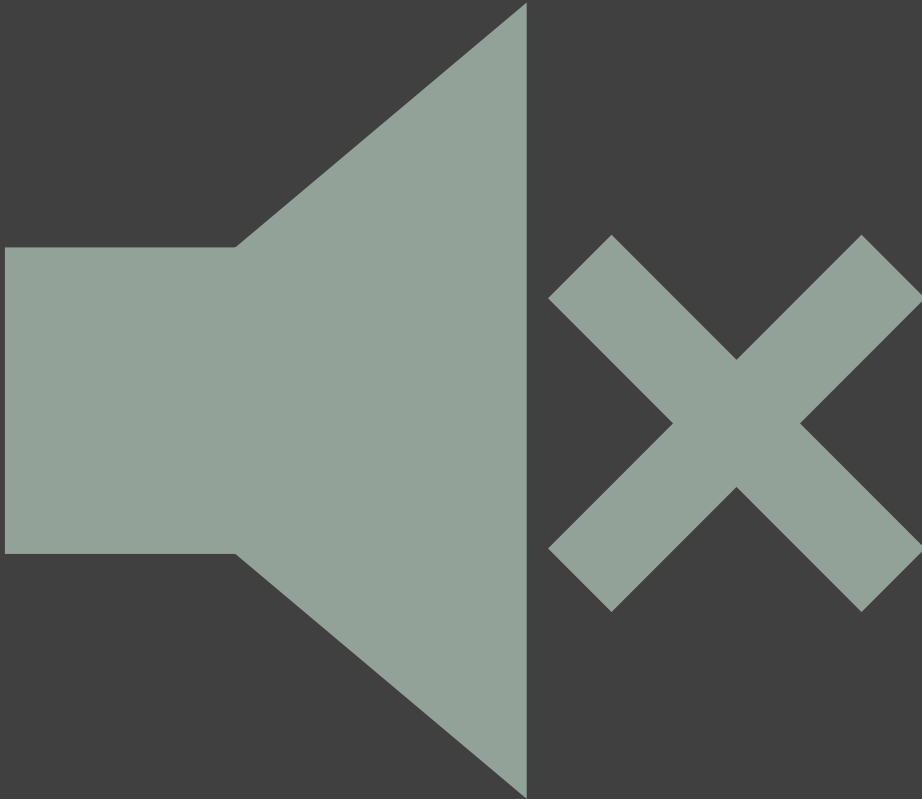
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[3M fit testing video](#)



# Rainbow Passage

## Why???



Short and phonetically balanced passage

Reflects the variety of sounds and mouth movements used in normal, unscripted English speech.

Ensures that they can carry out normal speech patterns while wearing the respirator.

# Guide to 3M qualitative fit testing.



Reusable half masks



Filtering facepiece respirators

3M™ FT-10 (sweet) and 3M™ FT-30 (bitter) fit test kits are suitable for filtering facepiece respirators and half-face masks fitted with particulate or combination filters.

## The taste test

### Part one: the sensitivity test

- 1 Add half a teaspoon of sensitivity solution (in red labelled bottle) into the sensitivity nebuliser (marked in red).
- 2 Put test hood on person.
- 3 Ask person to breathe through their mouth with their tongue at the front and ask them to indicate immediately when they taste solution.
- 4 Slowly squeeze solution into the hood and count the number of squeezes it takes for the solution to be tasted.
- 5 Ask the person to take a drink of water and wait until the taste has cleared, making sure that they wipe their lips to remove any traces of solution.



**Stop the test** if solution is not tasted after 30 squeezes.

**Try an alternative solution:**

**Sweet taste** 3M FT 11 (Sensitivity solution)  
3M FT12 (Fit test solution)

**Bitter taste** 3M FT 31 (Sensitivity solution)  
3M FT32 (Fit test solution)

**! Wearers must be clean shaven to get a good fit with a respirator for the fit test and every time the respirator is worn.**

**! Please note that in order to carry out a full fit test, all the steps detailed below must be followed (parts one and two).**

### Part two: the fit test

- 1 Add half a teaspoon of the fit test solution (in black labelled bottle) into the sensitivity nebuliser (marked in black).
- 2 Make sure respirator is fitted correctly. Refer to 3M fitting instructions or posters for correct procedure. Please ensure any other headworn PPE required by the wearer is worn during the fit test.
- 3 Put test hood on person.
- 4 Introduce solution in an 'initial dose' and start the exercises.

Number of squeezes needed in part one	Number of squeezes needed for initial dose	Number of squeezes for 'top-up' dose every 30 seconds
1-10	10	5
11-20	20	10
21-30	30	15

Add a 'top-up' dose after every 30 seconds as per below:

- 5 After the initial dose, ask the person to carry out the seven exercises shown in the images to the right for one minute and indicate immediately if solution is tasted. Remember to add 'top-up' dose every 30 seconds.
- 6 **Record results**  
If solution is not tasted after all seven exercises, they have passed the test with that respirator. If solution is tasted, **stop test**, clean mouth, face and hands, refit respirator and start part one of the test again.

If solution is still tasted on the second attempt, **stop test**, clean hands, mouth and face, and try another face fit test with an alternative 3M respirator.

**In the event of another failure, please call the 3M Health and Safety Helpline on 0870 60 800 60 (UK) or 1 800 320 500 (Ireland).**

### The seven exercises



1 Breathe normally.



2 Breathe deeply.



3 Head side-to-side.



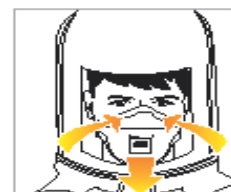
4 Head up-and-down.



5 Talking.



6 Bend over at waist.



7 Breathe normally.

For 3M fit testing support tools visit  
[3M.co.uk/fittestrespirator](https://3M.co.uk/fittestrespirator)  
[@3M\\_UK\\_Safety](https://twitter.com/3M_UK_Safety)

For further information or advice on correct selection and use of 3M PPE, call 3M Personal Safety Division on 0870 60 800 60 (UK) and 1 800 320 500 (Ireland) or visit [3M.co.uk/safety](https://3M.co.uk/safety)

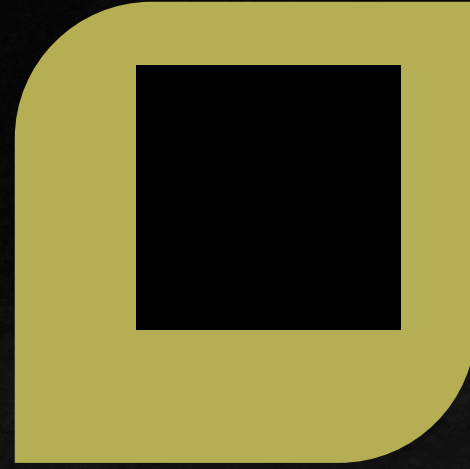
3M Personal Safety Division  
3M Centre, Cain Road, Bracknell, Berkshire RG12 8HT. Tel: 0870 60 800 60  
Personal Safety Division  
3M Ireland, The Iveagh Building, The Park, Carrickmines, Dublin 18, Ireland

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OSHA FIT TESTING VIDEO



1870+

## Helpful Videos

# Dental Requirements from OSHA

OSHA DENTAL  
REQUIREMENTS



# Links

[Clinic Respiratory Protection Policy Template](#)

[Public Health Respiratory Protection Policy Template](#)

<https://www.osha.gov/coronavirus/control-prevention/dentistry>



Quick Reference Guide:  
Qualitative Fit Testing

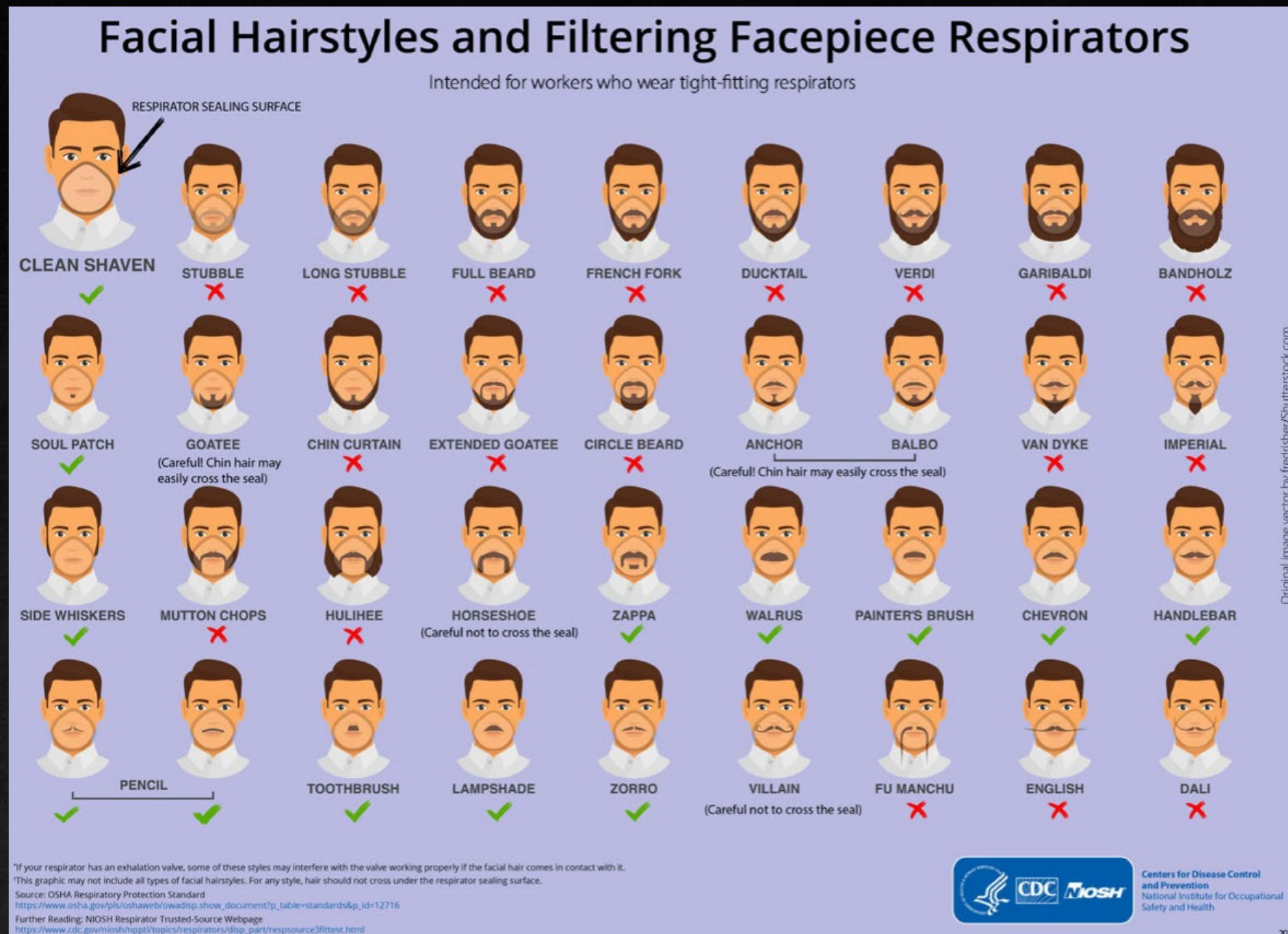
Fit Testing FAQs

What about facial hair

Fit testing

# Appropriate Facial Hair

CDC Facial Hairstyles and Filtering Facepiece Respirators,  
<https://www.cdc.gov/niosh/npptl/pdfs/facialhairwmask11282017-508.pdf>,  
 accessed 1/26/2023





# 3M Fit Testing OSHA Video

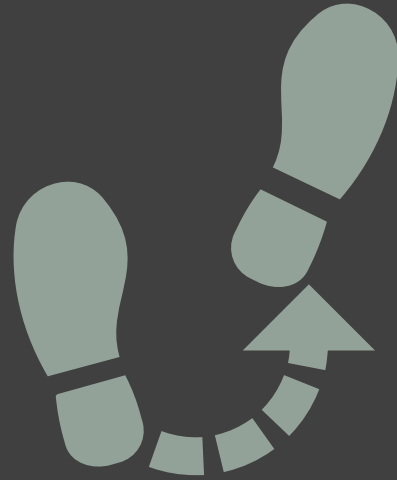
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## OSHA Respiratory Fit Testing



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# Step-by-Step Fit Testing Procedure

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## Gather Supplies (3M)

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- 3M fit testing kit
- N95 respirators
- Gloves (to keep solution off hands)
- MDH Qualitative Fit Testing Form

**Reminder:** Must have respiratory medical clearance completed and passed prior to fit testing



# Verify you have accurate (same) solution for sensitivity (red) and fit testing (black)

BITREX SOLUTION



SACCHARIN (SWEET) SOLUTION



Add sensitivity solution: Bitrex or Saccharin (red bottle) into nebulizer

Place test hood on person

Instruct person to breathe through mouth with tongue slightly extended

Slowly squeeze nebulizer until person indicates that it can be tasted

If solution is not tasted in 30 squeezes stop and try alternative solution

Remove the hood and prepare for fit testing

## Part 1: Sensitivity Test



# Part 2: Fit Testing

Add

- Add fit test solution (in black labeled bottle) into fit test nebulizer (marked in black)

Ensure

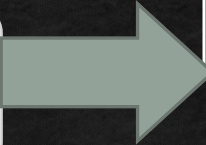
- Ensure that respirator is fitted correctly ([link located here.](#))

Place

- Place test hood on person

Introduce

- Introduce solution from the initial dose to start exercise (next slide)



Number of squeezes needed in part 1	Number of squeezes needed for initial dose	Number of squeezes every 30 seconds thereafter
1-10	10	5
11-20	20	10
21-30	30	15



## 7 Exercises

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1. Normal breathing

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2. Deep breathing

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3. Turning head side to side

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4. Moving head up and down

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5. Reading the Rainbow Passage or counting

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6. Bending or jogging in place

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7. Normal breathing



If solution is not tasted during any of the 7 exercises, the individual has passed the test with THAT respirator



If solution is tasted, stop test, refit masks and verify fit test solution has adequately been cleared from mouth/tongue and start test once again



If solution is still tasted on the 2<sup>nd</sup> attempt, stop test and try an alternative respirator



If no respirator is adequately fitted, look to PAPR/CAPRs for respiratory protections

## Record Results