FACE COVERINGS FOR COVID-19 PREVENTION

Guidance: Face Coverings for COVID-19 Prevention

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An earlier version of this publication (December 2022) mistakenly excluded the guidance on Function in Section B (The Three F's.) This version corrects that error and includes all relevant guidance on respirator function.

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A. INTRODUCTION AND KEY RECOMMENDATIONS

Face coverings – whether we call them masks or respirators – have been an important part of protecting people from infection during the COVID-19 pandemic. Even where they are not mandatory, people can choose to protect themselves and others by wearing the best possible face covering.

It is important to remember that wearing a face covering is just one element of protection against COVID-19. Preventing infection requires a layered approach with multiple prevention measures.

This document provides explanations and recommendations for use of face coverings for infection control. We will use the term "face covering" in this document to mean both respirators and masks. (See the sidebar for definitions.)

SARS-CoV-2, the virus that causes COVID-19, can be transmitted when airborne particles (aerosols) that contain the virus are emitted by an infected person and are inhaled by another person.

Risk of transmission is higher indoors, especially in poorly ventilated buildings, because infectious aerosols can accumulate. Risk may also be high in crowded outdoor settings.

Face coverings can help to prevent this transmission in two ways:

1. By preventing emission of infectious aerosols by an infected person, and;
2. By preventing infectious aerosols from being inhaled by an uninfected person.

Main recommendation: *To reduce risk of becoming infected or infecting others, wear a well-fitting respirator or face covering that provides particle filtration equivalent to an approved respirator such as an N95, in indoor settings or crowded outdoor areas.*

Respirator or mask – what's the difference?

1. "Respirator" means a device that is approved or certified by an appropriate agency as meeting a standard for respiratory protection (protecting the wearer from inhaling hazardous airborne substances). Some respirators can protect against gases and vapours, but in this document, we are only concerned with respirators that protect against particulates and aerosols.
2. "Mask" (as used here) means face coverings that are not certified respirators. A mask may meet another type of standard, such as standards for medical or surgical procedure masks.

See Section B for information on standards.

Key messages:

1. For the best protection, wear a respirator when indoors or in crowded outdoor spaces if infected people may be present (or if you may be infected).
2. If you do not use an approved respirator, select a mask that has a filtration efficiency equivalent to an N95 or better.
3. Get as good a fit as possible – if you can, get fit-tested. If you can't get fit-tested, learn how to get the best fit and check the seal when putting on your face covering (See Section F for guidance on fit-testing and seal-checking.)
4. Respirators with headbands usually fit better than masks with ear loops. If you must use ear loops, learn how to get the best fit. (See Section F for guidance on getting the best fit.)
5. Face coverings can be re-used. (See Section D for guidance on re-use.)
6. Where a respirator is used in the workplace, legal requirements may apply. See Section E for guidance on workplace requirements.

B. THE THREE F'S

The face covering you select and the way you use it determine how well it protects you. Three important factors in determining respirator or mask effectiveness can be summarized as the 3F's – **filtration, fit and function**.

1. **Filtration: How well the filter removes aerosols or particles so they cannot pass into or out of the user's breathing zone.**

Face coverings that meet a respirator protection standard are designed to filter particles in a range of sizes to minimise inhalation risks. The number 95 in the term "N95" refers to the level of filtration achieved by N95 respirators. This means they meet a standard for filtering 95% of the most penetrating particle size. The filter material does not just function like a sieve, only capturing particles above a certain size. Instead, it uses a variety of mechanisms (such as particle impaction, gravitational settling and electrostatic attraction) that capture particles in a wide range of sizes that a sieve alone would not achieve. So, if it traps 95% of the most penetrating particle size, it will actually capture more than 95% of all particles.

A variety of international agencies set respirator filtration standards, as listed in the sidebar. (Section F provides references to help you check if your face covering meets these standards).

2. **Fit: Whether the face-covering fits your face well enough that air cannot bypass the filter.**

The level of protection depends not only on filtration, but on how well the respirator or mask fits your face. Finding a face covering that provides the best face-fit is the most important feature in selection. Improperly fitting face coverings allow particles to bypass the filter and escape in or out of the face covering when you breathe. The best-fitting face coverings are certified respirators with headband straps. Masks with ear loops usually do not fit as well and are not approved by NIOSH. (Section D provides guidance on improving the fit of ear loop masks.)

The best fit can only be obtained if a respirator is fit-tested. This means that an individual is tested with a particular style of respirator to ensure it achieves the expected level of protection by providing a good seal to the skin of the face.

Fit-testing can be quantitative or qualitative. Quantitative fit-testing uses a machine to compare the concentration of an airborne contaminant outside and inside the respirator. Qualitative fit-testing tests whether an airborne substance can be detected (e.g. smelled, tasted or causing irritation) by a person wearing the respirator. More information on fit-testing is available in resources listed in Section F.

Fit-testing must be carried out prior to using a type of respirator to protect a worker from a workplace hazard. Respirators used for non-workplace protection are not routinely fit-tested, although it is helpful if they can be.

Respirators like N95s (where the whole facepiece is the filter) are called Filtering Facepiece Respirators (FFRs). Although protection can not be assured if a respirator is not fit-tested, even FFRs that have not been fit tested provide better protection than other masks, especially if the user has been trained in how to don the FFR and check the seal. (See Section C for further guidance on different types of face coverings.)

People's faces come in many shapes and sizes, and some face coverings will fit you better than others. Whether or not you have been fit-tested, you may need to try different face coverings to get the best fit. You can also learn how to use the face covering in a way that gives you optimal fit. (See Section F for resources on donning and seal checking a respirator.)

3. **Function: Whether the face covering is easy to breathe through and you can comfortably function while wearing it.**

The main factor in determining respirator function is breathability – how easy it is to breathe through the filter. Breathability is often measured as airflow resistance or pressure drop across the filter when the user breathes in or out. Some respirator standards include requirements for maximum acceptable airflow resistance. Approved respirators like N95s are usually easier to breathe through than non-approved masks. Other factors that contribute to function are comfort factors like heat and moisture buildup.

Standards for particulate respirators:

(US) National Institute for Occupational Safety and Health (NIOSH) - NIOSH-42CFR84; respirator example: N95

Canadian Standards Association (CSA) – new standard CSA Z94.4.1:21 respirator example: CA-N95

China GB2626-2006; respirator example: KN95

Korea KMOEL - 2017-64; respirator example: KF94

European EN 149-2001; respirator example: FFP2

Australia/New Zealand: AS/NZS 1716:2012; respirator example: P2

Health Canada does not approve respirators but maintains a list of authorized respirators.

See Section F for resources you can check to find out if a respirator or mask is approved or authorized.

If I smell something while wearing the respirator does that mean it's not working?

Not necessarily for particulate respirators.

Particulate respirators are designed to filter out particulates and aerosols. Smells may come from substances in gas or vapour form. Some respirators can filter gases and vapours, but particulate respirators do not.

Qualitative fit tests for particulate respirators may use a substance in aerosolized or particulate form that can be smelled or tasted. Often they use a sweet smelling/tasting substance like saccharin or a bitter one like BitrexTM. But a substance in gas or vapour form (e.g. perfume) would not be used for qualitative fit-testing a particulate respirator because the respirator is not designed to filter it out.

C. TYPES OF FACE COVERINGS

Various masks and respirators have been used for COVID-19 protection. This section describes these different types.

1. Filtering facepiece respirators (FFRs): as noted previously, these are approved respirators whose whole facepiece is the filter. The most familiar of these are N95s. The "N" notation means that the respirator is not approved for oil-containing contaminants. "95" means that it achieves a 95% particle filtration efficiency (PFE). (As explained above, "95%" refers to the filtration efficiency for the most penetrating particle size. Other particle sizes will be filtered at higher rates.) There are a variety of other notations, including N99 (higher filtration level) and P95 (approved for oil-containing contaminants). Some types of FFRs have exhalation valves to make it easier for the user to exhale. These are not recommended for COVID protection, because infectious aerosols could be released through the valve if the user is infected. However, research has shown that even FFRs with exhalation valves provide better source control than loose-fitting masks. [1]

2. Surgical, medical, or procedure masks: these are the familiar, commonly blue masks used in many medical settings. They were developed primarily to protect patients from infection by the mask user. They may be approved to a standard, but it is not a standard for respiratory protection. Surgical and medical masks may achieve good filtration, but are loose-fitting and will not fit as well as an FFR. (However, fit can be improved with some aids and techniques; see the fit resources in Section F.) Research has shown that surgical masks do not protect the wearer from exposure to aerosols as well as FFRs do. [2]

3. Cloth masks: these are non-approved masks that were commonly used during the pandemic when approved alternatives were not widely available. They vary widely in the degree of filtration offered, but generally do not provide good fit and therefore provide poor protection compared to FFRs. Better filtration can be obtained if the masks have three layers, including an inner layer made of polypropylene. An advantage of cloth masks is that they can be washed and re-used.

4. Elastomeric respirators: These are reusable respirators with replaceable filters and a facepiece made of an elastomeric material. They provide a high level of filtration protection and can provide good fit if fit-tested. They are cost-effective in the long term and a good alternative to FFRs, especially for workplace exposures. Elastomeric respirators may be preferable to FFRs, due to lower long-term cost and the ease of getting an effective face seal and better fit.

5. Powered Air Purifying Respirator (PAPR): These have a battery-operated fan that delivers air through a filter into the facepiece. Because there is net outflow of air in the user's breathing zone in relation to the outside air, PAPRs usually provide a much higher level of protection and greater comfort than all the options listed above. They have a high initial cost, but can be a good option, usually for workplace exposure.

To prevent COVID transmission, we need a layered approach – that is, many different preventive measures that add up to the best protection possible. An implication of this is that even poor protection is better than no protection, especially if it is complemented by other measures. A well-fitting, N95 or equivalent respirator should be the standard for protection. But if it is impossible to use the best fitting, best filtering respirator, using a less efficient mask is better than nothing if the user recognizes the mask's limitations and observes other protective measures.

D. PROPER RESPIRATOR AND MASK USAGE

Members of the public who want good protection against COVID-19 will often select a filtering facepiece with 95% particle filtration efficiency (PFE). Not all of these face coverings are approved respirators, but some can provide relatively good protection. Users should observe the following guidance:

1. Ensure you don't get a face covering with fraudulent claims. If an FFR says it is NIOSH approved, it will have a "TC" reference number which can be checked on the NIOSH web site. If a mask is not NIOSH-approved, you can check whether it is authorized by Health Canada for COVID protection or listed by other reliable sources. (See the resources in Section F.)
2. NIOSH and CSA do not have standards for children's masks. If a mask says it is an N95 for children, that is not correct. However, if the manufacturer makes an approved or Health Canada-authorized FFR for adults, this may be a sign that they make good quality children's masks. (See Section F for resources that can help you select a good mask for children. Guidance in this document about fit is applicable to children as well as adults.)
3. NIOSH will not approve masks with ear loops because they usually do not fit as well as a respirator with headband straps. So, if a mask has ear loops, it is not a true N95 (although it may provide good filtration). There is research showing that the fit of ear loop masks can be improved with techniques and aids like mask braces, ear loop length adjusters and adjustment clips. (See the resources in Section F.)
4. Filtering facepiece respirators and replaceable filters for re-usable respirators generally have an expiry date printed on the product or packaging. Ensure that this date will not be exceeded during the anticipated period of use.
5. Learn how to don (put on) a face covering to get the best fit and prevent leaks. Also learn how to doff (take off) the face covering to prevent contamination. Instructions for donning and doffing a face covering should be available from the manufacturer. (Users can also see the resources in Section F.)
6. After donning the face covering, conduct a seal check to make sure you get a good fit. A seal check confirms that air is not leaking out or in at the edges of the face covering. Follow instructions from the manufacturer and consult Section F for guidance on conducting a seal check.

7. A proper seal to the face requires the user to be clean shaven where the respirator contacts the skin, as facial hair (including hair follicles and stubble) can interfere with the seal. There are styles of beards and moustaches that will allow people with facial hair to get a good seal, as shown in this CDC graphic. [3]

   A method called the Singh Thatta technique, which uses a beard covering under the FFR, has been reported to result in a good fit for bearded users. The method is still being researched. [4] It has not been accepted for the purposes of satisfying fit-testing requirements. The Canadian standard for respirator selection and use (CSA Z94.4) prohibits the use of devices that may interfere with the facepiece seal of a tight-fitting respirator. Therefore, if a respirator is mandated for use in the workplace, other options, such as a Powered Air Purifying Respirator, should be sought for workers who cannot be clean shaven.

8. FFRs were initially designed to be "single use" (i.e. disposable – thrown away after one use.) Due to expense and limited availability during the pandemic, FFRs are often re-used. The US CDC has recommended the following FFR re-use practices for health care workers. [5] These are good guidelines for public use of face coverings as well:

   a. If the face covering will be re-used, air it out for 5 days between uses. This can be done by storing it in a breathable paper bag or hanging by the straps in a clean, dry place. A good practice is to label the storage bags with days of the week, so you know when you last used it. The purpose of airing out a face covering is to ensure that any moisture will evaporate and that active biological agents like bacteria or viruses, if present, will not survive between uses.

   b. Use the face covering up to 5 times (maximum 40 hours) if it is in good condition (i.e. not damaged, soiled or wet, the straps are intact and the facepiece maintains its shape.) If you use it for very brief periods (e.g. a visit to a store), it can be used more frequently.

   c. If the face covering becomes damaged or wet, it should be disposed of and not reused. If you know that you are infected when wearing a face covering, put it in a plastic zip-lock bag before placing into the waste bin / trash can.

E. MANDATORY RESPIRATORY PROTECTION IN THE WORKPLACE

Every Canadian jurisdiction has legal requirements regarding workplace use of respirators. In addition to the legal requirements, the Canadian Standards Association standard CAN/CSA-Z94.4-18 (Selection, use, and care of respirators) sets out important measures regarding selection and use of respirators. In some jurisdictions, this standard is referenced in regulation, so it is a legal requirement. This section provides some general guidance for workers and employers regarding legal requirements, but everyone responsible for respiratory protection in the workplace should become familiar with standards and legal requirements in their jurisdictions.

Most legal requirements cover the following issues:

1. A respirator program: If a respirator is required to protect workers from airborne hazards, the employer must have a written respirator program that covers selection, fitting, replacement and maintenance of respirators.

2. Selection: the respirator and filter selected must be appropriate to the nature and concentration of the hazard and should be based on a risk assessment. CAN/CSA-Z94.4-18 provides selection guidance based on the risk level of the biological agent, the generation rate, and existing control measures. (See the sidebar on “control banding.”)
3. Fit: workers required to wear a respirator must be fit-tested to ensure the respirator does not allow contaminated air to bypass the filter. The person(s) who conducts fit-testing must be qualified to do so through appropriate training.
4. Maintenance and replacement: the respirator program must address how re-usable respirators will be cleaned and maintained, and how FFRs and replaceable cartridges will be replaced.
5. Worker training: the program must provide for training workers on how to don and doff the respirator, conduct seal checks, check for defects, and care for the respirators assigned to them.

During the pandemic, face coverings were mandatory in many workplace settings. Although most legal requirements have been lifted, face coverings continue to be used on a discretionary basis, either voluntarily by workers, or required by employers. In most situations, it is not required that such face coverings be approved respirators.

Where approved respirators like N95 filtering facepieces are used on an optional basis, or are selected to fulfill masking requirements, questions arise as to whether they must be fit-tested and otherwise comply with respiratory protection programs. Generally, where approved FFRs are used for infection prevention, but are not required under occupational health and safety legislation, fit-testing is not required but is still strongly advised.

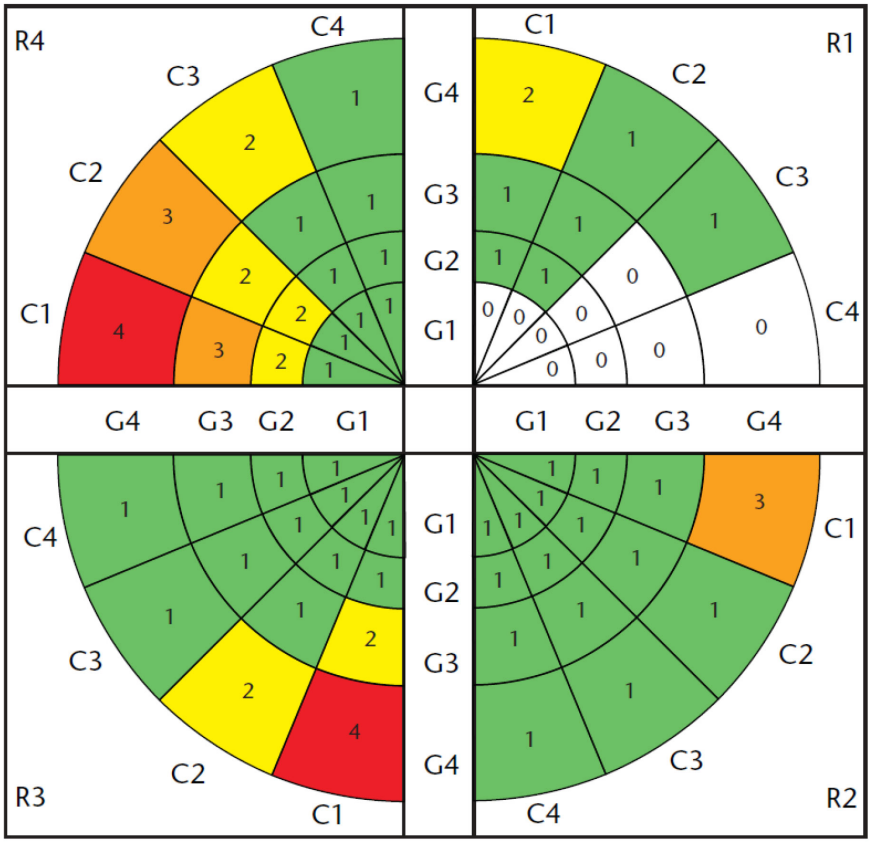
Control banding: respirator selection for COVID prevention:

CAN/CSA Z94.4-18 and other organizations use a control banding approach to selecting a respirator for COVID prevention. [6]

The following graphics from CAN/CSA Z94.4-18 shows how this approach takes account of the risk level of the virus, the generation rate, and the control measures to choose a respirator based on the risk level. The US National Institutes of Health has classified SARS-CoV-2 as a Risk Group 3 biological agent – this means that the bottom left quadrant of the control banding “wheel” is the appropriate one to use.

See Section F for other respirator selection resources.

Health care facilities	
Risk group	
Agents not associated with disease or serious adverse health effects in healthy adult humans	R1
Agents associated with human disease or adverse health effects that are rarely serious and for which preventive or therapeutic interventions are usually available	R2
Agents associated with serious or lethal human disease or adverse health effects for which preventive or therapeutic interventions might be available (high individual risk but low community risk)	R3
Agents likely to cause serious or lethal human disease or adverse health effects for which preventive or therapeutic interventions are not usually available (high individual risk and high community risk)	R4
Generation rate	
Patient not coughing or sneezing	G1
Patient coughing or sneezing with mouth covered	G2
Patient coughing or sneezing with mouth uncovered	G3
Aerosol-generating procedures	G4
Control level	
Poorly ventilated, <3 air changes per hour (ACH)	C1
Corridor or patient room, 3–6 ACH	C2
Negative pressure, laboratory, autopsy, 6–12 ACH	C3
Surgery >12 ACH	C4



(Source: Figure 2, CAN/CSA-Z94.4-18, Selection, use, and care of respirators. © 2018 Canadian Standards Association.)

Acceptable level						Air-purifying options	APF	Atmosphere-supplying options
0	1	2	3	4	5			
					5	No air-purifying option available	10000	SCBA (pressure-demand) full-facepiece SCBA (pressure-demand) tight-fitting hood Multi-functional SCBA/airline
				4 to 5		Powered air-purifying full-facepiece Powered air-purifying helmet/hood with SWPF study	1000	Airline (continuous-flow) full-facepiece Airline (pressure-demand) full-facepiece Airline (continuous-flow) helmet/hood with SWPF study
			3 to 5			Powered air-purifying half-facepiece Air-purifying (negative-pressure) full-facepiece	50	Airline (pressure-demand) half-facepiece Airline (continuous-flow) half-facepiece
		2 to 5				Powered air-purifying loose-fitting facepiece/visor Powered air-purifying helmet/hood without SWPF study	25	Airline (continuous-flow) loose-fitting facepiece/visor Airline (continuous-flow) helmet/hood without SWPF study
	1 to 5					Air-purifying (negative-pressure) half-facepiece (including filtering facepieces)	10	No atmosphere-supplying option available
						No respiratory protection required	<1	No respiratory protection required

Notes:
(1) *See Tables 1 and 2 for fit test pass/fail criteria for tight-fitt ng respirators.*
(2) *Fit testing is not required for loose-fitt ng respirators.*

(Source: Figure 4, CAN/CSA-Z94.4-18, Selection, use, and care of respirators. © 2018 Canadian Standards Association.)

F. RESOURCES

1. Finding a good mask and avoiding frauds and counterfeits

   a. Check here for NIOSH-approved N95's: https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/N95list1-f.html [7]

   b. Check here to find out if a mask has been authorized by Health Canada (search through the filter field): https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/medical-devices/authorized/other.html [8]

   c. For tips and sources for obtaining good quality masks, including children's masks, check Masks4Canada: https://masks4canada.org/how-to-properly-make-buy-and-use-a-mask/ [9]

   d. Aaron Collins (a.k.a. The Mask Nerd) provides information on fit tests of a variety of masks: see his Twitter and Youtube feeds with links [10, 11]

2. Donning, doffing and seal checks

   a. OHCOW fact sheet: https://www.ohcow.on.ca/wp-content/uploads/2022/02/respirator_use_ohcow.pdf [12]

   b. Donning a cup style respirator https://multimedia.3m.com/mws/media/40738O/3m-filtering-facepiece-respirator-fitting-instructions.pdf [13]

   c. Donning a flat fold respirator: https://multimedia.3m.com/mws/media/1908775O/3m-n95-disposable-respirator-canada-english.pdf [14]

   d. OSHA video on donning, doffing and seal checks: https://youtu.be/oU4stQgCtV8 [15]

3. Improving fit of surgical and cloth ear loop masks:

   a. US CDC study: https://www.cdc.gov/mmwr/volumes/70/wr/mm7007e1.htm [16]

   b. Government of Canada: https://www.canada.ca/content/dam/phac-aspc/documents/services/publications/diseases-conditions/covid-19-mask-fit-properly/covid-19-mask-fit-properly-en.pdf [17]

4. Fit-testing methods

   https://www.3m.com/3M/en_US/respiratory-protection-us/support/center-for-respiratory-protection/fit-testing/ [18]

5. Workplace and Respirator selection guidance

   a. OHCOW: All Workers Need Adequate Airborne Protection – factsheet. https://www.ohcow.on.ca/posts/all-workers-need-adequate-airborne-protection/ [19]

b. CAN/CSA Z94.4-18, Selection, Use and Care of Respirators. This standard can be viewed online at no cost by registering with CSA Group. https://www.csagroup.org/store/product/2426374/ [6]

c. ACGIH COVID Fact Sheet: Workers need respirators https://www.acgih.org/covid-19-fact-sheet-worker-resp/ [20]

d. IRSST, Guide sur la protection respiratoire, Respirator selection guide https://www.irsst.qc.ca/publications-et-outils/publication/i/101136/n/guide-sur-la-protection-respiratoire [21]

e. Australian Institute of Occupational Hygiene - Guide to Buying P2, or Equivalent, Respirators for use in the Work Environment (2020) - https://www.aioh.org.au/product/p2-guide/ [22]

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