

The recommended measures to protect yourself from infection with the coronavirus COVID-19 are the following:

- Stay home and avoid contact with other people**
- Avoid touching your face with your hands**
- Wash your hands very often**

Wear mask

DISCLAIMER

IDEAS NOT GUIDELINES

© Prof Subramanian Ponniah

Corona war'' THE MASK



MASKS WILL DO
THEIR
FUNCTION ONLY
IF THEY ARE
WORN
PROPERLY.



[Mckenzie Lacroix](#)

FIT TESTING

- ◎ Fit testing is a critical component to a respiratory protection program whenever workers use tight-fitting respirators. OSHA requires an initial respirator fit test to identify the right model, style, and size respirator for each worker, as well as annual fit tests. Additionally, tight-fitting respirators, including the N95, require a user seal check each time one is put on

- Qualitative and quantitative fit test methods (QLFT & QNFT) exist. Detailed descriptions are given in the US standard, developed by Occupational Safety and Health Administration [OSHA](#)
- This standard regulates respirator selection and organization (Appendix A describes fit testing). Compliance with this standard is mandatory for US employers.

- ◎ ... the newer OSHA Fast Fit Protocols for CNC methods, and introduction of newer instruments, have made all quantitative fit test devices equivalent in price and time required for testing.
- ◎ The CNP method has at present about 15% of the fit test market in industry. One such instrument is the Quantifit. [
- ◎ The Current CNC instruments are the PortaCount 8040 and the AccuFIT 9000.

PORTACOUNT FIT TESTERS

- ◎ <https://www.conceptcontrols.com/ca/tsi-portacount-canada>



ACCUFIT 9000 RESPIRATOR FIT TEST SOLUTION



- These methods use the reaction of workers to the taste or smell of a special material (if it leaks into mask) - [gas](#), [vapors](#) or [aerosols](#). Such reactions are subjective, making this test dependent on the subject reporting results honestly. A qualitative fit test starts with an unfiltered/non-respirator sampling of the substance of choice to verify that the subject can detect it accurately. Substances include:
 - [Isoamyl acetate](#)—This substance has the smell of bananas. It is used only for fit testing of elastomeric masks.^[18]
 - [Saccharin](#)—An aerosol of an [aqueous solution](#) of [saccharin](#) (*Sodium saccharin*) is used to test both an elastomeric and filtering respirator masks. Saccharin is perceived as sweet. The subject breathes through the mouth, slightly sticking out the tongue. The aerosol is created using a simple aerosol generator with rubber "pear", which is compressed manually.
 - [Denatonium](#)—A substance with a bitter taste can be used to detect gaps. It is mixed with water and sprayed in the same manner as the above materials.
- Irritant smoke fit test
- Irritant smoke—An irritating smoke causes irritation of the [mucous membranes](#)—resulting in discomfort, coughing, sneezing, etc. [NIOSH](#) recommended discontinuing this method, because research showed that exposure may significantly exceed the [Permissible Exposure Limit](#) (PEL) (e.g., in the presence of high humidity).

◎ Aerosol methods

- ◎ An aerosol test is carried out by measuring the internal and external [aerosol](#) concentrations. The aerosol can be artificially created (to check the mask), or a natural atmospheric component. The ratio of external concentration to the concentration under the mask is called a fit factor (FF).¹
- ◎ U.S. law requires employers to offer employees a mask with large enough fit factor. For half face-piece masks (used when the concentration of harmful substances is not more than 10 [PEL](#)), the fit factor should not be less than 100; and for full face masks (not more than 50 [PEL](#)), the fit factor should not be less than 500. The safety factor of 10 compensates for the difference between testing and workplace conditions.
- ◎ To use an atmospheric aerosol one needs a PortaCount or AccuFIT device. These devices increase the size of the smallest particles through a process of vapor condensation (Condensation Particle Counting or CPC), and then determines their concentration (by count).
- ◎ Aerosols may be: [sodium chloride](#), [calcium carbonate](#), and others. This method has been used as gold standard for determining whether or not a given respirator fits a healthcare worker in healthcare settings and research laboratories

OSHA APPROVED A FAST FIT PROTOCOL

- Recently OSHA approved a Fast Fit Protocol which enables the AAC/CPC (Ambient Aerosol Concentration/Condensation Particle Counting) method to be performed in less than three minutes. The major advantage of the AAC/CPC method is that the test subject is moving and breathing while the fit factor is being measured. This dynamic measurement is more representative of the actual conditions under which the respirator is used in the workplace.

PORTACOUNT PLUS (TSI) - DEVICE FOR ATMOSPHERIC AEROSOL FIT TEST



FLOW (PRESSURE) METHODS

- ◎ **Flow (pressure) methods**
- ◎ These methods appeared later than aerosol. When a worker inhales, a portion of the aerosol is deposited in their respiratory organs, and the concentration measured during the exhalation becomes lower than during inhalation. During inhalation leaked unfiltered air trickles under the mask, not actually mixing with air under the mask. If such a stream collides with the sampling probe, the measured concentration becomes higher than the actual value. But if the trickle does not come into contact with a probe the concentration becomes lower.

CONTROL NEGATIVE PRESSURE (CNP)

- ◉ Control Negative Pressure (CNP) from [OHD](#), LLLP directly measures facepiece leakage.
- ◉ Using state of the art Controlled Negative Pressure, the Quantifit pulls a negative pressure inside your mask, and to keep the pressure constant, it must pull out any additional air that leaks into the respirator.
- ◉ This measurement tells you how much air has leaked into the respirator, and this is converted into a fit factor. Using a challenge pressure of 53.8 - 93.1 L/min, the OHD
- ◉ Quantifit stresses the mask as an employee would while breathing heavily under extreme physical conditions. The manufacturer of the CNP device claims that the use of air as a standard (non-varying) gaseous challenge agent provides a more rigorous test of mask fit than an aerosol agent. If air leaks into a respirator, there is a chance that the particles, vapors, or gas contaminants also may leak in.

- ⦿ Using the Redon Protocol, a complete mask fit test can be performed in under 3 minutes. The CNP Method of fit testing is OSHA, NFPA and ISO certified (among others).
- ⦿ PortaCount Plus (*TSI*) - device for atmospheric aerosol fit test
- ⦿ Dichot method differs from CNP in that common filters are installed on the mask and the air is pumped out from the mask at high speed. In this case, a vacuum exists under the mask.
- ⦿ The degree of negative pressure depends on the resistance of the filters and on the amount of leaking air.
- ⦿ The resistance of the filter is measured with a sealed attachment of the mask to a dummy. This allows the operator to determine the amount of air leaking through the gaps.

Fit test methods for various masks^{[15][27]}

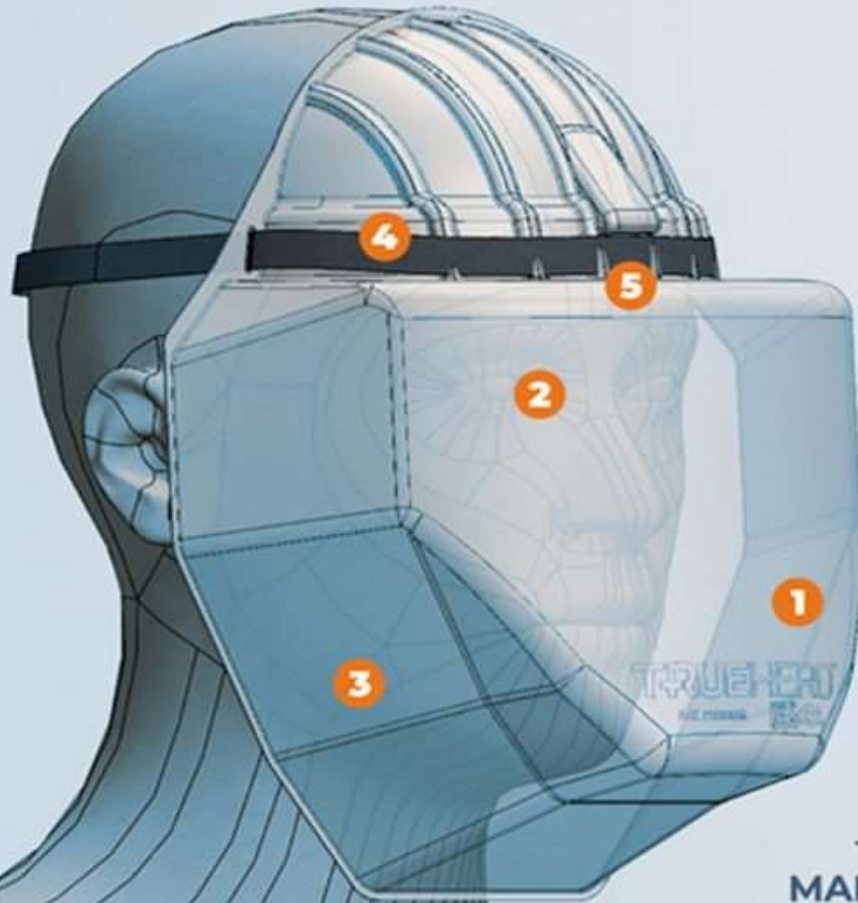
Fit test method	Respirator types			Devices for testing
	Filtering half facepiece	Elastomeric half facepiece respirators and elastomeric full facepiece mask, used in workplaces with concentrations of contaminants up to 10 PEL	Elastomeric full facepiece mask, used in workplaces with concentrations of contaminants up to 50 PEL	
<i>Qualitative fit test methods</i>				
Isoamil acetate	-	+	-	
Saccharin	+	+	-	3M FT-10 et al.
Bitrex	+	+	-	3M FT-30 et al.
Irritated smoke (*)	-	+	-	
<i>Quantitative fit test methods</i>				
Control Negative Pressure CNP	-	+	+	Quantifit, FitTest 3000 (OHD)
Aerosol method	+	+	+	PortaCount, Accufit 9000.

+ - may be used; - - cannot be used; (*) - NIOSH recommended to stop using this method.

INSPECTION PROCEDURES FOR THE RESPIRATORY PROTECTION STANDARD.

- <https://www.osha.gov/enforcement/directives/cpl-02-00-120#inspect>

N95 AND FACE SHIELD DESIGN



MADE IN USA

PATENT PENDING

RESPIRATORS

- ⦿ N series respirators, including the N95 mask, are only effective in the absence of oil particles, such as lubricants, cutting fluids, or glycerine.
- ⦿ For substances hazardous to the eyes, a respirator equipped with a full facepiece, helmet, or hood is recommended.
- ⦿ They should not be used during firefighting, in oxygen-deficient atmosphere, or in an unknown atmosphere, as a self-contained breathing apparatus is recommended instead.
- ⦿ They should not be used with hazardous gases or vapors, for which a cartridge respirator is recommended

CDC

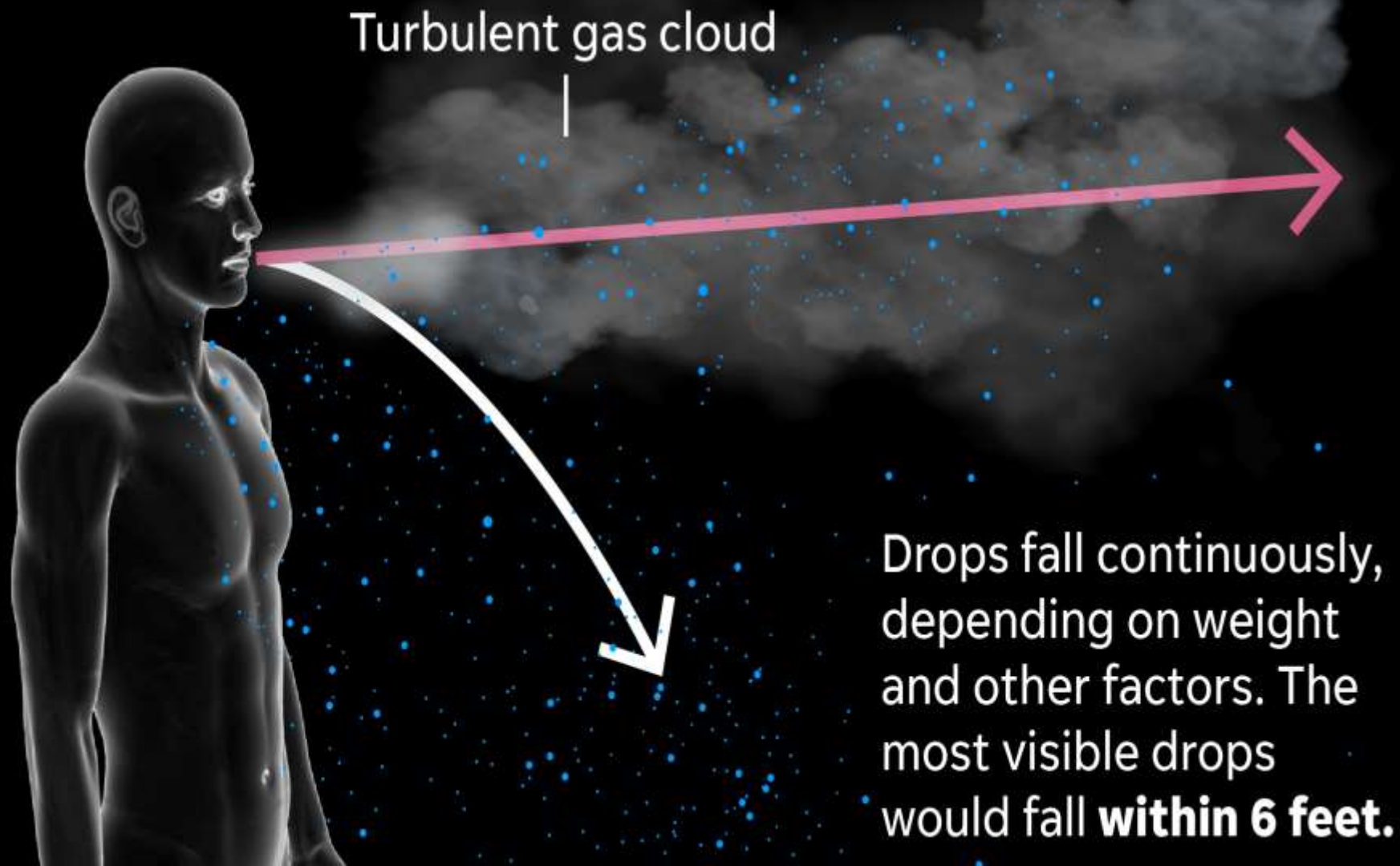
- The U.S. Centers for Disease Control and Prevention recommends surgical masks in procedures where there can be an aerosol generation from the wearer, if small aerosols can produce a disease to the patient.
- The CDC recommends the use of respirators with at least N95 certification to protect the wearer from inhalation of infectious particles including Mycobacterium tuberculosis, Avian influenza, severe acute respiratory syndrome (SARS), pandemic influenza, and Ebola.¹
- Some N95 respirators have been also cleared by the U.S. Food and Drug Administration as *surgical* are labeled "*Surgical N95*", and provide respiratory protection *to the wearer as well*

- ◉ N95 facemasks have several historical predecessors. One was a design for a [cloth facemask](#) by [Lien-teh Wu](#), who was working for the Chinese Imperial Court in the fall of 1910 during a [Bubonic plague](#) outbreak. It was the first that protected users from bacteria in empirical testing, and inspired masks used during the [1918 flu pandemic](#).
- ◉ Another predecessor was [gas masks](#) developed during [World War I](#), which were adapted for use by miners. They were reusable but bulky and uncomfortable due to their [fiberglass](#) filters and heavy rubber construction.
- ◉ In the 1970s, the [Bureau of Mines](#) and NIOSH developed standards for single-use respirators, and the first N95 respirator was developed by [3M](#) and approved in 1972.
- ◉ 3M used a [melt blowing](#) process that it had developed decades prior and used in products such as premade [ribbon](#) bows and [bra](#) cups; its use in a wide array of products had been pioneered by designer [Sara Little Turnbull](#).
- ◉ While designed for industrial use, they were increasingly used in healthcare settings in the 1990s, originally to prevent the spread of drug-resistant [tuberculosis](#).
- ◉ Many American companies stopped producing N95 masks in the 2000s due to litigation costs and foreign competition

AEROSAL

- ◎ Millions of virus- containing droplets between the size of 0.1 -900 microns (99% of which are less than 10 microns and 97% of which are less than 1 microns) are released into the air with each cough at a speed of around 40 Km/hr.
- ◎ The larger droplets travel up to a distance of 2 meters and fall to the ground within seconds, but the finer aerosols travel distances of up to 6 meters and remain suspended in the air for at least 10 mins in well ventilated areas,

The study suggests that droplets of various sizes are trapped in a turbulent gas cloud allowing them to travel up to **26 feet**.



Turbulent gas cloud

Drops fall continuously, depending on weight and other factors. The most visible drops would fall **within 6 feet**.

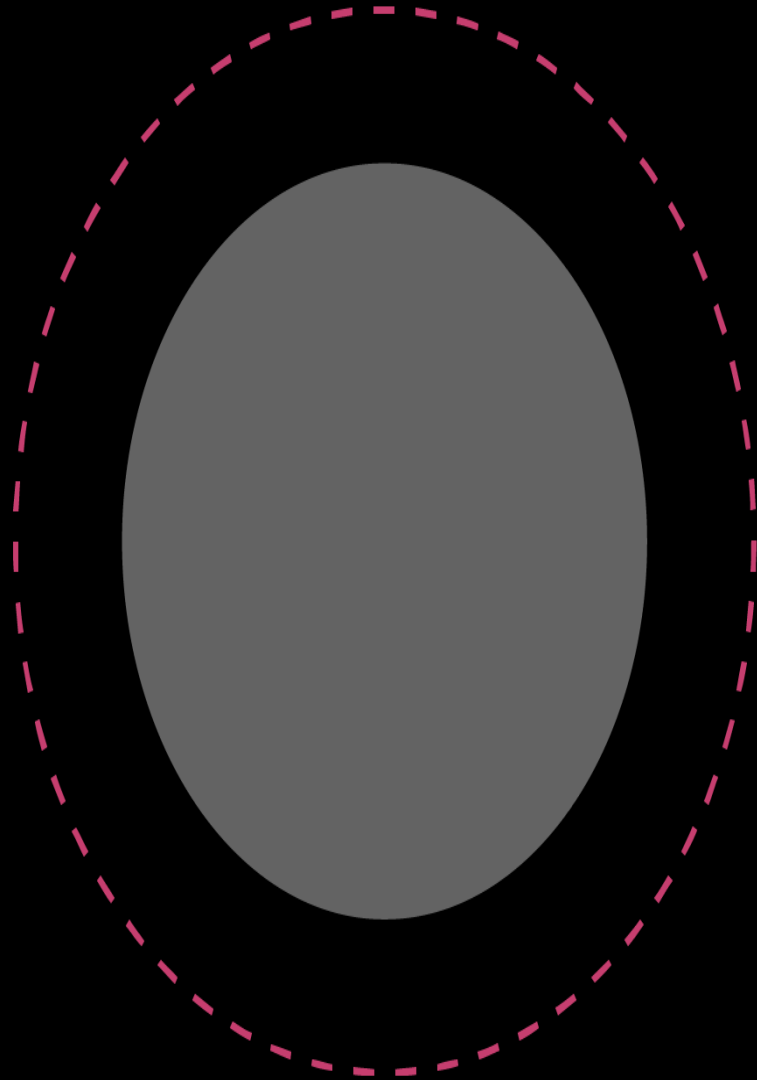


Peak exhalation speeds can
100 feet per second for sneezes.
The gas is emitted when a person coughs, sneezes or exhales.

3-6 feet



Droplets
containing
the virus can
be as small as
1 micron



Human hair:
60 -120 microns



The CDC says to maintain
6 feet distance to prevent
the spread of COVID-19.

The moist turbulent gas cloud helps prolong the droplets in a liquid form which may help the pathogen. In most environments it rises because it's warmer than ambient air.

— Air vent



The study suggests that the gas cloud with its pathogen payload can span a room in a few seconds and can be pulled into air circulation systems.

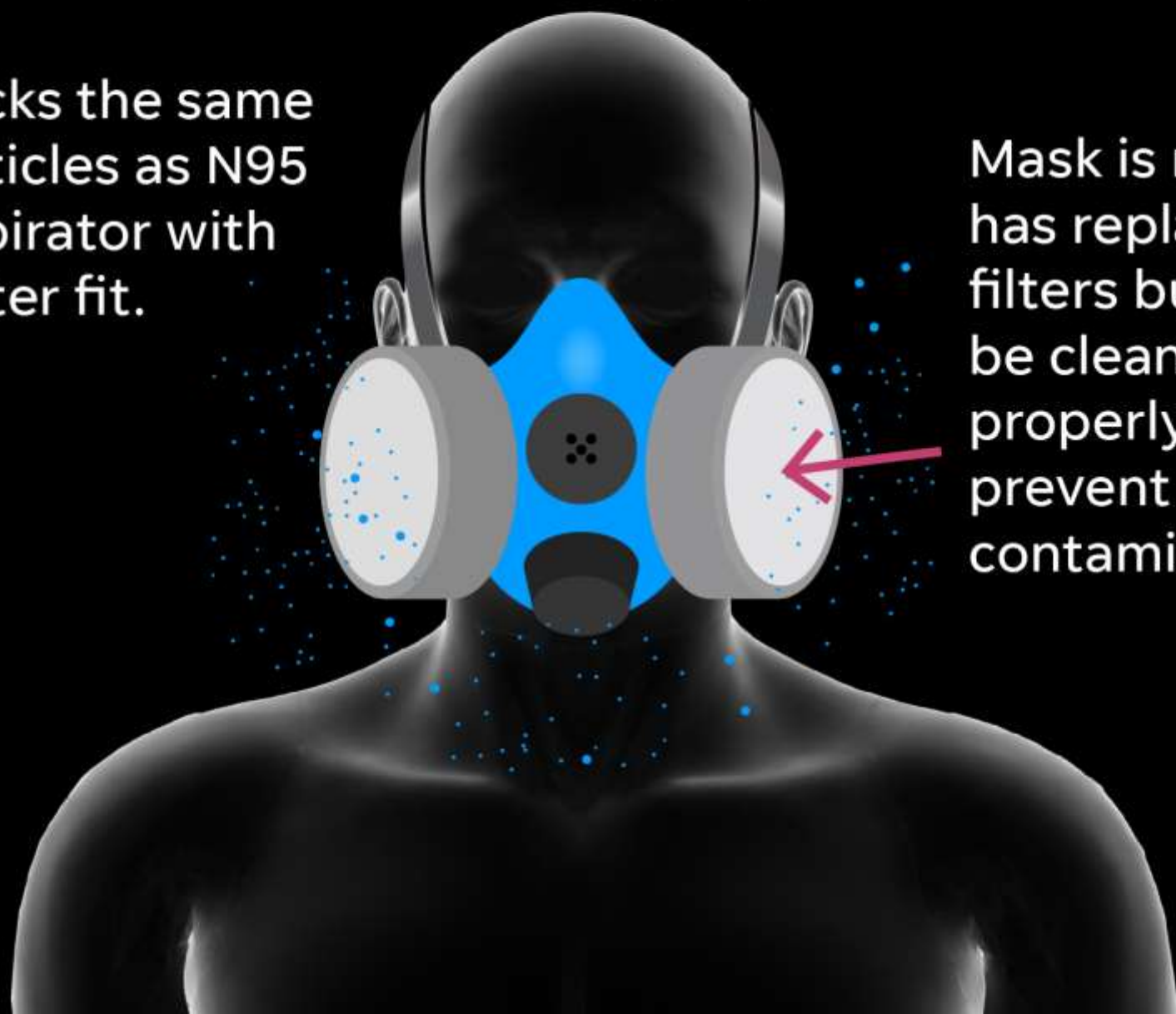
ELASTOMERIC RESPIRATOR

- ⦿ An elastomeric respirator is a reusable device with exchangeable cartridge filters. It fits tight against the user's face and also has a APF of 10. Before reusing the mask, all its surfaces need to be wiped down with a disinfectant.
- ⦿ In addition to respirators, health care workers should wear personal protective equipment (PPE) to help limit exposure to the virus through their eyes or contaminated clothing.

Elastomeric respirator

Effective at stopping the virus

Blocks the same particles as N95 respirator with better fit.



Mask is reusable, has replaceable filters but must be cleaned properly to prevent contamination.

N95 COMPROMISED

N95 respirator

Effective at stopping the virus



If properly fit
the N95 can
block 95%
of droplets

- ◎ <https://www.usatoday.com/in-depth/news/2020/03/25/coronavirus-survives-on-metal-plastic-cardboard-common-objects/2866340001/>

- ◎ The sneeze also produces similar sized droplets, but they are released at a faster speed of around 160 Km/hr and the finer aerosols also travel a distance of up to 6 meters and can remain suspended in the air for a long period of time.

- Infected people can shed the virus via aerosol droplets even 2.5 days before they start developing symptoms. Asymptomatic transmission accounted for 66% (range: 45-84%) in a Singaporean cluster and 77% (range: 65-87%) in the Tianjin cluster .

- ◎ They can survive on plastic (phones, laptops, bottles, stethoscopes) for up to 72 hours, stainless steel up to 48 hours, cardboard for 24 hours and on copper for up to 4 hours from where they can get transmitted to other humans. When an uninfected person's hand touches these virus containing droplets and then touches the face, mouth, nose or eyes, the virus reaches the respiratory tract, where it infects the cells and multiplies into millions of virions before it gets released into the air in the form of droplets to infect others.

RESPIRATORS N CATEGORY MASKS

- ⦿ A respirator mask is a tight-fitting mask with a filtration system that prevents the wearer from being exposed to noxious particles, gases, oils or microorganisms, including bacteria, viruses and fungi. It has two specific characteristics, viz: (1) an air filtering system that prevents the passage of noxious substances and microorganisms from entering inside the respiratory tract, and (2) a tight fit, so that air does not leak from the sides into the nose and mouth.
- ⦿
- ⦿ The filter of the N95 mask is made up of millions of microfibers of polypropylene layered on top of each other that have been permanently electrostatically charged. The electrical charge is necessary to retain its ability to filter microorganisms or microparticles.
- ⦿

- ⦿ Respiratory masks are certified into N, R or P depending on their ability to offer resistance to oil-based particles.
- ⦿ N stands for 'not oil resistant', these masks can only be used for particles that do not contain oil. R stands for 'somewhat resistant to oil' which has a service life for at about 8 hours, and P stands for 'strongly oil proof' which has a service life for at least 40 hours.
- ⦿ P and R are used only for industrial settings and are not relevant to this discussion.

- ◎ N is further divided into N95, N99, N100 depending on the filtration efficacy N95 means that this mask can filter off at least 95% of particles which are > 0.3 microns, while N99 means it can filter off 99% of these particles.
- ◎ The 0.3 μ m cut off is used for measuring filtration efficacy because that is the most penetrating size into the lungs. The coronavirus is between 0.06-0.14 microns in diameter or 60-140nm.
- ◎ Counterintuitively, viruses of this size are easier to filter than those that are >0.3 microns, because these sized particles follow a Brownian motion (random zig zag) and therefore trap more easily into filters. N95, N99, N100, FFP2, and FFP3 masks all filter the corona virus effectively.
- ◎ The only caveat is that the mask should not have any leakage. A fit test is therefore necessary before donning these masks.

CERTIFICATION STANDARD

- ◎ Each country has their own certification standard for each mask type, e.g. USA [NIOSH42CFR Part 84], Europe [149:2001], China [GB2626].
- ◎ As of now, India does not have any certification standard or certifying body for respiratory masks.
- ◎ The European Union classifies respirator masks into FFP1, FFP 2 and FFP3 where FFP stands for Filtering Face Piece. N95 is roughly equivalent to FFP2 and N99 is roughly equivalent to FFP3 masks. FFP1, FFP2 and FFP3 are also called P1, P2 and P3.

TC #XXX-XXXX – TC-approval number

Example of Exterior Markings:

Approval holder business name, a registered trademark manufacturer business name or an easily understood abbreviation. If privately labeled, the private label name or logo is here instead of the approval holder business name.

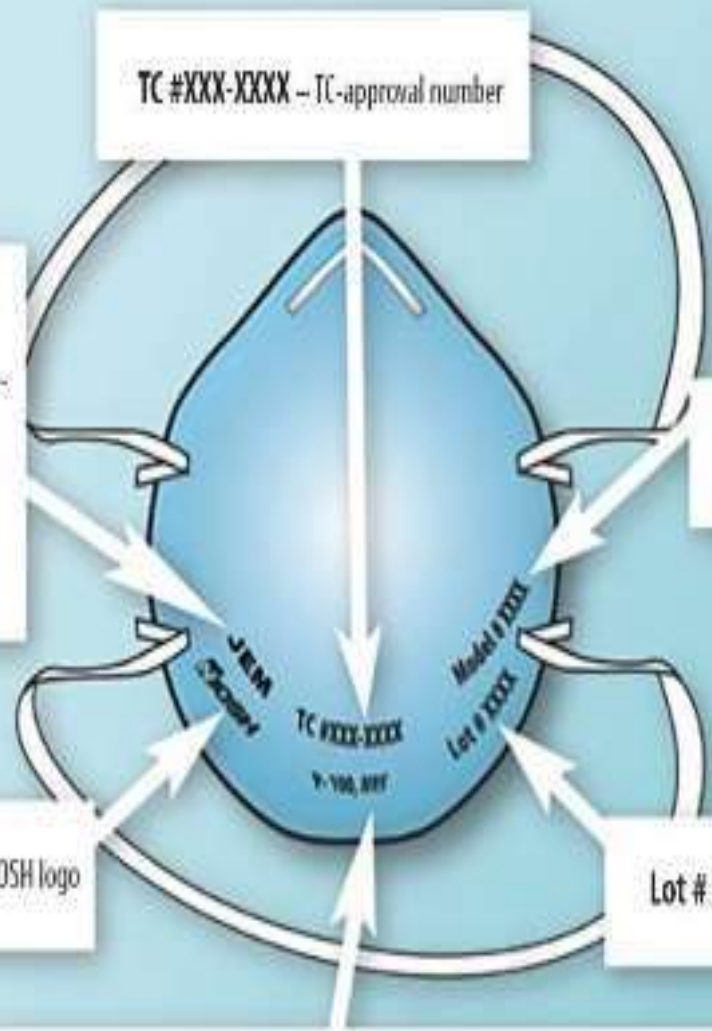
Model # XXXX – Model number

NIOSH – NIOSH name in block letters or a NIOSH logo

Lot # XXXX – Lot number (recommended)

Filter Designation – NIOSH filter series Alpha-numerical rating followed by filter efficiency level (ex. P100, N95)

EXTERIOR VIEW



- ◎ Ideally the N95 respiratory masks are only for single use, and this should be the standard practice whenever possible. If N95 masks are not available, the next option is to look for FFP2 respirator masks. N99, N100 and FFP3, although will fulfill the purpose of filtering the virus, they are not very comfortable to wear over a long period of time (make breathing difficult) and are therefore not recommended. With the recent COVID-19 pandemic, N95 and FFP2 masks are in severe short supply.

HEAT IN AN OVEN

- ◎ Heat in an oven: Heating at 70 degrees C for 30 mins kills the virus. There should be no contacting metal, and check if the N95 material used is not inflammable, if it is, do not heat in oven. You can hang the mask in the oven by using a wooden clip. This work has been done by the Stanford University team, USA and up dated on 25th March 2020

AIR DRYING

- ◎ Air drying: This is a simple way of reusing the N95 respirator mask. Drying the mask kills the virus, but it takes at least 48 hours to dry. Therefore, drying in a clean, dry place for 72 hours (3 days) is one way of reusing the mask. The only issue is that you have to wait for 3 days to reuse it. If you have four N95 masks, wear one every day and then keep it for drying, until the fourth when it can be reused. Keep the mask in a paper bag away from direct sunlight and ultraviolet rays.

DRY HEAT IN A RICE COOKER

- ◎ Dry heat in a rice cooker: Put the N95 mask in a traditional electric rice cooker without putting any water inside for 3 mins, until the temp is 149 -164 degrees

- ⦿ Attempts made for cleaning the mask with soap and warm water or alcohol or bleach or exposure to ultraviolet radiation or isopropranolol or microwaving have all been unsuccessful as they damage the electrostatic charge and significantly reduce the filtration capacity

- ◎ A recent systematic review and meta-analysis of surgical masks versus N95 respirator masks by the Chinese Cochrane Centre that included six randomized controlled trials with a total of 9171 healthcare workers showed that there was no difference in the efficacy between surgical masks and N95 masks in preventing laboratory-confirmed influenza, laboratory-confirmed respiratory viral infections, laboratory-confirmed respiratory infection and influenza-like illness). These studies add to the confidence that surgical masks may fare as well as N95 masks in a hospital setting, but they need to be worn regularly, adhered to proper standards of wearing and removing them, and need to be coupled with adequate hand hygiene measures.

- ⦿ Masks will do their function only if they are worn properly.

GUARDIAN G-VOLT MASKS WOULD USE GRAPHENE AND ELECTRICAL CHARGE TO REPEL VIRUSES AND BACTERIA



GRAPHENE FILTRATION SYSTEM

- ◉ With its graphene filtration system the Guardian G-Volt is 99 per cent effective against particles over 0.3 micrometers, and 80 per cent effective against anything smaller, claims LIGC Applications.
- ◉ For comparison, a N95 respirator mask blocks 95 per cent of particles over 0.3 micrometers. Viruses such as coronavirus can be transmitted through tiny droplets of water.

GUARDIAN G-VOLT

- ⦿ A low level electrical charge will pass through Guardian G-Volt when it is plugged in to a portable battery pack via a USB port. This charge would repel any particles trapped in the graphene mask.
- ⦿ At home, a docking system will allow the mask to be fully sterilised so it can be worn again.
- ⦿

GUARDIAN G-VOLT MASK



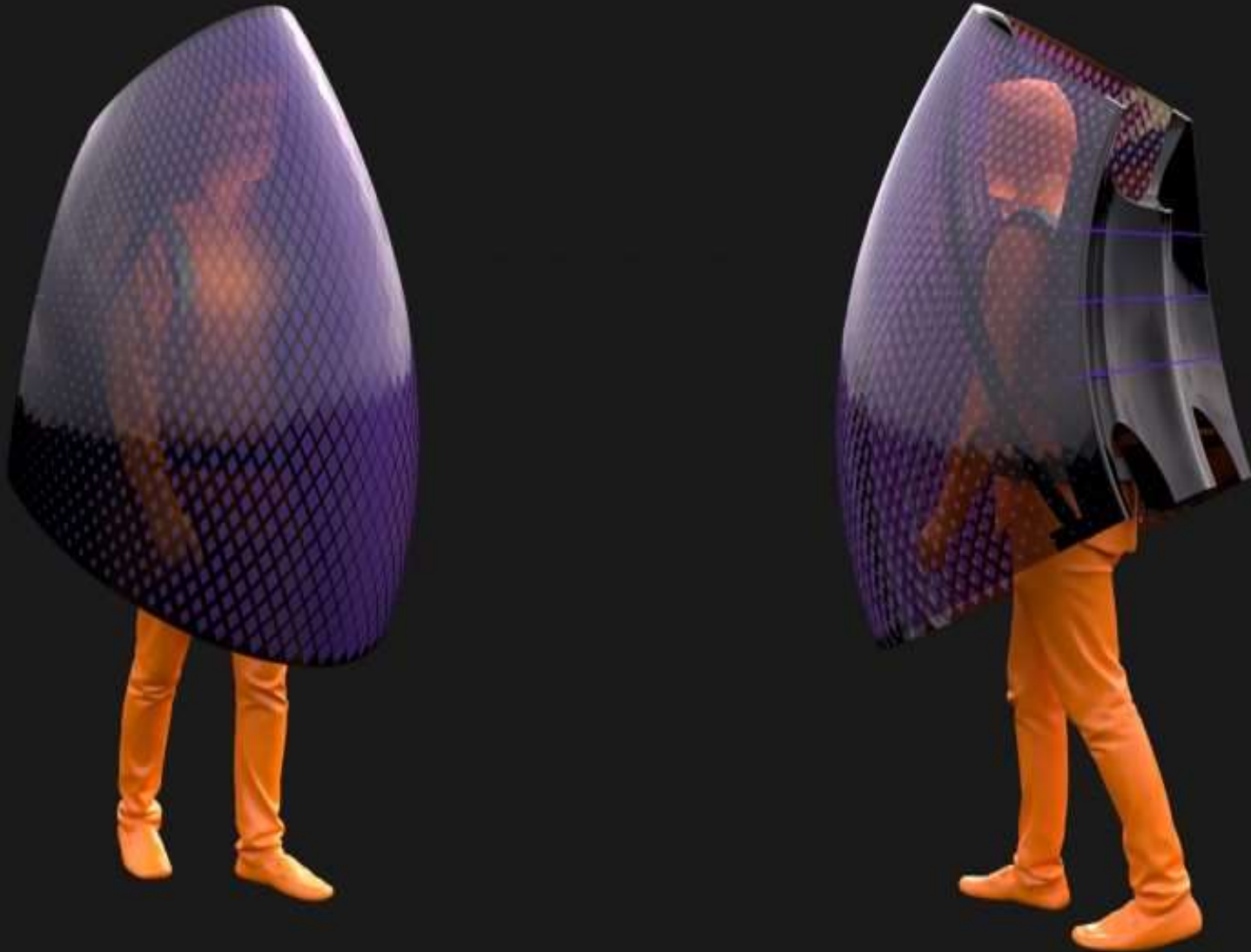
GRAPHENE IN THE MASK

- ◉ Graphene - an atom-thick material that has a range of impressive characteristics - is naturally antibacterial, so the Guardian G-Volt can also protect the wearer from bacteria. Antibiotic-resistant bacteria also poses an increasing threat to populations.
- ◉ The graphene in the mask is a kind called laser-induced graphene, a microporous conductive foam that can trap bacteria and conduct the electricity needed to sterilise the mask's surface. It can then be heated and sterilised in the at-home dock.
- ◉ Wearing the mask can also protect against breathing in air pollution

DANIELLE BASKIN

- ◉ A LED light alerts the user when the mask needs to be replaced.
- ◉ LIGC Applications will manufacture the laser-induced graphene filters and the masks in Belgium.
- ◉ In direct response to the coronavirus, artist Danielle Baskin has started developing printed face masks that can let the user still unlock their phone with facial recognition while wearing them.
- ◉ Chinese architect Sun Dayong has designed a concept for a wearable shield that would use UV light to sterilise itself and protect the wearer.

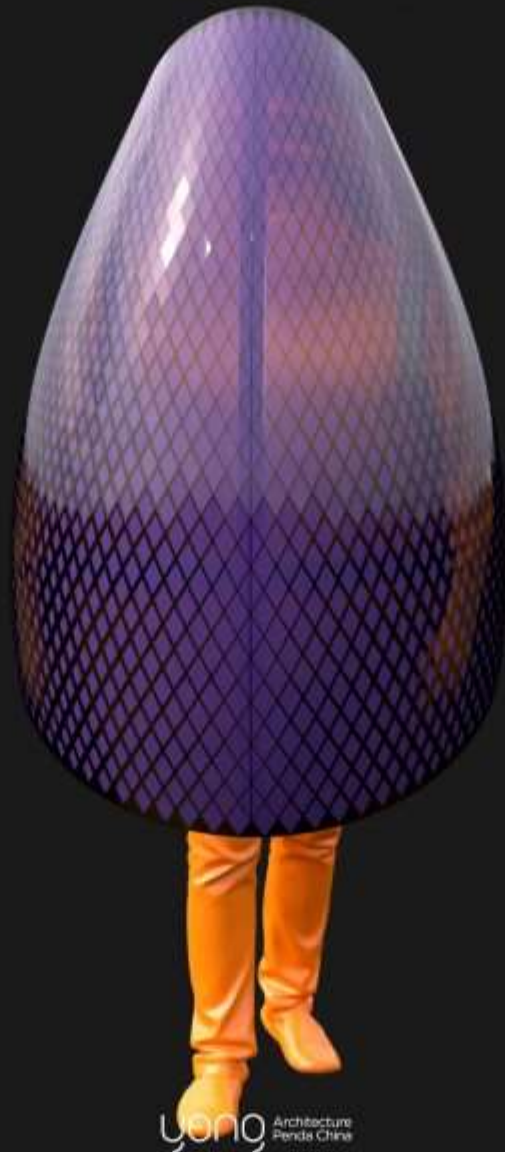
Sun Dayong designs wearable shield to protect against coronavirus outbreaks



- ◎ Chinese architect [Sun Dayong](#) has created a [conceptual design](#) for a body shield that would protect a wearer during a [coronavirus](#) outbreak by using UV light to sterilise itself.
- ◎ Named Be a Bat Man, the mobile safety device would be for "people who are exposed to the dangerous situation during the coronavirus emergency", said Sun Dayong, who co-founded architecture studio [Penda](#).

- ◎ The shield would be made from carbon fibre supports shaped like batwings that would be worn like a backpack. A PVC film would stretch between these supports, like the membrane of a bat's wing.
- ◎ Wires embedded in the plastic would heat up to a temperature high enough to kill any pathogens on them, creating a sterile environment inside for the wearer.

SHIELD OF FUTURE MUTATIONS



- ◎ The coronavirus will be killed by temperatures of 56 degrees Celcius," said Sun Dayong, who is a judge for [Dezeen Awards 2020](#).
- ◎ "The PVC film cover is like our car windshields - there are heater wire in between the glass for heat the ice and snow in the winter," he told Dezeen.
- ◎ "But sure we still need to do lot of work with engineers for the real production.





bones structure
支撑骨架

back structure
背托结构

ultraviolet light
紫外线消毒灯

bones structure
支撑骨架

ultraviolet light
紫外线消毒灯

pvc film
PVC 膜



perspective analysis 透视分析图

section analysis 剖面分析图

- ◎ The project is called Be a Bat Man, in reference to the fictional superhero who pushes the limits of human capabilities, and the fact that bats are one of the wild animals that could be the source of Covid-19 (coronavirus).
- ◎ Bats carry a large number of coronaviruses, and can spread the pathogens to other animals through their droppings, but rarely get sick themselves. The scientific theory is that bats' adaption for flight has made them better at repairing DNA damage.
- ◎

- ⦿ Bats belong to mammal species the same as human beings, with diverse varieties and long life that make for the ideal host of coronavirus," said Sun Dayong.
- ⦿ "Their body temperature can rise up to 40 degrees Celsius when flying due to accelerated metabolism and fall back to normal when taking a rest. Such change of body temperature enables them to carry the virus while curbing its spread in the body."
- ⦿ It currently isn't known how the coronavirus made the jump from bats to humans, or if it definitely came from the flying mammals and not other species such as snakes or pangolins.

NANOTECHNOLOGY-ENABLED N95 MASKS CAN HALT THE SPREAD OF CORONAVIRUS

Nanofibers are the perfect filter material for use in N95 respirators, which not only do provide a very large specific surface area, but can also be functionalized with various chemically active groups to improve the efficiency of the respirator in capturing naturally occurring nanoparticles (e.g., viruses), micron-sized particles (e.g., bacteria), and man-made particles (e.g., soot from diesel exhaust)

- ◎ Several methods are available for nanofiber production, such as conjugate spinning, chemical vapor deposition, phase separation, drawing, self-assembly, melt-blowing, and electrospinning; among which electrospinning is a widely used technique for fabricating air filter media, because electrospun nanofibers have an average specific surface area of 1000 times higher than microfibers, along with an average pore size of 4 to 100 times smaller than microfiber membranes.
- ◎ Hence, an electrospun nanofiber membrane has a remarkably higher capturing efficiency than a microfiber membrane, making a perfect filter for N95 respirators.

N95 MASKS DESIGNED BASED ON NANOFIBER TECHNOLOGY IS ONE OF THE WAYS THAT IS REPORTED TO BE HIGHLY EFFECTIVE.



SONOVIA'S ULTRASONIC FABRIC-FINISHING TECHNOLOGY,

- Tests have shown that Sonovia's treated textiles work against six types of bacteria including E. coli and Staph. Effectiveness lasts for up to 100 washes at 75° C (167° F) or 65 washes at 92° C (197° F).
- The impregnated polyester-cotton fabric has been shown effective against some strains of influenza. It has not been tested for effectiveness against the current coronavirus.
- Once a lab that can do this test is identified, the process could take eight weeks, says Goldhammer-Steinberg.
- “We are not commercialized yet,” she stresses. “But we have a prototype machine we are willing to put into operation using treated yardage from our R&D product – if we have a partner and interest.”

SONOVIA'S TREATED TEXTILES



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ARGAMAN'S BIO-BLOCK MASK

- ◉ Jerusalem-based [Argaman](#) is nearing commercialization of a reusable, washable, breathable antiviral facemask called Bio-Block.
- ◉ A prototype of the Bio-Block mask from Argaman Technologies. Photo: courtesy
- ◉ According to founder and CEO Jeff Gabbay, a textile engineer with a background in pathology and infectious diseases, Bio-Block is a layered mask.
- ◉ It's made from a proprietary cotton embedded with accelerated copper oxide particles, and a nanofiber textile that blocks pathogens.
- ◉ “The pores of the nanofiber pad are so small that bacteria cannot go through it – nor a droplet that contains a live virus -and our EPA-approved 100% CottonX fibers destroy the pathogens that come in contact with it,

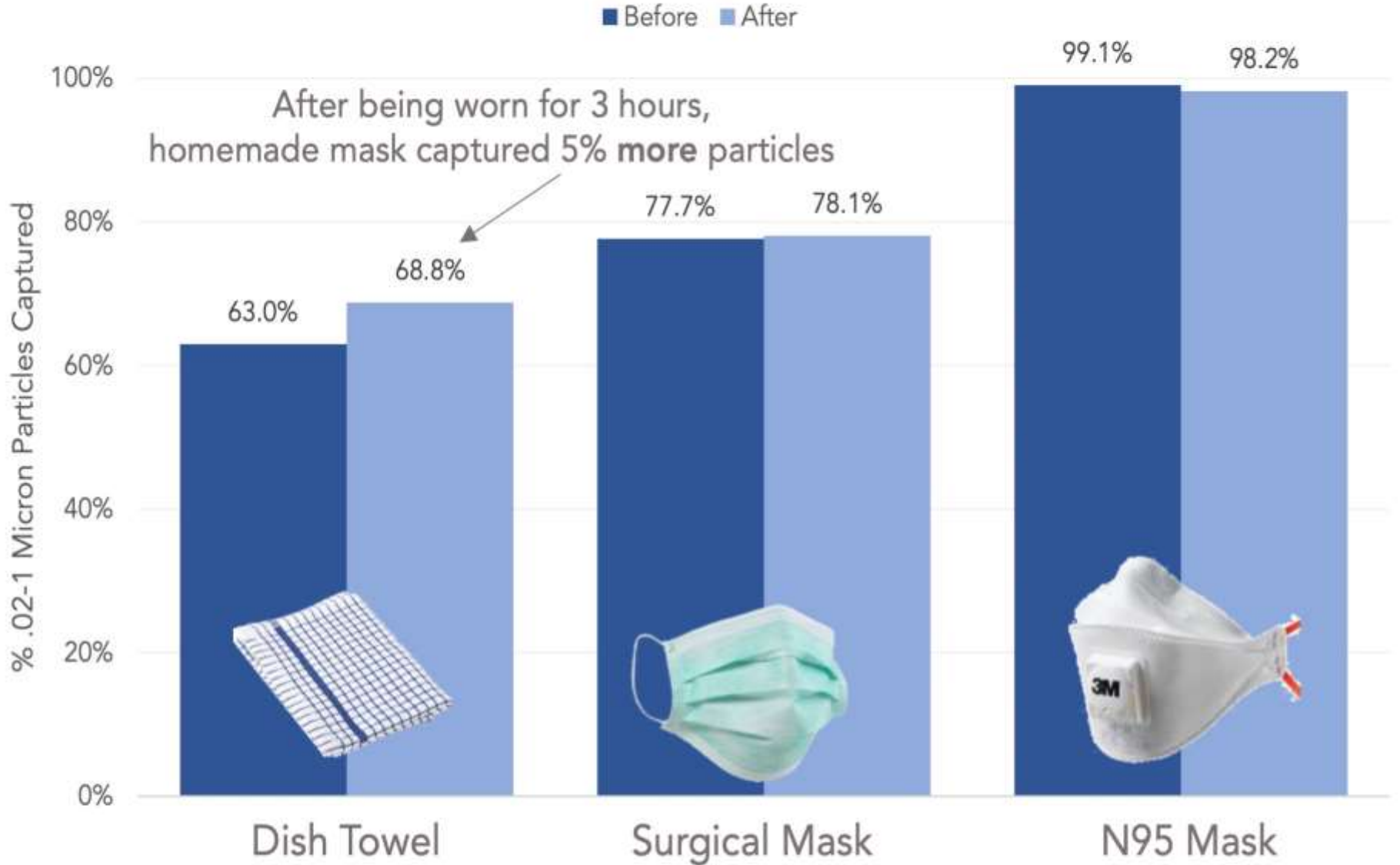
- ◎ “The mask not only blocks the virus but kills the viruses going both to the wearer and away from the wearer in case the wearer is infected,” he explains.
- ◎ An independent lab found that CottonX remains effective against Staph and E. coli bacteria for 50 industrial washings or 100 home washings.
- ◎ A hospital test sponsored by the US Centers for Disease Control found that CottonX bedding and gowns in the ICU reduced multi-drug resistant pathogens by 50%.

FIT TEST MACHINE





Mask Effectiveness Before and After 3 Hours



van der Sande et al., 2008.
PLoS One.

Open-data tests: Smart Air
smartairfilters.com

Homemade Mask Captures 60% of Sub-Micron Particles



van der Sande et al., 2008.
PLoS One.

Open-data tests: Smart Air
smartairfilters.com

VIRIMASK PROTECTIVE OCULO-RESPIRATOR (CREDIT: VIRIMASK)



NANOHACK 3D-PRINTED MASK

The manufacturer of 3D printing materials [Copper3D](#) has just published an open-source STL digital file of an [N95 respirator](#) that could be 3D printed and protect against the Covid-19. The aim of this initiative, called [Hack the Pandemic](#), is to mobilize manufacturers and printing services to make these respirators quickly available in order to tackle the lack of N95 masks (or FFP2) in the world and facilitate the work of healthcare professionals.

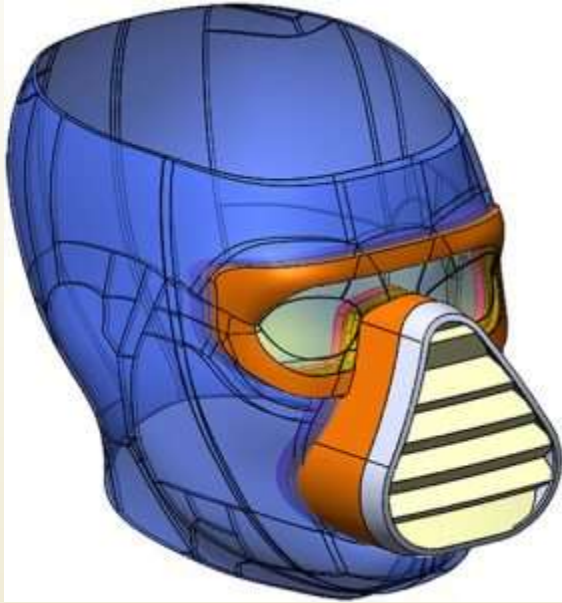
NANO HACK 3D-PRINTED MASK



NANO HACK 3D-PRINTED MASK

- ◎ Copper3D claims that its NanoHack 3D-printed mask is antimicrobial, antiviral, reusable and recyclable—adding that single-use surgical masks and N95 respirators will have a detrimental effect on the ecosystem. The mask has a flat pattern to facilitate massive shipping all over the world. According to the company, it incorporates a modular fine particle filtration system with a material using copper nanocomposite that is proven to deactivate viruses. The NanoHack also features a modular filtration disc that can regulate air intake and particle size.

VIRIMASK PROTECTIVE OCULO-RESPIRATOR



- Israel have designed a “protective oculo-respirator” that could be more efficient than an N95 (FFP2) mask while being more comfortable than a gas mask.

VIRIMASK

- ◉ Totally covering the nose, mouth and eyes (while air can penetrate around N95 masks), the ViriMASK—which looks like something a SuperHero would wear—would use 0.1-micron filters while N95 masks would use 0.3-micron filters. The filters are multi-use and replaceable.

ESPIRE GAS MASK

- Shield over n95



YANKODESIGN]

- ◎ The top of the mask remains free from fog thanks to the design that guides the air flow in a stream from the top of the mask through a valve in a divider that rests on the bridge of the nose, down through an outlet valve at the chin. Such an airflow prevents any exhaled air from coming in contact with the masks viewing area. It's a design that's ideal for any trade where the wearer relies heavily on sight to get the job done properly. Will this mask ever make into the hands of prominent tradesmen? We're not sure. Nonetheless, the concept is certainly a treat to admire. [H/T: [YankoDesign](#)]

THE OXYGEN REHABILITATION APPARATUS IS A FUTURISTIC CELL-CLEANSING ACCESSORY



Oxygen Rehabilitation Apparatus

There have been proven benefits to clinical hyperbaric treatments, raising the question of how to bring oxygen therapy to patients at home.

This Oxygen Rehabilitation Apparatus was designed by Bruce Walls to be used as a personal source of pure O₂.

Much of the current equipment does not efficiently supply air, allowing much of it to escape and go to waste.

What's proposed here is a full-face gas mask that ensures every last molecule will be inhaled through the wearer's nose or mouth.

A transparent window wraps around the front of the visor so that one can still easily see from behind the structured casing.

Even this would have a degree of flexibility.

The Oxygen Rehabilitation Apparatus has memory polymer cushioning and adjustable straps at the back.

CAIREN F10

- Cairen F10 is the world's first self-breathing face type oxygen mask used for emergency situations. The Cairen F10 protects the whole face and the embedded oxygen tank provides air for quick and safe extraction.
- A replaceable oxygen tank is hidden in the nose area and it is also used to grip for easy on and off action. The mask is held by 4 way mesh type adjustable strip and is designed to fit tight to prevent any gas leak.
- Polycarbonate and thermal resistant silicone are used to protect and relax the user from any dangerous situations. The overall shape is aesthetically pleasing and its futuristic look adds value to the product



KOMRAD RESPIRATOR



KOMRAD RESPIRATOR

- ◉ The brief of this project was to design protective gear for 2017, Tetsugaku Sasahara designed **KOMRAD Respirator** as an alternative to most commonly used respirator in the world 3M 6000. It is intended to be used by artists, designers and students to protect themselves from toxic particles.
- ◉ The existing product is actually inexpensive, however, it doesn't design to protect you very well and it's uncomfortable to wear. Based on interviews of 25 participants, 95% do not perform user seal checks ever, this is a standard procedure to test the validity of seal on face before each use. Why? Because no one knows about it due to insufficient user manual.
- ◉ *KOMRAD Respirator* offers effective, intuitive, and portable design. It folds in half with built-in zipper lock for great portability and sterility. Trust us, comfort is not overrated, most people choose not to use respirator because they prefer comfort over their health.



KEY BENEFITS

- 4 mm activated carbon fiber provides same protection as 2 cm granules.
- much more lightweight.
- easier and better filter sealing.
- better air circulation due to lower air resistance.

exhaled air is directed downward



Triple exhalation valve promotes significantly better air circulation.

flexing points

KEY BENEFITS

- stronger seal around nose bridge:
the area most prone to leaks
- more flexible to fit all facial structures
- Geckel technology ergonomically
replaces clumsy upper straps
- LiquidSkin silicone allows respirator
to be supremely comfortable and
leaves no marks

elastic Lycra fabric creates tension between
nose flaps which wraps around and applies
pressure on nose bridge for stronger seal



Geckel adhesive sticks to face
for safe and strong seal replacing
clumsy upper straps

Geckel pillars are etched directly
into LiquidSkin silicone to provide
optimum comfort



KOMRAD seals comfortably.

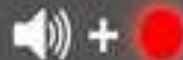
KEY BENEFITS

-notifies user precisely when the filters start running out and becomes fully exhausted

notifications



white light blinks once with a beep to notify user the filter is running low; it'll notify every 30 minutes



red light stays on with a beep to notify user the filter is exhausted and needs replacement

pinpoint LED indicator light

speaker

nano nose / CPU

plastic technology sensors only activate when user inhales through filter valves to conserve power

sensors are connected directly to nano nose microsensor which monitors air purity inside respirator

interior view



plastic technology sensor attached to valve



MODIFICATION

CORONA VIRUS FLU N99 DUST FACE MASK FFP3 P3 N99 (IDEAL MASK



▷ FFP2 & N95 Information:

FFP2 & N95 are both recommended by World Health Organization to help reduce the spread of the Coronavirus Flu Virus

They are not exactly the same, but are an equivalent standard. (FFP2 is a European standard, N95 is a USA standa

- ◎ **These respirators meet the requirements of EN149:2001 category FFP3D and protect the wearer from solid and non-volatile liquid particles. The respirator can be used in concentrations of contaminant up to 20 times the Occupational Exposure Limit.**

State of the art technology

High capacity, low resistance pleated filter.
Integrated low profile valve.



Soft and contoured face seal

For a comfortable and secure fit comparable to a half mask.

- ◉ Moldex 3405BP Series 3000 FFP3-D Reusable Mask with Ventex Valve Blister (
- ◉ Ventex Washable face seal, the Ventex-valve reduces moisture and heat
- ◉ Strap and Clip, for easy application and cleanable TPE face seal
- ◉ DuraMesh structure for optimum shape retention and durability
- ◉ ActivForm seal automatically adjusts to different face shapes
- ◉ The individual mask comes in a bag.



- ◉ In Europe, they must meet the European standard EN 149: 2001 which has three classes of disposable particulate respirators (FFP1, FFP2 and FFP3).
- ◉ **FFP1** refers to the least filtering of the three masks with an aerosol filtration of at least 80% and leakage to the inside of maximum 22%. This mask is mainly used as a dust mask (home renovations and various types of work).
- ◉ **FFP2** masks have a minimum of 94% filtration percentage and maximum 8% leakage to the inside. They are mainly used in construction, agriculture, and by healthcare professionals against influenza viruses. They are currently used for protection against the coronavirus.
- ◉ **FFP3** masks are the most filtering mask of the FFPs. With a minimum filtration percentage of 99% and maximum 2% leakage to the inside, they protect against very fine particles such as asbestos.

- ◎ Europe, they must comply with the European standard EN 14683, which has 3 levels of bacterial filtration efficiency (BFE1, BFE2, Type R). In the United States, they must respect ASTM standards which have **three levels of protection** (from low risk of exposure to fluids to high risk of exposure to fluids).

- ◉ In the United States, respirators must meet NIOSH (National Institute for Occupational Safety and Health) standards. Within this standard, there are several classes of respirators depending on the degree of oil resistance:
 - ◉ **Class N:** no oil resistance. A distinction is made between N95, N99 and N100. The number after the letter indicates the percentage of filtration of suspended particles.
 - ◉ **Class R:** mask resistant to oil for up to eight hours. Here again, a distinction is made between R95, R99 and R100.
 - ◉ **Class P:** a completely oil-resistant mask. There are also P95, P99 and P100.

- ◎ **So, Which Masks Protect Against Coronavirus?**
- ◎ A contagious patient should wear a surgical mask as soon as contagion is suspected.
- ◎ In Europe, for caregivers, it is necessary to wear a **respirator of at least class FFP2 or FFP3** for maximum filtration of particles and aerosols when caring for a patient who is infected or suspected of being so.
- ◎ In the United States, the N95 respirator filters 95% of airborne particles, and can even filter out bacteria and viruses, according to the [Centers for Disease Control and Prevention](#). So for caregivers, it is necessary to wear a respirator of class N, R or P.

HONEYWELL RESPIRATOR WITH REMOVABLE FILTERS (CREDIT: HONEYWELL)



- For respirators equipped with gas filters, if the wearer begins to perceive the smell of gas, he or she must immediately leave the work area and replace the filter. Similarly in the case of dust filters, if the wearer begins to perceive an increase in inspiratory effort, he or she should leave the premises and replace the filter. These masks are mainly worn by people working in contact with chemicals or by firefighters.

o

MAY BE A ANSWER FOR AEROSOL?



AEROSAL SURGEON?



[HTTPS://WWW.3DPRINTINGMEDIA.NETWORK/ISINNOVA-SHARES-3D-PRINTED-ADAPTER-TO-TURN-SNORKELING-MASK-INTO-A-NON-INVASIVE-VENTILATOR/](https://www.3dprintingmedia.network/isinnova-shares-3d-printed-adapter-to-turn-snorkeling-mask-into-a-non-invasive-ventilator/)

- <https://www.3dprintingmedia.network/isinnova-shares-3d-printed-adapter-to-turn-snorkeling-mask-into-a-non-invasive-ventilator/>



- ◎ While some designers had already created 3D printable adapters to transform Decathlon-like snorkelling masks into protective PPE masks,

COVID-19 MASK V2

3D PRINTABLE



1-2 HOURS TO PRINT
NO SUPPORT REQUIRED

- ◎ <https://cults3d.com/en/3d-model/tool/covid-19-mask-easy-to-print-no-support-filter-required>



DOES YOUR FACE MASK NEED A BREATHING VALVE OR NOT? YES IT IS REQUIRED

Durable Plastic
(PVC)



Flexible Rubber
for Exhalation



Durable Plastic
(PVC)





Surgical mask

N95 respirator



P100 respirator

Full face respirator



Self-contained breathing apparatus

WHO SHOULD CHECK WITH A HEALTHCARE PROVIDER FIRST?

- ◉ If you have a pre-existing medical condition, wearing a mask may make breathing more difficult because you must pull air through the mask as you inhale.
- ◉ People with known or suspected breathing problems, emphysema, chronic obstructive pulmonary disease (COPD), asthma, or cardio/pulmonary problems should consult with their physician before using one.
- ◉ If at any time during use of the mask you experience headache, nausea, dizziness or have difficulty breathing, immediately leave the area, remove the mask, get fresh air, and seek medical attention if needed.

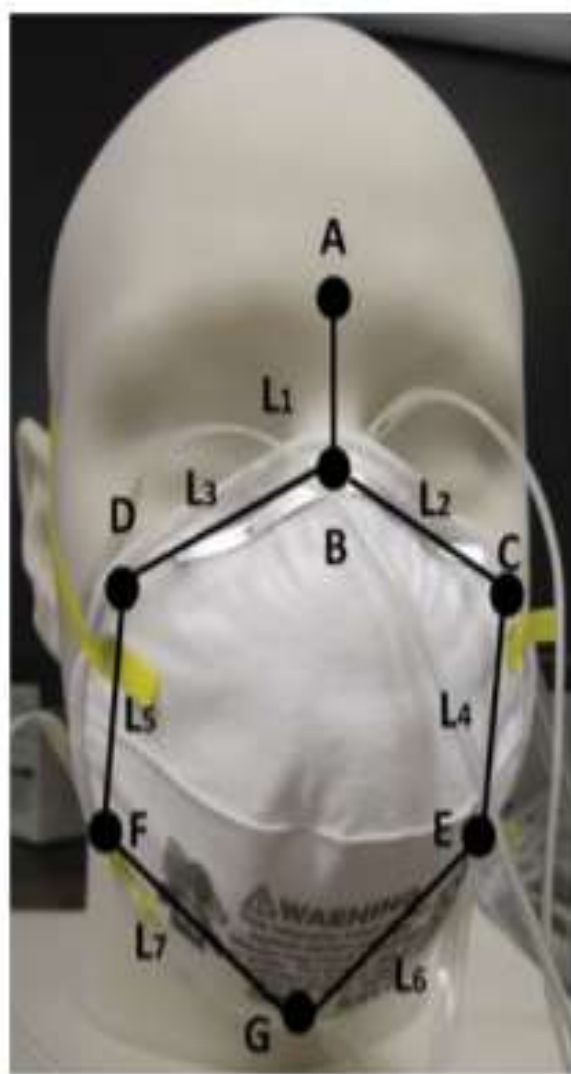
HOW TO WEAR THE N95 MASK?

- ◎ OxyBreath Pro Always read and follow the manufacturer's directions when using an N95 mask. It must cover both the nose and mouth to keep you from breathing in mold and dust. If it does not have a snug fit, it will not work properly. Correct fit of the mask requires contact with smooth skin. It will not work properly for people with beards or facial hair. Even one-day beard growth has been shown to let air leak in. Always use both straps on the mask to hold it in place to keep air from leaking around it.

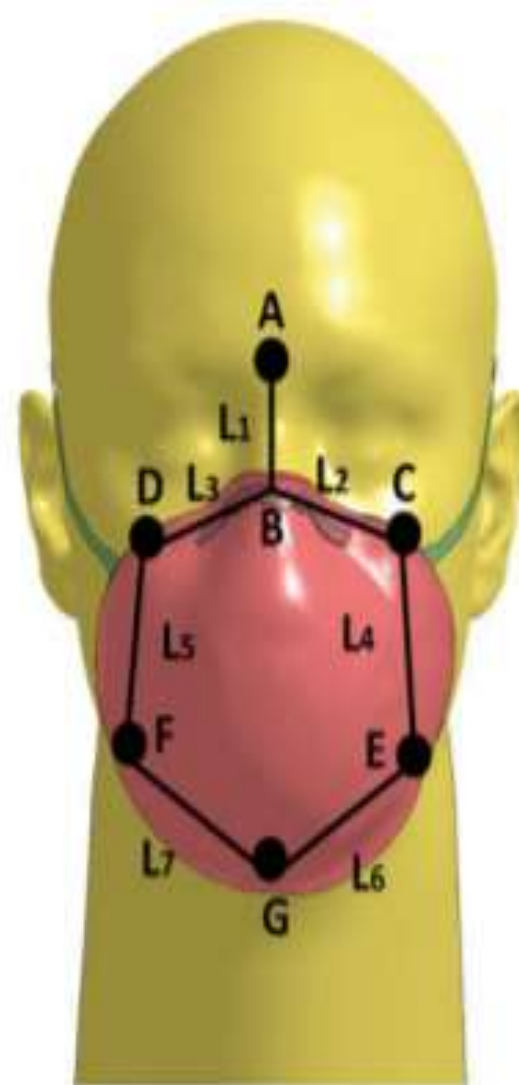
- ◎ **N95 v/s N99 mask-**
- ◎ N95 masks come with an N95 rating that has the ability to filter up to 95.99% of fine particulate matter. Fine particle matter means the dust particles present in the air which are too small that can be seen through naked eyes. Breathing polluted air can cause a number of health issues. Such as persistent headache, irritation in the eyes, nose, throat, and skin. Since PM 2.5 stays in the longest time in the air it is easily breathable, causing mentioned health issues.
- ◎ Wearing an N95 mask can help you breathe clean air. As they have either one valve or two that are dedicated to exhale the air. You can buy N95 pollution mask either by visiting pharmacy stores that sell certified mask or buy pollution mask online.

N99 Mask -

N99 mask promises to filter up to 99.99 particle matter efficiently. A lot of times people confuse themselves that cloth mask will filter dust particles the same way N99 mask does. However, cloth mask doesn't really work on the dangerous effect of pollution level. Hence, wearing a pollution mask that N99 approved helps in filtering dust, dirt, and other small airborne particles. This way you are breathing safe and healthy air when outdoors.



(a)



(b)

FIGURE 7. (a) Experimental measurements of contact area dimensions of a headform/N95 FFR combination; (b) computer-based determinations of contact area dimensions of a headform/N95 FFR combination (A: glabella, B: nasal bridge, C: left malar bone, D: right malar bone, E: left gonion, F: right gonion, and G: menton, L₁: upper nose, L₂: left nose, L₃: right nose, L₄: left cheek, L₅: right cheek, L₆: left chin, L₇: right chin). (color figure available online)

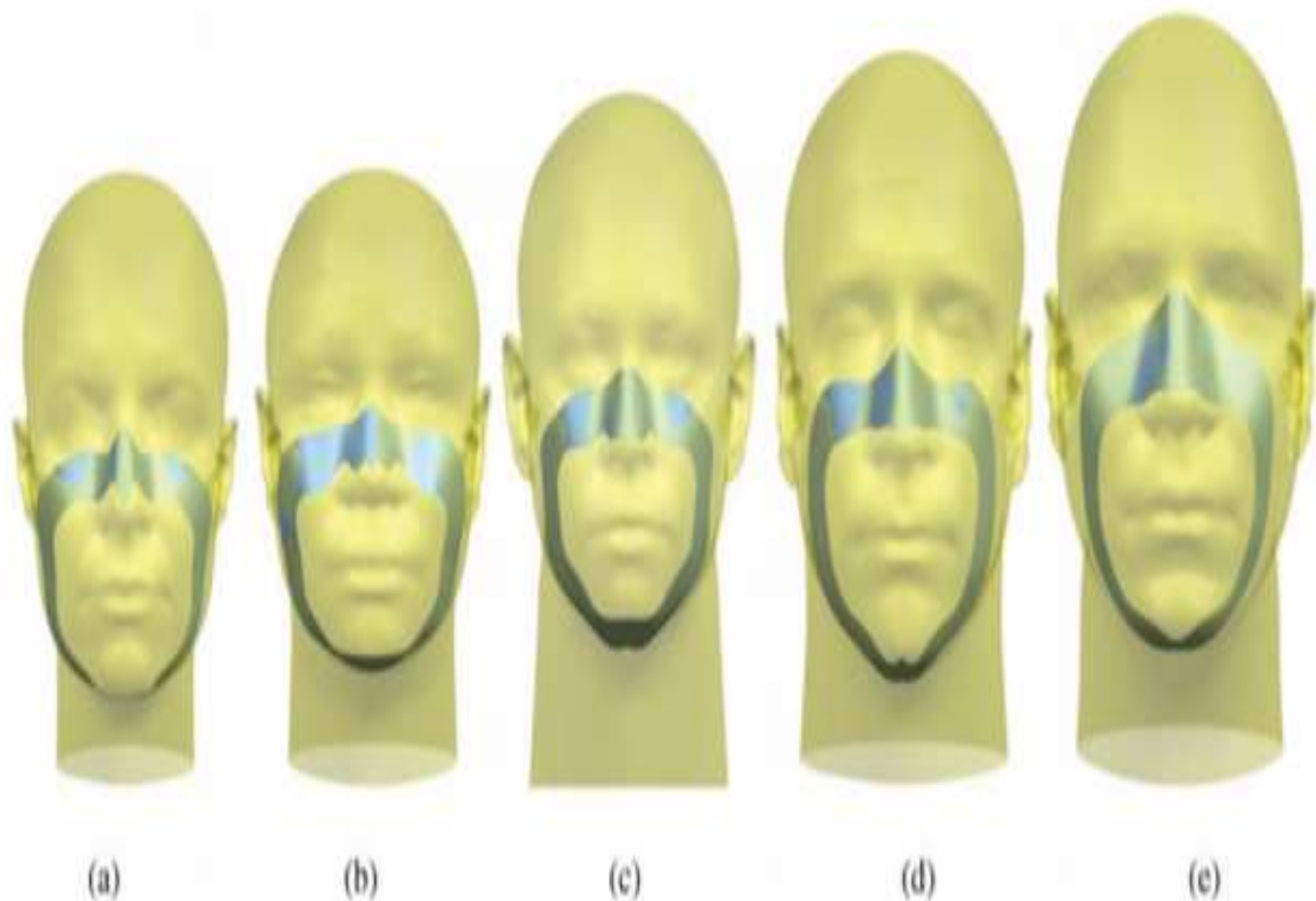


FIGURE 9. Superimposed contact areas of headform/N95 FFR combinations for the five sizes of headforms: (a) small; (b) short/wide; (c) medium; (d) long/narrow; and (e) large. (color figure available online)

AVERAGE CONTACT AREAS OF HEADFORM/N95 FFR

- Five superimposed contact areas and five average contact areas of headform/N95 FFR combinations can be used for improving the shapes of six types of N95 FFRs that were used in this study. To fit a headform, an improved N95 FFR should have a shape that is located within the headform's superimposed contact area and best covers the headform's average contact areas. Once more types of N95 FFRs are used for generating superimposed contact area and average contact area, the determined contact areas can be used in the future study of the N95 FFR customized design that is to fit individual people or target proportions of the population.

STUDY OF THE MICRO-CLIMATE AND BACTERIAL DISTRIBUTION IN THE DEADSPACE OF N95 FILTERING FACE RESPIRATORS

- ◉ In this work, the micro-climate features of water vapor condensation and temperature distribution in the dead-
- ◉ space of the N95 FFR during exhalation and inhalation were studied by use of CFD simulation and experimental
- ◉ investigation. An experiment was conducted to study the distribution of bacteria sampled from the inner surface
- ◉ of N95 FFR after wearing for 5 and 15 minute

- ◉ Simulation results show that the water vapor volume fraction around the FFR rises rapidly during exhalation, and that the largest concentration of water vapor is located in the core region at the end of exhalation.
- ◉ During inhalation, the concentration of water vapor significantly decreases. In addition, during inhalation, the liquid water on the inner surface of N95 FFR dramatically decreases because there is no additional water vapor being supplied and the re-evaporation of the liquid water occurs. Moreover, there is more liquid water condensing
- ◉ on the N95 FFR inner surface because it is subjected to direct exhaled airflow. Experimental results show that the measured relative humidity inside the FFR is approximately 1.5~2.6 times higher than that under the initial ambient condition of a temperature of 296.25 K and ambient relative humidity of 34.4%.
- ◉ results indicate that the wet and warm micro-climate may contribute to bacterial growth. Experimental results of the bacterial distribution indicate that more bacteria exist on the inner surface of the FFR close to the human chin where a larger relative humidity will take place.
- ◉ wetter and warmer region can be used to qualitatively estimate the bacterial distribution. In future work, we will study the microbes of patients with respiratory diseases.
- ◉

https://www.researchgate.net/publication/329192639_Study_of_the_microclimate_and_bacterial_distribution_in_the_dead-space_of_N95_filtering_face_respirators

TENT HOUSING

A DECONTAMINATION SYSTEM IN ONE
OF BATTELLE'S PARKING LOTS IN
COLUMBUS, OHIO.

TENT FOR MASKS





PHOTOS

Where Thousands of Masks a Day Are Decontaminated to Battle the Virus

- ◎ **N95 Grade Medical Protective Masks Market 2019: Deep Analysis of Current Trends and Future Demand by Top Key Players - Ansell, GERSON, Honeywell, Vogmask**

- ◎ **3M climbs on mask demand in latest coronavirus play**
- ◎ News: - Feb. 26, 2020, 3M is one of the top gainers citing demand for N95 respirator masks in short supply. U.S. health officials have been predicted need for 300 Million facemasks in the incident of a domestic coronavirus outbreak, and 3M is the biggest supplier of the masks, which are widely used by healthcare workers. Health and Human Services Secretary Azar has told House panel that the U.S. has 12 Million of N95 respirators stockpiled but would need significantly more in the event of an outbreak.
- ◎ **Request for Methodology**
@ <https://brandessenceresearch.com/requestMethodology/PostId/922>

THE UN

- According to the UN department of economic and social affairs, by 2050 the urban population of developing countries will reach 5.3 billion, with Asia expected to host 63% approximately 3.3 billion people and Africa nearly 20% of the world's urban population.
- Due to increasing geriatric population, the possibility of viral infection may rise which leads to increase the demand for the N95 grade medical protective masks. However, the N95 protective respirator mask may not provide full protection through the hazardous infections and it is avoided to use for the people with chronic respiratory, cardiac, or other medical conditions that make breathing difficult for the wearer to breathe

NIOSH RESPIRATOR FILTER CLASSES

NIOSH classifies the filtering media in respirators based on its resistance to oil and its particle filtering efficiency. The resistance to oil is designated as "N", "R", or "P". Particle filtering efficiency is designated "95", "99", or "99.97".



**NOT RESISTANT
TO OIL**

N95, N99, N100
Filters at least
95%, 99%, or 99.97%
of airborne particles

**SOMEWHAT RESISTANT
TO OIL**

R95, R99, R100
Filters at least
95%, 99%, or 99.97%
of airborne particles

**STRONGLY RESISTANT
TO OIL/OIL PROOF**

P95, P99, P100
Filters at least
95%, 99%, or 99.97%
of airborne particles

OILS

When products containing oil (like fuel, lubricating or hydraulic oils, solvents, paints, and pesticides) are sprayed or used in processes producing aerosols or droplets, the oil component may become airborne.



- ◎ The N95 masks that you buy are basically disposable Disposable N95 masks (above left), and they should be discarded directly into the covered garbage bin after use. The US-approved reusable N95 masks / Reusable Respirators are actually gas mask styles (above right), and they can be used freely with filter mats, as long as the filter mats are replaced regularly.

100-RATED RESPIRATORS

- ◉ <https://ellessco.com/blog/2019/12/n95-n99-n100-difference>
- ◉ **100-rated respirators** filter 99.97% of particulate matter. Some tiny trace amounts may still slip through, but it's not enough to be harmful without sustained exposure for long periods of time.
- ◉ Thus, the “weakest” respirator that still receives a classification is N95, which filters 95% of non-oil particulates. The strongest is P100, which filters 99.97% of oil and non-oil particulate.
- ◉ There are, of course, even more extreme forms of breathing protection available for cases where even a respirator won't suffice. These are typically closed-air systems, breathing out of tanks of compressed air similar to scuba gear or even a space suit. When you're operating in an environment so toxic that even a tiny amount of exposure can be deadly, it's better to be safe than sorry.

CORONAVIRUS MASKS



- ◎ <https://findme10.com/best-coronavirus-mask/>

MASP RESPIRATOR 3M



- ◎ If you're looking for a mask that will not only do the job for coronavirus but many other things including fire or gas leaks then this is the best mask you can buy.

Unlike other models I have reviewed this is a full face mask meaning your entire face is placed into the mask and not only your lungs are protected but your vision also. This is an N95 mask with replaceable carbon filter elements designed to keep you safe from viruses but also any airborne particles such as smoke.

- ◉ Comfortable to wear: The respirator is made of food-grade silicone material, and the elastic silicone fits the facial skin perfectly to achieve a firm seal. The soft silicone will not make you feel uncomfortable. The headband can be adjusted.
- ◉ Low breathing resistance: The flow valve in front of the respirator can effectively reduce heat and moisture, promote breathing, and reduce the risk of fatigue for users.
- ◉ Design: The filter box can effectively remove particles larger than 99.95% and can effectively prevent dust.
- ◉ Safe and reliable: The gas mask with dual filtering function can effectively and comfortably protect you from certain concentrations of specific particles. Can effectively protect the daily industrial gas pollution.
- ◉ Do not use this canister in a carbon monoxide environment. When not using a mask, securely close the lid of the lid and the bottom stopper and keep it in a cool place. Canisters should be stored in a dry, clean, ventilated, and heat-resistant warehouse.

3M RESPIRATOR



- ⦿ let's not mess around, this is the kind of mask you need if you're looking for something to be 100% effective. This virus can spread through the air, mouth, ears and eyes. This mask will protect everything except the ears and as listed above the best thing for the years is cotton balls with tea tree oil (the oil kills viruses).

This is an excellent mask and comes complete with 4 replacement N100 elements (although I would grab more if you can). If you're serious about protection this is where I would go. The masks below that protect your mouth only leave the possibility of infection through your eyes, eye protection is every bit as important as mouth protection.

- ⦿ Features
- ⦿ Vapors and particulates depending on your individual needs
- ⦿ Grey
- ⦿ Medium
- ⦿ <https://findme10.com/best-coronavirus-mask/>

INDIA ...MASKS

- ◎ <https://www.tangylife.com/blog/best-mask-for-coronavirus-protection/>

PAPR





⦿ **Benefits of PAPR Systems**

- ⦿ What are some of the benefits of PAPRs? Here are just a few advantages:
- ⦿ There is no fit test required for loose-fitting hoods
- ⦿ PAPRs used with loose-fitting headgear can be worn with a limited amount of facial hair
- ⦿ Some models offer particulate and acid gas/organic vapor protection options
- ⦿ Hoods and helmets may offer limited splash protection for the face and eyes
- ⦿ PAPR systems may provide assigned protection factors (APF) of either 25 or 1000
- ⦿ Most components can be cleaned, re-used or shared
- ⦿ When using certain disposable, loose-fitting headgear, patients can see the face of the healthcare provider, helping to provide for better interpersonal communication



MAXAIR® CONTROLLED AIR PURIFYING RESPIRATOR

- MAXAIR® Controlled Air Purifying Respirator (CAPR®) system is advanced respiratory protection equipment approved by the US National Institute for Occupational Safety and Hazard (NIOSH) for protection against aerosolised and airborne particulates.
- Developed by Bio-Medical Devices International, the equipment has become the respirator of choice for various healthcare organisations amid the 2019-n-CoV [coronavirus](#) outbreak for standard protection of the healthcare professionals as per CDC guidelines against COVID-19 during the coronavirus treatment.
- The personal protective equipment (PPE) has also seen approval by the US Occupational Safety and Health Administration (OSHA).

- ◎ **The system contains four primary components, a helmet with power cord, battery, belt and charger. Various components, fan, filter, airflow system and motor, are also integrated.”**

DRAGGER 50 DOLLAR PAPR



◎ **Draeger X-plore 8000 Standard Hood**

- The Draeger X-plore 8000 standard hoods are made from a lightweight and cost-effective material and are intended for limited use applications.
- The short version of the hood covers the head and face but leaves the ears uncovered for good communication.
- The long version of the hood provides full protection for the head, including the face and neck area. The dual-layer neck guard provides additional safety when combined with a protective suit.

◎ **Draeger X-plore 8000 Premium Hood**

- The Draeger X-plore 8000 premium hoods are made from a reusable, oil and water-repellent material. They provide a high level of chemical protection and a virtually unrestricted field of view.
- The short version of the hood covers the head and face but leaves the ears uncovered for good communication.
- The long version of the hood provides full protection for the head including the face and neck area. The dual-layer neck guard provides additional safety when combined with a protective suit.
- Both versions can be cleaned and disinfected.

- ◎ **3M Universal Size, PAPR/SAR Compatible Helmet with Face Shield**
- ◎ **Green, 6-Points, Compatible with Adflo & GVP**



COMPARE THE N95 FFR TO THE THREE PAPR'S.

- While the tolerability of an N95 FFR is subject to many variables, one of the major problems impacting the effectiveness of respirators is user discomfort. One of the most frequent complaints from N95 FFR users are related to the discomfort from facial and body heat. Thermal discomfort has also been shown to be a main reason for non-compliance when using the N95 FFR.

- study conducted required twelve subjects to wear three different types of respirators, including an N95 FFR, and two PAPR's. Each subject walked on a treadmill while undergoing physiological response monitoring. Results showed that when conducting low moderate work over a one hour period, there were no significant differences between the one FFR and the four PAPR's tested, in terms of heart rate, respiratory rate, oxygen saturation, transcutaneous CO₂, exertion, facial heat, and body heat. However, respirator dead space heat and humidity as well as facial temperature, were significantly higher for N95 respirators, compared to the other PAPRs



**Tight-Fitting Full Facepiece
Powered Air-Purifying Respirator
(PAPR)**

APF=1,000

Needs to be fit tested



**Tight-Fitting Half Facepiece
Powered Air-Purifying Respirator
(PAPR)**

APF=50

Needs to be fit tested



**Loose-Fitting Powered
Air-Purifying Respirator (PAPR)**

APF= 25



**Hood Powered Air-Purifying
Respirator (PAPR)**

APF= 25

[HTTPS://RESEARCHREPOSITORY.WVU.EDU/CGI/VIEWCONTEN
T.CGI?ARTICLE=4776&CONTEXT=ETD](https://researchrepository.wvu.edu/cgi/viewcontent.cgi?article=4776&context=etd)



②) MAXAIR CAPR® 710 System DLC-double shroud (loose-fitting), shown in figure 4, consists of a helmet (2065-03), battery (2000-36), charger (2600-01), belt (2000-76), and filter (2160-10). The airflow is set a 6 cfm and the total weight is 2.5 lbs.

3M™ VERSAFLO

- ◎ 3M™ Versaflo™ TR-600-ECK (loose-fitting), shown in figure 3, consists of a motor (TR602N), a battery (TR-971), easy clean belt (TR-627), airflow indicator (TR-971), a length adjusting breathing tube (BT-30), a chemical cartridge, and a filter. The standard airflow is 6.7 cfm and the system weights 4.5 lbs.



Figure 3: 3M™ Versaflo™ TR-600-ECK

3M™ AIR-MATE™



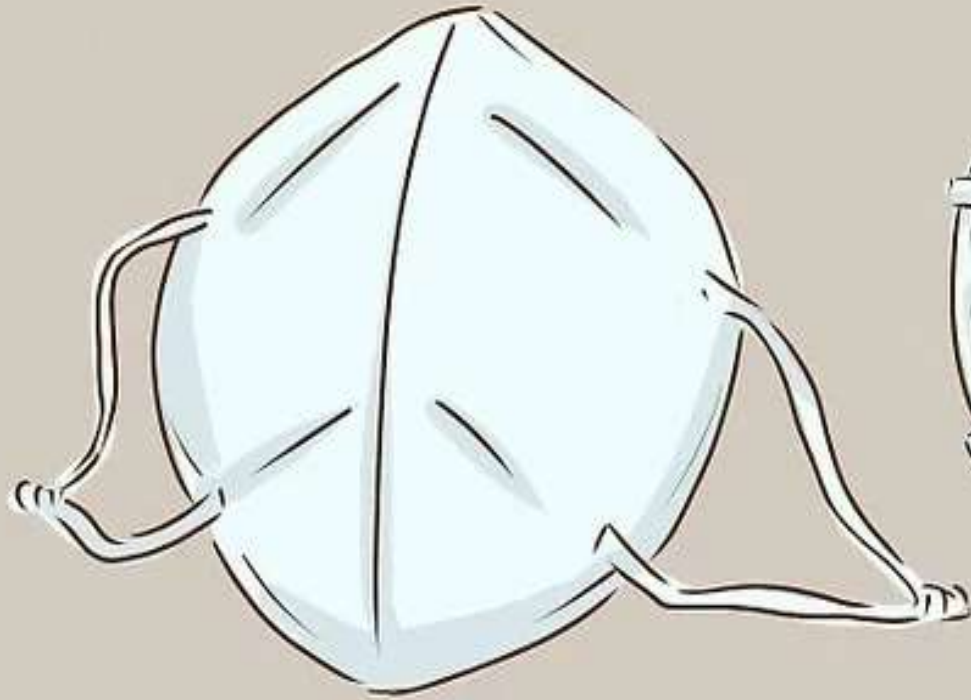
Figure 5: Air-Mate™

- 3M™ Air-Mate™ Belt-Mounted High Efficiency PAPR, shown in figure 5, consists of a hood assembly (520-03-63R01), battery (007000015R01), high efficiency filter (451-02-01R0), nylon waist belt (021-14-00R01), and an airflow indicator (021-14-00R01). The airflow can be set at different levels and the total weight is 3 lbs.

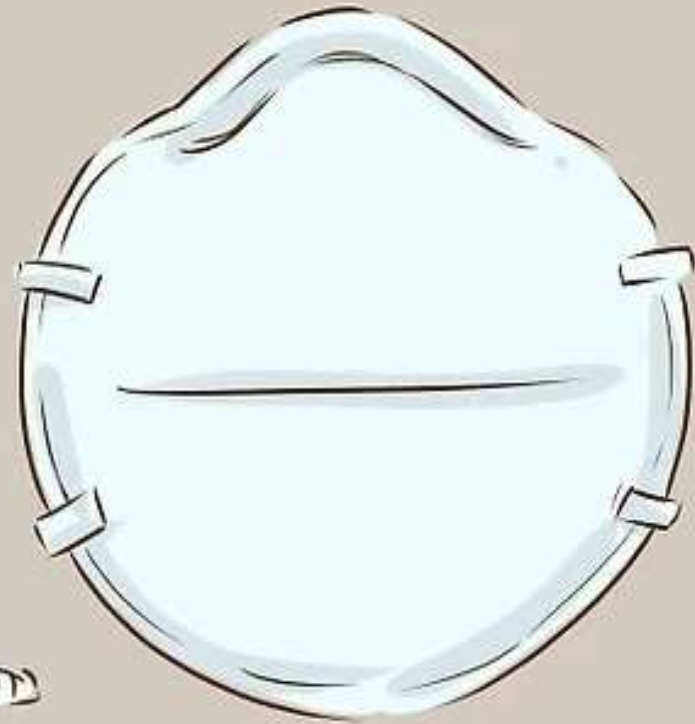
PAPRS COMBINED TO THE N95

PAPRS combined to the N95. These four categories were general comfort, pressure or pain, interference with wearing glasses/goggles/contacts, and how many hours could you wear this respirator continuously. Also, when □

clear line of vision and perceived efficiency against biological hazards. This is most likely due to the variation in the different types of PAPR's, since we combined the data from all three PAPR's. For instance, MAXAIR and AIRMATE were each preferred in almost all categories



P N95 Mask



R N95 Mask

**RESPIRATORY GAS MASK 6800 EN136 CHEMICAL
PROTECTION CORONAVIRUS COVID-19 BOOK
WITHOUT CARTRIDGE**



3935-GG-C FULL FACE SAFETY GOGGLE WITH DETACHABLE FACE SHIELD



- 3935-GG-C Full Face Safety Goggle with Detachable Face Shield
-
- - Full Face Protection
 - Premium grade Anti-Fog safety goggle with detachable polycarbonate shield
 - Anti-Fog to last over 6 months based on application
 - Features a Nylon head strap
 - Meets CE “N” standards for EN166:2001
 - Meets ANSI/ISEA Z8.1-2010 Standard for both goggle and mask
-

- Dr. Sarah Henderson, senior scientist at the B.C. Centre for Disease Control, says in a video posted on YouTube that N95 masks can be helpful if they are properly fitted. But surgical masks are of no help. People working outdoors in wildfire smoke should consider wearing a mask. “For the general public, however, we really recommend that you simply seek a cleaner air environment, because those masks make it harder to breathe if you’re already having breathing difficulty to begin with.”

<https://www.youtube.com/watch?v=yA3XM4p3Q7U&feature=youtu.be>

- ◉ Interior Health has issued a bulletin about mask use. Because of the limitations of masks, it's better to try to stay indoors, it says. "The best way to protect the health of yourself and your family during smoky sky events is to seek cleaner air. You can buy a HEPA air cleaner for a room in your home, you can go to a building with a good air filtration system, or you can leave the area. If this is not practical, it may help to simply stay indoors and reduce your physical activity."

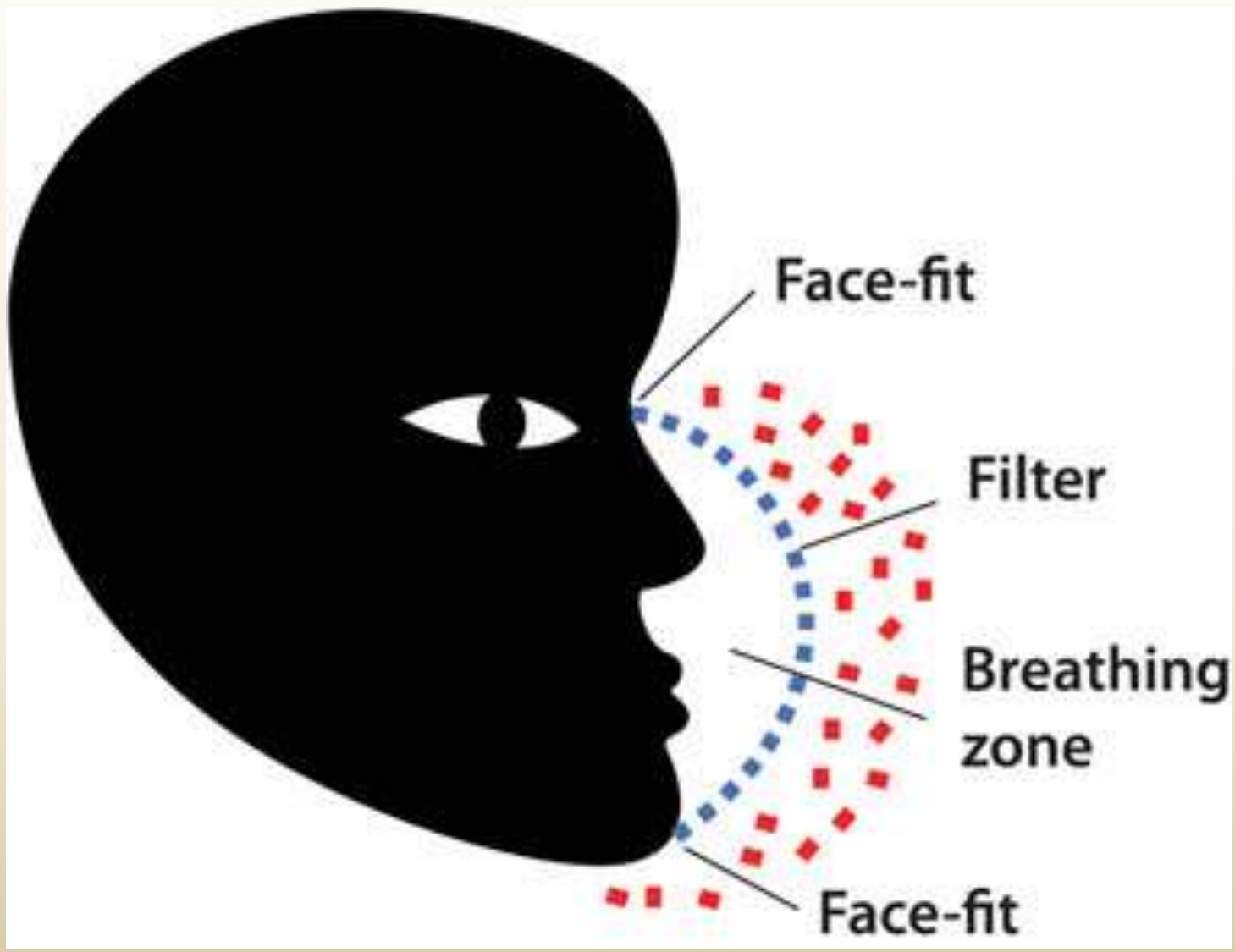
<https://www.interiorhealth.ca/YourEnvironment/EmergencyPreparedness/Documents/Using%20Face%20Masks%20During%20Wildfire%20Smoke%20Events.pdf>



- ⦿ An FAQ on wildfire smoke from WorkSafe B.C. makes a distinction between “masks,” which are not designed to filter out particulates, and “respirators” such as the N95, which do filter. It emphasizes the need for proper fit.
<https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/current-wildfire-situation/wildfire-smoke-faq-pdf-en.pdf>
- ⦿ Instruction booklets in PDF form from WorkSafe B.C. on how to select and fit a respirator.
<https://www.worksafebc.com/en/health-safety/tools-machinery-equipment/personal-protective-equipment-ppe/types/respiratory-protection>

- ◉ An instruction sheet from the Washington State Department of Health says masks such as the N95 and P100 – or respirators to be more precise – provide some protection for your lungs from particulates, but they do not protect you from hazardous gases such as carbon monoxide and formaldehyde.
<https://www.doh.wa.gov/Portals/1/Documents/Pubs/334-353.pdf>
- ◉ The AirNow website, hosted by the U.S. Environmental Protection Agency, emphasizes that dust and surgical masks do not provide protection from wildfire smoke.
<https://www.airnow.gov/index.cfm?action=smoke.index>
- ◉ An EPA document on selecting the right respirator and putting it on correctly.
https://www3.epa.gov/airnow/smoke_fires/respiratory-protection-508.pdf
- ◉





RESPIRATORY CONSEQUENCES OF N95-TYPE MASK USAGE IN PREGNANT HEALTHCARE WORKERS—A CONTROLLED CLINICAL STUDY

- Breathing through N95 mask materials have been shown to impede gaseous exchange and impose an additional workload on the metabolic system of pregnant healthcare workers, and this needs to be taken into consideration in guidelines for respirator use. The benefits of using N95 mask to prevent serious emerging infectious diseases should be weighed against potential respiratory consequences associated with extended N95 respirator usage.

IS 14166



CM/L-0003715864

Full Face Mask

6-Strap Head Harness

- Facilitates even distribution of weight and gives head support
- Good skin comfort in tough conditions
- Provides leak-proof fit

Option of TPE & Textile harness

Neck straps

Adjustable for better handling

Zero power hard coated visor

- PC lens impact resistant for face protection
- High clarity, durability and double anti-fog

Inner face piece silicone

Prevents fogging on visor

Option to use twin filters

Special Venus threads for superior ergonomic fit

Speech diaphragm

For easy and audible communication

Standard Thread

RD40 Thread for connection to any standard thread, gas filter as per IS 14138 (Part1): 1994



Adjustable Penta Belt

- Gives head support and even distribution of weight
- Good skin comfort in tough conditions
- Provides leakproof fit

Produced from TPE

- Easy to use
- Low maintenance

Inner face piece

Prevents fogging on visor

Compatible with Venus RF-V7700 / RF-V7800 Filters for class 2 & class 1

Silicone exhalation valve

Efficient ventilation system with easy maintenance

Venus SCBA 215-7ACX Item # 13433 / 215-6AS Item # 13434

(Type 2, high mobility backplate V15 design, V-777 / V-666 FFM, Analogue gauge, CC Cylinder with case / Steel cylinder)

Venus SCBA 215-7ACX

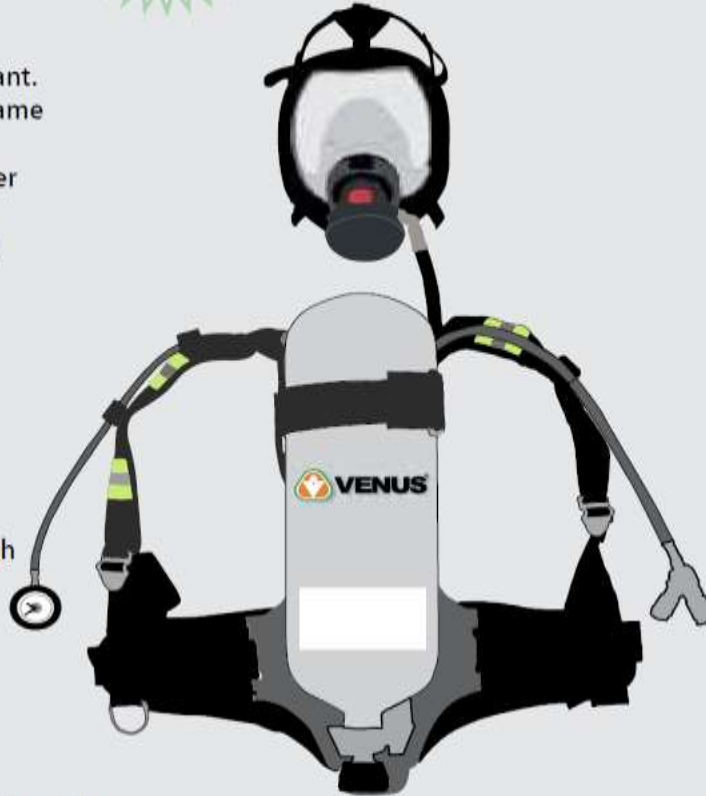
- Face mask V-777
- V-777 provides wide field vision with Kevlar textile head net harness
- Visor is made of Polycarbonate Hard coat & has Anti fog capability
- Impact resistance, Heat & flame resistant.
- Meets class 3 requirements of multi flame burner & radiant test.
- Carbon composite light weight Cylinder 6.8 l, 300 bar, Work Life :45 min.
- Pressure reducer valve & cylinder with PESO approved
- Set weight (filled CC cylinder) approx. 10.5 kg.
- ABS carrying case comes for storage of set

Height Adjustable Backplate design which is robust & easy to use

- Polyamide material for good Low / high temperature, chemical resistance, Flame / radiant heat resistance
- Ergonomically designed to suit shape of human back
- Height adjustable clip to suit profile of different users
- High mobility 3 axis rotating fixture which is designed to disperse the weight of the cylinder efficiently
- Pressure reducer valve is fixed on the backplate by wire dowels.

Analogue gauge

- Anti-collision, explosion proof & water-proof design
- Fluorescent display for reading in darkness
- Rubber cover provided dustproof, Water proof.



Demand Valve

- Connection to breathing apparatus is capable of 360 degree rotation
- Easy access button to increase the flow air
- Compact and robust design with excellent pneumatic performance.
- Ensure large flow and safe air supply by using manual for air flux button
- Flame retardant casing made using high strength engineered plastics

Venus SCBA 215-6AS

- Face mask V-666
- Neoprene Rubber harness tested upto 900° C.
- Visor is made of Polycarbonate Hard coat & has Anti fog capability
- Impact resistance, Heat & flame resistant.
- Meets class 2 requirements of multi flame burner test.
- Steel Cylinder 6.2 l, 300 bar, Work Life :45 min.
- Pressure reducer valve & cylinder PESO approved
- Set weight (filled CC cylinder) approx. 17.5 kg.

Y Hose Quick release coupling (QRC) connection

- Provides auxiliary air to two users in life saving situations.

Nomex Harness for increased rigidity

- Nomex material with Flame / radiant heat retardant capability.
- Anti-skidding, anti-tearing & comfortable to be worn for long periods.
- Reflective fabric sewn on harness for good visibility
- Buckles are made of heavy duty 304 Stainless steel



VENUS V-666-MN



Steel cylinder



Backplate with Analog Gauge

[HTTPS://WWW.VENUSOHS.COM/CA
TEGORY/SUPPLIED-AIR-SA](https://www.venusohs.com/category/supplied-air-sa)

**Hoods for SA & PAPR (Powered Air Purifying
Respirator)**



CAS CLEAN AIR SYSTEM SAVES EVEN
THE FUTURE LIFE OF THE
FIREFIGHTERS
PHOTOS
COMMENTS



- ◎ CAS is an air cleaning mask concept that has been specially designed for firefighters with the ability to filter particles smaller than 2.5 microns which can be most commonly found in burning spots and are the most hazardous for human health. Moreover, this innovative mask facilitates the firefighter to communicate with others through voice amplifier and transparent window. CAS features a tube that automatically kicks compressed air in as soon as it detects a sudden increase of the carbon monoxide level with the help of the carbon monoxide meter inside the mask and triggers a signal to notify the firefighter about it. If the level goes too high to handle, it starts feeding the firefighter clean air from the tube placed in the backside of the neck to ensure smooth breathing. Besides, the mask can be used parallel with a helmet through the easy to attach and remove clasp.

INSIDE THE AIRTIGHT HOOD CPAP



Clear view
Wide field of vision due to a specially fabricated visor which has Anti fog coating.

Inner mask
Inner mask prevents misting and minimizes Carbon Dioxide dead space.

Elastomeric neck seal
Uniquely designed hood with PVC coated materials provides ozone resistant neck seal.

Quick Release Pin

Whistle
Integrated whistle warning for depleted air

Carbon Composite Cylinder
Light weight cylinder for easy carrying

Demand valve

- Turns the air into a suitable pressure level for human body
- Prevents fogging on the visor



PF 23 / PF 33

**New!
2019**

Features & Benefits

- No trailing leads, hoses, or cables provides improved safety (no “snagging”) and permits use in wider range of applications compared to traditional back mounted powered respirators
- No belt mount blower unit required thereby improving user comfort. Ideal for use with a range of protective work wear
- Modular design can be configured to exactly match the required application (see options)
- No requirement for face fit testing and can be used safely with beards
- Lightweight integrated respiratory, head, eye, face protection
- Proven low running costs with exceptional protection levels
- ESM for Power On, Low air flow warning, Normal operation
- Protection factor NPF: 500



PF 23

Item # 13403



PF 33

Item # 13404

Air flow	P3 Filter – 220 lpm initial, 170 l/m minimum ABEP3 Filter – 205 l/m initial, 170 l/m minimum	
Operation Time	8-hrs (normal air flow, two fully charged battery packs fitted)	
Charging Time	2.5 hrs from fully discharged	
Weight	1.5 kg (nominal)	
Decibel	< 70 dB	
Battery	4-cell, nominal 4.8V, capacity 2.2AH per pack NiMH	
Certification	Respiratory Protection- Head Protection- Environmental Protection- Eye/Face Protection-	EN 12941 TH3 PF23 Bump cap EN 812 IP54Cat2:IP44 (Pending) PF23 EN 166 2002 1B3 PF33 EN 166 2002 1B39

SHIELD INSIDE HOOD





- ◎ **exolung** is a surface-supplied diving system, which means it uses a buoy that floats on the surface of the water to provide the diver with air. doubling as a safety restraint, a hose measuring 39 feet (12 meters) connects the buoy with the water bell worn on the front of the torso.

EXOLUNG



- ◎ <https://www.designboom.com/technology/exolung-underwater-air-supply-divers-01-16-2020/>

3M™ VERSAFLO TR-600 SILICA SAFETY PAPR KIT - WITH INTEGRATED HARD HAT



PURE OXYGEN PERFECTION
YANKO DESIGN - FORM BEYOND
FUNCTION



POC ZEPHYR







The goal of this project was to alter an existing company's position in the market while keeping their design style and company values constant. Our team chose the company POC. POC produces high-end, visually stunning, safety equipment for gravity sports such as mountain biking and skiing. I decided to create a gas mask for the fire services targeting the problems with current masks.

PURE OXYGEN PERFECTION



PACIFIC RIM JAEGER DRIFT PILOT HELMET



⦿ Negative pressure



C-THRU
SMOKE DIVING HELMET

SKETCH OF 3D PRINTED SHIELDS



[HTTPS://CLEANSPACE TECHNOLOGY
.COM/HEALTH/](https://cleanspacetechnology.com/health/)





CleanSpace® is the world's lightest powered respirator: delivering high protection from harmful airborne substances like silica.

- ✓ CE Mark & AS/NZS1716 Approved
- ✓ ANSI Z87.1+ Impact Rated Protection
- ✓ Training tools and product specialist support available





- CleanSpace Respirators run an intelligent algorithm that delivers clear fresh air on demand. Our proprietary AirSensit System adjusts the air flow in response to wearer's breathing no matter how hard the wearer is working, making it a remarkably comfortable respirator mask even over long periods of wear.”
- Dr Alex Birrell, CEO

- ◎ Applications
- ◎ Clinical care, infectious disease and emergency care
- ◎ Laboratories
- ◎ Pharmaceutical and bio-production facilities
- ◎ Research facilities
- ◎ First responders
- ◎ Handling & disposal of biohazards

3M VERSAFLO M-SERIES HEADTOPS



JACKSON SAFETY 18629 V90 GOGGLE
AND FACESHIELD, STANDARD, CLEAR
WITH BLUE TINT



What Are The Different Hazmat Suit Levels?

Level A



Level B



Level C



Level D



LEVEL B HAZMAT SUIT

What Are The Different
Hazmat Suit Levels?



LEVEL B

HAZMAT SUIT

- ◉ <https://www.dgdeclaration.com/different-hazmat-suit-levels/>
- ◉ very similar to Level A, the Level B suit is extremely protective and the difference is that these suits contain less skin and outer body protection compared the aforementioned level.
- ◉
- ◉ These are utilized when the wearer may require less skin protection but still a very high level of respiratory protection.
- ◉
- ◉ Level B suits require:
 - ◉ Full face Self Contained Breathing Apparatus ([SCBA](#))
 - ◉ Two-Way radio attached either inside or outside the suit to avoid contamination
 - ◉ Chemical-resistant gloves
 - ◉ Proper footwear including Safety boots with shanks on the outside
 - ◉ Secured wrist, ankles, face-piece and waist areas for splash protection
- ◉



ATM Annals of Translational Medicine - AME Publishing Company

A new horizon for the use of non-invasive ventilation

Visit

ITALIAN SNORKEL MASK



IMAGE CREDIT : @2CATSAB/TWITTER



Diving Mask Full Face Mask Underwater 180 Degree View Leak-Proof
GoPro Compatible Waterproof Anti Fog Single Window - Swimming
Diving Scuba Silicone - For Adults Kids Pink Green Blue Black Black
#05006771

★★★★★ (11)

• The special system "On all face" allows to reach quickly the patient's face with one pre-connection and
 • The special system "On all face" allows to reach quickly the patient's face with one pre-connection and
 • The special system "On all face" allows to reach quickly the patient's face with one pre-connection and

Helmets for NIV in CPAP and PSV

Helmets for NIV in CPAP and PSV - HAROL
online.fliphtml5.com

Single patient CPAP helmet HAROL - up - Special features

- 24 size head provides higher safety in the comfort and efficiency of the therapy
- Quick connection for fixed or adjustable PEEP valves
- Integrated anti-suffocation device (anti pop-off valve)
- Pressure gauge for the PEEP is integrated in the receiver
- Easy for transportation: stored with inflatable pump and inflatable optional device in
 the receiver

Size	Accessories	Weight
CPAP 10401X	Single patient CPAP helmet Pure HAROL - up to 2 pieces	1,2 kg
CPAP 10402X	Single patient CPAP helmet Pure HAROL - up to 2 pieces with PEEP valve adjustable from 2 to 20 cmH ₂ O	1,2 kg
CPAP 10403X	Single patient CPAP helmet Pure HAROL - up to 2 pieces with anti-suffocation device for breathing and high flow PEEP	1,2 kg
CPAP 10404X	Single patient CPAP helmet Pure HAROL - up to 2 pieces with PEEP valve adjustable from 2 to 20 cmH ₂ O and special device for transportation and inflatable pump	1,2 kg

• It is necessary to specify the size of the helmet according to it with size of the face-remedy.
 • Small Size - circumference of the head 50-55 cm
 • Medium Size - circumference of the head 57-62 cm
 • Large Size - circumference of the head 60-65 cm
 • Extra Large Size - circumference of the head 65-70 cm

Helmets for NIV in CPAP and PSV

Helmets for NIV in CPAP and PSV - HAROL
online.fliphtml5.com

NEWS

The first and unique single patient helmet in two pieces

HAROL



Helmets. Harol (A) NIV10201, (B) NIV103...
researchgate.net

Related images



Product

OTS Guardian Full Face Mask | Scuba Gea...
scubagearcanada.ca - In stock



Product

OTS Guardian Full Face Mask
americandivingsupply.com - In stock



Product

OTS Guardian | Dive Right In Scuba - Plain...
diverightinscuba.com - In stock



Product

OTS Guardian Full Face Mask, *Buy Ocea...
diveseekers.com - In stock







WITH NASAL
PRONGS AND
OXYGEN



- Connected to bipap in addition to n95 comfortable breathing

- ◎ What we need is a Nasal cannula-based NIV. This system humidifies air, mixes it with oxygen and then pushes a constant stream of it into doctors lungs. If we can design a simple and working system it eases the breathing for surgeons

- ◎ **Calling All Makers With 3D Printers:**
- ◎ **Join Critical Mission To Make Face Masks And Shields For 2020 Healthcare Workers**



Save Lives w 3D Printed Face Shields



- ◎ The Czech Institute of Informatics, Robotics and Cybernetics is responsible for the design you see above of all the N95-looking versions. They are in the midst of testing, evaluating, and getting it approved (through different standards entities), but you can tune into their page: [CIIRC CTU Develops Own Prototype of CIIRC RP95 Respirator / Half Mask](#). Kudos on this amazing and ultra-fast work. Note, it is not yet available for fused filament fabrication (FFF) 3D printing (FDM is a more common term, but trademarked by Stratasys).
- ◎ Materialise is one of HP's partners and they created a number of [free to download files for COVID-19 prevention](#), including the Hands-Free 3D-Printed Door Opener found on the HP site above, plus a Shopping Cart Handle.
- ◎ This ongoing GoFundMe: [Save Lives w 3D Printed Face Shields](#) is impressive and inspiring —

- ◎ The MatterHackers initiative is called the [COVID-19 Additive Manufacturing Community Response Hub](#) and it will “connect those in the U.S. who need medical aid (Hospitals and Govt. Agencies) and those who can create it using Digital Manufacturing, for which MatterHackers has a broad base of customers to engage with.” It has been live for three days and hundreds have signed up.

<https://www.forbes.com/sites/tjmccue/2020/03/24/calling-all-makers-with-3d-printers-join-critical-mission-to-make-face-masks-and-shields-for-2020-healthcare-workers/#d0f1c3f75006>



One of the biggest voices through all of these rapid changes has been Joseph Prusa, maker of the Original Prusa i3 MK3S 3D printer, and well-known for his commitment to the 3D printing community as a whole, including researching solutions at warp speed to make a difference in this COVID-19 crisis. After seeing a number of projects trying to help healthcare workers, he laid out a position that face shields was the way to go: *From Design to Mass 3D printing of Medical Shields in Three Days*. He then shared his [design with instructions and files: Prusa Protective Face Shield - RC2](#).

- ◉ ***These tweets will get you to other resources and files and people:***
- ◉ [Alex Gertner on Twitter](#): "St. Joseph Health in Washington is making their own face shield from common supplies. I reached out to them and they generously shared their instructions on how to make these face shields: Please share widely #COVID19 #coronavirus"
- ◉ [Joel Telling - 3D Printing Nerd on Twitter](#): "On @KING5Seattle in 30 minutes chatting #3dprinting face shields! cc: @josefprusa @erikcederb @repkord @David_Tobin @MasksForDocs <https://t.co/6haNxxg2rws>" / Twitter



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Johns Hopkins Designs More Protective Ebola Healthcare Worker Suit



- ◎ The suit aims to reduce the possibility of infection as well as to provide air circulation under the garment, a particular concern in the hot, humid areas of West Africa where Ebola is prevalent. The hood (shown above) is integrated into the suit and provides a large visual area for the wearer, as well as ample air vents *and* a cooling system originally designed by Johns Hopkins cardiologist [Harikrishna Tandri](#) to cool down patients suffering from cardiac arrest.
- ◎ The Ebola suit wraps around the body, cocoon-like, making it easier to don and disrobe. Additionally, it opens and is vented in the back, minimizing risk of infection. In this video, you will see more of the suit's protective features...

COVID-19 MASK V2 (FAST PRINT, NO SUPPORT, FILTER REQUIRED)



- **Printer Brand:**
- Creality
- **Printer:**
- Ender 3
- **Rafts:**
- No
- **Supports:**
- No
- **Resolution:**
- 0.2
- **Filament:** [WOL3D PLA](#)
- **Notes:**
- **Print Speed:** 100mm/s

<https://www.thingiverse.com/make:775736>

WHY NOT SURGEON USE AS MODIFIED PAPR



- ◎ Italian doctors fighting on the coronavirus frontline are using 'bubble helmets' to treat critically-ill patients in need of breathing assistance



◎ If you thought Venus had the worst weather, just wait until you leave the Solar System. Concept for methane-rainproof outdoor clothing.

◎



Q

Ampshield Arc Flash

Shield Kit with brim and adapters

AMP-12-RW-HT

The Highly Transparent (HT™) Arc Flash Protective Face Shield Kit is rated to 12 cal/cm². Featuring new technology that provides the arc flash head protection you need, now in a highly translucent arc flash faceshield, allowing enhanced color visibility resulting in a purer view. The product is designed to protect eyes and face, if used as intended, against the mechanical and thermal hazards of an arc flash during live working or when staying in the vicinity of live parts. It is not intended for arc welding, especially not to protect against long term high heat, chemicals or any other radiation than emitted by an arc flash.

A PROPER FULL FACE GAS MASK WITH A MILITARY NBC FILTER WOULD DO THE JOB.
AND OF COURSE THIS ALSO PROVIDES GOOD PROTECTION AGAINST VIRUSES. BUT IN EVERYDAY LIFE NOBODY WANTS TO WALK AROUND LIKE THIS.




https://www.honeywellsafety.com/Products/Protective_Clothing/BSL_4.aspx?site=/europe

HONEYWELL SAFETY



- ◎ **BSL 4**
- ◎ Ventilated and reusable pressurised protective suit for being used in Bio Safety Level 4 (deadly viruses) laboratories worldwide. Designed for multiple use in BSL4 laboratory.

	Product Numbers	Details
	CC8486203	<p>BSL 4-1</p> <p>BSL 4-1: ventilated protective suit for biological environment. With welded booties. Made of white reinforced PMI. Fed thanks to breathable air network 5,4 Bar. PPE category 3, EN 1073-1. Size: S(1) to XXL(5)</p>
	CC8486219	<p>BSL 4-2</p> <p>BSL 4-2: ventilated protective suit for biological environment. With welded safety boots. Made of white reinforced PMI. Fed thanks to breathable air network 5,4 Bar. PPE category 3, EN 1073-1. Size: S(1) to XXL(5)</p>
	CC8486919	<p>BSL 4-2 BLU</p> <p>BSL 4-2 both ways fed ventilated protective suit for biological environment(BSL4 lab or field sampling). Made of white reinforced PMI.BLU Blower (8 hours: 400l/mn) or air network 5,4 Bar.PPE category 3, EN 1073-1. Size: S(1) to XXL(5)</p>

- ⦿ **key Features**

- ⦿ Safe connection and disconnection in the working area thanks to hepa filter incorporated
- ⦿ High protection factor: class 5 according to the EN 1073-1.
- ⦿ Welded boots and gloves removable
- ⦿ Made to measure suit but also available in standard size.
- ⦿ Excellent comfort thanks to the integral air distribution and magnetic exhaust valves.
- ⦿ Comply with MNR (Magnetic Nuclear Resonnance)
- ⦿

- ◎ **Best protection: Don't forget to wash your hands**
- ◎ All masks and goggles are of little use if the most important hygienic principles are neglected. For example, if you come home after a long bus or train ride, where you touched handrails and handles, take off the mask and scratch your nose, You could have left out the protective mask just as well.
- ◎ It's the same at work: if you have been typing on the computer keyboard all morning and then go to lunch without washing your hands first, you take a considerable risk. Then, wearing a mask at the computer workstation would have been of little use either.

ONLY A FFP 3-GRADE MASK WILL FILTER OUT ENZYMES AND VIRUSES.



- ⦿ This mask is made a waste by improper wearing

ADIEUS AMIGOS

- Apart from current respiratory protocol the Aim of facial surgeons and aerosol surgeons is a level 2 hazmatsuit free from atmospheric air breathing to get protection from virus.

