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PERSONAL PROTECTIVE EQUIPMENT (PPE)

The need for PPE should be based on the **anticipated exposure to the blood and body substance** and precautions should be based on the **mode of transmission** of the infectious agents.

The COVID-19 virus is spread mainly from person-to-person in close contact with one another, through respiratory droplets produced when an infected person coughs or sneezes and by the host touching a surface or object that has the virus on it and then touching mucus membrane. The precautions applied for COVID-19 includes **contact** and **droplet** precautions with the addition of **airborne** for aerosol generating procedures (AGPs), hand hygiene and environmental cleaning (including shared equipment).

The PPE should be elected according to the manufacturer's product label that describes an intended use with the desired level of protection, based on the risk levels of care provided.

Considerations when using a gown for suspected or confirmed cases

When minimal liquid penetration is expected a Level 1 barrier gown is sufficient for personal protection; Level 2 barrier protection is required when having close contact with symptomatic COVID-19 patients. For AGPs with COVID-19 patients, Level 3-4 barrier protection is recommended. Refer to Appendix 1 for more information.

Considerations when using a surgical mask for suspected or confirmed cases

In the majority of situations where standard respiratory protection is needed, a single use surgical mask is appropriate (minimum Level 1 barrier). Refer to Appendix 2 for AS 4381: 2015 Single use surgical face mask standard.

- Masks should be changed between patients and when they become soiled or wet
- Masks should never be reapplied after they have been removed
- Masks should not be left dangling around the neck
- Touching the front of the mask while wearing it should be avoided
- Hand hygiene should be performed upon touching or discarding a used mask.

NB: The colour and properties may vary according to different manufacturers.

HIGH PARTICULATE RESPIRATORS (P2/N95) MASKS

P2 respirators are designed to help reduce the wearer's respiratory exposure to airborne contaminants such as particles, gases or vapours.

For COVID-19 the use of P2/N95 masks should be reserved for AGPs or where the risk assessment places the patient in airborne precautions.

When there is a high probability of aerosol transmission due to the infectious agent or procedure e.g. bronchoscopy, sound scientific principles support the use of a P2 mask to prevent transmission.

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While the terms ‘P2 mask and ‘N95 mask are often used interchangeably in the healthcare setting, they are required to meet different standards. In Australia, the requirements for P2 masks are stated in Standard AS/NZS 1716: 2012. The United States (US) National Institute of Occupational Safety and Health (NIOSH) specifies N95 mask requirements. The N95 versus P2 is associated with the testing requirements for compliance as respiratory protection. See Table 1 for properties of the two masks.

Table 1: Properties of P2 and N95 masks

PROPERTIES	P2 MASKS	N95 MASKS
Other names	N95 masks, respiratory protection device, particulate respirator	P2 respirator, respiratory protection device, particulate respirator
Characteristics	• Raised dome or duckbill • 4–5 layers (outer polypropylene, central layers electret [charged polypropylene]) • Filtration through mechanical impaction and electrostatic capture • Designed to provide a good facial fit to minimise aerosol contamination of the mucous membranes of the nose and mouth P2 particulate filtering respirators/ masks must have a filter efficiency of at least 94% when tested with sodium chloride aerosol at a flow rate of 95 litres/minute. Under the EN system, aerosol testing is similar to Standard AS/ NZS 1716: 2012, but have additional filter efficiency testing with paraffin oil aerosol that must also meet the minimum 94% filter efficiency to be classified as P2. The particle size of this aerosol has a mass median diameter of 0.3 to 0.6 microns with a range of particles in the 0.02 to 2 micron size range.	• Raised dome or duckbill • 4–5 layers (outer polypropylene, central layers electret [charged polypropylene]) • Filtration through mechanical impaction and electrostatic capture • Designed to provide a good facial fit to minimise aerosol contamination of the mucous membranes of the nose and mouth NIOSH classified N95 particulate filtering respirators/masks must have a filter efficiency of at least 95% when tested with sodium chloride aerosol at a flow rate of 85 litres/minute. N95 respirator masks can only be used for oil free aerosols. The particle size of this aerosol ~0.3 micron.
Sealing	• Ties at crown and bottom of head, pliable metal nose bridge • Fit testing and fit checking recommended	• Ties at crown and bottom of head, pliable metal nose bridge • Fit testing and fit checking recommended
Australian Standards	Standard AS/NZS 1715: 2009 Standard AS/NZS 1716: 2012	Set by the US NIOSH classification (NIOSH Guidelines – Procedure No. TEB-APR-STP-0059)

Intended use	• Routine care of patients on airborne precautions • High-risk procedures such as bronchoscopy when the patient's infectious status is unknown • Procedures that involve aerosolisation of particles that may contain specific known pathogens (AGPs)	• Routine care of patients on airborne precautions • High-risk procedures such as bronchoscopy when the patient's infectious status is unknown • Procedures that involve aerosolisation of particles that may contain specific known pathogens (AGPs)
Notes	Care must be taken if placing respirators on patients and must suit clinical need i.e. if the patient has chronic obstructive airways disease (COAD) or is in respiratory distress, the respirator will exacerbate symptoms.	Care must be taken if placing respirators on patients and must suit clinical need i.e. if the patient has chronic obstructive airways disease (COAD) or is in respiratory distress, the respirator will exacerbate symptoms.

Source: Australian Guidelines for the Prevention and Control of Infection in Healthcare, 2019

FIT CHECKING AND FIT TESTING

Fit Checking

Fit checking at time of use is the most reliable method of ensuring the healthcare worker has achieved the required seal in real time.

Fit checking (user-seal check) describes the process that health workers perform each time a respirator is donned to check that a good facial seal is achieved i.e. the respirator is sealed over the bridge of the nose and mouth and there are no gaps between the respirator and the face.

Fit checking is a process used for all P2/N95 masks regardless of whether or not fit tested. In NSW Health much of the testing and education for fit checking is with duckbill type masks but it should be highlighted there are differences depending on which mask is in use, and manufacturer's instructions for specific mask fit check should always be followed.

Refer to Principles of Fit Checking for the procedure for performing a fit check.

In normal circumstances a service should have access to various masks to suit the range of staff. Refer to Appendix 3 for available P2/N95 Mask Range within NSW Health.

Fit Testing

Fit testing is performed to determine whether a specific type, model and size of respirator is a suitable fit for an individual and that it is worn correctly to achieve a facial seal.

Fit testing may use quantitative or qualitative methods:

- quantitative methods use electronic equipment that measures air leakage into the respirator
- qualitative methods use a hood and an odour or taste solution to determine the ability of the respirator wearer to smell or taste the test agent.

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Application and barrier level of different types of PPE

P2/N95 masks must be prioritised for health workers performing AGPs, including tracheal intubation, bronchial suctioning, bronchoscopy, and induced sputum.

P2/N95 masks can be used for up to 4 hours for multiple patients without removing them unless the mask is damaged, soiled or contaminated, for example a symptomatic suspected case coughing on them.

Surgical mask Level 2-3 must be prioritised for symptomatic confirmed cases of COVID-19, followed by suspected cases.

See Table 2 explaining the indications and required level of protection for different types of PPE.

Table 2: Application and barrier level of different types of PPE

GOWN	SURGICAL MASK	P2/N95 MASK
Level 1 barrier performance	**Level 1 barrier performance**	**P2/N95 mask with fluid resistance property**
○ Minimal contact with COVID-19 suspected or confirmed cases with acute respiratory illness e.g. fever clinic assessments ○ Respiratory specimen collection in fever clinics with minimal physical contact ○ Assessment of patients in GP practice or outpatient clinics	**Health workers** ○ Procedures where low amounts of fluid, spray and/or droplets are produced* e.g. collecting respiratory specimens in low symptomatic patients NB eye protection is also recommended ○ Procedure involving MRI or any procedure involving minimal risk of exposure to droplets or other body substances ○ Protect health workers and/or the patient from droplet exposure to microorganisms e.g. patient with upper respiratory tract infection **Community** ○ People on home isolation (people with symptoms of acute respiratory illness while in close proximity with other people e.g. in the same room ○ People with acute respiratory illness if needing to leave home for any reason e.g. visiting a medical facility ○ Patients suspected or confirmed with COVID-19 during transit	○ P2/N95 respirators are only required for aerosol generating procedures (AGPs) or prolonged contact with critically ill patients – high volume/high frequency of care **Examples of AGPs:** ○ tracheal intubation ○ non-invasive ventilation tracheotomy ○ cardiopulmonary resuscitation ○ manual ventilation before intubation and bronchoscopy or bronchoalveolar lavage ○ dental and/or maxillary-facial procedures The use of **nebulisers** should be **avoided** and alternative medication administration devices used e.g. spacers or isolation tents **NB**: If a health worker remains in a patient room for a long period because of the need to perform multiple procedures, the use of a powered air purifying respirator (PAPR) may be considered for additional comfort and visibility Use of PAPR requires training, education and competency assessment of staff prior to implementation

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GOWN	SURGICAL MASK	
Level 2 barrier performance	**Level 2 barrier performance**	
○ Close contact with symptomatic COVID-19 suspected or confirmed patients	○ Procedures where moderate to low amounts of fluid, spray and/or droplets are produced (including surgery) ○ When providing care for symptomatic suspected/confirmed COVID-19 cases within <1.5 metres ○ **Use with eye protection**	
Level 3 and 4 barrier performance	**Level 3 barrier performance**	
○ Aerosol generating procedures (AGPs) with COVID-19 patients e.g. intubation, bronchoscopy, prolonged contact with critically ill patients, dental and/or maxillary-facial procedures	○ Procedures where moderate to low amounts of fluid, spray and/or droplets are produced (including surgery) ○ When providing care for symptomatic suspected/confirmed COVID-19 cases within <1.5 metres ○ **Use with eye protection**	

* Refer to Appendix 1 & 2 for details on barrier performance

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Table 3: PPE guidance for care of patients with suspected/confirmed COVID-19

PPE	Outpatient settings contact <1.5 Meter of Symptomatic Cases	Patient Contact >1.5 Meter	Patient Contact <1.5 Meter Of Symptomatic Case	High Risk Patient Environment# Contact <1.5 Meter	AGP
Disposable Gloves	**YES**	**NO**	**YES**	**YES**	**YES**
Disposable Plastic / impervious Apron	**YES**	**NO**	**YES**	**YES**	**NO**
Disposable Plastic / impervious Gown	**RISK ASSESS****	**NO**	**RISK ASSESS**	**RISK ASSESS**	**YES**
Fluid Resistant Surgical Mask Level 2 -3	**YES**	**NO**	**YES**	**YES**	**NO**
P2/N95 Mask	**NO**	**NO**	**NO**	**RISK ASSESS**	**YES**
Eye Protection	**YES**	**NO**	**YES**	**YES**	**YES**

Reference: Adapted from Public Health England March 2020

** Risk assessment is the individual assessment of the anticipated likelihood and amount of exposure to blood and or body substances through spray/splash resulting in the need for a barrier protection.

High risk patient environment is considered to be those inpatient environments where multiple COVID-19 cases are isolated/managed in one place e.g. COVID-19 management units

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Appendix 1: AAMI Level Standards for Gowns

Barrier Performance	Barrier Protection	Resistance Measure	Description
Level 1	Minimal	Liquid penetration	Used for **MINIMA**L risk situations Provides a slight barrier to small amounts of fluid penetration Single test of water impacting the surface of the gown material is conducted to assess barrier protection performance.
Level 2	Low	Liquid penetration	Used in **LOW** risk situations Provides a barrier to larger amounts of fluid penetration through splatter and some fluid exposure through soaking Two tests are conducted to assess barrier protection performance: • Water impacting the surface of the gown material • Pressurizing the material
Level 3	Moderate	Liquid penetration	Used in **MODERATE** risk situations Provides a barrier to larger amounts of fluid penetration through splatter and more fluid exposure through soaking than Level 2 Two tests are conducted to test barrier protection performance: • Water impacting the surface of the gown material • Pressurizing the material
Level 4	High	Liquid and viral penetration	Used in **HIGH** risk situations Prevents all fluid penetration for up to 1 hour May prevent VIRUS penetration for up to 1 hour In addition to the other tests conducted under levels 1-3, barrier level performance is tested with a simulated blood containing a virus – if no virus is found at the end of the test, the gown passes

Extracted from Standard ASTM F1670 / F1670M

NB: the above does not include classification for chemotherapy gowns
Plastic (or polyethylene gowns/aprons are fluid impervious.

Appendix 2: AS 4381:2015 Single use surgical face mask standard

AS 4381:2015 SINGLE USE FACE MASK				
Characteristics	**Level 1 Barrier**	**Level 2 Barrier**	**Level 3 Barrier**	**Test method**
Application	For procedures, where the wearer is not at risk of blood or bodily substance splash or to protect staff and/or the patient from droplet exposure to microorganisms e.g. patient with upper respiratory tract infection	For procedures where the wearer is at risk of moderate exposure to blood and body substances e.g. surgery, dentistry, general patient care areas; to protect staff and/or the patient from droplet exposure	For procedures such as major trauma first aid or in any area where the health worker is at risk of substantial exposure to blood or bodily substance splash e.g. orthopaedic, cardiovascular procedures	N/A
Bacterial Filtration Efficiency (BFE) %	≥ 95%	≥ 98%	≥ 98%	ASTM F2101-14 or EN 14683:2014
Particulate Filtration Efficiency (PFE) % (0.1 µm)	< 4.0	< 5.0	< 5.0	EN 14683:2014
Resistance to penetration by synthetic blood (fluid resistance) min pressure in mm Hg for pass result	80mm Hg	120mm Hg	160mm Hg	ASTM F1862 /F1862M-13 or ISO 22609

Extracted from AS 4381: 2015 Single use surgical face mask standard

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Appendix 3: P2/N95 Mask Range within NSW Health

MASK	DESCRIPTION	P2/N95	FLUID RESISTANT	STANDARD	PRECAUTIONS SUITED TO	SPECIFICATIONS & ADDITIONAL INFORMATION
 BSN Medical (Aust) Pty Ltd Code:848174	Mask, Particulate Respirator, Face, P2/N95 Filter, Medium, Pleated, Double Strap (Proshield)	P2/N95	160mmHg	AS/NZS 1716:2012	**Airborne / AGP**	○ With a Bacterial Filtration Efficiency (BFE) of greater than 99% for media greater than 3 microns. ○ The super high Particulate Filtration Efficiency (PFE) material filters >99% of particles greater than 0.1 microns. ○ The N-95 mask is NIOSH approved as an N-95 particulate filter respirator. It meets or exceeds the standard performance criteria demanded by NIOSH for the management of Tuberculosis (TB) ○ The fluid resistant qualities of the mask provide protection against fluid strikethrough.
 BSN Medical (Aust) Pty Ltd Code:848175	Mask, Particulate Respirator, Face, P2/N95 Filter, Small, Pleated, Double Strap (Proshield)	P2/N95	160mmHg	AS/NZS 1716:2012	**Airborne / AGP**	○ With a Bacterial Filtration Efficiency (BFE) of greater than 99% for media greater than 3 microns. ○ The super high Particulate Filtration Efficiency (PFE) material filters >99% of particles greater than 0.1 microns. ○ The N-95 mask is NIOSH approved as an N-95 particulate filter respirator. It meets or exceeds the standard performance criteria demanded by NIOSH for the management of Tuberculosis (TB) ○ The fluid resistant qualities of the mask provide protection against fluid strikethrough.

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 3M Australia Pty Ltd Code: 832352	P2 MASKS 1860	P2/N95	120mmHg	AS/NZS 1716:2012	**Airborne / AGP**	○ NIOSH certified N95 ○ Meets CDC guidelines for Mycobacterium tuberculosis exposure control ○ FDA cleared for use as a surgical mask ○ Bacterial Filtration Efficiency (BFE) > 99% according to ASTM F2101 ○ Fluid resistant according to ASTM F1862 at 120 mm Hg ○ Individually wrapped to ensure clean respirator each time. ○ Mould nose clip to wearer's nose shape to help reduce eyewear fogging and ensure a better seal/fit ○ Respirator contains no components made from natural rubber latex
 3M Australia Pty Ltd Code: 832353	P2 MASKS 1870	P2/N95	160mmHg	AS/NZS 1716:2012	**Airborne / AGP**	○ NIOSH certified N95 ○ Meets CDC guidelines for Mycobacterium tuberculosis exposure control ○ FDA cleared for use as a surgical mask ○ Bacterial Filtration Efficiency (BFE) > 99% according to ASTM F2101 ○ Fluid resistant according to ASTM F1862 at 160 mm Hg ○ Respirator contains no components made from natural rubber latex ○ Red coloured head straps for health care use ○ Mould nose clip to wearer's nose shape to help reduce eyewear fogging and ensure a better seal/fit
	P2 MASKS 8210	P2	X	AS/NZS 1716:2012	Dry Airborne*	○ 8210 can be used in certain applications against some bio-aerosols such as influenza virus ○ Lightweight construction for added comfort that may increase wearer time ○ Mould nose clip to the wearer's nose shape to help reduce eyewear fogging and for a better seal and fit ○ Made from 3M™ Advanced Electret Filter Material for effective filtration with low breathing resistance

3M Australia Pty Ltd Code: 832382						○ Does not contain components made from natural rubber latex ○ P2 rated filtration efficiency ○ Protects against hazards such as dusts, mists, smoke and fume ○ Complies with AS/NZS 1716:2012
 3M Australia Pty Ltd Code:832383	P2 MASKS 8110S	P2	N/A	AS/NZS 1716: 2012 Complies with NIOSH N95	Dry Airborne*	○ Lightweight construction for added comfort that may increase wearer time ○ Mould nose clip to the wearer's nose shape to help reduce eyewear fogging and for a better seal and fit ○ Made from 3M™ Advanced Electret Filter Material for effective filtration with low breathing resistance ○ Does not contain components made from natural rubber latex ○ Fluid Resistant (ASTM F1862) - not applicable ○ N95 (similar to Class P2) rated filtration efficiency ○ Protects against hazards such as dusts, mists, smoke and fume ○ Meets performance requirements of AS/NZS 1716 (P2) and complies with NIOSH N95

*Dry airborne: Minimal risk of exposure to droplets e.g. Tuberculosis, Measles, Chickenpox