

Selecting the right respiratory equipment

Mark Reggers

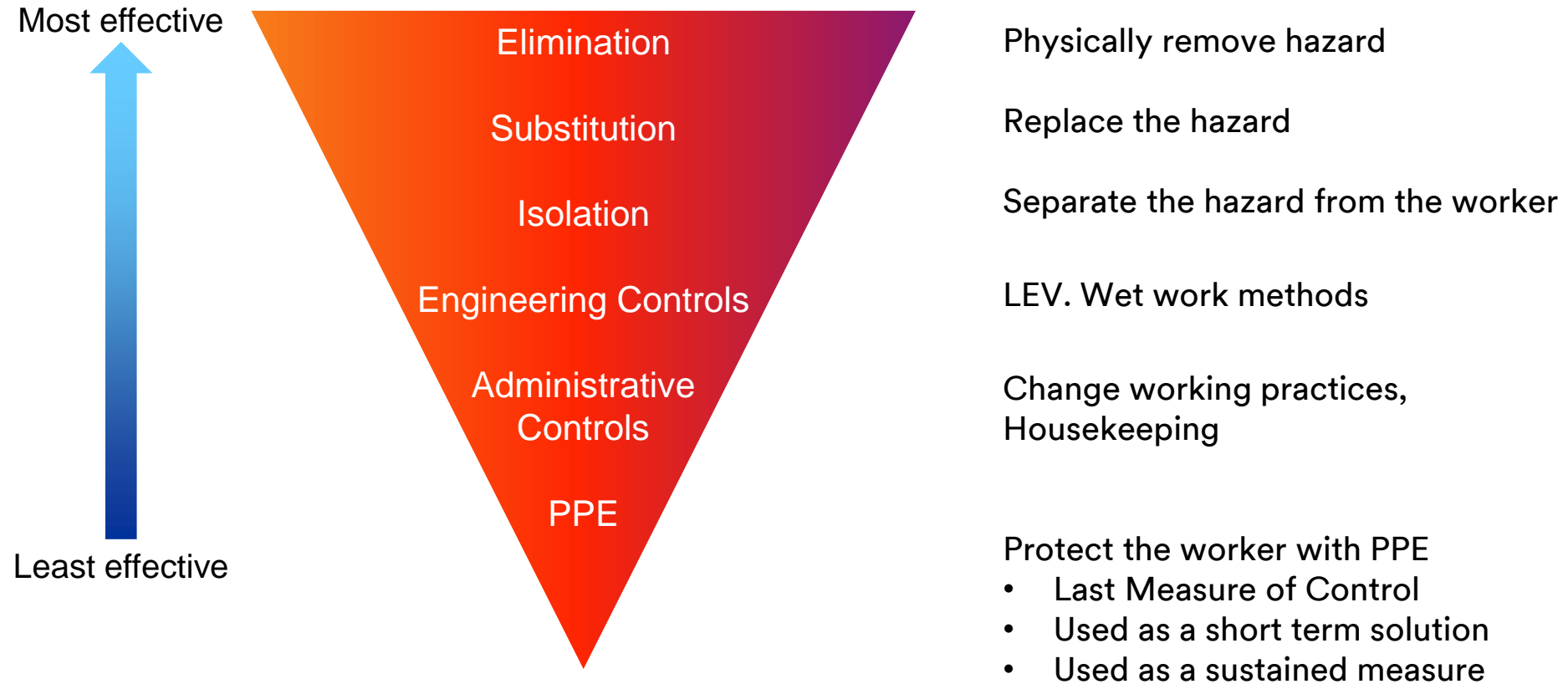
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Hazard Control Hierarchy



What does the first P in PPE stand for?

Selecting a Respirator

- Selection is a crucial part of a complete respiratory protection program as required by AS/NZS 1715
- Based on the results of a hazard assessment
- It is the PCBU's responsibility to do the exposure assessment and select suitable respirators
- **AS/NZS 1715 “Selection, use & maintenance of Respiratory Protective Equipment”**
- **AS/NZS 1716 “Respiratory Protective Devices”**



Identify the Hazard

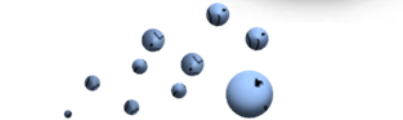
Particulates



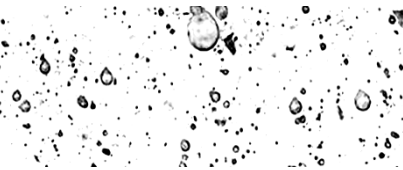
Dust



Mist



Fume



Fibers



Biological



Gases & Vapours



Gas

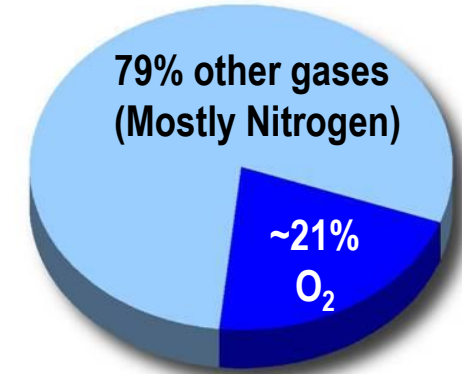


Vapours



Oxygen deficiency

Breathable quality air



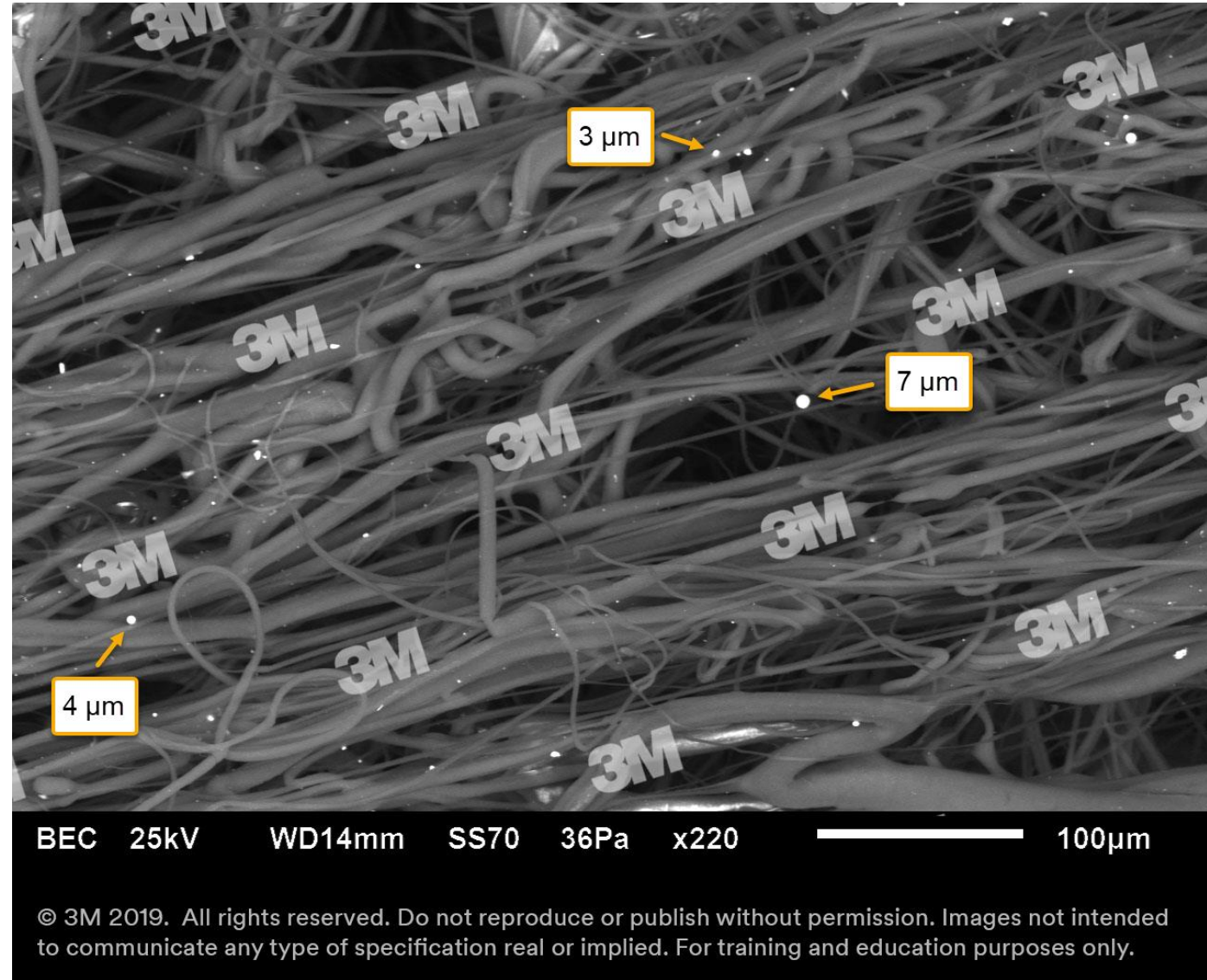
**Oxygen deficient
if < 19.5% oxygen**

Select Adequate Respirator





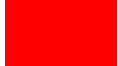
AS/NZS 1716 Particulate Filter Ratings

- **P1** for mechanically generated particles
 - eg silica, wood dust
- **P2** for mechanically & thermally generated particles
 - e.g. metal fumes & smokes
- **P3** for all particulates including highly toxic materials
 - e.g. beryllium

AS/NZS 1715 Test aerosol size 0.3-0.6 μ m



Types of Gas Filter – AS/NZS 1716

	A & AX - Organic Vapour
	B - Acid Gases
	E - Sulphur dioxide SO ₂
	G - low vapour pressure organic vapours
	K - Ammonia
	Hg - Mercury
	MB - Methyl Bromide
	Others

There is not a gas and vapour cartridge for every gas and vapour found in the workplace e.g. Carbon Monoxide, Carbon Dioxide

Capacity
Rating

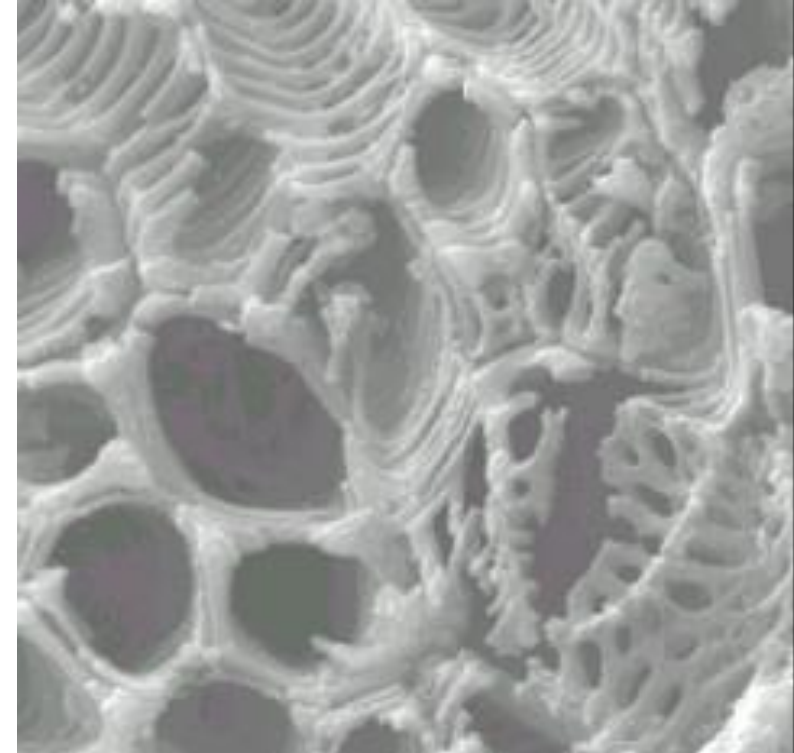
3

2

1

Aus

Increasing
capacity



Different Types of Respiratory Protective Equipment



Air Purifying Respirators
(Negative pressure)



Supplied Air
Respirators
(Positive
pressure)

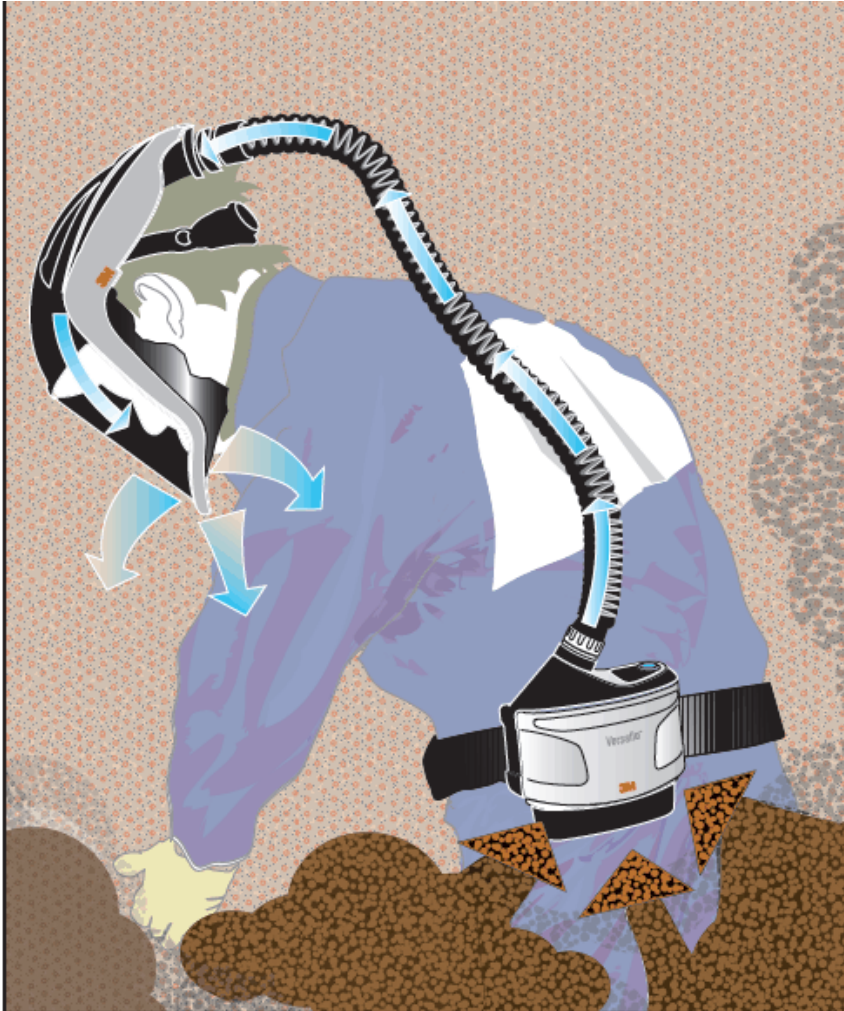


Breathing
Apparatus
BA or SCBA
(Positive
Pressure)



Powered Air
Purifying
Respirators PAPR
(Positive pressure)

Positive Pressure Respirators



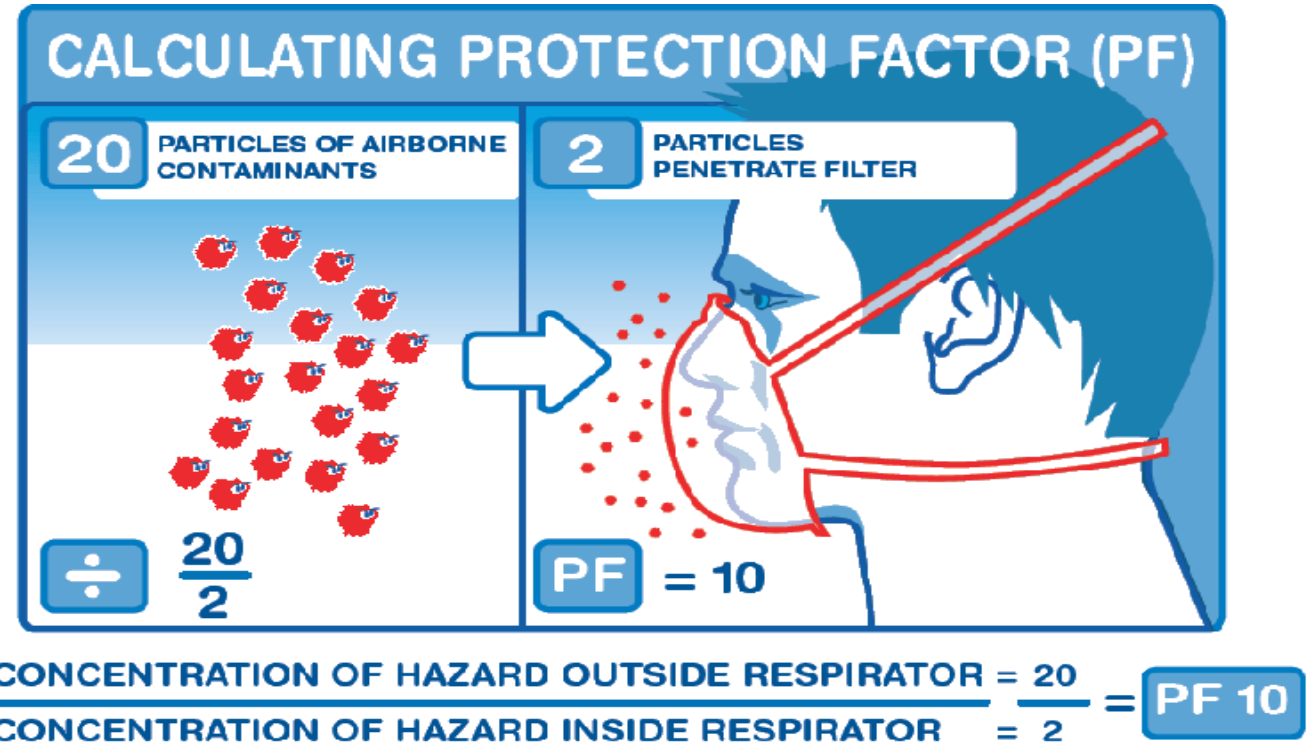
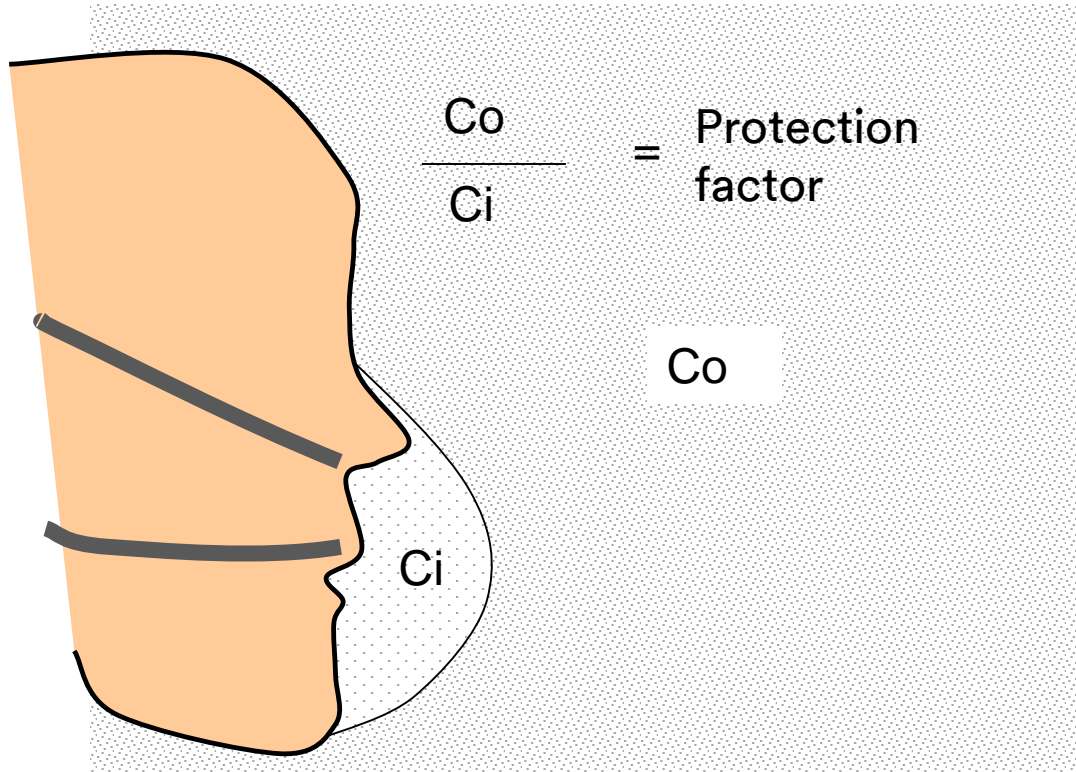
Respirators that rely on air flow through the headtop and have a loose fit to the face e.g. helmets and hoods or attached to a full face

Respiratory Protection Factors

Removes particles/gas & vapour from the air by breathing through some form of filter or cartridge.

Leakage can occur through

- Filter
- Valves
- Gaps between face and respirator



AS/NZS 1715 Particulate Minimum Required Protection Factors (MRPF)

Increasing Protection Factor

MRPF 100+

PAPR with Full face and P3
Supplied Air with full face



MRPF up to 100

Full face with P3



MRPF up to 50

Full face with P2
PAPR with loose fitting head tops



MRPF up to 10

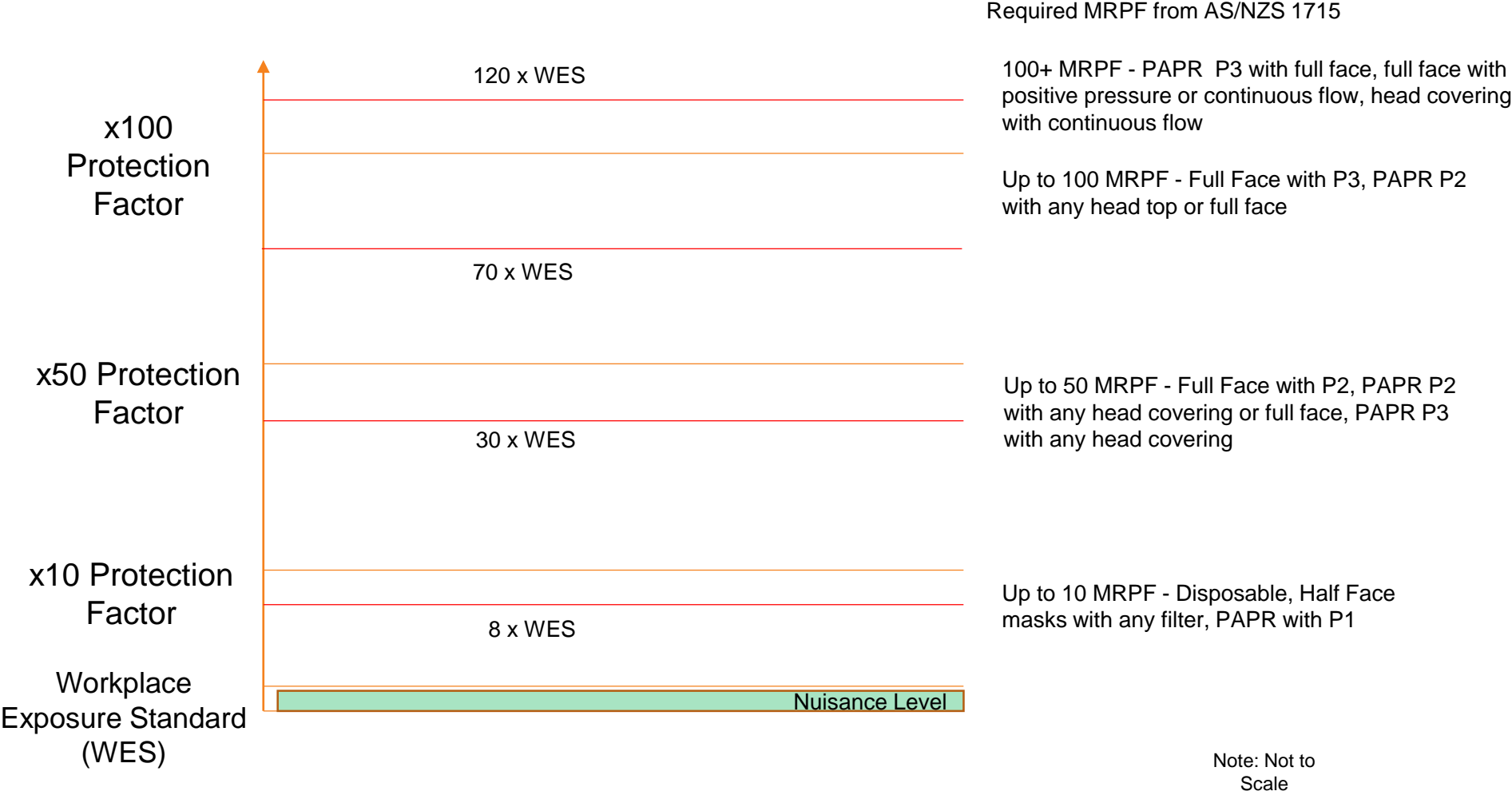
Disposable and Half Face



Refer AS/NZS
1715 for full table

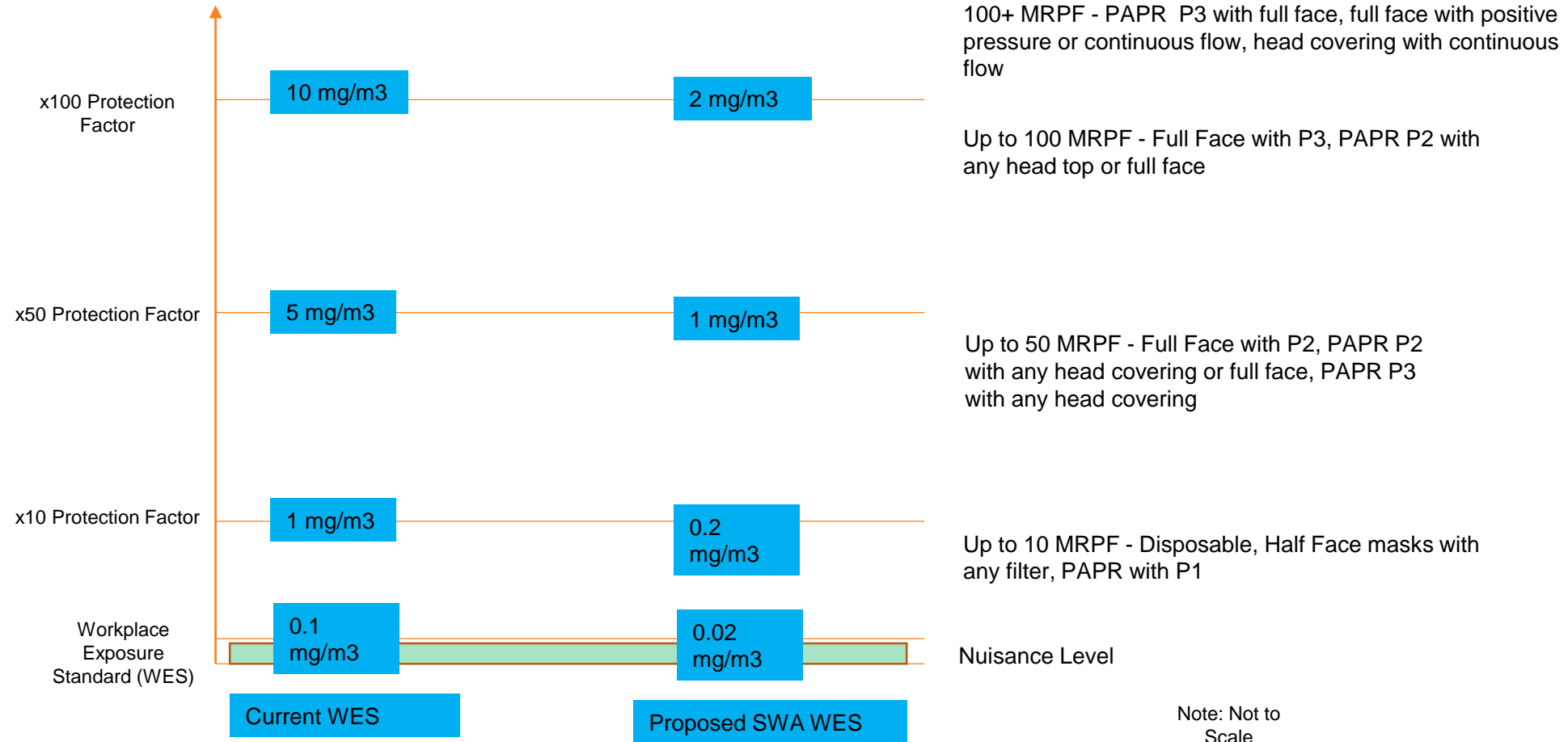
Based on the wearer being clean shaven, fit tested and trained

Protection Factor Respirator Selection



Australian Silica Workplace Exposure Standard

Required MRPF from AS/NZS 1715



Factors Affecting Fit

All tight fitting respirators (full or half face respirators) rely on an effective face seal to provide the expected protection.



Facial Hair



Training



Fitting skill



Other PPE



Dental Work

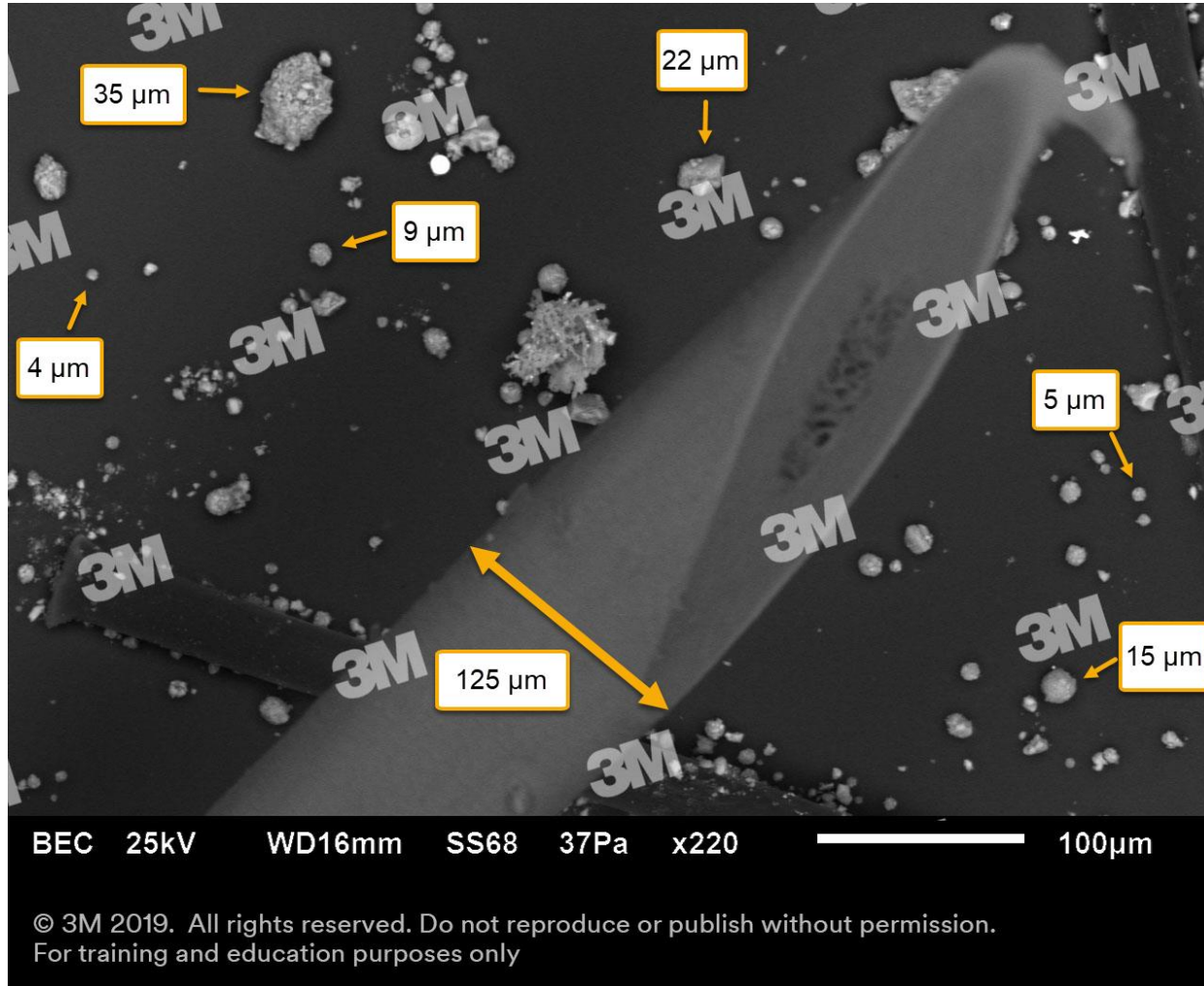


Makeup



Design &
Maintenance

All wearers must be clean shaven when wearing any close fitting respiratory including when being fit tested

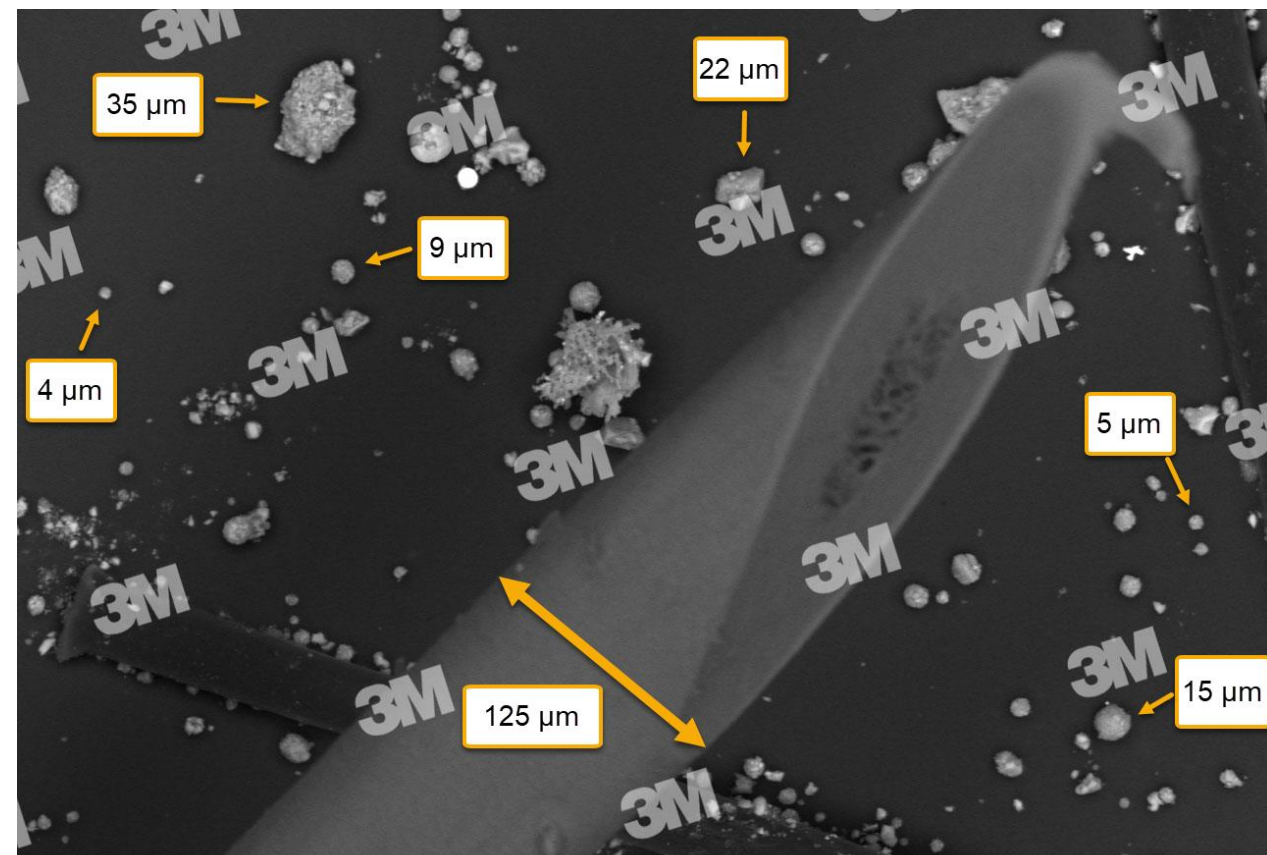


Studies have shown that the presence of facial hair significantly reduces the expected levels of protection

- Face seal leakage increases from 20 times to 1000 times in the presence of facial hair¹
- At least a 330 fold drop in protection was experienced by bearded wearers²

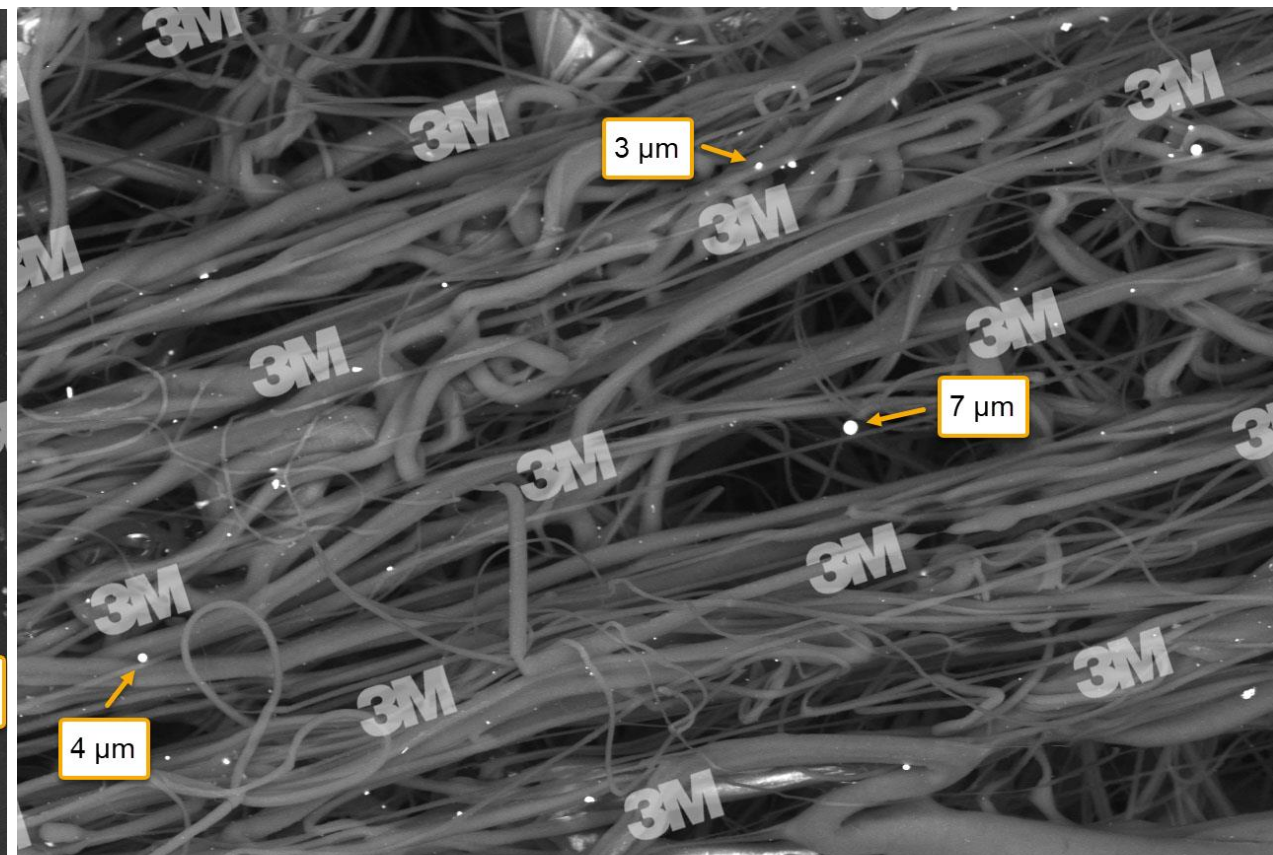
¹Facial Hair and respirator fit: a review of literature, Stobbe et al 1988

²Effect of facial hair on the face seal of negative pressure respirators, Skretvedt & Loschiavo 1984



BEC 25kV WD16mm SS68 37Pa x220 100μm

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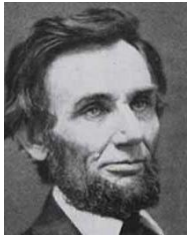
BEC 25kV WD14mm SS70 36Pa x220 100μm

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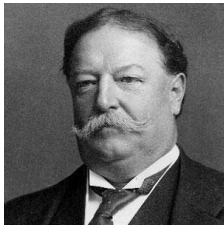
Facial Hair



Full Beard



Trimmed Beard



Mustache



Clean Shaven

**Disposable &
Half Face** (Positive
& Negative pressure)



Full Face
(Positive & Negative
pressure)



**Loose Fitting
Facepiece**
Positive pressure



**Hood or
Helmet**
Positive pressure





ROUND

OVAL

DIAMOND

OBLONG



Purpose of a fit test is to find a mask that fits you!!



If you don't pass a fit test, it means that is not the respirator for you.
Find a mask that does fit you

Fit Testing – Not a new concept

- Ensure the respirator provides adequate face to facepiece seal
- *Better fit=improve protection*



<https://research.archives.gov/id/46905>

Fit Testing Options

Qualitative

- Tight fitting disposable and reusable half face pieces only
- Cost effective
- Portable
- Power source not required
- No calibration
- Subjective (relies on sensory detection)



Quantitative

- Tight fitting disposable, reusable half & full face pieces
- Portable (limitations)
- Cost prohibitive
- Power source
- Annual calibration required
- Generates reports

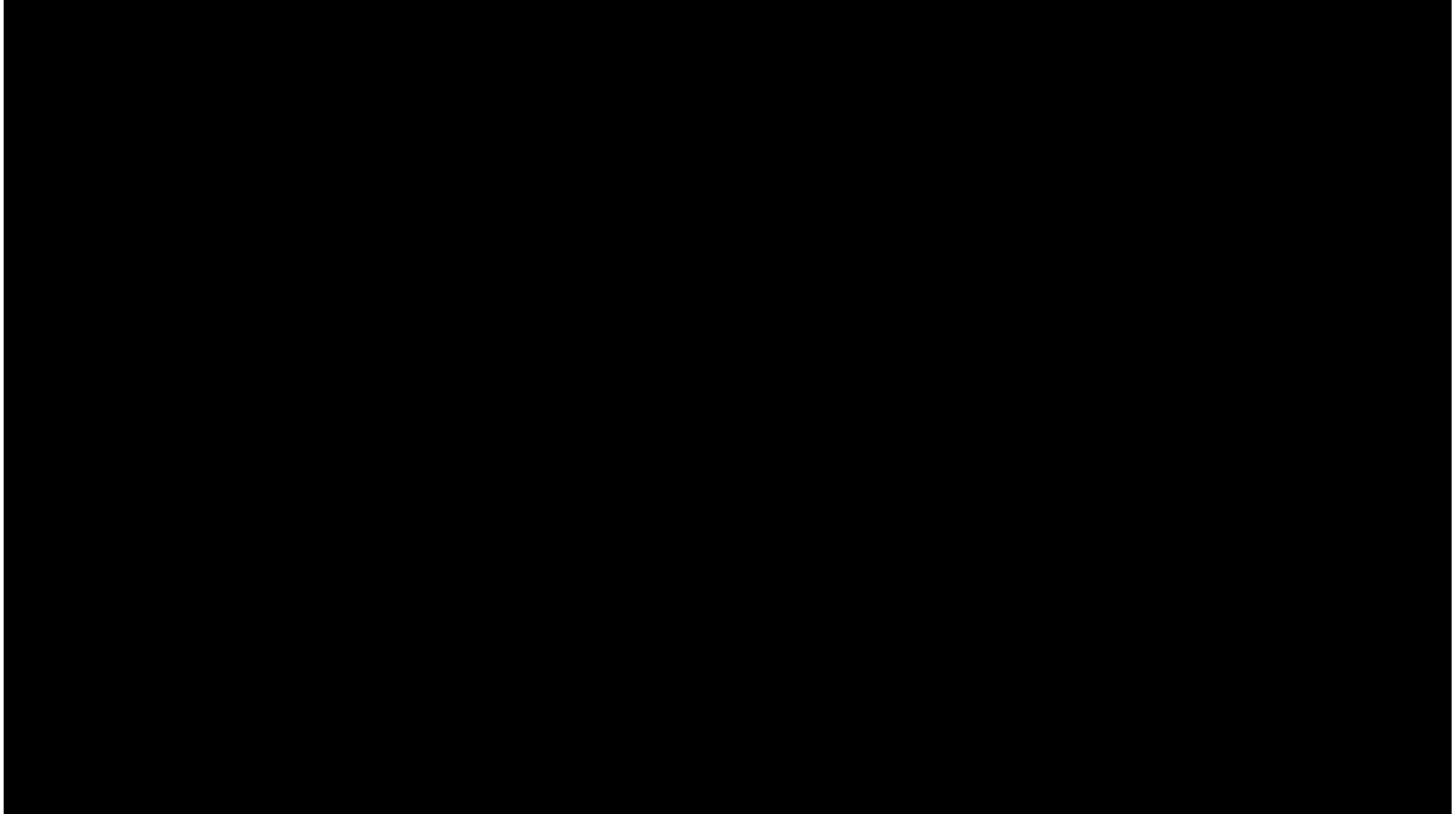


Ambient Particle Counter



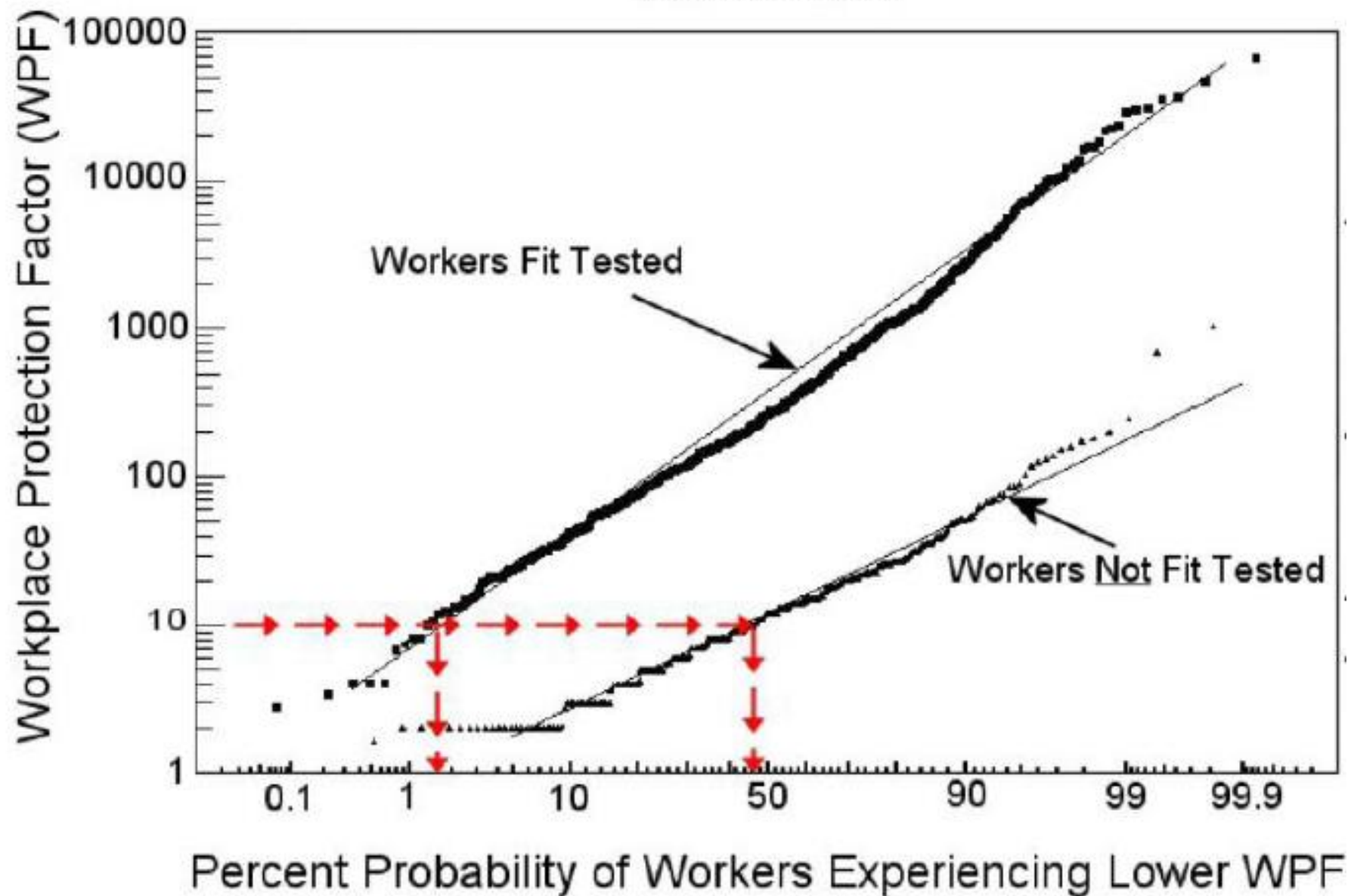
Controlled Negative Pressure (CNP)

What is involved in a fit test?



Respirator Performance with and without Fit Testing

(log probability plot)



Colton, C., Filtering facepieces: Study supports need for fit testing. 3M Job Health Highlights Volume 17, Number 2, 1999.

Who can conduct fit testing ?

Competent person's abilities (ISO 16975-3:2017)

- ✓ Purpose of a fit test
- ✓ Quantitative vs qualitative
- ✓ Capabilities and limitations
- ✓ How to perform fit test
- ✓ Diagnostic checks
- ✓ Interpret results
- ✓ Inspect a facepiece
- ✓ Preparation of facepiece
- ✓ Pre-use checks
- ✓ Correctly fit facepiece
- ✓ Recognise poor fit
- ✓ FF / APF / MRPF
- ✓ RPE selection



Training on the use of Respirators



The need for protection



Getting a good fit



Limitations of use



Maintenance procedures



Putting on and removing



Storage

Wear
Time

100%? 75%? 25%? Not at
all?

+

Mask/
Filter

Disposable? Half Face? Full
Face?

Particulate - P1, P2, P3?

G/V – A, B, E, K, Hg?

PAPR – Headtop?

Supplied Air?

+

Fit

Can it fit?

Is it worn correctly?

Clean shaven?

Other PPE?

=

Actual Protection Factor Level

Level of Protection?





Adequate

Filter?

Protection Factor Required?

Suitable

Comfort?

Compatibility with other PPE?

Facial Hair?

Fit?

Thermal load?

Communication?

Will it be worn?

How long will it be worn?

Conclusion

- Respiratory Protective Equipment (RPE) can be very effective in protecting workers from airborne contaminants. However, the effectiveness of the RPE relies on:
 - Correct selection of RPE for type and level of contaminant
 - The respirator fitting the individual
 - Being worn every time it is needed
 - Worn properly each and every time
- PPE & RPE controls are no less important than the higher controls when required
- Part of a Respiratory Protection Program (RPP)



Questions?

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