



21st October 2014

Personal Protective Equipment (PPE) for Ebola virus disease (EVD) Frequently Asked Questions (FAQs)

3M has received a number of inquiries regarding the appropriate personal protective equipment for potential exposures to Ebola virus disease (EVD). Following are responses to many of the most commonly asked questions. It is important to note this FAQ is not a substitute for the guidance of the United States Centers for Disease Control and Prevention (CDC), World Health Organization (WHO), the European Centres for Disease Prevention and Control (ECDC) and your local health authority. Please consult their websites frequently for the most current information and infection control procedures regarding EVD.

U.S. CDC	http://www.cdc.gov/vhf/ebola/index.html
European CDC	http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fevers/Pages/index.aspx
WHO	http://www.who.int/csr/disease/ebola/en/
U.S. OSHA	https://www.osha.gov/SLTC/ebola/control_prevention.html

For further information related to PPE use, please contact your local 3M Personal Safety Division Technical Services team.

There is currently no established guidance that specifies performance criteria for PPE specific to EVD and there is no '3M recommended list' of PPE. Specific scenarios and PPE selection will differ depending on many factors including the location and type of work (e.g. caring for patients vs laboratory tasks; hospitals outside of W Africa preparing for potential patients versus health care in W Africa). As with any use of PPE, there are no standardized solutions, and proper selection and use is critical to protection. There are a variety of options available within the different categories of PPE and associated advantages and disadvantages to the different types and models. It is the responsibility of each facility or organization to determine the appropriate level of protection by conducting a risk assessment which includes elements such as working conditions, tasks, and accessibility to decontamination facilities. As much as possible, engineering and administrative controls should be implemented. 3M cannot select PPE but can assist in helping purchasers identify the specific PPE models that meet or exceed the desired level of protection and the specifics of their situation.

What is Ebola virus disease (EVD)?

Ebola virus disease (also known as Ebola hemorrhagic fever) is a severe, often-fatal disease caused by infection with a species of Ebola virus. EVD is a severe acute viral illness often characterized by the sudden onset of fever, intense weakness, muscle pain, headache and sore throat. This is followed by vomiting, diarrhoea, rash, impaired kidney and liver function, and in some cases, both internal and external bleeding.

Outbreaks of Ebola outbreaks have occurred sporadically in parts of Africa, South America, the Middle East and Eastern Europe. It is a severe, often fatal disease in humans with fatality rates ranging up to 90%.

How is it transmitted?

Ebola is spread through direct contact with blood or body fluids (including, but not limited to urine, saliva, sweat, feces, vomit, breast milk and semen) of an infected person or animal, or through contact with objects that have been contaminated with the blood or other body fluids of an infected person, dead or alive. Transmission is believed to occur via contact with mucous membranes and non-intact skin (i.e., rashes, cuts, etc.). Risk of infection by inhalation of contaminated aerosols by healthcare workers has not been documented, but thought to be low at this time based on case history evidence.

Ebola virus is readily killed by soap, bleach, direct sunlight, or drying. Machine washing clothes that have been contaminated with fluids will destroy Ebola virus. Ebola virus survives only a short time on surfaces that are in the sun or have dried.¹

What does the WHO recommend for personal protection equipment (PPE) against Ebola virus disease?

The prevention of Ebola virus infection depends on avoiding contact with blood and body fluids of infected individuals and with objects contaminated with these fluids. Barrier precautions are used to prevent skin or mucous membrane exposure of the eyes, nose, and mouth with blood, other body fluids, secretions (including respiratory droplets), or excretions. For those working to control the Ebola Virus Disease (EVD) outbreak and treat patients, the WHO recommends a basic suite of personal protective equipment for most activities which includes:

- Impermeable gloves
- Impermeable footwear
- Eye and face protection
- Protective clothing
- Fluid resistant mask or respirator

Some tasks require additional body protection. Certain tasks, including administering aerosol generating medical procedures, certain laboratory tasks and autopsies require respiratory protection.

Please see “Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola.” for the full guidance:

http://www.who.int/csr/resources/publications/ebola/filovirus_infection_control/en/

It is important that anyone involved in infection control for ebola virus disease (EVD) thoroughly read and understand that document.

Hand hygiene is strongly emphasized. It is of the highest importance that hand hygiene be performed thoroughly and often including before and after donning and before and after doffing PPE.

PPE should be selected based primarily on the potential exposures and need for protection against infective fluids and agents. However, work conditions, environmental conditions, tasks and accessibility to decontamination facilities should also be considered.

Note, currently there is no established guidance that specifies performance criteria for personal protective equipment (clothing, gloves, foot coverings, etc.) specific to EVD. Emphasis should be on the prevention of infective materials from contacting mucous membranes (mouth, nose, and eyes) and non-intact skin.

PPE can help provide a barrier to infectious material. However, it is very important that all local infection control protocols and manufacturer's user instructions be followed when removing (doffing) the equipment to avoid contamination. Additionally, local infection control practices and manufacturer's user instructions should be followed when cleaning any reusable PPE. The WHO guidance contains recommendations for donning, doffing and cleaning PPE.

A more complete summary of the WHO PPE recommendations as well as the US CDC, ECDC and United Kingdom's PPE recommendations for EVD can be found in Appendix 4.

Eye Protection

Eye protection provides a barrier to infectious materials from entering the eye and is often used in conjunction with other personal protective equipment (PPE) such as gloves, gowns, and masks or respirators. See Appendix 1.

Goggles

Goggles are designed to fit snugly, but not necessarily seal around the wearer's eyes. NIOSH states²: "appropriately fitted, indirectly-vented goggles* with a manufacturer's anti-fog coating provide the most reliable practical eye protection from splashes, sprays, and respiratory droplets. However, to be efficacious, goggles must fit snugly, particularly from the corners of the eye across the brow. While highly effective as eye protection, goggles do not provide splash or spray protection for other parts of the face."

* Directly-vented goggles may allow penetration by splashes or sprays; therefore, indirectly-vented or non-vented goggles are preferred for infection control.

Face Shields

Face shields are designed to help protect portions of the wearer's face to certain exposures. For certain tasks a worker may choose to wear a face shield in addition to goggles for infection control. While goggles help protect a wearer's eyes from splashes, sprays, and droplets, a face shield can help reduce exposure to the eyes and provide protection to other facial areas. Face shields should have crown and chin protection and wrap around the face to the point of the ear. This will help reduce the possibility of splash, sprays and droplets from going around the edges of the shield and reaching the eyes or other facial areas.

Safety Glasses

Safety glasses provide impact protection but do not provide the same level of splash or droplet protection as goggles and generally should not be used for infection control purposes.

For more information consult 3M Tech Data Bulletin #192 – Eye Protection for Infection Control:
<http://multimedia.3m.com/mws/mediawebserver?mwsId=66666UF6EVsSyXTtNxMa5XFEEVtQEVs6EVs6EVs6E666666-->

Protective Clothing

Currently there is no established guidance that specifies detailed performance criteria for protective clothing (coveralls, gloves, foot coverings, etc.) specific to EVD. Until such guidance is published, selection of personal protection ensembles should be based on a site-specific PPE hazard assessment. Performance criteria included in EN 14126:2006 - Performance

Requirements and Test Methods for Protective Clothing Against Infective Agents should be considered. See Appendix 2.

In general, protective clothing offering the highest level of protection from infective agents, such as the 3M™ Protective Coverall 4570, is also the least breathable and may introduce hazards related to heat stress and dehydration.

Breathable protective clothing offers less protection but may be desired for tasks in extremely hot conditions where the risk of contacting infective agents is low, where sufficient decontamination facilities are available at the completion of work tasks, and where the risk of harm from heat stress and dehydration is high.

Selection for EVD should be based primarily on the potential exposures and need for protection against infective fluids and agents. However work conditions, environmental conditions, tasks and accessibility to decontamination facilities should be considered.

Respiratory Protection

Fluid resistant masks or respirators are another type of PPE recommended for those in contact with potential EVD cases. This section discusses the use of respiratory protection.

For more information on the differences between surgical masks and respirators please consult 3M Technical Data Bulletin #231 - Respirators and Surgical Masks: A Comparison.

http://multimedia.3m.com/mws/mediawebserver?SSSSSuH8gc7nZvTSP8_1oxmSevUqe17zHvTS-evTSeSSSSSS--

A respirator is a device designed to help provide the wearer with respiratory protection against inhalation of a hazardous atmosphere.

To help reduce nose, mouth and respiratory system exposures to particles that are potentially airborne (< 100 microns), particulate filtering respirators are often recommended. Particulate respirators are available as:

1. a filtering half facepiece respirator, where the filter is the entire respirator
2. an elastomeric (reusable) half mask with a particulate filter
3. an elastomeric (reusable) full facemask with a particulate filter
4. a powered air purifying respirator (PAPR) that includes a particulate filter
5. a supplied air respirator.

Particulate respirators are designed to help reduce the wearer's exposure to certain airborne particles. Currently, health authorities have not documented EVD as being transmitted from infected individuals via airborne Ebola virus. However, droplets containing the Ebola virus that have become aerosolized (e.g. from coughing, sneezing, vomiting, medical procedures, and surfaces etc.) may have the potential to come into contact with a person's mucous membranes in their nose or mouth or non-intact skin. Therefore, respiratory protection may be helpful in providing a barrier to help prevent infectious materials from contacting a wearer's mucous membranes.

They may also help limit inadvertent touching of the nose, mouth and/or eyes (if a full-facepiece or powered-air respirator is used). Respiratory protection is recommended for workers performing certain tasks such as aerosol generating procedures, laboratory procedures and autopsies. Many agencies are reportedly using respiratory protection for basic patient care out of an abundance of caution.

See Appendix 3 for examples of different types of respirators.

For more information consult 3M Tech Data Bulletin #174 – Respiratory Protection for Airborne Exposures to Biohazards

<http://multimedia.3m.com/mws/mediawebserver?mwsId=66666UF6EVsSyXTtmXT25XTXEvtQEvs6EVs6EVs6E666666-->

What are the advantages and disadvantages of different types of respirators?

For aerosol generating tasks, laboratory procedures and autopsies a respirator is recommended by health authorities. A control banding approach has been suggested for choosing between different levels of respiratory protection based on the organism, generation rate, level of control and respirator protection factor. <http://www.cidrap.umn.edu/news-perspective/2014/09/commentary-health-workers-need-optimal-respiratory-protection-ebola>

Following are some general advantages and disadvantages of different types of respirators.

Disposable filtering facepiece respirator

- Disposable, no maintenance
- Lightweight
- Less expensive
- Need separate eye and face protection
- Fit testing recommended (required in certain countries, including the US) to ensure respiratory protection

Reusable half mask or full facepiece respirator

- Often available in multiple sizes
- Facepieces can be disinfected and reused
- Full facepieces may provide eye and face protection
- Fit testing recommended (required in certain countries, including the US) to ensure respiratory protection
- Facepieces must be maintained

Powered air purifying (PAPR) respirator

- Some elements can be disinfected and reused
- Higher level of respiratory protection
- Less prone to fogging
- Improved voice communication and patient rapport
- No fit testing required for systems with loose fitting head covers
- May not need separate eye and face protection depending on the head covering
- Batteries need to be charged and entire unit maintained
- Higher initial cost

Supplied air respirators

- Some systems provide cooled air to the wearer
- Higher levels of respiratory protection
- Can be disinfected and reused
- No fit testing required for systems with loose fitting head covers
- May not need separate eye and face protection depending on the head covering
- Need adequate supply and pressure of compressed breathable air
- Unit needs to be maintained
- Higher initial cost

Please see the following link for guidelines for cleaning and disinfecting 3M™ Reusable Respirators (RR) and Powered Air Purifying Respirator (PAPR) Assemblies following potential exposure to the Ebola virus.

http://multimedia.3m.com/mws/mediawebserver?mwsId=SSSSSuH8gc7nZxtUPYten8_BevUqe17zHvTSevTSeSSSSSS--&fn=RR%20and%20PAPR%20cleaning%20Ebola%20appro

Summary




Those who will be exposed to individuals with known or suspected cases of EVD should wear PPE that provides a barrier to help prevent infectious material from contacting mucous membranes (mouth, nose, eyes) and non-intact skin (i.e., rashes, cuts, etc.). Respiratory protection should be utilized if there is a risk of aerosolized particles (i.e. aerosol generating procedures, certain laboratory tasks, autopsies), or according to local health authorities. Always ensure that PPE users are properly trained in the benefits and limitations of the equipment per all applicable guidance and regulations and the manufacturer's user instructions. Please consult your occupational safety and health professional, the appropriate health authority and the PPE manufacturer with questions.

References




- 1) ECDC http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fever/information-travellers/Pages/information-travellers.aspx
- 2) National Institute for Occupational Safety and Health (NIOSH). *Eye Protection for Infection Control*. September 2004. <http://www.cdc.gov/niosh/topics/eye/eye-infectious.html>
- 3) US CDC <http://www.cdc.gov/vhf/ebola/index.html>
- 4) WHO <http://who.int/mediacentre/factsheets/fs103/en/>
- 5) WHO "Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola." http://www.who.int/csr/resources/publications/ebola/filovirus_infection_control/en/
- 6) US CDC "Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Hemorrhagic Fever in U.S. Hospitals." <http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-control-recommendations.html>
- 7) The European Centre for Disease Prevention and Control has published "Outbreak of Ebola virus disease in West Africa. Third update, 1 August 2014." <http://www.ecdc.europa.eu/en/publications/Publications/ebola-outbreak-west-africa-1-august-2014.pdf>
- 8) ECDC Factsheet for Health Professionals. http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fever/factsheet-for-health-professionals/Pages/factsheet_health_professionals.aspx
- 9) The United Kingdom Advisory Committee on Dangerous "VIRAL HAEMORRHAGIC FEVERS RISK ASSESSMENT (Version 2: 09.07.2014)" http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317135155050
- 10) "Health workers need optimal respiratory protection for Ebola" Lisa Brosseau, Rachael Jones. Center for Infectious Disease Research and Policy Sept. 7, 2014. <http://www.cidrap.umn.edu/news-perspective/2014/09/commentary-health-workers-need-optimal-respiratory-protection-ebola>

Appendix 1 - Specifications for Examples of 3M Protective Eyewear










EN Tested, CE approved (marked)

		Goggles		Face Shields
				
Product		2890SA	Alternative: 2890S	71360-00015M
Description		2890SA Goggle Sealed Acetate AF (anti-fog)	2890S Goggle Sealed PC AS/AF (anti-scratch/anti-fog)	Fahrenheit™ Goggle Nonvent Acetate AS/AF (anti-scratch/anti-fog)
Protection	Liquids (splashes)	Yes	Yes	Yes
	Large particles (suspended droplets > 5µm)	Yes	Yes	Yes
	Gases / Fine Particles (airborne particles < 5µm)	Yes	Yes	No
				H8 Headgear with WP Series Visors
Description				H8 Headgear, with either of WP96 – 2mm PC visor, or WP98 – 2mm Acetate visor
				Yes
				No
				No

Meeting ANSI Standards






		Goggles		Face Shields
				
Product		16644-00000-10 (medium)	16645-00000-10 (large)	40671-00000-10
Description		3M™ Lexa™ Splash GoggleGear™ AS/AF (medium) (anti-scratch/anti-fog)	3M™ Lexa™ Splash GoggleGear™ AS/AF (medium) (anti-scratch/anti-fog)	3M™ Maxim™ Splash Goggle Over-the-Glass (OTG) AS/AF (anti-scratch/anti-fog)
Eye Protection (Splashes, sprays, and respiratory droplets)		Yes		Yes
Face Protection (Splashes, sprays, and respiratory droplets)		No		Yes
				82501-00000 and 82582-00000
				3M™ Ratchet Headgear H8A with 3M™ Clear Polycarbonate Faceshield WP96X

Appendix 2 - Specifications for 3M Protective Apparel

Important: These products will not eliminate the risk of infection. Currently there is no established guidance specifying performance criteria for protective clothing specific to EVD. This information is presented to help safety professionals make informed decisions as part of a site and task specific PPE hazard assessment.										
		3M™ Protective Coverall 4570*	3M™ Protective Coverall 4565	3M™ Protective Coverall 4545	3M™ Protective Coverall 4540+	3M™ Protective Coverall 4535	3M™ Protective Coverall 4510	3M™ Oversleeve 444	3M™ Overboot 440 / 450	3M™ Overhood 446
PPE Directive Approval		CE Category 3	CE Category 3	CE Category 3	CE Category 3	CE Category 3	CE Category 3	N/A	N/A	N/A
Fabric type		Multi-layered laminate	Non-Breathable Laminate	Micro-porous Laminate	SMMMS / Micro-porous Laminate Hybrid	SMMMS / Micro-porous Laminate Hybrid	Micro-porous Laminate	Micro-porous Laminate (same material as 4510)	Micro-porous Laminate (same material as 4535)	Micro-porous Laminate (same material as 4510)
Product Image										
General Data	Test Method									
Suit Type	ISO 16602:2007	Type 3	Type 4	Type 5/6	Type 5/6	Type 5/6	Type 5/6	N/A	N/A	N/A
Seam construction	N/A	Serged & Taped	Serged & Taped	Serged	Serged	Serged	Serged	Serged	Serged	Serged
Material Data per EN 14325										
Abrasion resistance Method 2	EN530:1994	5/6	1/6	1/6	1/6	1/6	1/6	N/A	N/A	N/A
Flex Cracking Resistance, Method B	ISO 7854	1/6	1/6	3/6	4/6	5/6	5/6	N/A	N/A	N/A
Trapezoidal tear resistance	EN ISO 9073-4:1997	2/6	1/6	1/6	1/6	1/6	1/6	N/A	N/A	N/A
Tensile strength	EN ISO 13934-1:1999	1/6	1/6	1/6	1/6	1/6	1/6	N/A	N/A	N/A
Puncture resistance	EN 863:1996	2/6	1/6	1/6	1/6	1/6	1/6	N/A	N/A	N/A
Seam Strength	EN ISO 13935-2:1999	3/6	2/6	2/6	1/6	2/6	1/6	N/A	N/A	N/A
Protection against Infective Agents										
Synthetic blood penetration resistance	ISO 16603:2004	6/6	6/6	3/6	N/A	N/A	N/A	N/A	N/A	N/A
Blood-borne pathogen penetration resistance	ISO 16604:2004	6/6	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Contaminated solid particle penetration resistance	EN ISO 22612:2005	3/3	3/3	3/3	N/A	N/A	N/A	N/A	N/A	N/A
Contaminated liquid aerosol penetration resistance	ISO/DIS 22611:2003	3/3	3/3	3/3	N/A	N/A	N/A	N/A	N/A	N/A
Wet bacteria penetration resistance	EN ISO 22610:2006	6/6	6/6	6/6	N/A	N/A	N/A	N/A	N/A	N/A
Liquid Chemical Permeation										
Chemical permeation resist. - H2SO4 98%	EN 374:2003	6/6	5/6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemical permeation resist. - NaOH 40%	EN 374:2003	6/6	6/6	N/A	N/A	N/A	N/A	N/A	N/A	N/A







*4570 Not available in the Americas.

Appendix 3 - Specifications for 3M Respiratory Protective Devices







	Half-face		Full Face	PAPR	
	Filtering Facepiece	Elastomeric Facepiece	Elastomeric Facepiece	Loose fitting Head gear	Loose Fitting Hood/Helmet
					
Eye Protection (Splashes, sprays, and respiratory droplets)	No	No	Yes	Limited	Yes
Face Protection (Splashes, sprays, and respiratory droplets)	No	No	Limited	Limited	Limited
Head Protection (Splashes, sprays, and respiratory droplets)	No	No	No	Limited	Limited
Respiratory Protection* (Airborne aerosols and respiratory droplets)	Yes	Yes	Yes	Yes	Yes

*When equipped with appropriate and approved filter and/or cartridge.

Examples of Disposable Respirators, EN Tested, CE approved (marked)

						
Product	3M TM Particulate Respirator 8810	3M TM Particulate Respirator 8822	3M TM Aura TM Particulate Respirator 9320+ and 3M TM Aura TM Health Care Respirator 1862+	3M TM Aura TM Particulate Respirator 9322+ and 3M TM Aura TM Health Care Respirator 1872V+	3M TM Aura TM Particulate Respirator 9330+ and 3M TM Aura TM Health Care Respirator 1863+	3M TM Aura TM Particulate Respirator 9332+ and 3M TM Aura TM Health Care Respirator 1873V+
Valve	Unvalved	Valved	Unvalved	Valved	Unvalved	Valved
Classification	EN 149:2001+A1:2009 FFP2 NR D	EN 149:2001+A1:2009 FFP2 NR D	EN 149:2001+A1:2009 FFP2 NR D	EN 149:2001+A1:2009 FFP2 NR D	EN 149:2001+A1:2009 FFP3 NR D	EN 149:2001+A1:2009 FFP3 NR D
	n/a	n/a	EN 14683:2005 Type IIR	n/a	EN 14683:2005 Type IIR	n/a
Fluid Splash Tested	No	No	Yes (1862+ only)	No	Yes (1863+ only)	No
PPE Directive Approval	Yes	Yes	Yes	Yes	Yes	Yes
MD Directive Approval	No	No	Yes (1862+ only)	No	Yes (1863+ only)	No

Examples of Disposable Respirators Approved by the US National Institute for Occupational Safety and Health (NIOSH)









						
Product	3M TM Particulate Respirator 8210	3M TM Particulate Respirator 8511	3M TM Health Care Particulate Respirator and Surgical Mask 1860	3M TM Health Care Particulate Respirator and Surgical Mask 1870	3M TM Aura TM Health Care Respirator 1870+	3M TM VFlex TM Health Care Particulate Respirator and Surgical Mask 1805
Valve	Unvalved	Valved	Unvalved	Unvalved	Unvalved	Unvalved
Size	8210 - one size	8511 - one size	1860 – regular 1860S – small	1870 - one size	1870+ - one size	1805 – regular 1805S - small
Classification	N95	N95	N95	N95	N95	N95
Fluid Resistant	No	No	Yes	Yes	Yes	Yes

Note: Other models of 3M disposable respirators are available, but supply may be constrained if demand increases

Examples of Reusable Respirators: EN Tested, CE approved (marked)

	Half Masks		Full Face Masks		Particulate Filters	
						
Product	3M™ Half Mask 6000	3M™ Half Mask 7500	3M™ Full Face Mask 6800	3M™ Full Face Mask 7907S	3M™ 2135 P3 R	3M™ 6035 P3 R
Description	6100 – small (light grey) 6200 – medium (grey) 6300 – large (dark grey)	7501 – small (grey blue) 7502 – medium (light blue) 7503 – large (dark blue)	6700 – small 6800 – medium 6900 – large	7907S – single size	Particulate filter	Encased particulate filter
Classification	EN 140:1998	EN 140:1998	EN 136:1998 Class 1	EN 136:1998 Class 2	EN 143:2000 P3 R	EN 143:2000 P3 R

Examples of Reusable Respirators Approved by the US National Institute for Occupational Safety and Health (NIOSH)














	Half Facepiece Respirator			Full Facepiece Respirators			Particulate Filters	
								
Product	3M™ Half Facepiece 6000 Series	3M™ Half Facepiece 6500 Series	3M™ Half Facepiece 7500 Series	3M™ Full Facepiece 6000 Series	3M™ Full Facepiece FF-400 Series	3M™ Full Facepiece 7800 Series	3M™ 2291 P100	3M™ 7093 P100
Description	6100 – small 6200 – medium 6300 – large	6501 – small 6502 – medium 6503 – large	7501 – small 7502 – medium 7503 – large	6700 – small 6800 – medium 6900 – large	FF-401 – small FF-402 – medium FF-403 – large	7800S-S – small 7800S-M – medium 7800S-L – large	Particulate filter	Encased particulate filter

Note: Chemical cartridges are available to help reduce exposures to chemical disinfectants (e.g. chlorine)

Examples of Powered Air Respirators: EN Tested, CE approved

	S-Series		M-Series			
	3M™ Versafo™ Headcovers	3M™ Versafo™ Hoods	3M™ Versafo™ Faceshield	3M™ Versafo™ Helmet	3M™ Versafo™ Helmet	
	S-133 or S-333G	S-433 or S-533	M-106	M-306	M-406	
Powered Air Turbo Unit						Breathing Tube & Cover
 3M™ Versafo™ Powered Air Turbo TR-300 with TR-3710E P Filter	EN 12941:1998+A2:2008 TH3 EN 166:2001 2:F:3		EN 12941:1998+A2:2008 TH2 EN 166:2001 1:BT:3		EN 12941:1998+A2:2008 TH3 EN 166:2001 1:BT:3	 3M™ Versafo™ Breathing Tube BT-20 S (735mm) or BT-20 L (965mm)
 3M™ Jupiter™ Turbo With 450-00-25P2X12 Filter					EN 12941:1998+A2:2008 TH2 EN 166:2001 1:BT:3	

Examples of Powered Air Purifying Respirators (PAPRs) by the US National Institute for Occupational Safety and Health (NIOSH)

	S-Series				M-Series		
							
Models	S-103 S-133	S-403, S-433, S-533	S-605/S-607	S-805/S-807	M-105	M-305	M-405
Assigned Protection Factor	25	1000	1000	1000	25	25	1000
	Breathing Tube						
3M™ Versaflo TR-300 PAPR With TR-3710N HEPA Filter 	3M™ Versaflo™ Breathing Tube BT-20, BT-30, BT-40 						
GVP PAPR with GVP-440 HEPA Filter (Requires V-199 adapter) 	3M™ Versaflo™ Breathing Tube Disposable Cover BT-922 						
Breathe Easy with 450-00-01R12 HEPA Filter 	BE-324 						

Appendix 4:

WHO Guidance:

In August 2014 WHO published “Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola.”

http://www.who.int/csr/resources/publications/ebola/filovirus_infection_control/en/

It is important that anyone involved in infection control for ebola virus disease (EVD) thoroughly read and understand that document. Below is a short summary of personal protective equipment recommendations both in text and table form. However, the WHO document contains extensive information regarding PPE donning and doffing procedures and cleaning methods.

Hand hygiene is strongly emphasized and it is of the highest importance that hand hygiene be performed thoroughly and often including before and after donning and before and after doffing PPE.

At a minimum, the WHO recommends a basic suite of PPE for most activities which includes gloves, a gown, boots or closed toe shoes with overshoes, a mask and eye protection. Some tasks require additional body protection. Certain tasks require respiratory protection.

Everyone entering the patient isolation rooms perform hand hygiene and wear at least gloves, gown, boots / closed toe shoes with overshoes and a mask and eye protection. This recommendation includes visitors. Additionally, this ensemble of PPE is recommended for those handling soiled linen from patients.

If a health care worker is undertaking any strenuous activity, such as carrying a patient, or performing any tasks in which contact with blood and body fluids is anticipated they should also wear two sets of gloves and a waterproof apron over the gown, if the gown is non-impermeable. Disposable overshoes and leg coverings should also be used if boots are not available.

Those examining remains or handling a dead body are instructed to wear an impermeable gown, mask, eye protection, double gloves and closed shoes or boots.

When cleaning the environment or handling infectious waste, workers should wear heavy duty rubber gloves, an impermeable gown and closed shoes (e.g. boots). If the cleaning activities have a risk of splash or contact with blood or bodily fluids, facial protection, such as a mask and goggle or face shield, should be used.

Summary of WHO PPE Recommendations by Task

Task	Recommended PPE
Work in Patient Areas	<ul style="list-style-type: none">• Gloves,• Gown: disposable impermeable• Medical mask• Eye protection (eye visor, goggles or face shield),• Shoes: closed, puncture and fluid resistant (e.g. rubber boots)
Strenuous tasks or exposure to blood and body fluids	<ul style="list-style-type: none">• Gloves, double set• Gown: disposable impermeable• Apron: waterproof (if gown is not impermeable)• Medical mask• Eye protection (eye visor, goggles or face shield),• Boots: rubber. Or Disposable overshoes and leg coverings with shoes.
Aerosol Generating Medical Procedures	<ul style="list-style-type: none">• Gloves,• Gown: disposable impermeable• Respirator: FFP2, NIOSH N95 or equivalent• Eye protection (eye visor, goggles or face shield),

	<ul style="list-style-type: none"> • Shoes: closed, puncture and fluid resistant (e.g. rubber boots)
Handling Infectious Waste	<ul style="list-style-type: none"> • Gloves, heavy duty/rubber • Gown: impermeable • Eye protection (eye visor, goggles or face shield); Goggles preferred for liquid handling • Shoes: closed, puncture and fluid resistant (e.g. rubber boots)
Laboratory Personnel handling potential Ebola specimens	<ul style="list-style-type: none"> • Gloves, • Gown: disposable impermeable • Respirator* • Eye protection (eye visor, goggles or face shield), • Shoes: closed with overshoes or boots <p>*FFP2, NIOSH N95 or equivalent for handling. PAPR for aliquoting, centrifugation or other aerosol generating procedures..</p>
Handling of Human Remains	<ul style="list-style-type: none"> • Gloves, double • Gown: disposable impermeable • Mask • Eye protection (eye visor, goggles or face shield), • Rubber boots or closed puncture or fluid resistant shoes and overshoes
Autopsies of known or suspected Ebola virus disease cases	<ul style="list-style-type: none"> • Gloves, double • Gown: disposable impermeable • Respirator: FFP2, NIOSH N95 or equivalent or a PAPR • Eye protection (eye visor, goggles or face shield), • Shoes: closed or boots

Respiratory protection is recommended for several applications including administering aerosol generating procedures to a patient, performing laboratory operations and during autopsies. If aerosol generating procedures are necessary, the health care worker should wear a respirator, such as an EN-certified FFP2 or NIOSH N95 or equivalent. The WHO cites examples of aerosol generating procedures as those that stimulate coughing or those that could generate aerosols such as bronchoscopy, endotracheal intubation, airway suctioning, positive pressure ventilation via a face mask, or administration of aerosolized or nebulised medication. FFP2 or N95 disposable filtering facepiece respirators are recommended for laboratory personnel handling potentially infected clinical specimens, as well as closed shoes with overshoes or boots, gloves, a disposable impermeable gown and eye protection or face shields. Workers aliquotting, performing centrifugation or undertaking any other procedures that may generate aerosols should use a powered air purifying respirator (PAPR). Persons performing autopsies are instructed to wear a particulate respirator (FFP2 or equivalent or NIOSH N95) or a PAPR as well as eye protection, double gloves, disposable impermeable gowns and closed shoes or boots.

In the 2007 WHO guidance document. "Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care," June 2007, the WHO also recommended "particulate respirators at least as protective as a NIOSH-certified N95, EU FFP2 or equivalent" for those performing aerosol generating procedures. They cited examples of acceptable disposable particulate respirators in use in various parts of the world:

- Australia/New Zealand: P2 (94%), P3 (99.95%)
- China: II (95%), I (99%)
- European Union: CE-certified filtering face-piece class 2 (FFP2) (95%), or class 3 (FFP3) (99.7%)
- Japan: 2nd class (95%), 3rd class (99.9%)
- Republic of Korea: 1st class (94%), special (99.95%)
- United States: NIOSH-certified N95 (95%), N99 (99%), N100 (99.7%).

This document can be found at

http://www.who.int/csr/resources/publications/WHO_CDS_EPR_2007_6c.pdf

US CDC:

On October 20, 2014 the US CDC published “Guidance on Personal Protective Equipment To Be Used by Healthcare Workers During Management of Patients with Ebola Virus Disease in U.S. Hospitals, Including Procedures for Putting On (Donning) and Removing (Doffing)”.
<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>

It is important that anyone involved in infection control for ebola virus disease (EVD) thoroughly read and understand this document. Below is a short summary of the revised personal protective equipment recommendations in the October 20 US CDC guidance.

Similar to the WHO, the US CDC emphasizes hand hygiene and instructs that hand hygiene be performed thoroughly and often including before and after donning and before and after doffing PPE. As of October 20, 2014 CDC has revised their PPE recommendations for U.S. Healthcare Workers to include the following:

- “Double gloves
- Boot covers that are waterproof and go to at least mid-calf or leg covers
- Single use fluid resistant or impermeable gown that extends to at least mid-calf *or* coverall without intergrated hood.
- Respirators, including either N95 respirators or powered air purifying respirator(PAPR)
- Single-use, full-face shield that is disposable
- Surgical hoods to ensure complete coverage of the head and neck
- Apron that is waterproof and covers the torso to the level of the mid-calf should be used if Ebola patients have vomiting or diarrhea.”

For more information, please see CDC’s “Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Virus Disease in U.S. Hospitals”.
<http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-control-recommendations.html>

European Centre for Disease Prevention and Control:

The European Centre for Disease Prevention and Control has published “Outbreak of Ebola virus disease in West Africa. Third update, 1 August 2014”
<http://www.ecdc.europa.eu/en/publications/Publications/ebola-outbreak-west-africa-1-august-2014.pdf>

Their recommendations are very similar to those of the WHO. It is important that anyone involved in infection control for ebola virus disease (EVD) thoroughly read and understand this document. The ECDC recommends that patient handling be conducted under droplet hygiene precautions; in case of invasive, potentially aerosol-generating procedures airborne transmission, precautions should be employed.

Additionally the ECDC has published a factsheet for health professionals.
http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_febv/factsheet-for-health-professionals/Pages/factsheet_health_professionals.aspx

United Kingdom

The United Kingdom Advisory Committee on Dangerous Pathogens has written a document “Management of Hazard Group 4 viral haemorrhagic fevers and similar human infectious diseases of high consequence” <https://www.gov.uk/government/publications/viral-haemorrhagic-fever-algorithm-and-guidance-on-management-of-patients> This document updated in September 2014 “VIRAL HAEMORRHAGIC FEVERS RISK ASSESSMENT (Version 4: 10.09.2014)” also addresses health care worker PPE. This document is contained within the UK National Travellers’ Health Network and Centre Health Professional Clinical Update of June 3rd 2014 for health professionals who are advising unwell returning travellers. http://www.nathnac.org/pro/clinical_updates/ebola_030614.htm

It is important that any health professionals potentially dealing with unwell travellers thoroughly read and understand this document. The document recommends that “Staff at Risk” such those caring for patients with a high possibility of a viral haemorrhagic fevers and similar human infectious diseases of high consequence (including ebola) should wear gloves, plastic apron, FFP3 respirator and eye protection for potential splash or aerosol generating procedures. “Staff at High Risk” such as those caring for a patient with positive confirmation of a viral haemorrhagic fever should wear fluid repellent disposable gown, double gloves, eye protection and an FFP3 respirator.