



Technical Data Bulletin

OH&ESD

#164 (July 2004); Revised October 2008 Selection of Negative Pressure Full Facepieces, Filters, Cartridges and Canisters for First Responders

Q: Do I need a CBRN approved full facepiece respirator?

A: It all depends on the anticipated hazards and intended use.

The OSHA/NIOSH *Interim Guidance CBRN Personal Protective Equipment Selection Matrix for Emergency Responders*, OSHA's standard for *Hazardous Waste Operations and Emergency Response (HAZWOPER – 29 CFR 1910.120)* and *NFPA 471 Recommended Practice for Responding to Hazardous Materials Incidents* provide instruction in the proper selection and use of personal protective equipment (PPE) during exposure to hazardous materials.

Respirators must be selected based upon the contaminant, exposure level, exposure limit, immediately dangerous to life or health (IDLH) level and the assigned protection factor of the respirator. If greater levels of skin and respiratory protection are needed, then a self-contained breathing apparatus (SCBA) and totally encapsulating suit may be appropriate. Level C PPE (including air purifying respirators) is only intended for use when lesser levels of skin and respiratory protection are required. Air purifying respirators can only be worn if the agent is known, concentrations are within the capabilities of the respirator, there is an appropriate cartridge or filter, a cartridge/canister change schedule has been developed and sufficient oxygen is present.

Therefore, the anticipated hazards and intended use need to be considered. Full face respirators that have been NIOSH approved for industrial gases and vapors could be used in response to terrorist events involving these contaminants. Although nerve, blister, tear, and vomiting agent vapors are all “organic vapors”, the standard NIOSH industrial testing does not consider permeation through the facepiece. Therefore these respirators should not be used if there is the potential for permeation of warfare agents.

CBRN approved full facepiece respirators have been tested to resist permeation of sarin and mustard vapor and liquid mustard droplets through both the canister and facepiece. Therefore, they are NIOSH approved to be used in environments containing warfare agents. However, all of the respirator selection logic in the HAZWOPER standard or NFPA 471 must still be followed. Due to the high toxicity and potential skin hazards associated with these agents, higher levels of PPE may be more appropriate for use in these environments.

In summary, skin and respiratory exposure must be considered jointly when selecting PPE for potential terrorist events. PPE must be selected based on the contaminant and concentration. Industrial full facepiece respirators, CBRN full facepiece respirators, and higher levels of PPE such as a SCBA with a totally encapsulating suit could all potentially be used in response to different terrorist events.

Q. Which 3M full facepieces, filters, cartridges and canisters may be used to respond to hazardous incidents including terrorist events?

A. 3M offers a variety of full facepiece respirators that may be used by first responders.

In Table 1, an “X” indicates that a full facepiece and filter, cartridge or canister is NIOSH approved together as a system. In Table 2, an “A” indicates that the cartridge, canister or filter is NIOSH approved for the given contaminant. An “E” indicates that it has been deemed effective in filtering the contaminant by other means. For example, under the CBRN standards NIOSH tests the canister against sulfur dioxide and hydrogen sulfide to demonstrate effectiveness in filtering other acid gases such as chlorine. CN and CS are mainly particulate aerosols with low levels of organic vapors.

Table 1. NIOSH Approved Full Facepiece Respirator Systems

	CP3N	FR-C2A1	FR-64	FR-15-CBRN
6000DIN	X		X	
7800S	X		X	
FR-M40	X	X	X	X ¹
FR-7800B	X			X

Table 2. NIOSH Approval (A) or Otherwise Effective (E)

	CP3N	FR-C2A1	FR-64	FR-15-CBRN
Ammonia			A	A
Chlorine		A	A	E
Chlorine Dioxide		E	A	E
Chloropicrin		E	E	E
CN	A	A	A	E
CS	A	A	A	E
Cyanogen Chloride		E	E	A
Formaldehyde			A	A
Hydrogen Chloride		A	A	E
Hydrogen Cyanide		E	E	A
Hydrogen Fluoride		E	A	E
Hydrogen Sulfide		E	A	A
Methylamine			A	E
Mustard (HD)		E	E	A
Nitrogen Dioxide			E	A
Organic Vapors			A	A
Particles (100 level filter)	A	A	A	A
Phosgene		E	E	A
Phosphine		E	A	A
Sarin (GB)		E	E	A
Sulfur Dioxide		A	A	A

1. The FR-15-CBRN is approved with the 3M™ Full Facepiece FR-M40; butyl rubber Second Skin, Small FR-M40-5 or Second Skin, Medium/Large FR-M40-6; and Eyepiece Outsert, Clear FR-M40-1 or Eyepiece Outsert, Gray FR-M40-2. All components must be used together in order to have a CBRN approved respirator.

As described in the previous question, skin and respiratory hazards must be considered together. For example, while an FR-64 is effective in filtering vapors from nerve or blister agents, the 6000DIN and 7800S facepieces have not been tested against liquid permeation of these agents. If exposed to liquid splashes of warfare agents, the FR-M40 full facepiece with butyl rubber second skin and eyepiece outserts (or higher levels of personal protective equipment) must be used. Air purifying respirators can only be worn if the agent is known, concentrations are within the capabilities of the respirator, there is an appropriate cartridge or filter, a cartridge/canister change schedule has been developed and sufficient oxygen is present.

All respirator use should comply with the requirements of the Occupational Safety and Health Administration (OSHA) Respirator Protection standard 29CFR1910.134

For more information regarding the use of full facepiece respirators and specific cartridges/canisters, please see Technical Data Bulletins 152 (*FR-C2A1*), 153 (*FR-64*), 159 (*Recommended Use of CBRN Full Facepiece Air Purifying Respirators*) and 162 (*FR-15-CBRN*) at <http://www.mmm.com/OccSafety>.



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