

CBRN Escape Respirator

CBRN Self-Contained Escape Respirator Concept

- Three Tiers of Requirements
 - 42 CFR, Part 84 Approval
 - Enhanced Performance Requirements
 - CBRN Requirements



CBRN Escape Respirator

CBRN Self-Contained Escape Respirator Concept

- Concept Tier 1: 42 CFR, Part 84 Approval
 - Rated Service Life 15, 30, 45, or 60 Minutes
 - Approved For Use at 10.5^o C or Lower



CBRN Escape Respirator

CBRN Self-Contained Escape Respirator Concept

- Concept Tier 2: Enhanced Requirement
 - Hood Type Head Covering
 - Donning time 30 Seconds
 - Environmental Conditioning
 - Flammability and Heat Resistance
 - Field of View
 - Fogging
 - Breathing Gas Concentrations



CBRN Escape Respirator

CBRN Self-Contained Escape Respirator Concept

- Escape Respirator Head Covering Concept
 - The escape respirator shall be designed as a hooded device.
 - The hood shall include an area for field vision and shall be compatible with wearing of glasses.



CBRN Escape Respirator

CBRN Self-Contained Escape Respirator Concept

- Donning Time Concept Requirement
 - 30 Seconds
 - From Ready To Use Configuration
 - Ready To Use = Operational Package

Prior To Use



Durability Test Matrix: Environmental, Transportation and Drop Tests

<u>•Test</u>	<u>•Test Method</u>	<u>•Test Condition</u>	<u>•Duration</u>
<u>•Hot Constant</u>	<u>•MIL-STD-810F, 501.4</u>	<u>•71 0C (160 0F), Constant</u>	<u>•5 Weeks</u>
<u>•Cold Constant</u>	<u>•MIL-STD-810F, 502.4</u>	<u>•Basic Cold, -32 0C (-24 0F), Constant</u>	<u>•3 Days</u>
<u>•Humidity</u>	<u>•MIL-STD-810E, 507.3</u>	<u>•Realistic, Natural Cycle Humidity Profiles in the U.S.</u>	<u>•5 Days “quick look”</u> <u>•Mil-Std-810E</u> <u>•Table 507.3-II</u>
<u>•Transportation</u> <u>•Vibration</u>	<u>•MIL-STD-810F, 514.5</u>	<u>•U. S. Roadway Vibration, Unrestrained</u>	<u>•12 hours/axis, 3 Axes;</u> <u>Total Duration = 36 hours</u> <u>= 12,000 miles</u>
<u>•Drop</u>	<u>•Adopted from NIOSH, CBRN APR Standard</u>	<u>•Height of 3 Feet</u>	<u>•1 Drop on each of the 3 Axes per Unit</u>



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Flammability Concept

- ANSI/ISEA Air-Purifying Respiratory Protective Smoke Escape Device - Draft
- EN 136 Test Equipment
- No After Flame After 5 Seconds
- No Drip, Melt, Hole or Other Damage



CBRN Escape Respirator

- Field of View (FOV)
 - Requirement: VFS \geq 70 Points
 - Same FOV STP as NIOSH CBRN APR
- Fogging
 - Requirement: PR(%) \geq 70 %
 - Conditions: Don at 22.2 °C (72 °F) and enter Low Temp - 10.5 °C (13 °F) and Hot Humid 32.2 °C (90 °F); RH @ 60%
- Communications
 - Requirement: Optional
 - For Communication Endorsement, Requirement \geq 70%
 - Same Communication STP as NIOSH CBRN APR



CBRN Escape Respirator

CBRN Self-Contained Escape Respirator Concept

- Breathing Gas Control Concept
 - ABMS @ $VO_2 = 1.0, 2.5 \text{ \& } 3.5 \text{ l/min}$
 - $CO_2 < 2.5\%$
 - $O_2 > 19.5\%$
 - For $VO_2 = 1.0 \text{ \& } 2.5 \text{ l/min}$
 - Test Time = Service Time (to Oxygen Depletion)
 - For $VO_2 = 3.5 \text{ l/min}$
 - Test Time = 5 Minutes



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- Concept Tier 3: CBRN Requirement
 - Laboratory Respiratory Protection Level
 - Live Chemical Warfare Agent



CBRN Escape Respirator

CBRN Self-Contained Escape LRPL Concept

- 20 – 40 mg/m³ Corn Oil Aerosol
- 0.4 to 0.6 Micrometer Mass Median Aerodynamic Diameter
- Five Tests From Each Cell
- Each Cell Uniquely Tested
- Measured LRPL 2000



CBRN Escape Respirator

CBRN Self-Contained Escape LRPL Concept

- Hood Type Respirator Required
- Anthropometrics
 - Head Circumference
 - Neck Circumference
 - Face Length



CBRN Escape Respirator

	Small	Medium	Large
Head Circumference	NA	NA	576 - 600
Neck Circumference	307 - 350	351 - 375	376 - 409
Face Length	NA	NA	124 – 133.5

- Five respirators shall be tested with test subjects from each cell of the above table with dimensions identified
- Each cell is uniquely tested

CBRN Escape Respirator

CBRN Self-Contained Escape Respirator Concept

- CWA Concept Requirement
- Sarin (GB):
 - Vapor Challenge - 2000 mg/m³
 - Breakthrough – 0.087 mg/m³ Peak
- 2.1 mg – min/m³ Ct
 - Time Agent Applied = Respirator Tested
Service Time
 - Total Test Time = 2 X Respirator Tested
Service Time



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- Mustard (HD):
 - Vapor Challenge 300 mg/m³
 - Liquid Challenge 0.46 ml
 - Breakthrough – 0.60 mg/m³ Peak
 - 6.0 mg – min/m³ Ct
 - Time Agent Applied = Respirator Tested Service Time
 - Total Test Time = 2 X Respirator Tested Service Time

