

LABORATORY RESPIRATOR PROTECTION LEVEL TESTING (LRPL)

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To evaluate respirator protective equipment (RPE) for military and civilian applications requiring protection against nuclear, biological and chemical (NBC) warfare agents

- ◆ **Chemical Stockpile Emergency Preparedness Program (CSEPP)**
 - ◆ Emergency responders
- ◆ **Chemical Agent Safety and Health Policy Action Committee (CASHPAC)**
 - ◆ Federal workers and contractors at U.S. Army research and storage facilities
- ◆ **Domestic Preparedness Program (Counter Terrorism)**
 - ◆ National, state, and local emergency responders
- ◆ **Technical Support Working Group (TSWG) on Counter Terrorism**
 - ◆ Federal law enforcement personnel

Relevant Test Standards and Protocols

- ◆ **“Joint Service Standardization Agreement for Fit Factor Testing of Military Masks”, 1 Oct 91 (approved 8 Apr 92)**
- ◆ **“Protection Factor Testing of Respirators and Suit Ensembles”**; Internal test protocol based on standardization agreement



- ◆ **29 CFR 1910.134**
- ◆ **AR 11-34**
- ◆ **AR 50-6**
- ◆ **AR 385-61**
- ◆ **DA PAM 385-61**
- ◆ **TB MED 502**
- ◆ **DA PAM 40-8**
- ◆ **ANSI Z88-2.1992**

- ◆ Each company would provide a minimum of 16 respirators (good quality) for testing. Providing fewer respirators for testing will increase costs.
- ◆ Each company would submit donning and sizing instructions.

- ◆ A minimum of 32 different data points will be generated from PF testing (statistically significant sample).
- ◆ Face length and face width will be measured (neck dam mask - neck circumference).
- ◆ Test subjects will be chosen based on anthropometrics.



- ◆ **Corn oil**
- ◆ **Concentration of 20 to 40 mg/m³**
- ◆ **Particle size of .4 to .6 microns (MMAD)**
- ◆ **The geometric standard deviation be less than 2.0**
- ◆ **Temperature 70F, Humidity 20%**

- ◆ **Subject trained and fit for each respirator model (contractors can witness testing)**
- ◆ **Each subject will self-don prior to testing**
- ◆ **Joint Service standard ten-one minute exercise routine**
- ◆ **Oral-nasal sampling**
- ◆ **Sampling rate of 2 to 5 lpm.**

- ◆ **Normal Breathing**
- ◆ **Deep Breathing**
- ◆ **Turn head side to side**
- ◆ **Turn head up and down**
- ◆ **Recite the rainbow passage**
- ◆ **Climb stairs or sight rifle**
- ◆ **Reach for the floor or ceiling**
- ◆ **On hands and knees, turn head side to side**
- ◆ **Facial expressions**
- ◆ **Normal breathing**

- ◆ **Rear- light scattering photometers or equivalent**
- ◆ **Capable of measuring 100,000 PF**
- ◆ **Real-time measurement**

- ◆ Expression of performance based on the ratio of concentration outside the mask to concentration inside the mask, or
- ◆ $(C_o / C_i) = PL$
- ◆ Example: 1000 ppm /1.0 ppm = 1000
- ◆ In other words, the air inside the mask is 1000 times cleaner than the outside air



TYPICAL PL DATA CHART



PF	Frequency	Cumulative%	Pass Rate
0.0	0	.00%	100.0%
10.0	1	2.08%	97.9%
50.0	0	2.08%	97.9%
100.0	1	4.17%	95.8%
150.0	0	4.17%	95.8%
200.0	0	4.17%	95.8%
500.0	1	6.25%	93.8%
1667.0	2	10.42%	89.6%
2000.0	0	10.42%	89.6%
3000.0	0	10.42%	89.6%
5000.0	4	18.75%	81.3%
6667.0	2	22.92%	77.1%
10000.0	3	29.17%	70.8%
20000.0	4	37.50%	62.5%
50000.0	3	43.75%	56.3%
100000.0	27	100.00%	0.0%

