

**National Personal Protective  
Technology Laboratory**

**Canister Requirements of CBRN  
Powered Air-Purifying Respirators  
with Benchmark Results**

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# Canister Requirements of CBRN Powered Air-Purifying Respirators

- The requirements for the PAPR canister testing will be based on the same tests as for the air purifying respirator canisters

*Statement of Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Full Facepiece Air Purifying Respirator (APR), Dated March 7, 2003*

- Hazard list derived during earlier CBRN standards development work

# Canister Requirements of CBRN Powered Air-Purifying Respirators

TRA	Challenge Concentration (ppm)	Breakthrough Concentration (ppm)
Cyclohexane	2600	10
Sulfur dioxide	1500	5
Hydrogen sulfide	1500	5
Cyanogen Chloride	300	2
Phosgene	250	1.25
Hydrogen Cyanide	940	4.7
Ammonia	2500	12.5
Phosphine	300	0.3
Nitrogen dioxide	500	1 ppm NO <sub>2</sub> or 25 ppm NO
Formaldehyde	500	1

# Canister Requirements of CBRN Powered Air-Purifying Respirators

- **Manufacturer will apply for**
  - Moderate breathing rate performance
  - High breathing rate performance
- **Manufacturer specifies filter capacity**
  - Cap 1 through 6

# Canister Requirements of CBRN Powered Air-Purifying Respirators

- Service life testing will be performed as a system
- An applicant submitted manifold will be used for the service life testing.
  - Three tests at 25% RH, 25°C at capacity requested
  - Three tests at 80% RH, 25°C at capacity requested
- Airflow
  - Constant flow PAPR
    - The manifold with canister(s) shall be tested at a continuous airflow rate of the measured airflow
  - Breath Response PAPR
    - 115 L/min (moderate) or 300 L/min (high)

# Canister Requirements of CBRN Powered Air-Purifying Respirators

## Stacking

Several comments were received at the docket which suggested that stacking did not fit and should be dropped from the concept.

# Canister Requirements of CBRN Powered Air-Purifying Respirators

## Crisis Provision

The crisis provision requirements for the CBRN PAPR is being investigated. A study is being set up to evaluate whether peak instantaneous panic flows will be covered in certification testing by the higher constant flows.

# Canister Requirements of CBRN Powered Air-Purifying Respirators

## CBRN PARTICULATE TESTING

- P100 Filter Requirements- Canisters shall meet the requirements for a P-100 filter which is 99.97% particulate filter efficiency against DOP, tested at the measured airflow of the PAPR system
- Constant flow PAPR – Individual canisters tested at the airflow of the PAPR
- Demand responsive PAPR - Individual canisters tested at 115 L/min for moderate breathing rate or 300 L/min for high breathing rate
- For multiple canister configuration the above airflows will be reduced in proportion by the number of canisters



# Canister Requirements of CBRN Powered Air-Purifying Respirators

## CBRN PARTICULATE TESTING

- Twenty (20) canisters will be tested against DOP
- Additionally nine canisters from cyclohexane service life tests will be tested against DOP
- The concept of testing using “Equivalent Face Velocity” was removed from the concept. Using docket comments and meetings with stakeholders showed that this was not effective for certification.

# Canister Requirements of CBRN Powered Air-Purifying Respirators

## High Flow Testing Equipment

- Equipment has been purchased from two manufacturers of filter testing devices
- Both devices will be able to test at flows up to 450 L/min
- Expected delivery date is in February 2005

# Canister Requirements of CBRN Powered Air-Purifying Respirators

## Benchmark Testing

- P-100 testing was performed for PAPR systems using existing TSI 8130 equipment with a 100 L/min maximum flow
- Three canisters with high efficiency capability showed P-100 efficiency
- Other benchmark testing will be performed at higher flows