

than 60 mg of flint (99 + percent free silica) per m³ of air.

(d) The flint in suspension will be 99 + percent through a 270-mesh sieve.

(e) The particle-size distribution of the test suspension will have a geometric mean of 0.4 to 0.6 µm and the standard geometric deviation will not exceed 2.

(f) The total amount of unretained test suspension in samples taken during testing must not exceed 14.4 mg for a powered air-purifying particulate respirator with tight-fitting facepiece, and 21.3 mg for a powered air-purifying particulate respirator with loose-fitting hood or helmet.

§ 84.180 Particulate loading test—PAPR series PAPR100-N and PAPR100-P filtration.

(a) Twenty filters of each powered air-purifying particulate respirator design will be tested for filter efficiency against:

(1) A solid sodium chloride particulate aerosol, in accordance with paragraph (d)(1) of this section, if series PAPR100-N approval is requested by the applicant.

(2) A dioctyl phthalate or equivalent liquid particulate aerosol, in accordance with paragraph (d)(2) of this section, if series PAPR100-P approval is requested by the applicant.

(b) Prior to filter efficiency testing of 20 series PAPR100-N filters, the 20 to be tested will be taken out of their packaging and placed in an environment of 85 ±5 percent relative humidity at 38 ±2.5 °C for 25 ±1 hours. Following the pre-conditioning, filters will be sealed in a gas-tight container and tested within 10 hours.

(c) For powered air-purifying particulate respirators with a single filter, filters will be tested at a continuous airflow rate of 85 ±4 liters per minute. Where filters are to be used in pairs, the test-aerosol airflow rate will be 42.5 ±2 liters per minute through each filter.

(d) Filter efficiency test aerosols:

(1) Series PAPR100-N filters:

(i) A sodium chloride or equivalent solid aerosol at 25 ±5 °C and relative humidity of 30 ±10 percent that has been neutralized to the Boltzmann equilibrium state will be used. Each fil-

ter will be challenged with a concentration not exceeding 200 mg/m³.

(ii) The sodium chloride test aerosol will have a particle size distribution with count median diameter of 0.075 ±0.020 µm and a standard geometric deviation not exceeding 1.86 at the specified test conditions as determined with a scanning mobility particle sizer or equivalent.

(2) Series PAPR100-P filters:

(i) A neat cold-nebulized dioctyl phthalate (DOP) or equivalent aerosol at 25 ±5 °C that has been neutralized to the Boltzmann equilibrium state will be used. Each filter will be challenged with a concentration not exceeding 200 mg/m³.

(ii) The DOP aerosol shall have a particle size distribution with count median diameter of 0.185 ±0.020 µm and a standard geometric deviation not exceeding 1.60 at the specified test conditions as determined with a scanning mobility particle sizer or equivalent.

(e) The test will continue until minimum efficiency is achieved or until an aerosol mass of at least 200 ±5 mg has contacted the filter. For PAPR100-P series filters, if the filter efficiency is decreasing when the 200 ±5 mg challenge point is reached, the test will be continued until there is no further decrease in efficiency.

(f) The efficiency of the filter will be monitored and recorded throughout the test period by a suitable forward-light scattering photometer or equivalent instrumentation.

(g) The minimum efficiency for each of the 20 filters will be determined and recorded and must be equal to or greater than the filter efficiency criterion for PAPR100-N and PAPR100-P, efficiency ≥99.97 percent, pursuant to § 84.170(b).

§ 84.181 Communication performance test—PAPR class PAPR100.

(a) Powered air-purifying respirators must be designed to allow for proper communication while worn.

(b) A Modified Rhyme Test⁷ will be used to test the wearer's ability to communicate efficiently.

⁷The Modified Rhyme Test is used in speech intelligibility experiments. See <https://www.fda.gov/oc/ohrt/>
Continued

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(c) The communications requirement is met if the overall performance rating is greater than or equal to 70 percent.

Subpart L—Chemical Cartridge Respirators

§ 84.190 Chemical cartridge respirators: description.

(a) Chemical cartridge respirators including all completely assembled respirators which are designed for use as respiratory protection during entry into or escape from atmospheres not immediately dangerous to life and health, are described according to the specific gases or vapors against which they are designed to provide respiratory protection, as follows:

Type of chemical cartridge respirator ¹	Maximum use concentration, parts per million
Ammonia	300
Chlorine	10
Hydrogen chloride	50
Methyl amine	100
Organic vapor	² 1,000
Sulfur dioxide	50
Vinyl chloride	10

¹ Not for use against gases or vapors with poor warning properties (except where MSHA or Occupational Safety and Health Administration standards may permit such use for a specific gas or vapor) or those which generate high heats of reaction with sorbent material in the cartridge.

² Maximum use concentrations are lower for organic vapors which produce atmospheres immediately hazardous to life or health at concentrations equal to or lower than this concentration.

(b) Chemical cartridge respirators for respiratory protection against gases or vapors, which are not specifically listed with their maximum use concentration, may be approved if the applicant submits a request for such approval, in writing, to the Institute. The Institute shall consider each such application and accept or reject the application after a review of the effects on the wearer's health and safety and in the light of any field experience in use of chemical cartridge respirators as protection against such hazards.

www.nist.gov/ctl/pscr/modified-rhyme-test-audio-library.

§ 84.191 Chemical cartridge respirators; required components.

(a) Each chemical cartridge respirator described in § 84.190 shall, where its design requires, contain the following component parts:

- (1) Facepiece, mouthpiece, and nose-clip, hood, or helmet;
- (2) Cartridge;
- (3) Cartridge with filter;
- (4) Harness;
- (5) Breathing tube; and
- (6) Attached blower.

(b) The components of each chemical cartridge respirator shall meet the minimum construction requirements set forth in subpart G of this part.

§ 84.192 Cartridges in parallel; resistance requirements.

Where two or more cartridges are used in parallel, their resistance to air-flow shall be essentially equal.

§ 84.193 Cartridges; color and markings; requirements.

The color and markings of all cartridges or labels shall conform with the requirements of the American National Standards Institute, American National Standard for Identification of Air-Purifying Respirator Canisters and Cartridges, ANSI K13.1-1973. ANSI K13.1 is incorporated by reference and has been approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018. Copies may be inspected at the NIOSH, National Personal Protective Technology Laboratory, P.O. Box 18070, 626 Cochran's Mill Road, Pittsburgh, PA 15236, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal-register/code_of_federal_regulations/ibr_locations.html.

[60 FR 30355, June 8, 1995, as amended at 80 FR 3908, Jan. 26, 2015]

§ 84.194 Filters used with chemical cartridges; location; replacement.

(a) Particulate matter filters used in conjunction with a chemical cartridge