

Sodium Chloride (NaCl) Aerosol Test Final Report

Test Article: Vogmask May 2013
 Purchase Order: 52155
 Laboratory Number: 693046
 Study Received Date: 22 May 2013
 Test Procedure(s): Standard Test Protocol (STP) Number: STP0014 Rev 06

Summary: This procedure was performed to evaluate particulate filter penetration as specified in 42 CFR Part 84, TEB-APR-STP-0058, and TEB-APR-STP-0059 for requirements on a N99 respirator. Respirators were conditioned then tested for particle penetration against a polydispersed, sodium chloride (NaCl) particulate aerosol. The challenge aerosol was dried, neutralized, and passed through the test article at a concentration not exceeding 200 mg/m³. The initial airflow resistance and particle penetration for each respirator was determined. All test method acceptance criteria were met.

Results: The NIOSH N99 filter efficiency as stated in 42 CFR Part 84.181 is a minimum efficiency for each filter of ≥99% (≤1% penetration). The test articles submitted by the sponsor conform to the NIOSH N99 criteria for filter efficiency.

| Test Article Number | Initial Airflow Resistance (mm H ₂ O) | Particle Penetration (%) | Filtration Efficiency (%) |
|---------------------|--|--------------------------|---------------------------|
| 1 | 13.8 | 0.913 | 99.087 |
| 2 | 16.1 | 0.247 | 99.753 |
| 3 | 16.4 | 0.562 | 99.438 |
| 4 | 15.6 | 1.00 | 99.00 |
| 5 | 18.5 | 0.234 | 99.766 |
| 6 | 15.5 | 0.557 | 99.443 |
| 7 | 19.3 | 0.294 | 99.706 |
| 8 | 15.0 | 0.407 | 99.593 |
| 9 | 13.2 | 0.378 | 99.622 |
| 10 | 16.9 | 0.246 | 99.754 |
| 11 | 13.0 | 0.674 | 99.326 |
| 12 | 13.3 | 0.161 | 99.839 |
| 13 | 16.1 | 0.385 | 99.615 |
| 14 | 13.2 | 0.314 | 99.686 |
| 15 | 18.9 | 0.427 | 99.573 |
| 16 | 17.4 | 0.256 | 99.744 |
| 17 | 14.9 | 0.334 | 99.666 |
| 18 | 20.0 | 0.349 | 99.651 |
| 19 | 16.7 | 0.287 | 99.713 |
| 20 | 14.0 | 0.424 | 99.576 |


 Study Director Brandon L. Williams

10 Jun 2013
 Study Completion Date

Acceptance Criteria: The filter tester must pass the “Tester Set Up” procedure. The airflow resistance and particle penetration of the reference material must be within the limits set by the manufacturer.

Filter Test Procedure: Prior to testing, respirators were taken out of their packaging and placed in an environment of $85 \pm 5\%$ relative humidity (RH) and $38 \pm 2.5^\circ\text{C}$ for 25 ± 1 hrs.

The filter tester used in this procedure was a TSI® CERTITEST® Model 8130 Automated Filter Tester that is capable of efficiency measurements of up to 99.999%. It produces a particle size distribution with a count median diameter of $0.075 \pm 0.020 \mu\text{m}$ and a geometric standard deviation not exceeding $1.86 \mu\text{m}$, as determined by a scanning mobility particle sizer (SMPS). The mass median diameter is approximately $0.26 \mu\text{m}$, which is generally accepted as the most penetrating aerosol size. The reservoir was filled with a 2% NaCl solution and the instrument allowed a minimum warm-up time of 30 min. The main regulator pressure was set to 75 ± 5 pounds per square inch (psi). The filter holder regulator pressure was set to approximately 35 pounds psi. The NaCl aerosol generator pressure was set to approximately 30 psi and the make-up airflow rate was set to approximately 70 liters per minute (L/min).

The neutralized NaCl test aerosol was verified to be at $25 \pm 5^\circ\text{C}$ and $30 \pm 10\%$ RH by the acceptance of the manufacturer’s reference material. The NaCl concentration of the test aerosol was determined in mg/m^3 by a gravimetric method prior to the load test assessment.

An entire respirator was mounted on a test fixture, placed into the test article holder, and the NaCl aerosol passed through the outside surface of the test article at a continuous airflow rate of 85 ± 4 L/min. In accordance with NIOSH policy, three respirators were challenged until 200 ± 5 mg of NaCl had contacted the filter. Based upon the load pattern of NIOSH Type 2, the initial penetration reading of the remaining 17 filters was recorded.