

Particulate Filtration Efficiency Test Report

Manufacturer: Vitacore Industries Inc.

Respirator Model Tested: Kids' CAN99e

Report Date: 2022/12/08

1. Executive Summary

Twenty Kids' CAN99e surgical respirators were tested for Particulate Filter Efficiency in accordance with test method TEB-APR-STP-0059¹. The twenty respirators were selected at random and subjected to a 5-minute Canadian Standards Association (CSA) test. All tested Kids' CAN99e surgical respirators exhibited particulate filtration efficiency greater than 99% (Table 2).

2. Sample Description

Table 1. Sample and testing information.

Sample Name	Number of Samples	Analysis ID	Test Date
Kids' CAN99e	20	221125-Kids-99e-A	20221125

3. Test method

The Particulate Filter Efficiency (PFE) testing was performed in accordance with NIOSH Procedure TEB-APR-STP-0059 on a TSI® CERTITEST® Automated Filter Tester Model 8130 (Serial No.: 8130163502). Surgical respirators were challenged by a NaCl aerosol which had been neutralized to the Boltzmann equilibrium state at $25 \pm 5^\circ\text{C}$ and $30 \pm 10\%$ relative humidity. The particle size distribution was verified to be a count median diameter of $0.075 \pm 0.020 \mu\text{m}$, and a geometric standard deviation not exceeding 1.86. The aerosol concentration was not exceeding 200 mg/m^3 .

The respirators were pre-conditioned at $85 \pm 5\%$ relative humidity and $38 \pm 2.5^\circ\text{C}$ for 25 ± 1 hours before testing. The challenge flow rate was checked for stability for at least 30 seconds prior to testing. Surgical respirators were mounted on holders by hot melt glue to prevent leakage around the filter holder.

The penetration of the 20 samples was measured, recorded, and printed at approximately 1-minute intervals

during the CSA-5 min test period. The highest penetration observed throughout the test of each filter was recorded as the maximum penetration of that respirator. The maximum filter penetration for each of the 20 samples was determined and record on the data sheet provided below.

Figure 1 below shows the setup of a Kids' CAN99e Surgical Respirator and the TSI Tester.

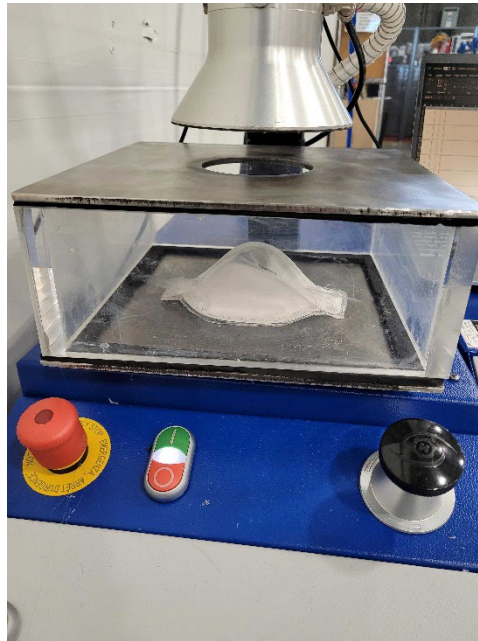


Figure 1. Kids' CAN99e Surgical Respirator under test using a TSI® CERTITEST® Automated Filter Tester Model 8130.

4. Results

All samples exhibited minimum PFE% over 99%, shown in Table 2 below.

Table 3 to Table 22 summarize the 5-minute loading results of each respirator.

Table 2. Test result summary for twenty Kids' CAN99e surgical respirator according to NIOSH Method TEB- APR-STP-0059, including initial inhalation resistance, maximum penetration and PFE%.

Sample ID	Initial Inhalation Resistance (mmH₂O)	Initial Penetration (%)	Maximum Penetration (%)	Maximum Allowable Penetration (%)	PFE (%)	PASS / FAIL
Kids-99e-A-1	15.23	0.0386	0.0386	5.000	99.961	PASS
Kids-99e-A-2	16.73	0.1463	0.1649	5.000	99.835	PASS
Kids-99e-A-3	15.87	0.0694	0.0694	5.000	99.931	PASS
Kids-99e-A-4	15.53	0.3424	0.3424	5.000	99.658	PASS
Kids-99e-A-5	16.13	0.0537	0.0577	5.000	99.942	PASS
Kids-99e-A-6	15.86	0.0296	0.0296	5.000	99.970	PASS
Kids-99e-A-7	15.76	0.0095	0.0095	5.000	99.990	PASS
Kids-99e-A-8	16.18	0.0413	0.0446	5.000	99.955	PASS
Kids-99e-A-9	16.18	0.1232	0.1244	5.000	99.876	PASS
Kids-99e-A-10	16.38	0.0558	0.0572	5.000	99.943	PASS
Kids-99e-A-11	19.04	0.0035	0.0042	5.000	99.996	PASS
Kids-99e-A-12	14.34	0.0017	0.0019	5.000	99.998	PASS
Kids-99e-A-13	14.61	0.0180	0.0196	5.000	99.980	PASS
Kids-99e-A-14	13.79	0.0386	0.0706	5.000	99.929	PASS
Kids-99e-A-15	14.76	0.0310	0.0477	5.000	99.952	PASS
Kids-99e-A-16	14.55	0.0125	0.0125	5.000	99.988	PASS
Kids-99e-A-17	14.63	0.1549	0.1549	5.000	99.845	PASS
Kids-99e-A-18	14.48	0.0159	0.0358	5.000	99.964	PASS
Kids-99e-A-19	13.99	0.0062	0.0070	5.000	99.993	PASS
Kids-99e-A-20	14.49	0.0068	0.0068	5.000	99.993	PASS

Table 3. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-1.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.27	15.89	0.039	99.961	2.1
2	85.32	16.49	0.038	99.962	4.2
3	85.31	16.99	0.038	99.962	6.3
4	85.34	17.61	0.036	99.964	8.4
5	85.37	18.16	0.036	99.964	10.5

Table 4. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-2.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.42	17.31	0.146	99.854	2.1
2	85.43	17.88	0.156	99.844	4.2
3	85.44	18.52	0.165	99.835	6.3
4	85.46	19.06	0.161	99.839	8.4
5	85.46	19.74	0.160	99.840	10.6

Table 5. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-3.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.30	16.57	0.069	99.931	2.1
2	85.34	17.07	0.062	99.938	4.2
3	85.26	17.61	0.063	99.937	6.3
4	85.13	18.15	0.067	99.933	8.4
5	85.13	18.81	0.067	99.933	10.5

Table 6. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-4.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.20	16.24	0.342	99.658	2.1
2	85.24	16.79	0.323	99.677	4.2
3	85.26	17.35	0.307	99.693	6.3
4	85.25	17.92	0.327	99.673	8.4
5	85.27	18.54	0.317	99.683	10.5

Table 7. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-5.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.30	16.87	0.054	99.946	2.1
2	85.29	17.41	0.058	99.942	4.2
3	85.21	18.01	0.050	99.950	6.3
4	85.20	18.63	0.048	99.952	8.4
5	85.21	19.35	0.043	99.957	10.5

Table 8. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-6.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.26	16.52	0.030	99.970	2.1
2	85.25	17.08	0.029	99.971	4.2
3	85.28	17.66	0.027	99.973	6.3
4	85.27	18.30	0.026	99.974	8.4
5	85.29	18.89	0.025	99.975	10.5

Table 9. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-7.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.29	16.55	0.010	99.990	2.1
2	85.32	17.19	0.008	99.992	4.2
3	85.33	17.70	0.006	99.994	6.3
4	85.33	18.39	0.007	99.993	8.4
5	85.35	19.06	0.006	99.994	10.5

Table 10. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-8.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.38	16.93	0.041	99.959	2.1
2	85.38	17.55	0.041	99.959	4.2
3	85.37	18.22	0.045	99.955	6.3
4	85.39	18.91	0.041	99.959	8.4
5	85.37	19.64	0.038	99.962	10.5

Table 11. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-9.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.41	16.95	0.123	99.877	2.1
2	85.40	17.57	0.124	99.876	4.2
3	85.40	18.14	0.122	99.878	6.3
4	85.43	18.82	0.120	99.880	8.4
5	85.12	19.40	0.112	99.888	10.5

Table 12. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-10.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	84.95	17.20	0.056	99.944	2.1
2	84.99	17.86	0.057	99.943	4.2
3	84.97	18.59	0.053	99.947	6.3
4	85.00	19.28	0.050	99.950	8.4
5	84.98	20.13	0.050	99.950	10.5

Table 13. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-11.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.06	15.99	0.003	99.997	2.1
2	85.09	16.76	0.004	99.996	4.2
3	85.04	17.36	0.004	99.996	6.3
4	85.05	18.11	0.004	99.996	8.4
5	85.06	18.98	0.004	99.996	10.5

Table 14. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-12.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.08	15.21	0.002	99.998	2.1
2	85.07	15.73	0.002	99.998	4.2
3	85.07	16.32	0.001	99.999	6.3
4	85.08	17.04	0.001	99.999	8.4
5	85.08	17.72	0.001	99.999	10.5

Table 15. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-13.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.06	16.41	0.018	99.982	2.1
2	85.02	17.08	0.019	99.981	4.2
3	85.02	17.78	0.019	99.981	6.3
4	85.00	18.53	0.017	99.983	8.4
5	85.03	19.34	0.020	99.980	10.5

Table 16. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-14.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.05	14.51	0.039	99.961	2.1
2	85.02	15.15	0.044	99.956	4.2
3	85.02	15.84	0.052	99.948	6.3
4	85.02	16.49	0.061	99.939	8.4
5	84.99	17.26	0.071	99.929	10.5

Table 17. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-15.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.13	15.57	0.031	99.969	2.1
2	85.14	15.99	0.037	99.963	4.2
3	85.14	16.75	0.041	99.959	6.3
4	85.13	17.45	0.042	99.958	8.4
5	85.12	18.19	0.048	99.952	10.5

Table 18. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-16.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.13	15.35	0.012	99.988	2.1
2	85.16	15.95	0.010	99.990	4.2
3	85.13	16.61	0.010	99.990	6.3
4	85.14	17.31	0.010	99.990	8.4
5	85.13	17.98	0.012	99.988	10.5

Table 19. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-17.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.16	15.45	0.155	99.845	2.1
2	85.16	16.14	0.150	99.850	4.2
3	85.15	16.77	0.148	99.852	6.3
4	85.15	17.52	0.154	99.846	8.4
5	85.15	18.33	0.150	99.850	10.5

Table 20. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-18.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.15	16.52	0.016	99.984	2.1
2	85.14	17.18	0.021	99.979	4.2
3	85.14	17.94	0.025	99.975	6.3
4	85.13	18.69	0.030	99.970	8.4
5	85.12	19.59	0.036	99.964	10.5

Table 21. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-19.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.12	14.60	0.006	99.994	2.1
2	85.14	15.17	0.007	99.993	4.2
3	85.12	15.78	0.005	99.995	6.3
4	85.13	16.43	0.004	99.996	8.4
5	85.13	17.14	0.003	99.997	10.5

Table 22. Loading test data including flow rate, inhalation resistance, penetration, PFE and NaCl mass loading according to NIOSH Method TEB-APR-STP-0059 for Sample ID Kids-99e-A-20.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H ₂ O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.12	15.28	0.007	99.993	2.1
2	85.10	15.98	0.006	99.994	4.2
3	85.11	16.66	0.005	99.995	6.3
4	85.14	17.34	0.005	99.995	8.4
5	85.15	18.13	0.005	99.995	10.5

Reviewed by: *Yuxuan (Steven) Fan MEng*, Project Associate

Prepared by: *Jamie Chiam BAsc*, Research Assistant

These data are representative of only the samples tested.

References

1. National Institute for Occupational Safety and Health. Determination of Particulate Filter Efficiency Level for N95 Series Filters against Solid Particulates for Non-Powered, Air Purifying Respirators Standard Test Procedure TEB-APR-STP-0059 Revision 3.2. 2019.