Vitacore Industries Inc.
Website: https://vitacore.ca/
Email: info@vitacore.ca

Particulate Filtration Efficiency
Test Report

Manufacturer: Vitacore Industries Inc.

Respirator Model Tested: CAN99e (White)

Report Date: 2023-01-19

1. Executive Summary

Twenty white CAN99e respirators were tested for Particulate Filter Efficiency in accordance with test method TEB-APR-STP-0059[1]. The twenty respirators were selected at random and subjected to a 5-minute Canadian Standards Association (CSA) test. All tested CAN99e respirators exhibited particulate filtration efficiency greater than 95% (Table 2).

2. Sample Description

Table 1. Sample and testing information.

Sample Name	Number of Samples	Analysis ID	Test Date
CAN99e	20	230112-WT99e-A	2023-01-12

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 8130A (Serial No.: 8130163502). Respirators were challenged by a NaCl aerosol which had been neutralized to the Boltzmann equilibrium state at 25 ± 5˚C and 30 ± 10% relative humidity. The particle size distribution was verified to be a count median diameter of 0.075 ± 0.020 µm, 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 ± 5% relative humidity and 38 ± 2.5 °C for 25 ±1 hours before testing. The challenge flow rate was checked for stability for at least 30 seconds prior to testing. Respirators were mounted on holders by hot melt glue to prevent leakage around the filter holder.

Three respirators were chosen randomly from the 20 submitted samples and subjected to a 5-minute CSA aerosol loading level, at the challenge flow rate of 85 Lpm. The penetration of the 20 samples was measured,

recorded, and printed at approximately 1-minute intervals during the 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 CAN99e Respirator and the TSI Tester.

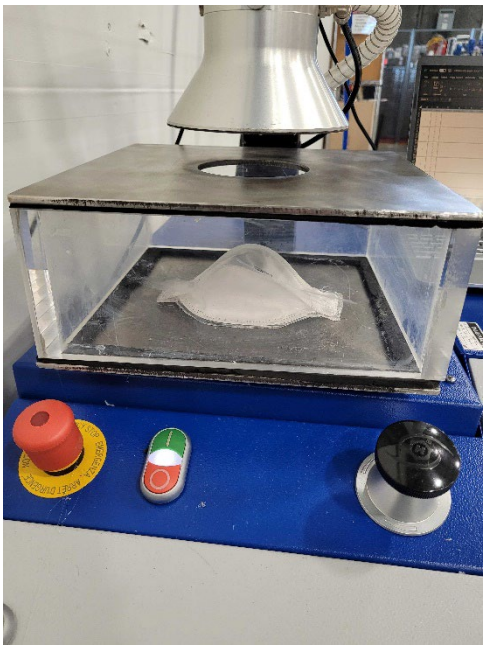

Figure 1. White CAN99e Respirator under test using a TSI® CERTITEST® Automated Filter Tester Model 8130A.

4. Results

All samples exhibited minimum PFE% over 95%, 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 CAN99e Respirators according to NIOSH Method TEB- APR-STP-0059, including initial inhalation resistance, maximum penetration and PFE%.

Sample ID	Initial Inhalation Resistance (mmH_2O)	Initial Penetration (%)	Maximum Penetration (%)	Maximum Allowable Penetration (%)	PFE (%)	PASS / FAIL
230112-WT99e-A -1	10.31	0.070	0.079	5.000	99.921	Pass
230112-WT99e-A-2	10.71	0.167	0.192	5.000	99.808	Pass
230112-WT99e-A-3	10.67	0.156	0.164	5.000	99.836	Pass

230112-WT99e-A-4	10.31	0.044	0.047	5.000	99.953	Pass
230112-WT99e-A-5	10.86	0.011	0.013	5.000	99.987	Pass
230112-WT99e-A-6	10.61	0.040	0.042	5.000	99.958	Pass
230112-WT99e-A-7	10.43	0.030	0.030	5.000	99.970	Pass
230112-WT99e-A-8	10.05	0.091	0.105	5.000	99.895	Pass
230112-WT99e-A-9	9.93	0.077	0.077	5.000	99.923	Pass
230112-WT99e-A-10	10.24	0.036	0.043	5.000	99.957	Pass
230112-WT99e-A-11	10.05	0.025	0.025	5.000	99.975	Pass
230112-WT99e-A-12	10.21	0.139	0.166	5.000	99.834	Pass
230112-WT99e-A-13	10.19	0.019	0.021	5.000	99.979	Pass
230112-WT99e-A-14	10.04	0.035	0.038	5.000	99.962	Pass
230112-WT99e-A-15	10.08	0.547	0.553	5.000	99.447	Pass
230112-WT99e-A-16	12.1	0.021	0.021	5.000	99.979	Pass
230112-WT99e-A-17	10.15	0.055	0.061	5.000	99.939	Pass
230112-WT99e-A-18	10.15	0.189	0.225	5.000	99.775	Pass
230112-WT99e-A-19	10.28	0.039	0.042	5.000	99.958	Pass
230112-WT99e-A-20	10.15	0.062	0.064	5.000	99.936	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 230112-WT99e-A-1.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.4	10.6	0.070	99.930	2.1
2	85.5	10.9	0.074	99.926	4.2
3	85.5	11.1	0.075	99.925	6.3
4	85.5	11.4	0.077	99.923	8.5
5	85.5	11.7	0.079	99.921	10.6

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 230112-WT99e-A-2.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.2	11.1	0.167	99.833	2.1
2	85.3	11.3	0.177	99.823	4.2
3	85.3	11.6	0.184	99.816	6.3
4	85.3	11.9	0.190	99.810	8.4
5	85.3	12.2	0.192	99.808	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 230112-WT99e-A-3.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.2	11.0	0.156	99.844	2.1
2	85.2	11.3	0.164	99.836	4.2
3	85.3	11.6	0.159	99.841	6.3
4	85.3	11.9	0.160	99.840	8.4
5	85.3	12.2	0.162	99.838	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 230112-WT99e-A-4.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.4	10.4	0.044	99.956	2.1
2	85.4	10.6	0.046	99.954	4.2
3	85.2	11.0	0.044	99.956	6.3
4	85.2	11.2	0.046	99.954	8.4
5	85.2	11.5	0.047	99.953	10.6

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 230112-WT99e-A-5.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.2	11.2	0.011	99.989	2.1
2	85.2	11.5	0.010	99.990	4.2
3	85.2	11.8	0.013	99.987	6.3
4	85.3	12.1	0.013	99.987	8.4
5	85.3	12.4	0.011	99.989	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 230112-WT99e-A-6.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	10.9	0.040	99.960	2.1
2	85.3	11.1	0.041	99.959	4.2
3	85.3	11.4	0.040	99.960	6.3
4	85.3	11.7	0.042	99.958	8.4
5	85.3	12.0	0.041	99.959	10.6

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 230112-WT99e-A-7.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	84.9	10.8	0.030	99.970	2.1
2	84.9	11.1	0.029	99.971	4.2
3	85.0	11.3	0.029	99.971	6.3
4	85.0	11.6	0.029	99.971	8.4
5	85.0	11.9	0.030	99.970	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 230112-WT99e-A-8.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.1	10.4	0.091	99.909	2.1
2	85.1	10.6	0.095	99.905	4.2
3	85.2	10.9	0.100	99.900	6.3
4	85.1	11.2	0.102	99.898	8.4
5	85.2	11.5	0.105	99.895	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 230112-WT99e-A-9.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.2	10.2	0.077	99.923	2.1
2	85.2	10.4	0.074	99.926	4.2
3	85.2	10.7	0.074	99.926	6.3
4	85.2	10.9	0.073	99.927	8.4
5	85.2	11.2	0.071	99.929	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 230112-WT99e-A-10.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	10.5	0.036	99.964	2.1
2	85.3	10.9	0.037	99.963	4.2
3	85.3	11.1	0.041	99.959	6.3
4	85.3	11.4	0.043	99.957	8.4
5	85.3	11.7	0.042	99.958	10.6

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 230112-WT99e-A-11.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	10.4	0.025	99.975	2.1
2	85.3	10.6	0.024	99.976	4.2
3	85.3	11.0	0.023	99.977	6.3
4	85.3	11.3	0.024	99.976	8.4
5	85.3	11.6	0.025	99.975	10.6

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 230112-WT99e-A-12.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	10.5	0.139	99.861	2.1
2	85.4	10.8	0.151	99.849	4.2
3	85.4	11.0	0.157	99.843	6.3
4	85.4	11.4	0.159	99.841	8.4
5	85.4	11.7	0.166	99.834	10.6

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 230112-WT99e-A-13.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.2	10.5	0.019	99.981	2.1
2	85.2	10.7	0.021	99.979	4.2
3	85.2	11.0	0.017	99.983	6.3
4	85.2	11.2	0.018	99.982	8.4
5	85.2	11.6	0.018	99.982	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 230112-WT99e-A-14.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.2	10.5	0.035	99.965	2.1
2	85.2	10.7	0.038	99.962	4.2
3	85.2	11.0	0.037	99.963	6.3
4	85.2	11.3	0.037	99.963	8.4
5	85.2	11.6	0.037	99.963	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 230112-WT99e-A-15.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	10.5	0.547	99.453	2.1
2	85.2	10.7	0.550	99.450	4.2
3	85.3	11.0	0.548	99.452	6.3
4	85.2	11.3	0.553	99.447	8.4
5	85.3	11.6	0.529	99.471	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 230112-WT99e-A-16.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	11.2	0.021	99.979	2.1
2	85.3	11.4	0.019	99.981	4.2
3	85.3	11.6	0.019	99.981	6.3
4	85.3	11.9	0.021	99.979	8.4
5	85.3	12.2	0.021	99.979	10.6

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 230112-WT99e-A-17.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	10.5	0.055	99.945	2.1
2	85.3	10.8	0.058	99.942	4.2
3	85.3	11.0	0.061	99.939	6.3
4	85.3	11.3	0.056	99.944	8.4
5	85.3	11.6	0.057	99.943	10.6

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 230112-WT99e-A-18.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	10.5	0.189	99.811	2.1
2	85.3	10.7	0.201	99.799	4.2
3	85.3	11.0	0.212	99.788	6.3
4	85.3	11.2	0.213	99.787	8.4
5	85.3	11.5	0.225	99.775	10.6

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 230112-WT99e-A-19.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	10.6	0.039	99.961	2.1
2	85.3	10.9	0.039	99.961	4.2
3	85.3	11.1	0.040	99.960	6.3
4	85.3	11.4	0.042	99.958	8.4
5	85.3	11.7	0.042	99.958	10.6

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 230112-WT99e-A-20.

Run Time (min)	Flow Rate (Lpm)	Inhalation Resistance (mm H_2O)	Penetration (%)	PFE (%)	NaCl Mass Loading (mg)
1	85.3	10.5	0.062	99.938	2.1
2	85.3	10.7	0.060	99.940	4.2
3	85.3	11.0	0.060	99.940	6.3
4	85.3	11.3	0.061	99.939	8.4
5	85.3	11.6	0.064	99.936	10.6

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.