

Date Tested: 5/18/2020 – 6/1/2020

Respirator Model(s): 3M 8511, 3M 1860, 3M 8210, 3M V-flex 1804, Moldex 2200, Moldex 1512, Sperian 1125, Sperian 1105, Sperian One-Fit

Tests: Filtration with NaCl (modified version of STP-0059), Manikin Fit Factor with Static Advanced Headform, and Strap Integrity with Tensile Testing

Decontamination Method: VPHP

Decontamination Cycles: 5, 10, 15, and 20 cycles

While decontamination and reuse of FFRs are not consistent with standard and approved usage, these options may need to be considered when FFR shortages exist. This assessment was developed to quantify the filtration efficiency and manikin fit factor¹ of an N95 respirator that has been decontaminated. This assessment is not to determine the effectiveness of the decontamination procedure at killing pathogenic microorganisms. The results provided in this report are specific to the subset of samples that were provided to NPPTL for evaluation. These results may be used to update the CDC guidance for Crisis Capacity Strategies (during known shortages).

231 respirators that were unworn and not subjected to any pathogenic microorganisms were submitted for evaluation. This included 15 respirators that were subjected to 5 cycles of the VPHP decontamination process, 45 respirators subjected to 10 cycles, 15 respirators subjected to 15 cycles, 120 respirators subjected to 20 cycles, and an additional 36 respirators that served as controls. Figure 1 photos document the procedures used. The samples were tested using a modified version of the NIOSH Standard Test Procedure (STP) TEB-APR-STP-0059 to determine particulate filtration efficiency. The TSI, Inc. model 8130 using sodium chloride aerosol was used for the filtration evaluation. For the laboratory fit evaluation, a static manikin headform was used to quantify changes in manikin fit factor. The TSI, Inc. PortaCount® PRO+ 8038 in “N95 Enabled” mode was used for this evaluation. Additionally, tensile strength testing of the straps was performed to determine changes in strap integrity. The Instron® 5943 Tensile Tester was used for this evaluation. The full assessment plan can be found [here](#).

Filtration Efficiency Results All respirators measured more than 95%. See Tables 1, 4, 7, 10, 13, 16, 19, and 22.

Manikin Fit Factor Results: The manikin fit factor showed passing fit factors (≥ 100) for the following respirators evaluated: 3M 1860 (15 and 20 cycles), 3M 8511 (5 and 10 cycles), 3M 8210 (20 cycles), and Moldex 1512 (20 cycles). The manikin fit test procedure used in this assessment did not show any detriments in fit associated with the decontamination method used for these models/cycles.

The manikin fit factor did not show passing fit factors for all samples of the following models: 3M V-flex 1804 (20 cycles), Moldex 2200 (20 cycles), Sperian N1105 (20 cycles), and Sperian N1125 (10 and 20 cycles).

The Sperian One-Fit (10 and 20 cycles) could not be assessed due to the inability to achieve adequate fit on the control respirators.

¹The American Industrial Hygiene Association defines the Manikin Fit Factor as “An expression related to the amount of leakage measured through the face or neck seal of a respirator mounted to a manikin under specified airflow and environmental conditions. If the challenge to the seal is an airborne substance, it is the ratio of its airborne concentration outside the respirator divided by the concentration that enters the respirator through the seal. If the challenge is airflow or air pressure, conditions and assumptions for quantifying leakage must be specified. Leakage from other sources (e.g., air purifying elements) must be essentially zero. The respirator may be mounted to the manikin without sealants; be partially sealed to the manikin; or be sealed to the manikin with artificially induced leaks.”

See Tables 2, 5, 8, 11, 14, 17, 20, and 23 for manikin fit factor results.

Strap Integrity Results: Decontaminated 3M V-flex 1804 (20 cycles) straps had a yellow tint, while the control straps were white. No visual degradation of the straps from other models was observed.

Increases in recorded force for both top and bottom straps were seen in the following models: 3M 1860 (15 and 20 cycles), 3M 8511 (5 and 10 cycles), 3M V-flex 1804 (20 cycles), Moldex 2200 (20 cycles), and Sperian One-Fit (20 cycles).

Decreases in recorded force for both top and bottom straps were seen in the following models: 3M 8210 (20 cycles) and Moldex 1512 (20 cycles).

Inconsistent changes were shown between the top and bottom straps, with the top strap showing an increase in recorded force and the bottom strap showing a decrease in force, for the following models: Sperian N1105 (20 cycles), Sperian One-Fit (10 cycles), Sperian N1125 (10 and 20 cycles).

While the exact correlation between the force exerted by straps and fit is not well understood, higher force values may be associated with a tighter fit of the respirator to the face. Significant reductions in this force would be associated with a loss of elasticity of the straps, thereby reducing their ability to create a tight fit. See Tables 3, 6, 9, 12, 15, 18, 21, and 24.

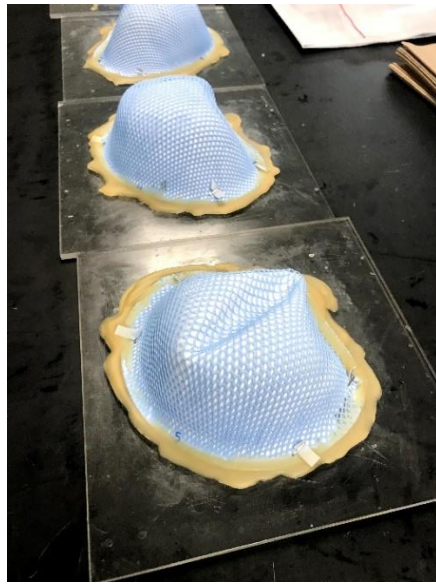
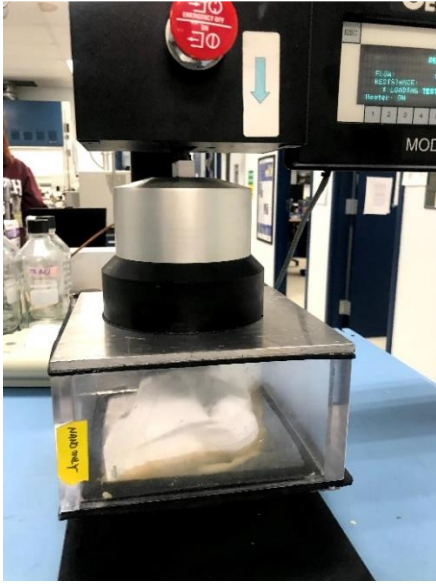


Figure 1. Laboratory Test Photos

Table 1. Filter Efficiency Evaluation – 3M 1860

Respirator Model, Decon Method, # of cycles	Treated Sample #	Flow Rate (Lpm)	Initial Filter Resistance (mmH ₂ O)	Initial Percent Leakage (%)	Maximum Percent Leakage (%)	Filter Efficiency (%)
3M 1860, VPHP, 15 cycles Min Fil Eff: 99.32% Max Fil Eff: 99.76%	1	85	10.4	0.312	0.478	99.52
	2	85	9.6	0.544	0.685	99.32
	3	85	9.8	0.247	0.372	99.63
	4	85	10.2	0.376	0.493	99.51
	5	85	10.4	0.350	0.410	99.59
	6	85	9.4	0.220	0.275	99.73
	7	85	9.5	0.303	0.375	99.63
	8	85	9.9	0.363	0.474	99.53
	9	85	9.6	0.200	0.298	99.70
	10	85	10.4	0.188	0.241	99.76
	Control 1	85	9.0	0.363	0.416	99.58
3M 1860, VPHP, 20 cycles Min Fil Eff: 99.16% Max Fil Eff: 99.74%	1	85	10.1	0.515	0.842	99.16
	2	85	10.2	0.314	0.379	99.62
	3	85	9.9	0.345	0.427	99.57
	4	85	9.8	0.244	0.336	99.66
	5	85	10.3	0.349	0.406	99.59
	6	85	11.1	0.389	0.494	99.51
	7	85	10.2	0.279	0.367	99.63
	8	85	11.0	0.333	0.444	99.56
	9	85	9.8	0.567	0.759	99.24
	10	85	8.8	0.193	0.259	99.74
	Control 2	85	9.7	0.374	0.459	99.54

Notes:

- The test method utilized in this assessment is not the NIOSH standard test procedure that is used for certification of respirators. Respirators assessed to this modified test plan do not necessarily meet the requirements of STP-0059, and therefore cannot be considered equivalent to N95 respirators that were tested to STP-0059.

Table 2. Manikin Fit Evaluation - 3M 1860

Manikin Fit Factor of Decontaminated N95s					
Respirator Model, Decon Method, # of cycles	Treated Sample #	mFF Normal Breathing 1	mFF Deep Breathing	mFF Normal Breathing 2	Overall Manikin Fit Factor
3M 1860, VPHP, 15 cycles Static Advanced Medium Headform (Hanson Robotics)	11	157	122	200+	153
	12	200+	181	200+	194
	13	200+	151	200+	181
	14	200+	200+	200+	200+
	15	164	68	121	104
	Control 3	200+	161	200+	185
3M 1860, VPHP, 20 cycles Static Advanced Medium Headform (Hanson Robotics)	11	200+	200+	200+	200+
	12	200+	200+	200+	200+
	13	200+	200+	200+	200+
	14	200+	200+	200+	200+
	15	143	121	139	134
	Control 4	200+	200+	200+	200+

Notes:

- Per [OSHA 1910.134\(f\)\(7\)](#), if the fit factor as determined through an OSHA-accepted quantitative fit testing protocol is equal to or greater than 100 for tight-fitting half facepieces, then the fit test has been passed for that respirator.
- This assessment does not include fit testing of people and only uses two exercises (normal and deep breathing) on a manikin headform.
- This assessment is a laboratory evaluation using a manikin headform and varies greatly from the OSHA individual fit test. This headform testing only includes normal breathing and deep breathing on a stationary (non-moving) headform; therefore, fit results from this assessment cannot be directly translated to using the standard OSHA-accepted test. Instead, this testing provides an indication of the change in fit performance (if any) associated with the decontamination of respirators.

Table 3. Strap Integrity Evaluation – 3M 1860

Tensile Force in Respirator Straps of Decontaminated N95s (recorded force values are at 150% strain)			
Respirator Model, Decon Method, # of cycles	Straps from Treated Sample #	Force in Top Strap (N)	Force in Bottom Strap (N)
3M 1860, VPHP, 15 cycles	1	3.335	3.787
	2	3.221	3.563
	3	3.246	3.863
	Decontaminated Strap Average	3.267	3.738
	Control 1	2.701	2.534
	Control Strap Average	2.669	2.615
	% Change ((Deconned - Controls) / Controls)	22.42	42.96
3M 1860, VPHP, 20 cycles	1	3.302	3.386
	2	3.313	3.773
	3	3.382	3.75
	Decontaminated Strap Average	3.332	3.636
	Control 2	2.637	2.695
	Control Strap Average	2.669	2.615
	% Change ((Deconned - Controls) / Controls)	24.85	39.08

Table 4. Filter Efficiency Evaluation – 3M 8511

Respirator Model, Decon Method, # of cycles	Treated Sample #	Flow Rate (Lpm)	Initial Filter Resistance (mmH ₂ O)	Initial Percent Leakage (%)	Maximum Percent Leakage (%)	Filter Efficiency (%)
3M 8511, VPHP, 5 cycles Min Fil Eff: 99.63% Max Fil Eff: 99.81%	1	85	6.6	0.277	0.334	99.67
	2	85	6.5	0.264	0.287	99.71
	3	85	6.5	0.224	0.296	99.70
	4	85	6.6	0.257	0.336	99.66
	5	85	6.5	0.299	0.368	99.63
	6	85	6.5	0.137	0.199	99.80
	7	85	6.3	0.141	0.190	99.81
	8	85	6.6	0.229	0.279	99.72
	9	85	6.8	0.200	0.245	99.76
	10	85	6.7	0.272	0.344	99.66
	Control 1	85	6.5	0.451	0.485	99.52
3M 8511, VPHP, 10 cycles Min Fil Eff: 99.46% Max Fil Eff: 99.88%	1	85	7.1	0.076	0.177	99.82
	2	85	6.9	0.074	0.120	99.88
	3	85	7.1	0.136	0.189	99.81
	4	85	6.5	0.238	0.372	99.63
	5	85	6.3	0.164	0.243	99.76
	6	85	6.7	0.245	0.290	99.71
	7	85	6.5	0.187	0.288	99.71
	8	85	6.8	0.322	0.398	99.60
	9	85	6.5	0.349	0.426	99.57
	10	85	6.5	0.417	0.541	99.46
	Control 2	85	6.8	0.359	0.398	99.60

Notes:

- The test method utilized in this assessment is not the NIOSH standard test procedure that is used for certification of respirators. Respirators assessed to this modified test plan do not necessarily meet the requirements of STP-0059, and therefore cannot be considered equivalent to N95 respirators that were tested to STP-0059.

Table 5. Manikin Fit Evaluation – 3M 8511

Manikin Fit Factor of Decontaminated N95s					
Respirator Model, Decon Method, # of cycles	Treated Sample #	mFF Normal Breathing 1	mFF Deep Breathing	mFF Normal Breathing 2	Overall Manikin Fit Factor
3M 8511, VPHP, 5 cycles Static Advanced Medium Headform (Hanson Robotics)	11	200+	200+	200+	200+
	12	200+	200+	200+	200+
	13	200+	180	200+	193
	14	200+	200+	200+	200+
	15	200+	200+	200+	200+
	Control 3	200+	172	200+	190
3M 8511, VPHP, 10 cycles Static Advanced Medium Headform (Hanson Robotics)	11	200+	200+	200+	200+
	12	200+	200+	200+	200+
	13	200+	200+	200+	200+
	14	200+	200+	200+	200+
	15	200+	200+	200+	200+
	Control 4	200+	200+	200+	200+

Notes:

- Per [OSHA 1910.134\(f\)\(7\)](#), if the fit factor as determined through an OSHA-accepted quantitative fit testing protocol is equal to or greater than 100 for tight-fitting half facepieces, then the fit test has been passed for that respirator.
- This assessment does not include fit testing of people and only uses two exercises (normal and deep breathing) on a manikin headform.
- This assessment is a laboratory evaluation using a manikin headform and varies greatly from the OSHA individual fit test. This headform testing only includes normal breathing and deep breathing on a stationary (non-moving) headform; therefore, fit results from this assessment cannot be directly translated to using the standard OSHA-accepted test. Instead, this testing provides an indication of the change in fit performance (if any) associated with the decontamination of respirators.

Table 6. Strap Integrity Evaluation – 3M 8511

Tensile Force in Respirator Straps of Decontaminated N95s (recorded force values are at 150% strain)			
Respirator Model, Decon Method, # of cycles	Straps from Treated Sample #	Force in Top Strap (N)	Force in Bottom Strap (N)
3M 8511, VPH, 5 cycles	1	3.647	3.355
	2	3.62	3.217
	3	3.574	3.316
	Decontaminated Strap Average	3.614	3.296
	Control 1	3.275	2.668
	Control Strap Average	3.195	2.640
	% Change ((Deconned - Controls) / Controls)	13.10	24.85
3M 8511, VPH, 10 cycles	1	3.948	3.285
	2	3.237	3.218
	3	3.862	3.273
	Decontaminated Strap Average	3.682	3.259
	Control 2	3.115	2.612
	Control Strap Average	3.195	2.640
	% Change ((Deconned - Controls) / Controls)	15.25	23.43

Table 7. Filter Efficiency Evaluation – 3M 8210

Respirator Model, Decon Method, # of cycles	Treated Sample #	Flow Rate (Lpm)	Initial Filter Resistance (mmH₂O)	Initial Percent Leakage (%)	Maximum Percent Leakage (%)	Filter Efficiency (%)
3M 8210, VPHP, 20 cycles Min Fil Eff: 98.19% Max Fil Eff: 99.90%	1	85	7.0	0.428	0.446	99.55
	2	85	7.3	0.109	0.151	99.85
	3	85	7.0	0.146	0.223	99.78
	4	85	7.5	0.095	0.131	99.87
	5	85	7.7	1.700	1.810	98.19
	6	85	7.3	0.124	0.174	99.83
	7	85	7.6	0.102	0.156	99.84
	8	85	7.2	0.154	0.235	99.77
	9	85	7.4	0.111	0.171	99.83
	10	85	7.0	0.061	0.098	99.90
	Control 1	85	8.4	0.114	0.142	99.86
	Control 2	85	7.4	0.119	0.188	99.81

Notes:

- The test method utilized in this assessment is not the NIOSH standard test procedure that is used for certification of respirators. Respirators assessed to this modified test plan do not necessarily meet the requirements of STP-0059, and therefore cannot be considered equivalent to N95 respirators that were tested to STP-0059.

Table 8. Manikin Fit Evaluation – 3M 8210

Manikin Fit Factor of Decontaminated N95s					
Respirator Model, Decon Method, # of cycles	Treated Sample #	mFF Normal Breathing 1	mFF Deep Breathing	mFF Normal Breathing 2	Overall Manikin Fit Factor
3M 8210, VPHP, 20 cycles Static Advanced Medium Headform (Hanson Robotics)	11	200+	150	200+	180
	12	200+	200+	200+	200+
	13	200+	200+	200+	200+
	14	200+	139	200+	175
	15	200+	170	200+	189
	Control 3	200+	200+	200+	200+
	Control 4	200+	200+	200+	200+

Notes:

- Per [OSHA 1910.134\(f\)\(7\)](#), if the fit factor as determined through an OSHA-accepted quantitative fit testing protocol is equal to or greater than 100 for tight-fitting half facepieces, then the fit test has been passed for that respirator.
- This assessment does not include fit testing of people and only uses two exercises (normal and deep breathing) on a manikin headform.
- This assessment is a laboratory evaluation using a manikin headform and varies greatly from the OSHA individual fit test. This headform testing only includes normal breathing and deep breathing on a stationary (non-moving) headform; therefore, fit results from this assessment cannot be directly translated to using the standard OSHA-accepted test. Instead, this testing provides an indication of the change in fit performance (if any) associated with the decontamination of respirators.

Table 9. Strap Integrity Evaluation – 3M 8210

Tensile Force in Respirator Straps of Decontaminated N95s (recorded force values are at 150% strain)			
Respirator Model, Decon Method, # of cycles	Straps from Treated Sample #	Force in Top Strap (N)	Force in Bottom Strap (N)
3M 8210, VPHP, 20 cycles	1	4.491	4.318
	2	4.407	3.976
	3	4.435	4.072
	Decontaminated Strap Average	4.444	4.122
	Control 1	4.741	4.925
	Control 2	4.729	4.966
	Control Strap Average	4.735	4.9455
	% Change ((Deconned - Controls) / Controls)	-6.14	-16.65

Table 10. Filter Efficiency Evaluation – 3M V-flex 1804

Respirator Model, Decon Method, # of cycles	Treated Sample #	Flow Rate (Lpm)	Initial Filter Resistance (mmH ₂ O)	Initial Percent Leakage (%)	Maximum Percent Leakage (%)	Filter Efficiency (%)
3M V-Flex 1804, VPHP, 20 cycles Min Fil Eff: 99.00% Max Fil Eff: 99.67%	1	85	4.9	0.256	0.357	99.64
	2	85	5.1	0.227	0.331	99.67
	3	85	4.8	0.283	0.384	99.62
	4	85	4.8	0.233	0.377	99.62
	5	85	5.0	0.272	0.402	99.60
	6	85	5.0	0.411	0.510	99.49
	7	85	5.1	0.439	0.536	99.46
	8	85	5.0	0.988	1.000	99.00
	9	85	5.3	0.410	0.507	99.49
	10	85	7.0	0.384	0.502	99.50
	Control 1	85	5.3	0.214	0.342	99.66
	Control 2	85	4.9	0.161	0.301	99.70

Notes:

- The test method utilized in this assessment is not the NIOSH standard test procedure that is used for certification of respirators. Respirators assessed to this modified test plan do not necessarily meet the requirements of STP-0059, and therefore cannot be considered equivalent to N95 respirators that were tested to STP-0059.

Table 11. Manikin Fit Evaluation – 3M V-flex 1804

Manikin Fit Factor of Decontaminated N95s					
Respirator Model, Decon Method, # of cycles	Treated Sample #	mFF Normal Breathing 1	mFF Deep Breathing	mFF Normal Breathing 2	Overall Manikin Fit Factor
3M V-Flex 1804, VPHP, 20 cycles Static Advanced Medium Headform (Hanson Robotics)	11	200+	200+	200+	200+
	12	200+	200+	200+	200+
	13	139	116	132	128
	14	126	63	88	85
	15	200+	200+	200+	200+
	Control 3	200+	200+	200+	200+
	Control 4	200+	200+	200+	200+

Notes:

- Per [OSHA 1910.134\(f\)\(7\)](#), if the fit factor as determined through an OSHA-accepted quantitative fit testing protocol is equal to or greater than 100 for tight-fitting half facepieces, then the fit test has been passed for that respirator.
- This assessment does not include fit testing of people and only uses two exercises (normal and deep breathing) on a manikin headform.
- This assessment is a laboratory evaluation using a manikin headform and varies greatly from the OSHA individual fit test. This headform testing only includes normal breathing and deep breathing on a stationary (non-moving) headform; therefore, fit results from this assessment cannot be directly translated to using the standard OSHA-accepted test. Instead, this testing provides an indication of the change in fit performance (if any) associated with the decontamination of respirators.
- **BOLD** overall manikin fit factors < 100.

Table 12. Strap Integrity Evaluation – 3M V-flex 1804

Tensile Force in Respirator Straps of Decontaminated N95s (recorded force values are at 150% strain)			
Respirator Model, Decon Method, # of cycles	Straps from Treated Sample #	Force in Top Strap (N)	Force in Bottom Strap (N)
3M V-Flex 1804, VPHP, 20 cycles	1	2.359	2.557
	2	2.411	2.574
	3	2.695	2.735
	Decontaminated Strap Average	2.488	2.622
	Control 1	2.308	2.455
	Control 2	2.385	2.495
	Control Strap Average	2.3465	2.475
	% Change ((Deconned - Controls) / Controls)	6.04	5.94

Table 13. Filter Efficiency Evaluation – Moldex

Respirator Model, Decon Method, # of cycles	Treated Sample #	Flow Rate (Lpm)	Initial Filter Resistance (mmH ₂ O)	Initial Percent Leakage (%)	Maximum Percent Leakage (%)	Filter Efficiency (%)
Moldex 1512, VPHP, 20 cycles Min Fil Eff: 97.56% Max Fil Eff: 99.53%	1	85	9.0	2.18	2.44	97.56
	2	85	8.9	1.23	1.23	98.77
	3	85	9.1	1.41	1.41	98.59
	4	85	9.4	1.02	1.02	98.98
	5	85	9.8	0.957	0.957	99.04
	6	85	10.0	0.462	0.474	99.53
	7	85	9.0	1.14	1.15	98.85
	8	85	10.0	1.22	1.25	98.75
	9	85	9.8	0.658	0.658	99.34
	10	85	9.2	1.10	1.10	98.90
	Control 1	85	10.5	0.780	0.780	99.22
	Control 2	85	9.8	0.888	0.888	99.11
Moldex 2200, VPHP, 20 cycles Min Fil Eff: 98.38% Max Fil Eff: 99.46%	1	85	9.6	0.977	0.977	99.02
	2	85	10.3	1.17	1.18	98.82
	3	85	11.8	0.602	0.614	99.39
	4	85	10.9	1.50	1.51	98.49
	5	85	11.7	0.542	0.542	99.46
	6	85	11.6	0.720	0.720	99.28
	7	85	12.2	1.36	1.36	98.64
	8	85	10.6	1.62	1.62	98.38
	9	85	10.5	0.755	0.755	99.25
	10	85	11.2	1.50	1.54	98.46
	Control 1	85	9.7	2.00	2.01	97.99
	Control 2	85	11.2	0.606	0.606	99.39

Notes:

- The test method utilized in this assessment is not the NIOSH standard test procedure that is used for certification of respirators. Respirators assessed to this modified test plan do not necessarily meet the requirements of STP-0059, and therefore cannot be considered equivalent to N95 respirators that were tested to STP-0059.

Table 14. Manikin Fit Evaluation – Moldex

Manikin Fit Factor of Decontaminated N95s					
Respirator Model, Decon Method, # of cycles	Treated Sample #	mFF Normal Breathing 1	mFF Deep Breathing	mFF Normal Breathing 2	Overall Manikin Fit Factor
Moldex 1512, VPHP, 20 cycles Static Advanced Medium Headform (Hanson Robotics)	11	200+	200+	200+	200+
	12	159	166	148	158
	13	131	175	132	143
	14	184	131	131	145
	15	200+	200+	200+	200+
	Control 3	200+	200+	200+	200+
	Control 4	200+	200+	200+	200+
Moldex 2200, VPHP, 20 cycles Static Advanced Medium Headform (Hanson Robotics)	11	172	153	160	161
	12	193	99	143	135
	13	200+	200+	200+	200+
	14	108	76	92	90
	15	182	107	155	141
	Control 3	200+	200+	200+	200+
	Control 4	200+	200+	200+	200+

Notes:

- Per [OSHA 1910.134\(f\)\(7\)](#), if the fit factor as determined through an OSHA-accepted quantitative fit testing protocol is equal to or greater than 100 for tight-fitting half facepieces, then the fit test has been passed for that respirator.
- This assessment does not include fit testing of people and only uses two exercises (normal and deep breathing) on a manikin headform.
- This assessment is a laboratory evaluation using a manikin headform and varies greatly from the OSHA individual fit test. This headform testing only includes normal breathing and deep breathing on a stationary (non-moving) headform; therefore, fit results from this assessment cannot be directly translated to using the standard OSHA-accepted test. Instead, this testing provides an indication of the change in fit performance (if any) associated with the decontamination of respirators.
- **BOLD** manikin fit factors < 100.

Table 15. Strap Integrity Evaluation – Moldex

Tensile Force in Respirator Straps of Decontaminated N95s (recorded force values are at 150% strain)			
Respirator Model, Decon Method, # of cycles	Straps from Treated Sample #	Force in Top Strap (N)	Force in Bottom Strap (N)
Moldex 1512, VPHP, 20 cycles	1	3.007	2.856
	2	3.017	2.908
	3	2.88	2.738
	Decontaminated Strap Average	2.968	2.834
	Control 1	3.515	3.428
	Control 2	3.427	3.282
	Control Strap Average	3.471	3.355
	% Change ((Deconned - Controls) / Controls)	-14.49	-15.53
Moldex 2200, VPHP, 20 cycles	1	3.958	4.198
	2	4.159	3.859
	3	4.476	4.183
	Decontaminated Strap Average	4.198	4.080
	Control 1	4.229	4.054
	Control 2	4.052	3.804
	Control Strap Average	4.1405	3.929
	% Change ((Deconned - Controls) / Controls)	1.38	3.84

Table 16. Filter Efficiency Evaluation – Sperian N1105

Respirator Model, Decon Method, # of cycles	Treated Sample #	Flow Rate (Lpm)	Initial Filter Resistance (mmH₂O)	Initial Percent Leakage (%)	Maximum Percent Leakage (%)	Filter Efficiency (%)
Sperian N1105, VPHP, 20 cycles Min Fil Eff: 99.75% Max Fil Eff: 99.94%	1	85	10.9	0.065	0.069	99.93
	2	85	11.8	0.085	0.085	99.92
	3	85	11.3	0.082	0.092	99.91
	4	85	12.3	0.051	0.059	99.94
	5	85	11.8	0.064	0.072	99.93
	6	85	13.6	0.058	0.061	99.94
	7	85	12.3	0.205	0.247	99.75
	8	85	13.1	0.195	0.212	99.79
	9	85	13.3	0.146	0.165	99.84
	10	85	12.7	0.163	0.197	99.80
	Control 1	85	12.9	0.167	0.175	99.83
	Control 2	85	14.2	0.161	0.183	99.82

Notes:

- The test method utilized in this assessment is not the NIOSH standard test procedure that is used for certification of respirators. Respirators assessed to this modified test plan do not necessarily meet the requirements of STP-0059, and therefore cannot be considered equivalent to N95 respirators that were tested to STP-0059.

Table 17. Manikin Fit Evaluation – Sperian N1105

Manikin Fit Factor of Decontaminated N95s					
Respirator Model, Decon Method, # of cycles	Treated Sample #	mFF Normal Breathing 1	mFF Deep Breathing	mFF Normal Breathing 2	Overall Manikin Fit Factor
Sperian N1105, VPHP, 20 cycles Static Advanced Large Headform (Lunar Studios)	11	153	132	123	135
	12	200+	200+	200+	200+
	13	200+	200+	200+	200+
	14	200+	180	200+	193
	15	68	54	55	58
	Control 3	131	184	187	163
	Control 4	200+	200+	200+	200+

Notes:

- Per [OSHA 1910.134\(f\)\(7\)](#), if the fit factor as determined through an OSHA-accepted quantitative fit testing protocol is equal to or greater than 100 for tight-fitting half facepieces, then the fit test has been passed for that respirator.
- This assessment does not include fit testing of people and only uses two exercises (normal and deep breathing) on a manikin headform.
- This assessment is a laboratory evaluation using a manikin headform and varies greatly from the OSHA individual fit test. This headform testing only includes normal breathing and deep breathing on a stationary (non-moving) headform; therefore, fit results from this assessment cannot be directly translated to using the standard OSHA-accepted test. Instead, this testing provides an indication of the change in fit performance (if any) associated with the decontamination of respirators.
- **BOLD** manikin fit factors < 100.

Table 18. Strap Integrity Evaluation – Sperian N1105

Tensile Force in Respirator Straps of Decontaminated N95s (recorded force values are at 150% strain)			
Respirator Model, Decon Method, # of cycles	Straps from Treated Sample #	Force in Top Strap (N)	Force in Bottom Strap (N)
Sperian N1105, VPHP, 20 cycles	1	1.737	1.868
	2	1.884	1.679
	3	1.859	1.577
	Decontaminated Strap Average	1.827	1.708
	Control 1	1.719	1.778
	Control 2	1.742	2.028
	Control Strap Average	1.7305	1.903
	% Change ((Deconned - Controls) / Controls)	5.56	-10.25

Table 19. Filter Efficiency Evaluation – Sperian One-Fit

Respirator Model, Decon Method, # of cycles	Treated Sample #	Flow Rate (Lpm)	Initial Filter Resistance (mmH ₂ O)	Initial Percent Leakage (%)	Maximum Percent Leakage (%)	Filter Efficiency (%)
Sperian One-fit, VPHP, 10 cycles Min Fil Eff: 97.01% Max Fil Eff: 99.80%	1	85	11.7	0.241	0.280	99.72
	2	85	13.1	2.63	2.74	97.26
	3	85	11.3	2.75	2.99	97.01
	4	85	13.8	0.312	0.358	99.64
	5	85	12.0	1.05	1.12	98.88
	6	85	11.6	0.707	0.832	99.17
	7	85	9.1	0.444	0.609	99.39
	8	85	11.3	0.198	0.239	99.76
	9	85	10.7	0.255	0.284	99.72
	10	85	10.4	0.181	0.201	99.80
	Control 1	85	10.8	0.121	0.176	99.82
Sperian One-fit, VPHP, 20 cycles Min Fil Eff: 99.42% Max Fil Eff: 99.85%	1	85	10.9	0.199	0.222	99.78
	2	85	11.2	0.300	0.338	99.66
	3	85	11.4	0.117	0.152	99.85
	4	85	11.5	0.337	0.353	99.65
	5	85	9.7	0.516	0.579	99.42
	6	85	11.8	0.312	0.340	99.66
	7	85	11.4	0.235	0.258	99.74
	8	85	10.7	0.245	0.300	99.70
	9	85	11.0	0.348	0.383	99.62
	10	85	10.0	0.550	0.647	99.35
	Control 2	85	10.7	0.228	0.286	99.71

Notes:

- The test method utilized in this assessment is not the NIOSH standard test procedure that is used for certification of respirators. Respirators assessed to this modified test plan do not necessarily meet the requirements of STP-0059, and therefore cannot be considered equivalent to N95 respirators that were tested to STP-0059.

Table 20. Manikin Fit Evaluation – Sperian One-Fit

Manikin Fit Factor of Decontaminated N95s					
Respirator Model, Decon Method, # of cycles	Treated Sample #	mFF Normal Breathing 1	mFF Deep Breathing	mFF Normal Breathing 2	Overall Manikin Fit Factor
Sperian One-fit, VPHP, 10 cycles Static Advanced Medium Headform (Hanson Robotics)	11	n/a*			
	12				
	13				
	14				
	15				
	Control 3	2	3	2	2
Sperian One-fit, VPHP, 20 cycles Static Advanced Medium Headform (Hanson Robotics)	11	n/a*			
	12				
	13				
	14				
	15				
	Control 4	3	2	3	2

*unable to achieve adequate fit (overall mFF >= 100) on control respirators, so reliable fit test results cannot be reported

Notes:

- Per [OSHA 1910.134\(f\)\(7\)](#), if the fit factor as determined through an OSHA-accepted quantitative fit testing protocol is equal to or greater than 100 for tight-fitting half facepieces, then the fit test has been passed for that respirator.
- This assessment does not include fit testing of people and only uses two exercises (normal and deep breathing) on a manikin headform.
- This assessment is a laboratory evaluation using a manikin headform and varies greatly from the OSHA individual fit test. This headform testing only includes normal breathing and deep breathing on a stationary (non-moving) headform; therefore, fit results from this assessment cannot be directly translated to using the standard OSHA-accepted test. Instead, this testing provides an indication of the change in fit performance (if any) associated with the decontamination of respirators.
- **BOLD** manikin fit factors < 100.

Table 21. Strap Integrity Evaluation – Sperian One-Fit

Tensile Force in Respirator Straps of Decontaminated N95s (recorded force values are at 150% strain)			
Respirator Model, Decon Method, # of cycles	Straps from Treated Sample #	Force in Top Strap (N)	Force in Bottom Strap (N)
Sperian One-fit, VPHP, 10 cycles	1	10.802	11.848
	2	8.868	7.762
	3	11.334	10.082
	Decontaminated Strap Average	10.335	9.897
	Control 1	8.939	9.461
	Control Strap Average	8.725	10.270
	% Change ((Deconned - Controls) / Controls)	18.46	-3.63
Sperian One-fit, VPHP, 20 cycles	1	6.763	11.552
	2	9.665	12.189
	3	10.695	12.61
	Decontaminated Strap Average	9.041	12.117
	Control 2	8.51	11.079
	Control Strap Average	8.725	10.270
	% Change ((Deconned - Controls) / Controls)	3.63	17.98

Table 22. Filter Efficiency Evaluation – Sperian N1125

Respirator Model, Decon Method, # of cycles	Treated Sample #	Flow Rate (Lpm)	Initial Filter Resistance (mmH ₂ O)	Initial Percent Leakage (%)	Maximum Percent Leakage (%)	Filter Efficiency (%)
Sperian N1125, VPHP, 10 cycles Min Fil Eff: 99.24% Max Fil Eff: 99.83%	1	85	13.5	0.632	0.757	99.24
	2	85	13.8	0.502	0.580	99.42
	3	85	12.8	0.623	0.669	99.33
	4	85	16.3	0.355	0.376	99.62
	5	85	14.3	0.268	0.296	99.70
	6	85	13.7	0.217	0.238	99.76
	7	85	12.7	0.183	0.220	99.78
	8	85	14.8	0.258	0.303	99.70
	9	85	14.3	0.140	0.175	99.83
	10	85	13.6	0.204	0.230	99.77
	Control 1	85	13.9	0.197	0.221	99.78
Sperian N1125, VPHP, 20 cycles Min Fil Eff: 99.33% Max Fil Eff: 99.85%	1	85	14.4	0.157	0.185	99.82
	2	85	12.9	0.618	0.647	99.35
	3	85	14.2	0.172	0.187	99.81
	4	85	15.0	0.351	0.370	99.63
	5	85	15.9	0.386	0.437	99.56
	6	85	14.8	0.147	0.147	99.85
	7	85	12.2	0.650	0.671	99.33
	8	85	13.1	0.213	0.235	99.77
	9	85	14.0	0.155	0.179	99.82
	10	85	14.6	0.165	0.177	99.82
	Control 2	85	14.5	0.178	0.194	99.81

Notes:

- The test method utilized in this assessment is not the NIOSH standard test procedure that is used for certification of respirators. Respirators assessed to this modified test plan do not necessarily meet the requirements of STP-0059, and therefore cannot be considered equivalent to N95 respirators that were tested to STP-0059.

Table 23. Manikin Fit Evaluation – Sperian N1125

Manikin Fit Factor of Decontaminated N95s					
Respirator Model, Decon Method, # of cycles	Treated Sample #	mFF Normal Breathing 1	mFF Deep Breathing	mFF Normal Breathing 2	Overall Manikin Fit Factor
Sperian N1125, VPHP, 10 cycles Static Advanced Large Headform (Lunar Studios)	11	200+	106	200+	155
	12	156	146	176	158
	13	143	111	120	123
	14	200+	168	148	169
	15	108	72	94	89
	Control 3	200+	102	97	120
Sperian N1125, VPHP, 20 cycles Static Advanced Large Headform (Lunar Studios)	11	174	130	139	145
	12	88	50	71	66
	13	92	71	71	77
	14	111	118	97	108
	15	92	35	85	58
	Control 4	178	125	177	156

Notes:

- Per [OSHA 1910.134\(f\)\(7\)](#), if the fit factor as determined through an OSHA-accepted quantitative fit testing protocol is equal to or greater than 100 for tight-fitting half facepieces, then the fit test has been passed for that respirator.
- This assessment does not include fit testing of people and only uses two exercises (normal and deep breathing) on a manikin headform.
- This assessment is a laboratory evaluation using a manikin headform and varies greatly from the OSHA individual fit test. This headform testing only includes normal breathing and deep breathing on a stationary (non-moving) headform; therefore, fit results from this assessment cannot be directly translated to using the standard OSHA-accepted test. Instead, this testing provides an indication of the change in fit performance (if any) associated with the decontamination of respirators.
- **BOLD** manikin fit factors < 100.

Table 24. Strap Integrity Evaluation – Sperian N1125

Tensile Force in Respirator Straps of Decontaminated N95s (recorded force values are at 150% strain)			
Respirator Model, Decon Method, # of cycles	Straps from Treated Sample #	Force in Top Strap (N)	Force in Bottom Strap (N)
Sperian N1125, VPHP, 10 cycles	1	1.954	1.696
	2	1.847	1.951
	3	2.015	1.963
	Decontaminated Strap Average	1.939	1.870
	Control 1	1.748	1.967
	Control Strap Average	1.772	1.959
	% Change ((Deconned - Controls) / Controls)	9.44	-4.54
Sperian N1125, VPHP, 20 cycles	1	1.837	1.894
	2	1.732	1.769
	3	1.76	1.837
	Decontaminated Strap Average	1.776	1.833
	Control 2	1.795	1.951
	Control Strap Average	1.772	1.959
	% Change ((Deconned - Controls) / Controls)	0.27	-6.41