CITY OF SOMERVILLE, MASSACHUSETTS
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MAYOR
DEPARTMENT of INFRASTRUCTURE & ASSET MANAGEMENT

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DIRECTOR OF INFRASTRUCTURE & ASSET MANAGEMENT

BRIAN C. POSTLEWAITE, PE
DIRECTOR OF ENGINEERING

MELISSA WOODS. AICP
DIRECTOR OF CAPITAL PROJECTS

MEMORANDUM

Date: 22 November 2022
To: School Building Facilities and Maintenance Special City Council / School Committee Joint Committee
From: Richard E. Raiche, PE, PMP, MCPPO
RE: 2020-2021 Ventilation Upgrades Completed in Response to Covid-19

This memorandum provides a high-level summary of the work completed in 2020 and 2021 to improve ventilation and reduce the probability of Covid-19 transmission in Somerville Public Schools buildings. Following investigations and designs by our engineering consultant, Fitzemeyer & Tocci Associates, Inc., contracts for system improvements were awarded to JC Cannistraro LLC (JCC) and Thomas G. Gallagher Inc. (TGG). Those improvements are listed by school building below.

- Argenziano School
  - Replaced all MERV-8 filters with MERV-13 filters
  - Installed duct-mounted humidifiers and UV disinfection bulbs
  - Replaced filters in 70 fan-powered boxes
  - Reconfigured ventilation in nurse's suite for negative pressure and external venting
  - Retro-commissioned 5 air handling units, and 3 heat recovery units
- Brown School
  - Provided portable air filtration units for specific rooms
- Capuano Early Childhood Center
  - Replaced all MERV-8 filters with MERV-13 filters
  - Installed duct-mounted humidifiers and UV disinfection bulbs
  - Reconfigured ventilation in nurse's suite for negative pressure and external venting
  - Retro-commissioned 5 air handling units, and 24 unit ventilators
  - Rebalanced 15 exhaust fans
  - Provided portable air filtration units for specific rooms
- East Somerville Community School
  - Replaced all MERV-8 filters with MERV-13 filters
  - Installed duct-mounted humidifiers
  - Retro-commissioned twelve air handling units
  - Reconfigured ventilation in nurse's suite for negative pressure and external venting

- Rebalanced exhaust fans
- Provided portable air filtration units for specific rooms

- Healy School
  - Replaced all MERV-8 filters with MERV-13 filters
  - Installed duct-mounted humidifiers and UV disinfection bulbs
  - Reconfigured ventilation in nurse's suite for negative pressure and external venting
  - Retro-commissioned 8 air handling units, and 35 unit ventilators
  - Rebalanced 15 exhaust fans
  - Provided portable air filtration units for specific rooms
- Kennedy School
  - Replaced all MERV-8 filters with MERV-13 filters
  - Installed duct-mounted humidifiers and UV disinfection bulbs
  - Reconfigured ventilation in nurse's suite for negative pressure and external venting
  - Retro-commissioned 7 air handling units, and 45 unit ventilators
  - Rebalanced 22 exhaust fans and 7 air handling units
  - Provided portable air filtration units for specific rooms
- West Somerville Neighborhood School
  - Replaced all MERV-8 filters with MERV-13 filters
  - Installed duct-mounted humidifiers and UV disinfection bulbs
  - Retro-commissioned 25 unit ventilators and 5 air handling units
  - Reconfigured ventilation in nurse's suite for negative pressure and external venting
  - Provided portable air filtration units for specific rooms
- Winter Hill Community Innovation School
  - Replaced all MERV-8 filters with MERV-13 filters
  - Installed duct-mounted humidifiers and UV disinfection bulbs
  - Reconfigured ventilation in nurse's suite for negative pressure and external venting
  - Rebalanced system for passive operation
  - Provided portable air filtration units for specific rooms

In the course of the work above, JCC and TGG identified extensive evidence of significant deferred and under executed maintenance ranging from simple dust buildup to mechanical part failure. The City's then on-call operations and maintenance contractor, Honeywell, addressed approximately 190 individual items in the winter of 2020/2021.

The intent of the work was to align air handling in the schools with the best CDC guidance at the time, and achieve the goals established with the educators' union. The upgrades were intended to provide four air exchanges per hour with 20-percent outside air. Where that was not feasible, the upgrades provided six air exchanges per hour with a minimum of MERV-13 filtration. Following the completion of the work in each school by JCC and TGG, Fitzemeyer & Tocci completed independent testing and verification of the air exchanges. The resulting certification letters for each building are attached to this memorandum.

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FREDERICK MASSARO, JR. CFM, SFP
DIRECTOR OF CAPITAL PROJECTS

MEMORANDUM

To: Mary Skipper, Superintendent of Schools
From: Richard E. Raiche, Director of Infrastructure & Asset Management
CC: Jeff Curley, Kristen Stilljes, Tim Snyder, Emily Monea
Date: 29 July 2021
Subject: Post-construction certification of Argenziano School air handling

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JC Cannistraro completed the post-construction testing and balancing at the Argenziano School, and Fitzemeyer & Tocci has completed the engineering review of that data. Per our approved plan, detailed data was collected and reviewed in rooms that are representative of different areas of the building. The table below summarizes that analysis:

Room Number	Volume (CU.FT)	Served by	Outside Air Volume (CFM)	Total Air Volume (CFM)	Outdoor Air %	Outdoor Air Changes per Hour	Total Air Change per Hour
B105	9504	AHU-3	158.34	946	42%	1.0	8.4
B114	13968	AHU-3	166.32	1038	42%	0.7	6.2
B139	12500	AHU-2	350.856	1099	89%	1.7	7.2
A203	8800	AHU-1	108.54	1509	27%	0.7	13.1
B218	7700	AHU-2	334.022	959	89%	2.6	10.4
B205	8000	AHU-3	159.18	929	42%	1.2	9.8
A303	9367	AHU-1	395.3	1554	27%	2.5	19.4
B324	8640	AHU-2	354.4	1400	89%	2.5	12.5
B305	8417	AHU-3	164.19	917	42%	1.2	9.3

Based on the data for the representative rooms, Fitzemeyer & Tocci concluded that the building systems are delivering total air exchanges and outside air percentages in excess of our guidelines to the entire building. Consequently, we can discontinue use of the portable air purification units (a.k.a. portable HEPA filters), and we intend to redeploy those units to municipal buildings.

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FREDERICK MASSARO, JR. CFM, SFP
DIRECTOR OF CAPITAL PROJECTS

MEMORANDUM

To: Mary Skipper, Superintendent of Schools
From: Richard E. Raiche, Director of Infrastructure & Asset Management
CC: Jeff Curley, Kristen Stilljes, Tim Snyder, Emily Monea
Date: 30 August 2021
Subject: Post-construction certification of Capuano School air handling

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JC Cannistraro completed the post-construction testing and balancing at the Capuano School, and Fitzemeyer & Tocci has completed the engineering review of that data. Per our approved plan, detailed data was collected and reviewed in rooms that are representative of different areas of the building. The table below summarizes that analysis:

Room Number	Volume (CU.FT)	Served by	Outside Air Volume (CFM)	Total Air Volume (CFM)	Outdoor Air %	Outdoor Air Changes per Hour	Total Air Change per Hour
Rm# 108	6245	RTU-1	334.368	864	39%	3.2	8.3
Rm# 109	1160	RTU-1	35.604	92	39%	1.8	4.8
Rm# 110	1160	RTU-1	82.044	212	39%	4.2	11
Rm# 111	3430	RTU-1	150.543	389	39%	2.6	6.8
Rm# 122	5215	RTU-1	197.757	511	39%	2.3	5.9
Rm# 156	1900	RTU-2	10.6	212	5%	0.3	6.7
Rm# 203	7543	RTU-1	360.297	931	39%	2.9	7.4
Rm# 204	7500	RTU-1	446.598	1154	39%	3.6	9.2
Rm 210A	2694	RTU-1	1116.882	286	39%	2.5	6.4
Rm# 220	9452	RTU-1	194.274	502	39%	1.2	3.2
Rm# 239	1865	RTU-2	9.95	199	5%	0.3	6.4

Based on the data for the representative rooms, Fitzemeyer & Tocci concluded that the building systems are delivering total air exchanges and outside air percentages in compliance with our guidelines (i.e. providing a minimum 4 air exchanges per hour with 20% outside air OR providing a minimum of 6 air

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exchanges per hour with a minimum of MERV-13 filtration) to the entire building. Consequently, we can discontinue use of the portable air purification units (a.k.a. portable HEPA filters), and we intend to redeploy those units to other buildings.

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FREDERICK MASSARO, JR. CFM, SFP
DIRECTOR OF CAPITAL PROJECTS

MEMORANDUM

To: Mary Skipper, Superintendent of Schools
From: Richard E. Raiche, Director of Infrastructure & Asset Management
CC: Jeff Curley, Kristen Stilljes, Tim Snyder, Emily Monea
Date: 21 May 2021
Subject: Post-construction certification of East Somerville Community School air handling

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TG Gallagher completed the post-construction testing and balancing at the East Somerville Community School, and Fitzemeyer & Tocci has completed the engineering review of that data. Per our approved plan, detailed data was collected and reviewed in rooms that are representative of different areas of the building. The table below summarizes that analysis:

Room Number	Floor Area (SF)	Ceiling Height (FT)	Volume (CU.FT)	Avg. Chilled Beam P.D.	Outside Air Volume (CFM)	Calculated Recirculating Air Volume (CFM)	Outdoor Air %	Outdoor Air Changes per Hour	Total Air Change per Hour
108	772.7	10.8	8345.0	0.27	320	864	37%	2	9
113	689.6	10.8	7447.5	0.29	336	907.2	37%	3	10
133	837.4	10.8	9044.3	0.25	300	810	37%	2	7
140	821.4	10.8	8871.5	0.25	300	810	37%	2	8
214	794.8	10.8	8583.8	0.43	412	1112.4	37%	3	11
239	883.3	10.8	9539.5	0.26	310	837	37%	2	7

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Based on the data for the representative rooms, Fitzemeyer & Tocci concluded that the building systems are delivering total air exchanges and outside air percentages in excess of our guidelines to the entire building. Consequently, we can discontinue use of the portable air purification units (a.k.a. portable HEPA filters), and we intend to redeploy those units to municipal buildings. While it will be worthwhile to monitor the CO2 levels for the remainder of the year to understand how carbon dioxide concentrations vary with occupancy, we should be able to discontinue their use soon.

Work at the other schools is nearing completion, and the final testing and balancing has begun. The schedule indicates that we should have similar reports starting the first week of June for the Aregenziano, the Capuano, and the West, and concluding with the Healey, Kennedy and Winter Hill later in June.

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FREDERICK MASSARO, JR. CFM, SFP
DIRECTOR OF CAPITAL PROJECTS

MEMORANDUM

To: Mary Skipper, Superintendent of Schools
From: Richard E. Raiche, Director of Infrastructure & Asset Management
CC: Jeff Curley, Kristen Stilljes, Tim Snyder, Emily Monea
Date: 30 August 2021
Subject: Post-construction certification of Healey School air handling

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JC Cannistraro completed the post-construction testing and balancing at the Healey School, and Fitzemeyer & Tocci has completed the engineering review of that data. Per our approved plan, detailed data was collected and reviewed in rooms that are representative of different areas of the building. Measuring air exchanges in the Healey presents a challenge as the system varies airflow rates depending upon heating and cooling needs. To provide the most conservative estimate, the system was tested at minimum airflow rates. The table below summarizes that analysis:

Room Number	Volume (CU.FT)	Served by	Outside Air Volume (CFM)	Measured Air Volume @ Minimum Rate (CFM)	Outdoor Air %	Outdoor Air Changes per Hour	Total Air Change per Hour
Exam 114	1209	AHU-1	34	46	75%	1.7	2.3
Nurse 113	1209	AHU-1	33	44	75%	1.6	2.2
Health 111	1584	AHU-1	52	69	75%	2	2.6
110	1209	AHU-1	35	47	75%	1.7	2.3
109	1209	AHU-1	34	45	75%	1.7	2.2
Admin 102	3420	AHU-1	177	237	75%	3.1	4.2
Dining 142	3427	AHU-1	78	105	75%	1.4	1.8
210	1209	AHU-1	36	48	75%	1.8	2.4

Based on the data for the representative rooms, Fitzemeyer & Tocci concluded that when operating at minimum rates, the building systems do not provide air quality in compliance with our guidelines (i.e. providing a minimum 4 air exchanges per hour with 20% outside air OR providing a minimum of 6 air exchanges per hour with a minimum of MERV-13 filtration) to the entire building. It should be noted that the variable nature of airflow rates in the system result in air exchanges in excess of those indicated in the

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table above under normal operating conditions (i.e., when heating or cooling is needed). However, we cannot conclude that condition is achieved on all days. Consequently, we will continue use of the portable air purification units (a.k.a. portable HEPA filters), while we explore other options to modify the operations of the building systems.

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MEMORANDUM

To: Mary Skipper, Superintendent of Schools
From: Richard E. Raiche, Director of Infrastructure & Asset Management
CC: Jeff Curley, Kristen Stilljes, Tim Snyder, Emily Monea
Date: 30 August 2021
Subject: Post-construction certification of Kennedy School air handling

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JC Cannistraro completed the post-construction testing and balancing at the Kennedy School, and Fitzemeyer & Tocci has completed the engineering review of that data. Per our approved plan, detailed data was collected and reviewed in rooms that are representative of different areas of the building. Measuring air exchanges in the Kennedy presents a challenge as the system varies airflow rates depending upon heating and cooling needs. To provide the most conservative estimate, the system was tested at minimum airflow rates. The table below summarizes that analysis:

Room Number	Volume (CU.FT)	Served by	Outside Air Volume (CFM)	Measured Air Volume @ Minimum Rate (CFM)	Outdoor Air %	Outdoor Air Changes per Hour	Total Air Change per Hour
A304	2650	AHU-2	102.184	241	42%	2.3	5.5
A114	3456	AHU-2	31.8	75	42%	0.6	1.3
A109	1048	AHU-2	23.744	56	42%	1.4	3.2
A108	1382	AHU-2	26.712	63	42%	1.2	2.7
A106	4320	AHU-2	12.296	29	42%	0.2	0.4
A103	1944	AHU-2	22.472	53	42%	0.7	1.6
A111	504	AHU-2	7.632	18	42%	0.9	2.1
A110	504	AHU-2	12.72	30	42%	1.5	3.6
A119	504	AHU-2	11.872	28	42%	1.4	3.3

Based on the data for the representative rooms, Fitzemeyer & Tocci concluded that when operating at minimum rates, the building systems do not provide air quality in compliance with our guidelines (i.e. providing a minimum 4 air exchanges per hour with 20% outside air OR providing a minimum of 6 air

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exchanges per hour with a minimum of MERV-13 filtration) to the entire building. It should be noted that the variable nature of airflow rates in the system result in air exchanges in excess of those indicated in the table above under normal operating conditions (i.e., when heating or cooling is needed). However, we cannot conclude that condition is achieved on all days. Consequently, we will continue use of the portable air purification units (a.k.a. portable HEPA filters), while we explore other options to modify the operations of the building systems.

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MEMORANDUM

To: Mary Skipper, Superintendent of Schools
From: Richard E. Raiche, Director of Infrastructure & Asset Management
CC: Jeff Curley, Kristen Stilljes, Tim Snyder, Emily Monea
Date: 30 August 2021
Subject: Post-construction certification of Winter Hill School air handling

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JC Cannistraro completed the post-construction testing and balancing at the Winter Hill Community Innovation School, and Fitzemeyer & Tocci has completed the engineering review of that data. Following the extensive work at the WHCIS, data was collected for virtually every room in the school. The table below summarizes that analysis:

Room Number	Volume (CU.FT)	Outside Air Volume (CFM)	Total Air Volume (CFM)	Outdoor Air %	Outdoor Air Changes per Hour	Total Air Change per Hour
204	7875	78.5	785	10%	0.6	6.0
205	7875	75.2	752	10%	0.6	5.7
206	7875	96.9	969	10%	0.7	7.4
222	7875	103.8	1038	10%	0.8	7.9
229	2520	98.2	982	10%	2.3	23.4
231	1440	31.2	312	10%	1.3	13.0
241	7875	68.9	689	10%	0.5	5.2
245	7875	57.1	571	10%	0.4	4.4
246	7875	48.7	487	10%	0.4	3.7
250	7875	35.7	357	10%	0.3	2.7
304	8640	50.8	508	10%	0.4	3.5
305	8640	72.6	726	10%	0.5	5.0
306	8640	93.6	936	10%	0.7	6.5
322	14400	142.7	1427	10%	0.6	5.9
323	7488	57.1	571	10%	0.5	4.6

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Room Number	Volume (CU.FT)	Outside Air Volume (CFM)	Total Air Volume (CFM)	Outdoor Air %	Outdoor Air Changes per Hour	Total Air Change per Hour
329	7956	33.5	335	10%	0.3	2.5
330	7956	50.8	508	10%	0.4	3.8
334	7956	68.5	685	10%	0.5	5.2
404	4680	64.8	648	10%	1	8.3
405	4320	44.3	443	10%	1	6.2
406	1800	32.7	327	10%	1	10.9
407	4680	60.8	608	10%	0.8	7.8
416	4680	73.6	736	10%	0.9	9.4
417	4320	70	700	10%	1.0	9.7
418	1800	33.5	335	10%	1.1	11.2
420	4680	88	880	10%	1.1	11.3
423	7344	41.7	417	10%	0.3	3.4
427	7344	45.8	458	10%	0.4	3.7
428	7344	59	590	10%	0.5	4.8
432	7344	64.8	648	10%	0.5	5.3
242/244	15750	137.5	1375	10%	0.5	5.2
249/247	15750	192.9	1929	10%	0.7	7.3
326/328	15552	110.7	1107	10%	0.4	4.3
331/333	15552	123.4	1234	10%	0.5	4.8
424/426	14688	91.2	912	10%	0.4	3.7
429/431	14688	32.3	323	10%	0.1	1.3

Compared to our air quality guidelines (i.e., providing a minimum 4 air exchanges per hour with 20% outside air OR providing a minimum of 6 air exchanges per hour with a minimum of MERV-13 filtration) it is apparent that many rooms exceed the thresholds, but some do not. To avoid operational confusion, we will continue use of the portable air purification units (a.k.a. portable HEPA filters) throughout the building.

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FREDERICK MASSARO, JR. CFM, SFP
DIRECTOR OF CAPITAL PROJECTS

MEMORANDUM

To: Mary Skipper, Superintendent of Schools
From: Richard E. Raiche, Director of Infrastructure & Asset Management
CC: Jeff Curley, Kristen Stilljes, Tim Snyder, Emily Monea
Date: 29 July 2021
Subject: Post-construction certification of West Somerville Neighborhood School air handling

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JC Cannistraro completed the post-construction testing and balancing at the West Somerville Neihborhood School, and Fitzemeyer & Tocci has completed the engineering review of that data. Per our approved plan, detailed data was collected and reviewed in rooms that are representative of different areas of the building. The table below summarizes that analysis:

Room Number	Volume (CU.FT)	Served by	Outside Air Volume (CFM)	Measured Air Volume (CFM)	Outdoor Air %	Outdoor Air Changes per Hour	Total Air Change per Hour
Corridor	638	AC-3	65.835	231	29%	6.2	21.7
Rm# 111	2999	AC-3	69.54	244	29%	1.4	4.9
Rm# 119	2689	AC-3	62.13	218	29%	1.4	4.9
Rm# 314C	2037	AC-3	100.035	351	29%	2.9	10.3
Rm# 303	7912	Unit Ventilator	174	1034	17%	1.3	7.8
Rm# 311	6211	Unit Ventilator	468	1459	32%	4.5	14.1
Rm# 203	7920	Unit Ventilator	121	947	13%	0.9	7.2
Rm# 209	7725	Unit Ventilator	217	939	23%	1.7	7.3
Rm# 102	10564	Unit Ventilator	412	905	46%	2.3	5.1
Rm# 107	10470	Unit Ventilator	149	816	18%	0.9	4.7

Based on the data for the representative rooms, Fitzemeyer & Tocci concluded that the building systems are delivering total air exchanges and outside air percentages in excess of our guidelines to the entire building. Consequently, we can discontinue use of the portable air purification units (a.k.a. portable HEPA filters), and we intend to redeploy those units to municipal buildings.

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