



Update on Transition to Hybrid Learning

February 4, 2021



Update on Facilities

Summary of Ventilation Systems Work

NEEDLEPOINT BIPOLAR IONIZATION

- All schools will receive ionization equipment.
- NBPI devices produce positive and negative ions that neutralize viruses, allergens and other harmful airborne particles.

Status: 99.5% Complete

VENTILATION SYSTEMS ANALYSIS

- Review and ascertain original design intent of ventilation capacity
- Review and determine filtration capabilities of various system types.

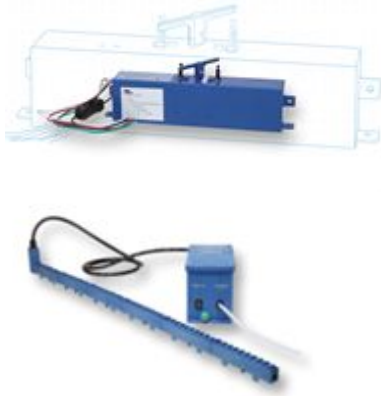
Status: Review 100% Complete

Next Steps: Systems Testing (where applicable)

Needlepoint Bipolar Ionization

INSTALLED DIRECT INTO VENTILATION SYSTEM

- 1,290 units installed



PORTABLE AIR CLEANER

Filters and ionizes air with MERV 13 filters

- 1,614 units installed



SENSORS AND PROGRAMMING

- Connection measurement and multifunction indoor air quality sensors. Testing, balancing, and programming of equipment.



Summary of Ventilation Systems Work

How NPBI Works

With a cough or a sneeze, any individual can introduce harmful pathogens into the air. To minimize exposure, NPBI produces millions of positively and negatively charged ions that travel through the air via the HVAC system, continuously seeking out and attaching to harmful particles — including pathogens' surface proteins, rendering the pathogens ineffective.

Harmful Particles
(including pathogens)



NPBI renders the pathogens
ineffective by introducing millions
of positive and negative ions



The ions breakdown harmful VOCs
into harmless compounds like O₂,
CO₂, N₂, and H₂O.



Source: EMCOR Facilities Services

White paper on Improving Indoor Air
Quality Needlepoint Bipolar Ionization

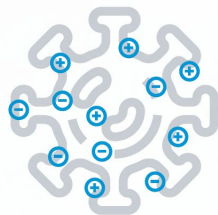
emcorfacilities.com

Summary of Ventilation Systems Work

Reducing the Spread of Disease

Rapid, Continuous Air Cleaning NPBI technology releases ions that immediately begin attaching to particulates, and, as ions enter the air stream, they offer continuous cleaning throughout the entire facility.

Inactivate Pathogens When ions come into contact with pathogens, they not only make them more filterable, their microbicidal effects also reduce the infectivity of the virus.



PATHOGEN	TIME EXPOSED	KILL/INACTIVATION RATE
E. coil	15 minutes	99.68%*
C. Diff	30 minutes	86.50%*
Noro Virus	30 minutes	93.50%*
MRSA	30 minutes	96.24%*
COVID-19	30 minutes	99.40%*

*White papers that detail these results are available upon request from the manufacturer of the needlepoint bipolar ionization technology.

Source: EMCOR Facilities Services

White paper on Improving Indoor Air Quality Needlepoint Bipolar Ionization

emcorfacilities.com

Filtration Upgrades

Analysis of System Capability to Upgrade to MERV 13 filtration

MERV 13 Existing: Nelson Place

Potential MERV 13 Capacity

Subject to System Testing:

1. Burncoat High School
2. Burncoat Middle School
3. Claremont & Woodland Academies
4. Durkin Administration Building
5. Elm Park Community School
6. Hiatt Magnet School
7. South High School*
8. Sullivan Middle School
9. Worcester Technical High School

*South High received portable units due to the construction of the new school.

Potential MERV 13 Capacity on large central air handling systems

Subject to System Testing:

Heard Street
Lake View
Rice Square

Potential MERV 13 Capacity on specific building areas

Subject to System Testing:

Belmont St., Canterbury St., Chandler Magnet, Doherty High, Forest Grove Middle, Norrback Ave, North High, Quinsigamond, and Roosevelt

All portable ionization units have MERV-13 filters

Filtration Upgrades

Use of Bipolar Ionization and MERV-rated filtration

Needlepoint Bipolar Ionization (NBPI) Increases Filter Efficiency to Fight Current Pathogens

How to save on expensive cost of up-sizing filters

Needlepoint Bipolar Ionization technology produces positive and negative ions that travel with the supply air into the space. In the space, these ions cause particles like dust, dander, pollen, bacteria and virus to attract and stick together (agglomeration). This action significantly increases the effectiveness of existing filters. MERV 8 + GPS = MERV 13.

Source: <http://www.dac-hvac.com/>

Will this impact the performance of an HVAC system?

It depends on model selected and mounting, but it can actually improve the performance of a system. The GPS iMOD, mounted on the air inlet side of the cooling coil, will actually keep the coil clean, reducing the load on the chiller plant and on the fan, resulting in energy-saving pressure drop. Likewise, independent research has confirmed that NPBI, when combined with a MERV 8 rated filter, will actually increase the effectiveness of that filter to MERV 13.

Filtration Upgrades

Use of Bipolar Ionization and MERV-rated filtration

% of SARS VIRUS CONTROLLED BASED ON TECHNOLOGY*

MERV Rating	Filter Only	Filter+UVC***	Filter + Ionization*, **
6	6.2%	10%	34%
7	7%	12%	61%
8	11%	19%	84%
10	12%	35%	89%
13	46%	84%	97%
15	71%	97%	99%
16	76%	98.80%	99.90%
17 (HEPA)	99.90%	99.99%	99.999%

*Ionization increases the filter efficiency 4-5 MERV levels – this column added by GPS

**Does not take into account ionization kills in the space and on surfaces

***UVC does not effectively kill airborne pathogens in high RH conditions²

2. ASHRAE Technical Paper on
Airborne Infectious Diseases

1. 2009 EPA Tech Paper

MERV 8 + GPS => MERV 13

 2820 S. English Station Rd. Louisville, Ky 40299 Tel: (502) 357-0132 Fax: (502) 267-8379	Date: 23-Oct-17
	Report No.: 17-618
	MODIFIED CADR CHAMBER TEST
	TEST REPORT SUMMARY
	Chamber Smoke Concentration Decay Test
MERV 13 vs. MERV 8 w/GPS Device	

Test Results

- 1 It was determined that the 1" MERV 13 Panel filter reduced particle count from 2,730,958 to 808 particles in a timeframe of 34 minutes.
- 2 It was determined that the 1" MERV 8 Panel filter with GPS Technology reduced particle count from 3,645,943 to 745 particles in a timeframe of 16 hours.
- 3 It was determined that the 1" MERV 8 Panel filter with GPS Technology reduced particle count from 2,753,181 to 745 particles in a timeframe of 15 hours - 40 minutes in comparison to the MERV 13 at 34 minutes.

Quantitative Results

MERV 13 Filter

Elapsed Time, Min.	Microns								# total Particles	#/cm3 Concentration
	0.30	0.40	0.55	0.70	1.00	1.30	1.60	2.20		
4	1805492	738537	144867	40941	855	153	96	3	2730958	2730
34	636	101	25	23	8	5	2	5	808	0.81

MERV 8 Filter with GPS Technology

Elapsed Time, Min.	Microns								# total Particles	#/cm3 Concentration
	0.30	0.40	0.55	0.70	1.00	1.30	1.60	2.20		
5	1958081	1222632	332433	129698	2610	341	136	6	3645943	3645
19	1876059	736434	117644	22892	116	11	20	5	2753181	2753
16 hours	619	90	12	17	2	1	2	2	745	0.74

National Research Council of Canada



The combination of the NPBI with MERV 12 has the same efficiency as a MERV 16 filter for size bin E2 (PM2.5), i.e. a filter eff. ≥ 95%

Testing based on GPS-iMOD in a western CA hospital

Source: Global Plasma Solutions