

Indoor Air Quality Assessments Summary Report

Durham Public Schools



Submission Date: 12/10/2021

BACKGROUND

Brady has completed assessments of 49 schools within Durham Public Schools with the focus of determining the condition of the mechanical equipment that protects the learning environment. Our goal is to gauge the ability of these mechanical systems to provide increased ventilation rates, identify any deficiencies that could contribute to poor indoor air quality, and aid the district in prioritizing future capital improvements.

This report includes summaries of the following areas of analysis:

1. Current airflow ratings vs. recommended levels
2. Equipment ratings and capital improvement recommendations
3. Maintenance and repair recommendations
4. Indoor air quality testing
5. Maintenance gap analysis

AIRFLOW SUMMARIES

Brady performed outdoor airflow readings at each school between August and November of 2021. These are point-in-time readings but help identify the current status of how much fresh air each school is bringing in during occupied times. The actual outdoor airflow levels are compared to the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) standard based on occupancy counts and building size.

School	School Type	% of ASHRAE 62.1
City of Medicine	Other	424.9%
Sandy Ridge ES	Elementary	146.8%
Y.E. Smith ES	Elementary	138.8%
Shephard MS	Middle	138.4%
W.G. Pearson ES	Elementary	121.9%
Holton Career	High	97.5%
Lucas MS	Middle	94.9%
Bethesda ES	Elementary	71.6%
Southwest ES	Elementary	69.0%
Merrick-Moore ES	Elementary	68.3%
Lakewood ES	Elementary	66.9%
Neal MS	Middle	62.8%
Little River ES	Elementary	57.2%
Roger Herr MS	Middle	57.2%
Parkwood ES	Elementary	54.5%
George Watts ES	Elementary	54.3%
Lowes Grove MS	Middle	53.2%
Club Blvd ES	Elementary	52.2%
Oak Grove ES	Elementary	51.4%
Morehead Montessori	Elementary	47.5%
C.C. Spaulding ES	Elementary	46.8%
Mangum ES	Elementary	46.1%
R.N. Harris ES	Elementary	45.5%
Lakeview SS	High	36.5%
DSA	High	36.3%

School	School Type	% of ASHRAE 62.1
Eno Valley ES	Elementary	35.7%
Fayetteville St. ES	Elementary	31.7%
Lakewood Montessori	Middle	30.9%
Hillandale ES	Elementary	26.3%
Burton ES	Elementary	25.2%
Creative Studies	Middle	23.2%
Hope Valley ES	Elementary	21.3%
Glenn ES	Elementary	20.3%
Easley ES	Elementary	20.1%
Hillside HS	High	17.9%
Southern HS	High	14.1%
Northern HS	High	12.8%
Riverside HS	High	12.2%
Githens MS	Middle	11.8%
Eastway ES	Elementary	11.3%
E.K. Powe ES	Elementary	11.0%
Brogden MS	Middle	10.4%
Carrington MS	Middle	8.8%
Creekside ES	Elementary	8.3%
Forest View ES	Elementary	5.9%
Jordan HS	High	4.0%
Holt ES	Elementary	3.8%
Spring Valley ES	Elementary	1.7%
Pearsonstown ES	Elementary	0.6%

EQUIPMENT AND CAPITAL IMPROVEMENT ASSESSMENT

We have assigned each piece of equipment a rating from 1 to 5, with 1 being the lowest priority and 5 being the highest priority. We then summarized these ratings across the school, and then broke those scores down by equipment type. Finally, we provided a "top recommendation," which is our recommendation for the highest need at that school. That means schools with a "1 for 1 Replacement" recommendation do not need **all** units replaced, just those with a condition rating of a 4 or 5.

Equipment was scored based on the following grading criteria:

1	In excellent condition
2	In good condition.
3	In moderate condition.
4	In poor condition.
5	Consider for immediate replacement.

Below are the ratings per school:

School	Avg. Total Rating	Top Recommendation
Eno Valley ES	1.00	Service Existing
City of Medicine	1.14	Service Existing
C.C. Spaulding ES	1.38	Service Existing
Y.E. Smith ES	1.50	Service Existing
Fayetteville St. ES	1.75	Service Existing
Creekside ES	1.92	Service Existing
Club Blvd ES	2.00	Service Existing
E.K. Powe ES	2.00	Service Existing
Lakewood Montessori MS	2.00	Service Existing
Lucas MS	2.00	Service Existing
Morehead Montessori	2.00	Service Existing
Spring Valley ES	2.00	Service Existing
Holton Career and Resource Center	2.21	System Redesign
Merrick-Moore ES	2.24	Service Existing
Sandy Ridge ES	2.27	Service Existing
W.G. Pearson ES	2.30	Service Existing
Mangum ES	2.35	Service Existing
Neal MS	2.35	System Redesign
Shepard MS	2.39	Service Existing
Hillside HS	2.54	Service Existing
Burton ES	2.63	Service Existing
Parkwood ES	2.67	Service Existing
George Watts ES	2.71	System Redesign
Durham School of the Arts	2.73	System Redesign
Lakewood ES	2.80	1 for 1 Replacement

School	Avg. Total Rating	Top Recommendation
Eastway ES	3.00	1 for 1 Replacement
R.N. Harris ES	3.10	System Redesign
Rogers-Herr MS	3.17	1 for 1 Replacement
Carrington MS	3.38	1 for 1 Replacement
Bethesda ES	3.44	1 for 1 Replacement
Pearsontown ES	3.50	1 for 1 Replacement
Oak Grove ES	3.62	1 for 1 Replacement
Lakeview Secondary School	3.69	1 for 1 Replacement
Lowes Grove MS	3.71	1 for 1 Replacement
Jordan HS	3.84	1 for 1 Replacement
Little River ES	3.85	1 for 1 Replacement
Northern HS	3.85	1 for 1 Replacement
Riverside HS	3.88	1 for 1 Replacement
Southern HS	3.88	1 for 1 Replacement
Holt ES	4.00	1 for 1 Replacement
School for Creative Studies	4.07	System Redesign
Hope Valley ES	4.07	1 for 1 Replacement
Easley ES	4.08	1 for 1 Replacement
Forest View ES	4.17	1 for 1 Replacement
Brogden MS	4.47	System Redesign
Hillandale ES	4.50	1 for 1 Replacement
Southwest ES	4.54	1 for 1 Replacement
Glenn ES	4.58	1 for 1 Replacement
Githens MS	4.77	1 for 1 Replacement

EQUIPMENT REPLACEMENT ESTIMATE

Brady estimated the cost to replace all major equipment based on its age, recommended replacement year and industry-standard cost estimating metrics. We identified over \$70M in **major equipment** HVAC replacements over the next 40 years, with \$40 million of major equipment HVAC replacements needed over the next five years.

This analysis was limited to a like-for-like replacement of major equipment, defined as chillers, boilers, air-handling equipment and cooling towers. It excludes minor equipment, such as fan-coil units, unit ventilators, heat pumps, split systems, exterior wall-mounted units and other light commercial equipment.

The chart below identifies the major equipment replacement costs by 5-year replacement cycle.

5-Year Replacement Cycle	Major Equipment Replacement Cost
2022-2026	\$40,144,590
2027-2031	\$15,839,027
2032-2036	\$8,796,221
2037-2041	\$3,919,270
2042-2046	\$1,640,820
Grand Total	\$70,339,929

MAINTENANCE AND REPAIR RECOMMENDATIONS

Brady identified a total of 737 issues as part of maintenance and repair recommendations across all schools. Some of these are straightforward repairs, others are more complex issues that will require specialized expertise. Each of these deficiencies have been logged with a priority rating and a list is included within the associated individual school reports, and the complete list has been shared with DPS staff. The issues were categorized based on the equipment that the identified deficiency was associated with, such as Air Handling Units (AHUs), Heat Recovery Units (HRUs), Hot Water (HW) systems, Controls, etc.

Below is a summary of the issues identified at all schools:

	High	Medium	Low	Total
AHU	143	203	131	477
CHW System	14	34	12	60
Controls	-	52	1	53
ERV	10	14	2	26
HRU	3	-	-	3
HW System	5	18	5	28
RTU	18	25	5	48
Whole Building	9	23	10	42
Total	202	369	166	737

INDOOR AIR QUALITY READINGS

Brady performed limited mold and Volatile Organic Compound (VOCs) readings at each school to identify areas of concern. The sampling was conducted following the cleaning of the HVAC equipment and the upgrade from MERV 8 to MERV 13 filtration. This testing was limited to two indoor samples and so any elevated readings should be understood only as a recommendation for additional testing.

Below is a list of where elevated mold samples were identified that were higher than the exterior baseline sample and where the VOC samples returned levels lower than the LEED Version 3.0 standard:

School	Elevated Mold	Elevated VOCs
Bethesda ES		
Brogden MS		
Burton ES		
C.C. Spaulding ES		
Carrington MS		x
City of Medicine		
Club Blvd ES	x	
School for Creative Studies		
Creekside ES		x
Durham School of the Arts		
E.K. Powe ES		
Easley ES		x
Eastway ES	x	
Eno Valley ES		
Fayetteville St. ES	x	
Forest View ES		
George Watts ES		
Githens MS		x
Glenn ES	x	x
Hillandale ES	x	
Hillside HS	x	
Holt ES	x	x
Holton Career and Resource Center		
Hope Valley ES	x	
Jordan HS		

School	Elevated Mold	Elevated VOCs
Lakeview Secondary School		x
Lakewood ES		
Lakewood Montessori MS		
Little River K-8	x	x
Lowes Grove MS		
Lucas MS		
Mangum ES		
Merrick-Moore ES	x	
Morehead Montessori	x	
Neal MS		x
Northern HS	x	
Oak Grove ES		
Parkwood ES	x	x
Pearsontown ES	x	x
R.N. Harris ES		x
Riverside HS	x	
Rogers-Herr MS	x	x
Sandy Ridge ES		
Shepard MS		
Southern HS		
Southwest ES		
Spring Valley ES		x
W.G. Pearson ES	x	
Y.E. Smith ES		

MAINTENANCE GAP ASSESSMENT

The DPS maintenance team works extremely hard to keep all schools operating and functional. However, as deferred maintenance levels increase, this team is required to spend more time on emergency repairs than on preventive maintenance. In order to meet the recommended maintenance levels for DPS school facilities, DPS must begin to close the staffing and funding gaps for maintenance that are identified in the tables below.

Staffing Gap

Today, DPS's seven HVAC technicians are able to spend at most 10-20% of their time on preventive maintenance activities. This team spends the majority of their time addressing emergency repairs, comfort concerns and other immediate requirements. It is difficult for this team to perform preventive maintenance due to staffing levels, high levels of deferred maintenance and a consistent volume of emergency repairs.

Our recommendations for HVAC preventive maintenance are broken down into two options: "Best in Class" and "Best Practice". Best in Class refers to the industry gold standard, while Best Practice reflects the best practices for K-12 school maintenance programs. We recommend instituting a preventive maintenance program that strives to meet the Best Practice benchmark. In order to meet the Best in Class or Best Practice maintenance levels, DPS will need to hire additional technicians or supplement them with specialized service contracts.

The table below lays out the estimated amount of labor hours required to perform the Best in Class and Best Practice maintenance programs. This is then compared to the estimated amount of time spent today by the DPS team on preventive maintenance in order to identify the gap of how many people (internal or external) who should be **exclusively dedicated** to preventive maintenance.

Description	Best In Class	Best Practice
Recommended PM Hours	16,000	10,000
Estimated Current PM Hours	2,450	2,450
Gap in PM Hours	13,550	7,550
FTE (1750 Hrs)	8	4

Funding Gap

We recommend that DPS increase the maintenance budget for additional staff, service agreements and maintenance repairs by **at least \$5 million**. The table below shows an estimated range of costs for both preventive maintenance activities and the repairs that are identified through a robust maintenance program.

Description	Range (\$MM)
Preventive Maintenance	\$1.5M - \$2.5M
Maintenance Repairs	\$2.5M - \$5M
Total	\$4.5M - \$7.5M