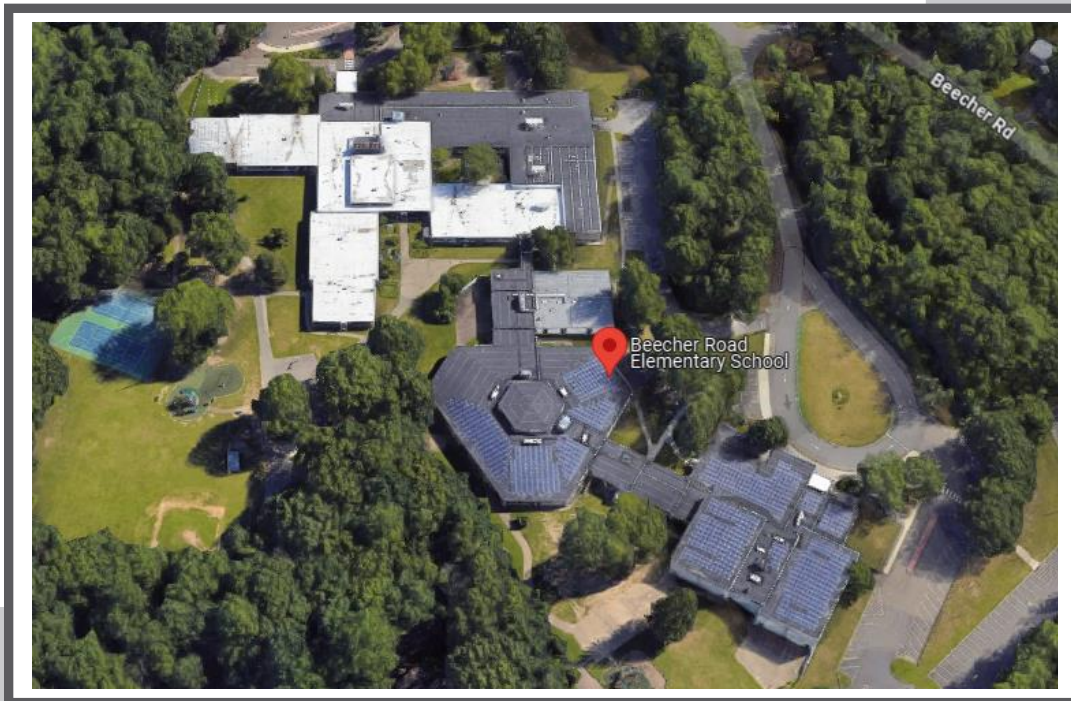


Beecher Road Elementary School

40 Beecher Rd.

Woodbridge, CT 06525



Indoor Air Quality (IAQ) Evaluation and HVAC Systems Assessment van Zelm Project # 2022231.00 March 28, 2024

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Beecher Road Elementary School

INDOOR AIR QUALITY (IAQ) EVALUATION AND HVAC SYSTEMS ASSESSMENTS

EXECUTIVE SUMMARY

The following Findings Report is an overview of the heating, ventilation, and air conditioning (HVAC) systems and operations that impacts overall ventilation and indoor air quality to support a healthy learning environment in your school. The report’s main focus, however, relates to occupied areas indoor ventilation and the compliance or non-compliance of this school with current ASHRAE-62.1, (2010) guidelines regarding Ventilation for Acceptable Indoor Air Quality for Schools.

Building Overview

The school is a single-story building with rising elevations from South to North. The extreme South end of the building houses the District Office and a public pool. These are technically separate from the Beecher Road School. Adjacent to this is the South Gym, Boy’s Locker Room, Lower-Level Girl’s Locker Room, Assembly Room/Auditorium, Music, and an office area that had been used by the Town Recreation Department but is now used for SPED. A corridor of classrooms (E Wing) joins this area to the central Rotunda (S Wing) which has a Multipurpose Room surrounded by 5th and 6th grade classrooms. Another corridor (D Wing) of 4th grade classrooms joins to the North section of the building. This is where the Media and Tech Centers are located, adjacent to the Cafeteria and Kitchen. The 3rd grade C Wing and Kindergarten K Wing corridors lead to the Administration area and main entrance to the school. The main corridor leads to the 2 grade and MAG classrooms in B Wing and the 1st grade classroom in A Wing.

HVAC System Overview

The building and HVAC control system utilizes a Honeywell Direct Digital (DDC) Control system integrated into a Honeywell Building Automation System (BAS). Carbon Dioxide (CO₂) based Demand Controlled Ventilation (DCV) is incorporated into most of the HVAC equipment to optimize the required ventilation rate. The CO₂ sensor calibration was verified by Wings Testing and Balancing.

The school ventilation is provided by 16-HVAC units consisting of 6-AHU’s, 4- ERV’s feeding fresh air to 42-Fan Coil units in E, S, D, and K classrooms, 5-RTU’s and 1-Dectron pool dehumidification unit. There are also 24 classroom Unit Ventilators in the A, B and C Wing classrooms.

- AHU-1 located in Mechanical room serves Music area. This unit is an older Trane UCCAG10COAORDN12 with an apparent design CFM of 2,215 and OA 1,000. The cooling and heating coils are connected to the central plant 2-pipe system. The HVAC units are functional. Dampers and actuators appear to be functional although the dampers show signs of corrosion and should be cleaned and lubricated to ensure smooth operation and proper functionality.
- AHU-2 & 3 are located in the Gym space suspended from the ceiling. They serve the North Gym and the common space. As these units are up high, there is no accessibility without a high lift. These units are the newer Trane UCCAG12COAORDN12 with an apparent design CFM of 5,200 and OA 1,700. The configuration includes a heating and cooling unit with a rear sectional mixing box with bottom return and fresh air. Damper conditions unknown. Systems were operating and space was adequate conditioned.

- AHU-4 located in the mezzanine MER serves the assembly area. This unit is Trane Climate Changer model UCCAG14C0A0RDN12000000FC872, serial number K15G54994 with an apparent design CFM of 6,700. The outside air CFM is listed as 3,300 CFM. Cooling and heating coils are served from a central plant 2-pipe system. The unit is in good condition.
- AHU-5 located in the MER serves the South Gym and Locker Rooms. This is a three zone unit. This unit is a newer Trane Climate Changer model UCCAG21COA with an apparent design CFM of 9,700 and OA intake set for 4,300. Cooling and heating coils are served from a central plant 2-pipe system. There are associated reheat zone coils that serve the south Gym, Boys locker, and Girls Locker areas. The unit is in good condition.
- AHU-6 serves the Multipurpose and Language classrooms. This unit is a Trane Climate Changer model UCCAG08C0AEN-12 with an apparent design CFM of 3,500 and OA intake of 775. Access to this unit is limited. Cooling and heating coils are served from a central plant 2-pipe system. The unit is in good condition.
- ERV-1 located on building roof serves Fan Coil Units in the S Wing classrooms. This unit is a Xetex heat recovery unit with Cube heat recovery only supply and return air model IAQ-4000-RT-BT-SP. The unit has an apparent design supply air CFM of 2800, and a return air CFM of 2,225. The unit appears to be in good condition.
- ERV-2 located on building roof serves Fan Coil Units in the E and S Wing classrooms. This unit is a Xetex heat recovery unit with Cube heat recovery only supply and return air model IAQ-10000-RT-BT-SP. The unit has an apparent design supply air CFM of 6,275, and a return air CFM of 4,900. The unit appears to be in good condition.
- ERV-3 located on building roof serves Coil Units in the D Wing classrooms. This unit is a Xetex heat recovery unit with Cube heat recovery only model IAQ-4000-RT-BN-SP. The unit has an apparent design supply air CFM of 2,900, and a return air CFM of 2100. The unit appears to be in good condition.
- ERV-4 located on the building roof serves Fan Coil Units in the K Wing classrooms. This unit is a Xetex heat recovery unit with Cube heat recovery only model IAQ-3000-BP-PHW-HW. The unit has an apparent design supply air CFM of 4,500 and a return air CFM of 4,500. The unit appears to be in good condition.
- RTU-1 is located on the building roof dunnage. The unit serves the District Office Area, specifically the Conference Room and Rec Office. The unit is a Trane model CSAA003UBL00 with an apparent design CFM of 800 and OA 200. This unit is a Trane Climate Changer constant volume unit with cooling and heating water coils served from a central plant 2-pipe system. The unit is in good condition. Piping serving RTU's are within hinged door access house which give good control valve accessibility.
- RTU-2 is located on the building roof dunnage. The unit is a variable volume unit serving the main office. The unit is a Trane model CSAA006UBL00 with serial number K15G57531 and has an apparent design CFM of 3,000 and OA 600. This unit is a Trane Climate Changer with Cooling and Heating water coils served from a central plant 2-pipe system. There are associated VAV Terminal Boxes with hot water reheat coils serving, Waiting, Conference, Main Office, Principals Office, Vice Principals Office and PPT area. The unit is in good condition. Piping serving RTU's are within hinged door access house which give good control valve accessibility.
- RTU-3 is located on the building roof dunnage. Unit serves the cafeteria. The unit is a Trane model CSAA021UBL00 with serial number K15G55690 with an apparent design CFM of 10,560 and OA of 5,800. This unit is a Trane Climate Changer with Cooling and Heating water coils are served from a central plant 2-pipe system. The unit is in good condition. Piping serving RTU's are within hinged door access house which give good control valve accessibility.

- RTU-4 is located on the building roof dunnage. Unit serves the Library-Media. The unit is a Trane model CSAA017UBL00 with an apparent Design CFM of 7,400 and OA 2,100. This unit is a Trane Climate Changer with Cooling and Heating water coils are served from a central plant 2-pipe system. The unit is in good condition. Piping serving RTU's are within hinged door access house which give good control valve accessibility.
- RTU-5 is located on the building roof dunnage. Unit serves the Tech Center. The unit is a Trane Variable Volume Unit model CSAA008UBL00 with serial number K15G57541 with an apparent design CFM of 3,600 and OA of 700. This unit is a Trane Climate Changer with Cooling and Heating water coils are served from a central plant 2-pipe system. There are associated VAV Terminal Boxes serving Tech Center Office, Tech Center, and Tech Center Server area. Unit is in good condition.
- DH-1 is a dedicated heating, cooling, and dehumidification unit serving the Pool and surrounding areas. The unit is a Dectron model DSH-1532-7 with an apparent design CFM of 13,500 supply and exhaust of 3,100. This unit includes mechanical cooling compressors with gas reheat and operates similar to typical heat pump principal by recirculation pool air and removing the excess moisture content delivering warm, dry air to the pool area.
- Piping serving RTU's are within hinged door access house which give good control valve accessibility.

Additional Information Related to HVAC Systems

Classrooms that are served by the UV's have an exhaust grill that is used to prevent over-pressurization of the space. The original design documents for the renovation project indicate that most of the classrooms are designed to exhaust 350 CFM through the exhaust grill in the room. These airflow quantities change based on the size of the rooms that are served by the UV's.

Classrooms served by the UV's control the ventilation air based upon CO2 levels (DCV) by modulating the UV's outside air dampers open to response to rising CO2 levels in the space.

Classrooms served by the ERU/FCU arrangement control the ventilation air based upon CO2 levels (DCV) by modulating the FCU outside air damper, which is ducted from the ERV to the FCU. There are 4 small PTAC units serving the Superintendent, Secretary, Business Manager and Kitchenette. These units have very small two position outside air dampers for ventilation. The outside air flow was not able to be measured.

Aside from above mentioned HVAC units, the building ventilation system has in place exhaust fans for various purposes including, but not limited to, toilet exhaust, kitchen exhaust, mechanical / electrical space ventilation, etc.

It is our opinion that all the Air Handling Heating, Cooling and Ventilation Units are in good shape for their age and should continue to be maintained at regular intervals.

van Zelm along with Wings Testing and Balancing performed the on-site inspections during the month of June 2023. The goal of this study is primarily focused towards addressing the operational conditions and outside air and outside air change rates of the occupied spaces. Although there are code exhaust air requirements for spaces like storage rooms, electrical rooms, mechanical rooms, etc., these spaces are often not directly ventilated with outside air, nor are they required to be since they typically have no occupancy. These non-occupied spaces typically do not affect building occupied areas as they are typically provided with some form of exhaust creating a negative pressure on the surrounding area. Unoccupied space exhaust may impact outside air infiltration into occupied areas; however, this would typically be limited and is not included in occupied spaces ventilation calculations. Should the School District pursue any Phase II activities for the building including recommissioning, balancing, and controls upgrades, these spaces could then be addressed as a component of that process.

Overall, the performance of the building with regard to ventilation was found to be addressed with added CO₂ control of ventilation incorporated into older HVAC equipment and local controls. Preliminary findings from the IAQ inspections and air-side Testing Adjusting and Balancing (TAB) to date found and documented issues that could be addressed immediately to improve building environmental control, reduce energy usage, and improve building ventilation compliance with the 2010 version of the ASHRAE-62.1, (2010) guidelines. Although there are very similar guidelines and regulations put forward by publications such as the International Mechanical Code that focuses on guidelines and directives to help achieve healthy well-ventilated buildings, the State program requires that ASHRAE-62.1, (2010) ventilation guidelines be used in this study calculations. It should be noted that often suggested changes to HVAC systems to improve ventilation could increase energy costs; in some cases, this increase could be significant. Measures should be considered that offset this additional energy use with control upgrades that adjust ventilation systems based on use and measured values. The remainder of this report will address these concerns directly and provide a path forward for Beecher Public Schools.

EVALUATION

For the purposes of this study, our findings address identified deficiencies or concerns related to overall school building ventilation, inherent capability of systems to achieve needed ventilation and operational performance of the site HVAC systems. Based on our findings, we offer some beneficial insight and recommendations as follows:

ASHRAE-62.1, (2010) Compliance

Our field observations indicate, most if not all of the individual occupied spaces at this school seem to comply with the applicable building codes or guidelines regarding indoor air quality and outdoor ventilation.

The ideal supply of outside air to interior occupied spaces should be based upon the 2018 Connecticut Building Code, which is based on the most currently adopted 2015 International Mechanical Code and coincides with ASHRAE-62.1, (2010) guidelines. These codes and guidelines prescribe the flow rate of outside air that must be supplied mechanically to occupied areas based on occupancy classifications. Depending on the type of use of a space, outdoor air flow rates in cubic feet per minute (CFM) per person are defined when the number of occupants within a space is known. When total occupants per space are unknown, the code defines occupant density for each classification type in number of occupants per space floor area. The final flow rate in CFM for every occupied space can thus be calculated. Please note that, although this is a school, the (CFM) per person requirements for some spaces such as an office may utilize the same occupancy classification ventilation rate of a commercial office space, as the rates are the same regardless on type of building. This applies to nearly every space that is not considered a space for traditional classroom activities including, but not limited to, nurse and healthcare offices, gymnasium, assembly halls, etc.

It shall be noted that this school utilizes automatic space Carbon Dioxide (CO₂) Demand Controlled Ventilation (DCV) as a means to increase or decrease outdoor ventilation air into areas based upon CO₂ levels within the spaces. There is an absolute correlation between CO₂ levels and cubic feet per minute (CFM) of ventilation air per person that could be controlled by the Building Automation System (BAS) to meet ASHRAE 62.1 (2016) indoor ventilation requirements for schools that should be understood. The accepted formula to calculate CFM/Person utilizes: Outdoor CO₂ level in ppm, Measured Indoor CO₂ level in ppm, and CO₂ Generation Rates (CFM) for different metabolic rates by age and activity level i.e., CO₂ generation by an individual for a classroom would be lower than within an art room. Active DCV control is an acceptable alternate method to determine if ventilation requirements are met and could supersede rooms that may fail otherwise using traditional measured data collection procedures prescribed by established ASHRAE guidelines!

As an alternative to providing outside air mechanically to occupied spaces, the code and guidelines also allows for outside air to enter occupied areas naturally through operable windows. If the area of operable windows for an occupied space is at least 4% of the space’s floor area, mechanical ventilation for that space is not required by code. However, although spaces with sufficient operable window area may satisfy code requirements, this is not a realistic way of providing adequate ventilation during periods of cold or hot weather, and this often adversely affects the temperature and humidity levels within the building.

The amount of outside air supplied to occupied spaces is important for occupant comfort and health because contaminants generated by people and materials in the space must be removed or they will build up to undesirable or unhealthy levels. It should be noted that diluting interior air with outside air reduces the concentration of various airborne contaminants, including viral particles that carry the COVID-19 virus and other viral and bacterial contaminants.

Outside Air Flow and Air Change Rate Findings

By individual space area/volume measurements and ventilation air being delivered, it could then be determined if spaces conform to the requirements within codes / guidelines and the results are calculated based on individual space classification and category. Additionally, these readings should be based upon “worst case” scenario, whereby each space is considered fully occupied and the associated air handling units are operating with minimum outside air to satisfy the controlled parameters. The reason for using this method is to ensure that if a building can maintain required outside air flow in this minimum ventilation mode, it will maintain them when more outside air is introduced. It does not necessarily mean that the units will handle thermal or humidity regulation in maximum ventilation modes, which should be considered prior to any system modifications. As a caveat, it is important to understand that forcing the worst case is not necessarily typical building operation but is necessary to discover root issues behind the ventilation control of the building. It is possible that making changes regarding outside airflow may cause other issues to be revealed, which in turn may require additional analysis.

The data collected in this study will provide a quantitative conclusion about how well the building performs regarding ventilation if not using CO2-based demand-controlled ventilation. For the occupied zones within this building, the total minimum required ventilation airflow will be calculated. The planned continuation TAB activity will attempt to determine the total delivered outside air for the best possible case by operating the units in 100% outside air mode to simulate the systems had the ability to function in this mode. Using this method along with room volumes and occupancy will reveal the potential amount of outside air is delivered to the spaces, and if it meets current ventilation codes.

A common calculation used for measuring the amount of air that is exchanged through space every hour is the Air Change Rate (ACH), and for this analysis specifically we are concerned with the Outside Air Change Rate (OACH). At its core, this is a ratio of the volume of air that can theoretically completely fill the volume of each space and how many times it can do that every hour. For example, a 1000 ft² room with 10 ft ceilings will have a volume of 10,000 ft³. If 250 CFM is delivered to this space, that results in 15,000 ft³ of air. Every hour, the space will be flushed with that much air, resulting in an ACH of 1.5. This number on its own will not determine if a space satisfies code requirements and it does not mean that every molecule of the air in that space has been replaced after the hour, but it helps to give an idea into the type of performance that could be expected and there are guidelines for many spaces regarding the OACH. While general spaces like classrooms and offices are among the space categories that do not have outside air ACH requirements, these rates help to give some insight into overall performance. Current recommendations prescribe a total ACH of at least 3 throughout the building, without falling below the minimum outside air CFM.

Outside Air Flow Improvement Recommendations

It is possible that based upon study findings some remedial action will be suggested to improve the HVAC systems' operation and overall environmental control. These measures alone will help to ensure required outside ventilation air will be delivered to spaces that currently have a deficit and could improve overall building ventilation performance as a result. Due to the age of the building and changes over the years in occupancy, systems and codes, considerations for HVAC rebalancing and systems recommissioning to current design requirements will provide added benefits to building performance and operations.

Aside from the above, since the emergence of the COVID-19 virus in December 2019, the specific requirements and precautions taken regarding outside air have become more stringent. For example, ASHRAE has been continuously investigating the transmission of COVID-19 through HVAC systems and has made recommendations on how to adapt existing HVAC systems to minimize transmission of COVID-19. Changes to building systems to address the virus also positively improve the performance of the ventilation systems with handling the filtration of other particulate that directly impacts building air quality. On April 14, 2020, ASHRAE released a document "ASHRAE Position Document on Infectious Aerosols". ASHRAE also gave a presentation on June 16, 2020, regarding Recommendations and Activities for re-opening schools for the fall 2020 academic semester. These recommendations remain relevant as COVID and other contaminants that impact indoor air quality continue to remain a concern. Although this report is primarily concerned with meeting ASHRAE-62.1 (2010) ventilation guidelines, the complementing Technical Committee 9.7 publication provides for an informative prioritizing school checklist addressing advanced indoor air quality in schools that could also be utilized. ASHRAE's recommendations for reducing the transmission of infectious aerosols through HVAC systems as they apply to schools are as follows:

- Increase outdoor ventilation rates (Dilution) for all zones with deficit minimum outside air by adjusting the outside air damper minimum position of the associated air handling equipment. Generally, more is better, but any changes should follow ASHRAE Standard 62.1 as a minimum and should not overpower the capability of the heating or cooling equipment to maintain temperature and humidity requirements in the occupied spaces.
- HVAC unit filter changes should be scheduled with intervals as needed based on manufactures suggested pressure drop across filter media. Filters efficiencies should meet a MERV-11 rating with the exception of 100% outdoor air units or prefilters, where MERV-8 would be acceptable.
- Increase total air change rates to between 3 and 6 ACH where possible while still satisfying minimum OA ventilation.
- Flush or purge the building before and after occupancy for at least two (2) hours, if possible.
- Consider installation of UV-C or bi-polar ionization to systems with return air where installation of these systems does not interfere with the unit construction or operation.
- Supplement poorly or un-ventilated areas with portable HEPA filtration units in classrooms until such time as proper ventilation can be delivered to the space.
- Increase restroom exhaust where possible while maintaining a positive building pressurization to the exterior.
- Perform ductwork inspection and cleaning if needed for existing systems.

General Recommendations to Improve Schools Performance

Full Retro-commissioning of the building mechanical and control systems is strongly recommended at this time. Retro-commissioning offers the opportunity for energy savings and improved efficiency. For optimal benefits, conduct retro-commissioning every 3-5 years for each building. Without Retro-commissioning, it would be difficult to determine the extent of additional services or modifications needed with the existing control system, however our cursory review and evaluation determined the following services should be considered as high priority considerations:

- Generally, increase airflow to each space or decrease if the supplied air is significantly beyond necessary levels. Decreasing air to some locations might seem counterintuitive but if some zones are being supplied with significantly more than 100% of what is required, backing these down will help move air to where it may be deficient. This item should not be addressed without a certified TAB contractor to verify flow adjustments are correct.
- Increase the minimum OA damper position for each unit under control to the heating cooling and dehumidification capacity of each unit. Seasonal limits should be taken into consideration.
- Confirm that trending and alarms have been set up in the BAS for all units and establish alarm points for units operating below required minimum ventilation levels during occupied modes.

Equipment Upgrade Recommendations

Generally, the more outside air that can be supplied to occupied areas, the better. Existing HVAC systems where practical should have outside air flow rates increased above current setpoints if determined required and have the ability. Even units that currently meet code requirements for ventilation flow rates could be increased if there is not a negative energy impact but should not be increased beyond the capacity of the unit to heat or cool the air. Total space air change rates (ACH) should also be increased to the extent possible along with increases in outside air flow to better remove contaminants from the air. If a unit at maximum fan speeds is still incapable of providing at least the minimum ventilation or ACH required, then the system should be evaluated further to determine the best solution such as a total system modification, or the installation of a self-contained HEPA filtration unit in areas where increasing fresh air is limited.

Supplemental air cleaning technology, such as ultraviolet-C (UV-C) light or bi-polar ionization, is available and could be considered if additional disinfection measures are desired. UV-C is short wavelength ultraviolet light that has been found to effectively kill COVID-19 particles. UV-C systems are already used in other HVAC systems where they are installed in air streams to kill bacteria and other harmful living organisms. These systems can be installed relatively easily in already constructed system ductwork or air handlers without major modifications. Bi-polar ionization systems are also installed in ductwork or air handlers and use an electric charge to create a concentration of positively and negatively charged particles in an airstream. These particles cause pathogens to stick to each other and become larger, thus increasing the probability of them being captured by air filters. The charged particles created also leave the ductwork and remain charged when they enter occupied spaces. If the particles encounter pathogens in the occupied space, the charge removes hydrogen from the pathogen so that it is no longer able to sustain itself. For this reason, bi-polar ionization is preferred to UV-C air cleaning because bi-polar ionization could decontaminate pathogens outside of the ductwork whereas UV-C only decontaminates pathogens that enter the ducts.

ASHRAE recommends relative humidity values between 40 and 65% as these values have been shown to hamper the ability of COVID-19 and other pathogens to travel and thrive. Retrofitting these systems into existing units is difficult but if there are complaints about building humidity then it is worth considering,

albeit costly. When cooling systems are in operation, ensure dehumidification is adequate to keep relative humidity below 65%. During heating system operation, relative humidity values are typically less than 40%. Adding humidification to the existing HVAC systems is often exceedingly difficult and costly; additionally, humidification for HVAC systems can be problematic if not well maintained and adds to operating costs. For this reason, the recommendations discussed above should be enacted before humidification is considered.

To best confirm optimum performance once the implementation of the above recommendations is met as well as other improvements, we again recommend performing Recommissioning of this school. This is an extensive procedure that will help with fully documenting the building systems, their capabilities, and optimizes the control system to maintain the best performance while conserving the most energy. In general, Recommissioning should be performed approximately once every five years to keep the buildings operating smoothly.

For the Beecher Road Elementary School HVAC units with recirculation air, it could be suggested that the following recommendations would be beneficial with improving indoor air quality throughout the school if implemented:

- For units that may have, or planned to have dual series filter racks where the first has room for 2” filters and the second has room for 4” or greater filters, the 2” filters should be MERV 8 for pre-filtering, but the larger filters should remain MERV 11+.
- Utilizing a low differential pressure gauge or transmitter through the BAS would be suggested to determine filter loading and optimum replacement intervals.
- Consider adding Bi-polar ionization or another means of air disinfection wherever possible.
- Consider in-room HEPA filtration units to improve and control air quality in underperforming rooms.
- Consider investigating the potential of increasing the ventilation air flow rate wherever possible without impacting energy usage greatly.
- The following bullet items may be performed in-house or through outside service providers that could improve indoor air quality and energy consumption. Some typical issues include, but are not limited to:
 - Cleaning all unit coils on a yearly basis: Cleaning the coils will improve airflow patterns through the coil, increasing coil effectiveness and preventing deterioration due to rust or corrosion.
 - Damper cleaning, lubrication, and adjusting: All unit dampers should be cleaned and lubricated and tested throughout their movement range from the localized controller. As dampers age, lubrication and dirt builds up on linkages, blades and pivot points causing the actuator to need to push harder to move the damper into the required position. Too much build-up can result in control actuators failures or broken damper hardware, which would need to be replaced. Missing or worn blade-to blade or damper end seals could impact ventilation control and energy use, and therefore inspection of such should be provided on a regular basis.
 - General Unit Cleanliness: All unit’s internals, ductwork, and grills should be cleaned to remove any dirt or debris that has accumulated. Systems that are not maintained and cleaned frequently can become a breeding ground for bacteria and molds should those materials absorb moisture.

- **Fan Belt Tension:** All fan pulleys and belts should be reviewed for fit. Some motors might need to be repositioned in the unit to fix the tension or adjust for alignment. Consider installing belt tensioners where possible, to extend intervals between belt changes without compromising unit efficiency as the belt wears out.

General Air Handling Unit Upgrade or Replacement Recommendations

In review of the aged constant volume Air Handling units serving Music area and Common occupied areas, we have identified that for their age they appear to have been maintained very well but need replacement to help ensure reliable and efficient operation for years to come.

Field Study Findings & General Comments

General Comments:

- All dampers and linkages should be cleaned and lubricated to allow free movement and reduce potential damage to actuators or linkages. Replace damper and damper seals where necessary.
- Check heating and cooling coils for cleanliness and integrity. Clean coils as required to increase heat transfer performance.
- Calibrate as required all CO2 sensors used for space demand control ventilation and ensure controller operates to maintain a maximum CO2 ppm reading of no more than 1,000 ppm yearly.

Detailed in the attached appendix are our high-level observations of identified equipment unit information and overall operational notations.

CONCLUSIONS

The Woodbridge Public Schools clearly has taken measures in the past to address identified deficiencies with aging equipment including proper maintenance and filtration upgrades for indoor air quality (IAQ) improvements.

The School had also previously installed CO2 Sensors in the classrooms which are helpful to control the volume of outside ventilation air, which in turn helps reduce the humidity levels in the spaces (DCV increases or decreases outdoor ventilation air into areas based upon CO2 levels within the spaces).

As stated above, this evaluation found that the Beecher Road Elementary School seems to be meeting the current minimum ventilation requirements per ASHRAE-62.1, (2010) guidelines with CO2-based Demand Control Ventilation strategies.

Given the results of this survey, we highly recommend further evaluation to be performed with whole-building Recommissioning, which would entail further testing and verification to confirm proper equipment and BAS operation.

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Appendix 1

Ventilation Data Calculations



Project Name:	Beecher Road School RCx & TAB Study
Project Number:	2022231.00
Scope	Ventilation Calculation by Building
Date	March 28, 2024



Zone Identification												ASHRAE-62.1, (2010) Ventilation Calculations							
Floor	Room#	Room Name	Occupancy Classification	Category	Total Airflow	Unit Actual OA %	BAS OA Damper Cond	Served By	Zone Area, Az, per space	Ceiling Height	Volume, per space	Zone Population, Pz, per space	People OA Rate in Breathing Zone, Rp	Area OA Rate in Breathing Zone, Ra	Default Occupant Density	Min. Required Ventilation Airflow	ACTUAL MEASURED VENTILATION AIR FLOW	Meets Ashrae 62.1	DCV?
					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)		YES
1	A1	Classroom	Education	Classroom (ages 9+)	N/A		30%	UV	822	10	8220	20	10.0	0.12	35	299	242	Meets	YES
1	A2	Classroom	Education	Classroom (ages 9+)	N/A		30%	UV	825	10	8250	20	10.0	0.12	35	299	208	Meets	YES
1	A3	Classroom	Education	Classroom (ages 9+)	N/A		30%	UV	826	10	8260	20	10.0	0.12	35	299	198	Meets	YES
1	A4	Classroom	Education	Classroom (ages 9+)	N/A		30%	UV	820	10	8200	20	10.0	0.12	35	298	256	Meets	YES
1	A5	Classroom	Education	Classroom (ages 9+)	N/A		30%	UV	829	10	8290	20	10.0	0.12	35	299	189	Meets	YES
1	A6	Classroom	Education	Classroom (ages 9+)	N/A		30%	UV	818	10	8180	20	10.0	0.12	35	298	218	Meets	YES
1	A7	Art	Education	Art Classroom	N/A		30%	UV	1137	10	11370	20	10.0	0.18	20	405	144	Meets	YES
1	A8	Classroom	Public Spaces	Classroom (ages 9+)	N/A		30%	UV	1188	10	11880	20	10.0	0.12	35	343	170	Meets	YES
1	A9	Speech	Offices	Office spaces	N/A		30%	UV	334	10	3340	10	5.0	0.06	5	70	191	Meets	YES
1	---	CONFERENCE	Offices	Conference rooms	N/A		10%	E(VAV) RTU-2	248	9	2232	10	5.0	0.06	50	65	54	Meets	YES
1	---	WAIT/MAIN OFFICE	Education	Classroom (ages 5-8)	N/A		10%	E(VAV) RTU-2	723	9.5	6869	6	10.0	0.12	25	147	226	Meets	YES
1	---	VICE PRINCIPLE	Offices	Office spaces	N/A		10%	E(VAV) RTU-2	153	9.5	1454	2	5.0	0.06	5	19	44	Meets	YES
1	---	PRINCIPLE	Offices	Office spaces	N/A		10%	E(VAV) RTU-2	150	9.5	1425	2	5.0	0.06	5	19	34	Meets	YES
1	---	KITCHEN	Food and beverage service	Kitchens (cooking)	N/A		10%	E(VAV) RTU-2	91	9.5	865	6	0.0	0.00	0	0	20	N/A	YES
1	B13	STOR. SALLY PORT	Education	Multiuse assembly	N/A		10%	E(VAV) RTU-2	200	9.5	1900	6	7.5	0.06	100	57	72	Meets	YES
1	B14	STAFF ROOM	Education	Multiuse assembly	N/A		10%	FCU	780	9	7020	14	7.5	0.06	100	152	166	Meets	YES
1	B12	STORAGE	Storage	Warehouses	N/A		---	EF	288	8.9	2563	0	0.0	0.06	0	17	---	N/A	---
1	B11	NURSE	Education	Multiuse assembly	N/A		30%	FCU	590	8.9	5251	6	7.5	0.06	100	80	59	Meets	YES
1	B10	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	FCU (x2)	823	8.9	7325	20	10.0	0.12	35	299	316	Meets	YES
1	B1	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	UV	827	10	8270	20	10.0	0.12	35	299	227	Meets	YES
1	B2	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	UV	819	10	8190	20	10.0	0.12	35	298	253	Meets	YES
1	B3	CLASSROOM	Education	Classroom (ages 5-8)	N/A		30%	UV	823	10	8230	20	10.0	0.12	25	299	230	Meets	YES
1	B4	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	UV	822	10	8220	20	10.0	0.12	35	299	166	Meets	YES
1	B5	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	UV	820	10	8200	20	10.0	0.12	35	298	176	Meets	YES
1	B6	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	UV	824	10	8240	20	10.0	0.12	35	299	259	Meets	YES
1	B9	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	UV	331	10	3310	20	10.0	0.12	35	240	355	Meets	YES
1	B7	CLASSROOM	Education	Classroom (ages 5-8)	N/A		30%	UV	1194	10	11940	20	10.0	0.12	25	343	282	Meets	YES
1	B8	CLASSROOM	Education	Classroom (ages 5-8)	N/A		30%	UV	1190	10	11900	20	10.0	0.12	25	343	234	Meets	YES
1	NORTH	GYMNASIUM	Education	Multiuse assembly	N/A		30%	AHU-2, AHU-3	2910	17	49470	50	7.5	0.06	100	550	1650	Meets	YES
1	FITNESS	COMMONS	Education	Multiuse assembly	N/A		30%	AHU-2, AHU-3	2648	10.2	27010	40	7.5	0.06	100	459	1719	Meets	YES

Project Name:	Beecher Road School RCx & TAB Study
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Zone Identification												ASHRAE-62.1, (2010) Ventilation Calculations								
Floor	Room#	Room Name	Occupancy Classification	Category	Total Airflow	Unit Actual OA %	BAS OA Damper Cond	Served By	Zone Area, Az, per space	Ceiling Height	Volume, per space	Zone Population, Pz, per space	People OA Rate in Breathing Zone, Rp	Area OA Rate in Breathing Zone, Ra	Default Occupant Density	Min. Required Ventilation Airflow	ACTUAL MEASURED VENTILATION AIR FLOW	Meets Ashrae 62.1	DCV?	
					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)		YES	
1	K9	CLASSROOM	Education	Classroom (ages 5-8)	N/A		30%	FCU	840	9	7560	20	10.0	0.12	25	301	190	Meets	YES	
1	K7	CLASSROOM	Education	Classroom (ages 5-8)	N/A		30%	FCU	511	9	4599	8	10.0	0.12	25	141	102	Meets	YES	
1	KP	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	FCU	997	9.4	9372	20	10.0	0.12	35	320	190	Meets	YES	
1	K1	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	FCU	1008	9.6	9677	20	10.0	0.12	35	321	314	Meets	YES	
1	K2	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	FCU	1037	9.5	9852	20	10.0	0.12	35	324	184	Meets	YES	
1	K8	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	FCU	776	9.5	7372	20	10.0	0.12	35	293	146	Meets	YES	
1	K3	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	FCU	1005	9.6	9648	20	10.0	0.12	35	321	214	Meets	YES	
1	ADD	Gym Teacher office	Offices	Office spaces	N/A		30%	FCU	72	8	576	1	5.0	0.06	5	9	10	Meets	NO	
1	K4	CLASSROOM	Education	Classroom (ages 5-8)	N/A		30%	FCU	1000	9.5	9500	20	10.0	0.12	25	320	187	Meets	YES	
1	K6	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	FCU	1041	9.7	10098	20	10.0	0.12	35	325	159	Meets	YES	
1	K5	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	FCU	1036	9.6	9946	20	10.0	0.12	35	324	114	Meets	YES	
1	---	Kitchen	Food and beverage service	Kitchens (cooking)	N/A		25%	RTU-3	1444	8.9	12852	6	0.0	0.00	0	0	309	N/A	YES	
1	---	Cafeteria	Food and beverage service	Dining Rooms	N/A		25%	RTU-3	3777	10.5	39659	125	7.5	0.18	70	1617	2608	Meets	YES	
1	---	Library	Education	Multiuse assembly	N/A		10%	RTU-4	5500	10.9	59950	80	7.5	0.06	100	930	482	Meets	YES	
1	---	Tech Center	Education	Classroom (ages 9+)	N/A		25%	VAV 5-2,3, RTU-5	1299	7.7	10002	40	10.0	0.12	35	556	713	Meets	YES	
1	---	Media Center Storage	Storage	Warehouses	N/A		10%	RTU-4	646	10.9	7041	0	0.0	0.06	0	39	94	Meets	YES	
1	---	Break Rm. Office	Offices	Office spaces	N/A		25%	VAV-1, RTU-5	287	8	2296	5	5.0	0.06	5	42	10	Meets	YES	
1	---	Green Screen	Education	Multiuse assembly	N/A		25%	VAV-1, RTU-5	197	7.6	1497	2	7.5	0.06	100	27	81	Meets	YES	
1	---	Tech Office	Offices	Office spaces	N/A		25%	VAV-1, RTU-5	156	8	1248	1	5.0	0.06	5	14	21	Meets	YES	
1	---	Reading Room	Education	Classroom (ages 9+)	N/A		10%	RTU-4	161	7.9	1272	2	10.0	0.12	35	39	9	Meets	YES	
1	C6	Hutchinson	Education	Classroom (ages 9+)	N/A		N/A / 30%	UV	828	10	8280	20	10.0	0.12	35	299	227	Meets	YES	
1	C5	Meacham	Education	Classroom (ages 9+)	N/A		30%	UV	808	10	8080	20	10.0	0.12	35	297	269	Meets	YES	
1	C4	CLASSROOM	Education	Classroom (ages 9+)	N/A		30%	UV	817	10	8170	20	10.0	0.12	35	298	243	Meets	YES	
1	C3	Classroom	Education	Classroom (ages 9+)	N/A		30%	UV	823	10	8230	20	10.0	0.12	35	299	269	Meets	YES	
1	C2	Triplet	Education	Classroom (ages 9+)	N/A		30%	UV	827	10	8270	20	10.0	0.12	35	299	227	Meets	YES	
1	C1	Ngov	Education	Classroom (ages 9+)	N/A		30%	UV	814	10	8140	20	10.0	0.12	35	298	278	Meets	YES	
1	D5/D6	Office	Offices	Office spaces	N/A		30%	FCU	129	8	1032	1	5.0	0.06	5	13	15	Meets	NO	
1	D5	Nurse	Education	Multiuse assembly	N/A		30%	FCU	1009	9	9081	6	7.5	0.06	100	106	166	Meets	YES	
1	D6	Nolan	Education	Classroom (ages 9+)	N/A		30%	FCU	10098	9	90882	21	10.0	0.12	35	1422	317	Meets	YES	
1	D4	Marcellino	Education	Classroom (ages 9+)	N/A		30%	FCU	855	10	8550	21	10.0	0.12	35	313	54	Meets	YES	

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Zone Identification												ASHRAE-62.1, (2010) Ventilation Calculations							
Floor	Room#	Room Name	Occupancy Classification	Category	Total Airflow	Unit Actual OA %	BAS OA Damper Cond	Served By	Zone Area, Az, per space	Ceiling Height	Volume, per space	Zone Population, Pz, per space	People OA Rate in Breathing Zone, Rp	Area OA Rate in Breathing Zone, Ra	Default Occupant Density	Min. Required Ventilation Airflow	ACTUAL MEASURED VENTILATION AIR FLOW	Meets Ashrae 62.1	DCV?
					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)		YES
1	D3	Shepard	Education	Classroom (ages 9+)	N/A		30%	FCU	1349	10	13490	22	10.0	0.12	35	382	352	Meets	YES
1	D2	Mumford	Education	Classroom (ages 5-8)	N/A		30%	FCU	919	10	9190	22	10.0	0.12	25	330	65	Meets	YES
1	D1	Lavigne	Education	Classroom (ages 9+)	N/A		30%	FCU	1270	10	12700	21	10.0	0.12	35	362	185	Meets	YES
1	D7	Reading	Education	Classroom (ages 9+)	N/A		30%	FCU	433	9	3897	5	10.0	0.12	35	102	90	Meets	YES
1	D7-1	W/in Reading	Education	Classroom (ages 9+)	N/A		30%	FCU	116	8	928	1	10.0	0.12	35	24	29	Meets	NO
1	D7-2	W/in Reading	Education	Classroom (ages 9+)	N/A		30%	FCU	132	8	1056	1	10.0	0.12	35	26	34	Meets	NO
1	D7-3	W/in Reading	Education	Classroom (ages 9+)	N/A		30%	FCU	110	8	880	1	10.0	0.12	35	23	22	Meets	NO
1	S1	Rogers	Education	Classroom (ages 5-8)	N/A		30%	FCU	1021	9	9189	20	10.0	0.12	25	323	172	Meets	YES
1	S2	Glennon	Education	Classroom (ages 9+)	N/A		30%	FCU	1256	9	11304	20	10.0	0.12	35	351	290	Meets	YES
1	S16	Resources	Education	Classroom (ages 5-8)	N/A		30%	FCU	382	9	3438	6	10.0	0.12	25	106	131	Meets	YES
1	S3	Irfran	Education	Classroom (ages 5-8)	N/A		30%	FCU	1256	9	11304	21	10.0	0.12	25	361	178	Meets	YES
1	S4	Chase	Education	Classroom (ages 5-8)	N/A		30%	FCU	1021	9	9189	21	10.0	0.12	25	333	172	Meets	YES
1	S17	Greene	Education	Classroom (ages 9+)	N/A		30%	FCU	561	9.6	5386	4	10.0	0.12	35	107	346	Meets	YES
1	S5	Horvath	Education	Classroom (ages 9+)	N/A		30%	FCU	1024	9	9216	20	10.0	0.12	35	323	181	Meets	YES
1	S6	Campbell	Education	Classroom (ages 9+)	N/A		30%	FCU	1256	9	11304	20	10.0	0.12	35	351	185	Meets	YES
1	S7	Guerra	Education	Classroom (ages 9+)	N/A		30%	FCU	1256	8.9	11178	20	10.0	0.12	35	351	196	Meets	YES
1	S8	Conroy	Education	Classroom (ages 9+)	N/A		30%	FCU	1024	8.9	9114	20	10.0	0.12	35	323	199	Meets	YES
1	S9	Mulligan	Education	Classroom (ages 5-8)	N/A		30%	FCU	1021	8.9	9087	20	10.0	0.12	25	323	301	Meets	YES
1	S10	McHugh	Education	Classroom (ages 5-8)	N/A		30%	FCU	1256	8.9	11178	20	10.0	0.12	25	351	210	Meets	YES
1	S13	Resources	Education	Classroom (ages 5-8)	N/A		30%	FCU	380	8.9	3382	20	10.0	0.12	25	246	120	Meets	YES
1	S11	Rourke	Education	Classroom (ages 9+)	N/A		30%	FCU	1256	8.9	11178	20	10.0	0.12	35	351	168	Meets	YES
1	S12	Antonelles	Education	Classroom (ages 9+)	N/A		30%	FCU	1021	8.9	9087	20	10.0	0.12	35	323	203	Meets	YES
1	---	FAC Director Vito	Education	Classroom (ages 9+)	N/A		25%	AHU-6	144	7.2	1037	1	10.0	0.12	35	27	18	Not Meets	NO
1	S19	Computer	Education	Computer lab	N/A		30%	FCU	830	9	7470	4	10.0	0.12	25	140	91	Meets	YES
1	S15	Taylor	Education	Classroom (ages 9+)	N/A		25%	AHU-6	178	9	1602	4	10.0	0.12	35	61	16	Not Meets	NO
1	S18	Criscuola	Education	Classroom (ages 9+)	N/A		25%	AHU-6	458	7.8	3572	10	10.0	0.12	35	155	28	Not Meets	NO
1	S14	Krawel	Education	Classroom (ages 9+)	N/A		30%	FCU	830	9	7470	10	10.0	0.12	35	200	146	Meets	YES
1	S22	Simoniello	Education	Classroom (ages 9+)	N/A		30%	FCU	830	9	7470	10	10.0	0.12	35	200	110	Meets	YES
1	S21	Teach lounge	Education	Multiuse assembly	N/A		25%	AHU-6	521	9	4689	6	7.5	0.06	100	76	32	Not Meets	NO
1	S20	Mallor	Education	Classroom (ages 9+)	N/A		25%	AHU-6	178	9	1602	2	10.0	0.12	35	41	14	Not Meets	NO

Project Name:	Beecher Road School RCx & TAB Study
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Zone Identification												AHSRAE-62.1, (2010) Ventilation Calculations							
Floor	Room#	Room Name	Occupancy Classification	Category	Total Airflow	Unit Actual OA %	BAS OA Damper Cond	Served By	Zone Area, Az, per space	Ceiling Height	Volume, per space	Zone Population, Pz, per space	People OA Rate in Breathing Zone, Rp	Area OA Rate in Breathing Zone, Ra	Default Occupant Density	Min. Required Ventilation Airflow	ACTUAL MEASURED VENTILATION AIR FLOW	Meets Ashraae 62.1	DCV?
					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)		YES
1	---	ROTUNDA	Education	Classroom (ages 9+)	N/A		25%	AHU-6	1665	22	36630	30	10.0	0.12	35	500	170	Meets	YES
1	ADD	Music Office	Education	Music/theater/dance	N/A		25%	AHU-6	65	8	520	2	10.0	0.06	35	24	18	Not Meets	NO
1	E1	Acheson (Art)	Education	Art Classroom	N/A		30%	FCU	1128	9	10152	22	10.0	0.18	20	423	44	Meets	YES
1	E2	Trofimclik (Science)	Education	Science Laboratories	N/A		30%	FCU	905	8.6	7783	21	10.0	0.18	25	373	205	Meets	YES
1	E3	Saunders	Education	Classroom (ages 9+)	N/A		30%	FCU	922	9	8298	25	10.0	0.12	35	361	352	Meets	YES
1	E4	Summer Camp Office	Offices	Office spaces	N/A		30%	FCU	529	9	4761	2	5.0	0.06	5	42	118	Meets	YES
1	E5	Recreation Office	Education	Classroom (ages 5-8)	N/A		30%	FCU	113	8	904	1	10.0	0.12	25	24	112	Meets	No
1	E6	Special Ed	Education	Classroom (ages 5-8)	N/A		30%	FCU	795	8	6360	2	10.0	0.12	25	115	307	Meets	YES
1	NEW Office	Special Ed Office	Offices	Office spaces	N/A		30%	FCU	105	8	840	2	5.0	0.06	5	16	114	Meets	YES
1	E7	MUSIC	Education	Music/theater/dance	N/A		20%	AHU-1	1698	9.1	15452	20	10.0	0.06	35	302	551	Meets	YES
1	AUD	ASSEMBLY ROOM	Education	Multiuse assembly	N/A		20%	AHU-4	3160	12.1	38236	120	7.5	0.06	100	1090	921	Meets	YES
1	---	SUPERINDENDANT	Offices	Office spaces	N/A		30%	UV	375	8.5	3188	7	5.0	0.06	5	58	101	Meets	NO
1	RECEPT.	RECEPTION	Offices	Office spaces	N/A		30%	UV	386	8.5	3277	2	5.0	0.06	5	33	36	Meets	NO
1	KITCHEN	KITCHEN	Food and beverage service	Kitchens (cooking)	N/A		30%	UV	100	8.5	850	2	0.0	0.00	0	0	64	N/A	NO
1	CONF	CONFERENCE	Offices	Conference rooms	N/A		5%	RTU-1	192	8	1536	6	5.0	0.06	50	42	---	Meets	YES
1	B. MANAGER	B. MANAGER	Education	Classroom (ages 5-8)	N/A		N/A / 5%	RTU-1	123	8.5	1046	3	10.0	0.12	25	45	---	N/A	NO
1	POOL	POOL	Sports and amusement	Swimming pools (pool and deck area)	N/A			DH-1	4328	26	112528	125	0.0	0.48	0	2077	365	Not Meets	NO
1	OFFICE	Jimencz (Payroll)	Offices	Office spaces	N/A		5%	RTU-1	355	8	2840	3	5.0	0.06	5	36	---	Meets	YES
1	Office	Office	Offices	Office spaces	N/A		30%	UV	46	8	368	1	5.0	0.06	5	8	42	Meets	NO
1	Boy	(1ST.) BOYS LOCKER	Education	Locker/dressing room	N/A		20%	AHU-5	931	7.8	7262	40	0.0	0.00	0	0	68	Meets	YES
1	Girl	(LL) GIRLS LOCKER	Education	Locker/dressing room	N/A		20%	AHU-5	1144	7.7	8809	40	0.0	0.00	0	0	46	Meets	YES
1	OFFICE	OFFICE- Off Gym	Offices	Office spaces	N/A		20%	AHU-5	212	7.9	1675	2	5.0	0.06	5	23	26	Meets	YES
1	SOUTH	GYMNASIUM	Sports and amusement	Gym, stadium, arena (play area)	N/A		20%	AHU-5	4982	22.5	112095	100	0.0	0.30	0	1495	196	Meets	YES
1	Office	Pool Life Guard	Offices	Office spaces	N/A		20%	AHU-5	165	7	1155	2	5.0	0.06	5	20	0	Meets	YES

Appendix 2

TAB Airflow Survey Data





WING'S TESTING & BALANCING CO., INC.

Woodbridge Public Schools

Beecher Road School

Ventilation Verification

* * * *

VanZelm Engineers
Attn: Bill Donald
10 Talcott Notch Road
Farmington, CT. 06032

August 16, 2023

94 North Branford Road • Suite One • Branford, CT 06405
(203) 481-4988 • wings@wingstesting.com



WING'S TESTING & BALANCING CO., INC.

August 16, 2023

VanZelm Engineers
Attn: Bill Donald
10 Talcott Notch Road
Farmington, CT. 06032

Re: Woodbridge Public Schools - Beecher Road School Ventilation Survey

Dear Bill,

The Ventilation Verification survey of the above referenced location has been completed. Readings at all spaces were documented on the tables provided. Fresh air at each unit was also tested and documented on our data sheets.

CO₂ sensors were checked for calibration and operation. We have included a CO₂ testing table which shows the location of all sensors, actual readings, BMS readings, and verification that the CO₂ sensor operates as designed, and opens on a call for increased ventilation. All CO₂ sensors are functioning properly except for RTU-1, which needs replacing.

We noted that all AHU and RTU OA dampers are functioning and responding to commands. Please be advised that the outside air intakes are plugged on RTU-2 and RTU-4, and that the OA grilles on AHU-2, AHU-3, and RTU-5 are dirty and should be cleaned to ensure proper fresh air delivery.

The following pages are your record of the tested conditions. If you have any questions, or if we can be of further service please do not hesitate to call.

Very truly yours,

Wing's Testing & Balancing Co., Inc.

ICB Certified Contractor for:

TABB—Commissioning—Fire/Life Safety L1&L2—Sound & Vibration

Barry Stratos
Certified TABB Technician
CT SM-2 License 6386
MA SM-2 13595



94 North Branford Road • Suite One • Branford, CT 06405
(203) 481-4988 • wings@wingstesting.com

VELOCITY PRESSURE READINGS								
PROJECT: Woodbridge Public Schools - Beecher Road School						DATE: 8/10/23		
AREA SERVED: Building - 1st Floor						TECH: BS, MS		
TRAVERSE LOCATIONS	DUCT SIZE "	AREA SQ.FT.	DESIGN		CENT. STAT. PRESS."	TEST		NOTES
			FPM	CFM		FPM	CFM	
AHU-2								
Return	48" x 12"	4		3600	w/Velgrid	1486	5944	(1)
OA	40" x 19"	5.28		1700	w/Velgrid	0	0	
AHU-3								
Return	48" x 12"	4		3600	w/Velgrid	1073	4292	(1)
OA	40" x 19"	5.28		1700	w/Velgrid	0	0	
RTU-1								
OA	20" x 14"	1.94		200	w/Velgrid	50	97	
RTU-2								
OA	31" x 12"	2.58		600	w/Velgrid	0	0	(2)
RTU-3								
OA	44" x 44"	13.44		6320	w/Velgrid	217	2917	
RTU-4								
OA	45" x 36"	11.25		2100	w/Velgrid	52	585	(2)
RTU-5								
OA	30" x 24"	5.		700	w/Velgrid	165	825	(1)
ERV-1								
Supply	56" x 26"	10.1		2800	w/Velgrid	124	1252	
Exhaust	35" x 24"	5.83		2225	w/Velgrid	325	1895	
ERV-2								
Supply	72" x 38"	19.		6275	w/Velgrid	292	5548	
Exhaust	34" x 34"	8.03		4900	w/Velgrid	1038	8335	
ERV-3								
Supply	56" x 26"	10.1		2900	w/Velgrid	214	2161	
Exhaust	35" x 24"	5.83		2100	w/Velgrid	521	3037	
ERV-4								
Supply	56" x 36"	14.		4500	w/Velgrid	198	2772	
Exhaust	35" x 24"	5.83		4500	w/Velgrid	713	4157	
REMARKS								
(1) Dirty Grille. (2) Intake Plugged.								
N/A Not Available N/D No Design D/D Direct Drive N/R No Requirement								



WING'S TESTING & BALANCING CO., INC.

Woodbridge Public Schools

Beecher Road School

Retesting

* * * *

VanZelm Engineers
Attn: Bill Donald
10 Talcott Notch Road
Farmington, CT 06032

February 20, 2024

94 North Branford Road • Suite One • Branford, CT 06405
(203) 481-4988 • Fax (203) 488-5634 • wings@wingstesting.com



WING'S TESTING & BALANCING CO., INC.

February 20, 2024

VanZelm Engineers
Attn: Bill Donald
10 Talcott Notch Road
Farmington, CT 06032

Re: Woodbridge Public Schools – Beecher Road School Retesting

Dear Bill,

We have completed our retesting of Beecher Road School. Included in this update are the outside air readings for UV's A-4, A-6, and A-7. Also included are the grille reading and outside air readings for the two gym units AHU-2 and AHU-3. It was noticed upon testing that AHU-3 goes to 78 Hz on a 100% command from the computer, whereas AHU-2 goes to 68 Hz on a 100% command from the computer. These setpoints are programmed into the VFDs and were left as-is.

Very truly yours,

Wing's Testing & Balancing Co., Inc.

ICB Certified Contractor for:

TABB—Commissioning—Indoor Air Quality
Fire & Smoke Damper—Smoke Control Systems
Sound & Vibration

Barry Stratos
CT SM-2 License 6386
MA Sheetmetal Journeyperson License #13595
TABB Technician-BB996928T
Indoor Air Quality Technician- IAQ996928T
Indoor Air Quality Supervisor- IAQ996928S



94 North Branford Road • Suite One • Branford, CT 06405
(203) 481-4988 • Fax (203) 488-5634 • wings@wingstesting.com

AIR DEVICE REPORT										
PROJECT: Woodbridge Public Schools - Beecher Road School								DATE: 2/20/2024		
SYSTEM / AREA: Beecher Road School								TECH: BS		
LOCATION	NO.	SIZE	A K	DESIGN		TEST		FINAL		NOTES
				FPM	CFM	FPM	CFM	FPM	CFM	
AHU-2 (@ 68 Hz)										
North Gym	1	27" x 11.5"	1.55	---	N/D	498	772			
North Gym	2	27" x 11.5"	1.55	---	N/D	982	1522			
Commons	3	30" x 20"	4.17	---	N/D	547	<u>2281</u>			
							4575			
AHU-3 (@ 78 Hz)										
North Gym	1	27" x 11.5"	1.55	---	N/D	1414	2192			
North Gym	2	27" x 11.5"	1.55	---	N/D	372	577			
Commons	3	30" x 20"	4.17	---	N/D	715	<u>2982</u>			
							5751			
REMARKS										

N/A Not Available | N/D No Design | D/D Direct Drive | N/R No Requirement

Project Name:	Woodbridge Public Schools R Beecher Road School
Project Number:	2022231.00
Scope	TAB Data
Date	August 2, 2023

Zone Identification							
Floor	Room#	Room Name	Design Min/Max CFM	Measured Min OA Flow (cfm)	BAS Min OA Flow (cfm) / Pos. (%)	Associated VAV & RTU/AHU Unit	Notes
1	A1	Classroom	936	242	N/A / 30%	UV	
1	A2	Classroom	890	208	N/A / 30%	UV	
1	A3	Classroom	783	198	N/A / 30%	UV	
1	A4	Classroom	673	0	N/A / 30%	UV	
1	A5	Classroom	687	189	N/A / 30%	UV	
1	A6	Classroom	886	0	N/A / 30%	UV	
1	A7	Art	550	0	N/A / 30%	UV	
1	A8	Classroom	494	170	N/A / 30%	UV	
1	A9	Speech	635	191	N/A / 30%	UV	
1		CONFERENCE	132	54	N/A / 10%	E(VAV) RTU-2	Retested 02/20/24
1		WAIT/MAIN OFFICE	555	226	N/A / 10%	E(VAV) RTU-2	Retested 02/20/24
1		VICE PRINCIPLE	108	44	N/A / 10%	E(VAV) RTU-2	Retested 02/20/24
1		PRINCIPLE	83	34	N/A / 10%	E(VAV) RTU-2	Retested 02/20/24
1		KITCHEN	48	20	N/A / 10%	E(VAV) RTU-2	Retested 02/20/24
1	B13	STOR. SALLY PORT	176	72	N/A / 10%	E(VAV) RTU-2	Retested 02/20/24
1	B14	STAFF ROOM	479	166	0 / 30%	FCU	
1	B12	STORAGE	-395	---	---	EF	Space has Exhaust Only
1	B11	NURSE	474	59	N/A / 30%	FCU	
1	B10	CLASSROOM	1604	316	N/A / 30%	FCU (x2)	
1	B1	CLASSROOM	659	227	N/A / 30%	UV	
1	B2	CLASSROOM	788	253	N/A / 30%	UV	
1	B3	CLASSROOM	681	230	N/A / 30%	UV	
1	B4	CLASSROOM	796	166	N/A / 30%	UV	
1	B5	CLASSROOM	909	176	N/A / 30%	UV	

Project Name:	Woodbridge Public Schools R Beecher Road School
Project Number:	2022231.00
Scope	TAB Data
Date	August 2, 2023

Zone Identification							
Floor	Room#	Room Name	Design Min/Max CFM	Measured Min OA Flow (cfm)	BAS Min OA Flow (cfm) / Pos. (%)	Associated VAV & RTU/AHU Unit	Notes
1	B6	CLASSROOM	921	259	N/A / 30%	UV	
1	B9	CLASSROOM	702	355	N/A / 30%	UV	
1	B7	CLASSROOM	869	282	N/A / 30%	UV	
1	B8	CLASSROOM	798	234	N/A / 30%	UV	
1	NORTH	GYMNASIUM	6808	0	N/A / 20%	AHU-2, AHU-3	
1	FITNESS	COMMONS	3428	0	N/A / 20%	AHU-2, AHU-3	
1	K9	CLASSROOM	712	190	N/A / 30%	FCU	
1	K7	CLASSROOM	390	102	N/A / 30%	FCU	
1	KP	CLASSROOM	755	190	N/A / 30%	FCU	
1	K1	CLASSROOM	749	314	N/A / 30%	FCU	OA 100% Open
1	K2	CLASSROOM	380	184	N/A / 30%	FCU	
1	K8	CLASSROOM	701	146	N/A / 30%	FCU	
1	K3	CLASSROOM	890	214	N/A / 30%	FCU	
1	ADD	Gym Teacher office	30	8	N/A / 30%	FCU	
1	K4	CLASSROOM	714	187	N/A / 30%	FCU	
1	K6	CLASSROOM	754	159	N/A / 30%	FCU	
1	K5	CLASSROOM	700	114	N/A / 30%	FCU	
1		Kitchen	1015	309	N/A / 25%	RTU-3	
1		Cafeteria	8580	2608	N/A / 25%	RTU-3	
1		Library	4750	482	N/A / 10%	RTU-4	
1		Tech Center	1731	713	N/A / 25%	VAV 5-2,3, RTU-5	VAVs Constant Volume
1		Media Center Storage	930	94	N/A / 10%	RTU-4	
1		Break Rm. Office	24	10	N/A / 25%	VAV-1, RTU-5	
1		Green Screen	197	81	N/A / 25%	VAV-1, RTU-5	

Project Name:	Woodbridge Public Schools R Beecher Road School
Project Number:	2022231.00
Scope	TAB Data
Date	August 2, 2023

Zone Identification							
Floor	Room#	Room Name	Design Min/Max CFM	Measured Min OA Flow (cfm)	BAS Min OA Flow (cfm) / Pos. (%)	Associated VAV & RTU/AHU Unit	Notes
1		Tech Office	51	21	N/A / 25%	VAV-1, RTU-5	
1		Reading Room	90	9	N/A / 10%	RTU-4	
1	C6	Hutchinson	831	227	N/A / 30%	UV	
1	C5	Meacham	854	269	N/A / 30%	UV	
1	C4	CLASSROOM	618	243	N/A / 30%	UV	
1	C3	Classroom	746	269	N/A / 30%	UV	
1	C2	Triplett	880	227	N/A / 30%	UV	
1	C1	Ngov	762	278	N/A / 30%	UV	
1	D5/D6	Office	37	15	N/A / 30%	FCU	
1	D5	Nurse	493	166	N/A / 30%	FCU	
1	D6	Nolan	800	317	N/A / 30%	FCU	
1	D4	Marcellino	430	54	N/A / 30%	FCU	
1	D3	Shepard	779	352	N/A / 30%	FCU	
1	D2	Mumford	510	65	N/A / 30%	FCU	
1	D1	Lavigne	596	185	N/A / 30%	FCU	
1	D7	Reading	159	90	N/A / 30%	FCU	
1	D7-1	W/in Reading	52	29	N/A / 30%	FCU	
1	D7-2	W/in Reading	60	34	N/A / 30%	FCU	
1	D7-3	W/in Reading	38	22	N/A / 30%	FCU	
1	S1	Rogers	614	172	N/A / 30%	FCU	
1	S2	Glennon	614	290	N/A / 30%	FCU	
1	S16	Resources	333	131	N/A / 30%	FCU	
1	S3	Irfran	762	178	N/A / 30%	FCU	
1	S4	Chase	689	172	N/A / 30%	FCU	

Project Name:	Woodbridge Public Schools R Beecher Road School
Project Number:	2022231.00
Scope	TAB Data
Date	August 2, 2023

Zone Identification							
Floor	Room#	Room Name	Design Min/Max CFM	Measured Min OA Flow (cfm)	BAS Min OA Flow (cfm) / Pos. (%)	Associated VAV & RTU/AHU Unit	Notes
1	S17	Greene	417	346	N/A / 30%	FCU	
1	S5	Horvath	833	181	N/A / 30%	FCU	
1	S6	Campbell	902	185	N/A / 30%	FCU	
1	S7	Guerra	898	196	N/A / 30%	FCU	
1	S8	Conroy	854	199	N/A / 30%	FCU	
1	S9	Mulligan	660	301	N/A / 30%	FCU	
1	S10	McHugh	739	210	N/A / 30%	FCU	
1	S13	Resources	580	120	N/A / 30%	FCU	
1	S11	Rourke	600	168	N/A / 30%	FCU	
1	S12	Antonelles	419	203	N/A / 30%	FCU	
1		FAC Director Vito	145	18	N/A / 25%	AHU-6	
1	S19	Computer	492	91	N/A / 30%	FCU	
1	S15	Taylor	143	16	N/A / 25%	AHU-6	
1	S18	Criscuola	246	28	N/A / 25%	AHU-6	
1	S14	Krawel	555	146	N/A / 30%	FCU	
1	S22	Simoniello	532	110	N/A / 30%	FCU	
1	S21	Teach lounge	283	32	N/A / 25%	AHU-6	
1	S20	Mallor	127	14	N/A / 25%	AHU-6	
1		ROTUNDA	1490	170	N/A / 25%	AHU-6	
1	ADD	Music Office	165	18	N/A / 25%	AHU-6	
1	E1	Acheson (Art)	804	44	N/A / 30%	FCU	
1	E2	Trofimclik (Science)	822	205	N/A / 30%	FCU	
1	E3	Saunders	1083	352	N/A / 30%	FCU	
1	E4	Summer Camp Office	481	118	N/A / 30%	FCU	

Project Name:	Woodbridge Public Schools R Beecher Road School
Project Number:	2022231.00
Scope	TAB Data
Date	August 2, 2023

Zone Identification							
Floor	Room#	Room Name	Design Min/Max CFM	Measured Min OA Flow (cfm)	BAS Min OA Flow (cfm) / Pos. (%)	Associated VAV & RTU/AHU Unit	Notes
1	E5	Recreation Office	241	112	N/A / 30%	FCU	
1	E6	Special Ed	657	307	N/A / 30%	FCU	
1	NEW Office	Special Ed Office	243	114	N/A / 30%	FCU	
1	E7	MUSIC	1731	551	N/A / 20%	AHU-1	
1	AUD	ASSEMBLY ROOM	2975	921	N/A / 20%	AHU-4	
1		SUPERINDENDANT	536	101	N/A / 30%	UV	
1	RECEPT.	RECEPTION	267	36	N/A / 30%	UV	
1	KITCHEN	KITCHEN	363	64	N/A / 30%	UV	
1	CONF	CONFERENCE	134	---	N/A / 5%	RTU-1	
1	B. MANAGER	B. MANAGER	193	---	N/A / 5%	RTU-1	
1	POOL	POOL	14,266	365	N/A /	DH-1	
1	OFFICE	Jimencz (Payroll)	193	---	N/A / 5%	RTU-1	
1	Office	Office	312	42	N/A / 30%	UV	
1	Boy	(1ST.) BOYS LOCKER	1000	68	N/A / 20%	AHU-5	
1	Girl	(LL) GIRLS LOCKER	680	46	N/A / 20%	AHU-5	
1	OFFICE	OFFICE- Off Gym	391	26	N/A / 20%	AHU-5	
1	SOUTH	GYMNASIUM	2896	196	N/A / 20%	AHU-5	
1	Office	Pool Life Guard	0	0	N/A / 20%	AHU-5	

Appendix 3

CO₂-DCV Testing



Project Name:		Woodbridge Public Schools						
Project Number:		2022231.00						
Scope		CO2/ DCV TESTING						
Date								
Floor	Room#	Room Name	SERVED BY SYSTEM?	RESPOND TO SETPOINT YES/ NO	CO2 SENSOR INSTALLED YES/ NO	BAS CO2 READING (PPM)	WTB CO2 READING (PPM)	Notes
1	A1	CLASSROOM	UV	YES	YES	570	519	
1	A2	CLASSROOM	UV	YES	YES	459	429	
1	A3	CLASSROOM	UV	YES	YES	481	428	
1	A4	CLASSROOM	UV	YES	YES	658	590	
1	A5	CLASSROOM	UV	YES	YES	435	422	
1	A6	CLASSROOM	UV	YES	YES	445	402	
1	A7	Art	UV	YES	YES	437	434	
1	A8	CLASSROOM	UV	YES	YES	440	419	
1	A9	Speech	UV	YES	YES	429	403	
1		CONFERENCE	RTU-2	YES	YES	497	446	
1		WAIT/MAIN OFFICE	RTU-2	YES	YES	481	410	
1		VICE PRINCIPLE	RTU-2	YES	YES	460	439	
1		PRINCIPLE	RTU-2	YES	YES	444	426	
1		KITCHEN	RTU-2	YES	YES	482	441	
1	B13	STOR. SALLY PORT	RTU-2	YES	YES	480	436	
1	B14	STAFF ROOM	FCU	YES	YES	499	450	
1	B12	STORAGE	EF	---	---	---	---	Space Only Has Exhaust
1	B11	NURSE	FCU	YES	YES	437	434	
1	B10	CLASSROOM	FCU (x2)	YES / YES	YES / YES	437 / 442	415 / 415	
1	B1	CLASSROOM	UV	YES	YES	515	458	
1	B2	CLASSROOM	UV	YES	YES	523	527	
1	B3	CLASSROOM	UV	YES	YES	443	423	
1	B4	CLASSROOM	UV	YES	YES	474	444	
1	B5	CLASSROOM	UV	YES	YES	448	416	
1	B6	CLASSROOM	UV	YES	YES	455	442	
1	B9	CLASSROOM	UV	YES	YES	440	421	
1	B7	CLASSROOM	UV	YES	YES	432	420	
1	B8	CLASSROOM	UV	YES	YES	430	418	
1	NORTH	GYMNASIUM	AHU-2, AHU-3	YES	YES	476	455	
1		COMMONS	AHU-2, AHU-3	YES	YES	476	455	
1	K9	CLASSROOM	FCU	YES	YES	504	410	
1	K7	CLASSROOM	FCU	YES	YES	467	440	
1	KP	CLASSROOM	FCU	YES	YES	434	411	
1	K1	CLASSROOM	FCU	YES	YES	454	415	
1	K2	CLASSROOM	FCU	YES	YES	439	420	
1	K8	CLASSROOM	FCU	YES	YES	437	402	
1	K3	CLASSROOM	FCU	YES	YES	447	420	
1	ADD	Gym Teacher office	FCU	NO	NO	---	---	
1	K4	CLASSROOM	FCU	YES	YES	510	485	
1	K6	CLASSROOM	FCU	YES	YES	510	467	

Project Name:		Woodbridge Public Schools						
Project Number:		2022231.00						
Scope		CO2/ DCV TESTING						
Date								
Floor	Room#	Room Name	SERVED BY SYSTEM?	RESPOND TO SETPOINT YES/ NO	CO2 SENSOR INSTALLED YES/ NO	BAS CO2 READING (PPM)	WTB CO2 READING (PPM)	Notes
1	K5	CLASSROOM	FCU	YES	YES	438	413	
1		Kitchen	RTU-3	YES	YES In Cafeteria	429	413	
1		Cafeteria	RTU-3	YES	YES	429	408	
1		Library	RTU-4	YES	YES	480	461	
1		Tech Center	RTU-5	YES	YES in Unit	434	458	
1		Media Storage	RTU-4	---	Yes in Library	466	444	
1		Break Rm. Office	RTU-5	YES	YES in Unit	444	440	
1		Green Screen	RTU-5	YES	YES in Unit	436	428	
1		Tech Office	RTU-5	YES	YES in Unit	450	431	
1		Reading Room	RTU-4	---	Yes in Library	471	446	
1	C6	Hutchinson	UV	YES	YES	427	421	
1	C5	Meacham	UV	YES	YES	479	433	
1	C4	CLASSROOM	UV	YES	YES	528	502	
1	C3	?	UV	YES	YES	444	449	
1	C2	Triplett	UV	YES	YES	445	425	
1	C1	Ngov	UV	YES	YES	464	424	
1	D5/D6	Office	FCU	NO	NO	---	---	
1	D5	Nurse	FCU	YES	YES	433	417	
1	D6	Nolan	FCU	YES	YES	437	413	
1	D4	Marcellino	FCU	YES	YES	443	408	
1	D3	Shepard	FCU	YES	YES	431	411	
1	D2	Mumford	FCU	YES	YES	420	408	
1	D1	Lavigne	FCU	YES	YES	343	427	
1	D7	Reading	FCU	YES	YES	434	406	
1	D7-1	W/in Reading	FCU	NO	NO	---	---	
1	D7-2	W/in Reading	FCU	NO	NO	---	---	
1	D7-3	W/in Reading	FCU	NO	NO	---	---	
1	S1	Rogers	FCU	YES	YES	431	411	
1	S2	Glennon	FCU	YES	YES	459	430	
1	S16	Resources	FCU	YES	YES	418	420	
1	S3	Irfan	FCU	YES	YES	459	434	
1	S4	Chase	FCU	YES	YES	435	416	
1	S17	Greene	FCU	YES	YES	461	402	
1	S5	Horvath	FCU	YES	YES	430	417	
1	S6	Campbell	FCU	YES	YES	435	413	
1	S7	Guerra	FCU	YES	YES	445	416	
1	S8	Conroy	FCU	YES	YES	443	432	
1	S9	Mulligan	FCU	YES	YES	484	470	
1	S10	McHugh	FCU	YES	YES	444	426	
1	S13	Resources	FCU	YES	YES	430	427	

Project Name:		Woodbridge Public Schools						
Project Number:		2022231.00						
Scope		CO2/ DCV TESTING						
Date								
Floor	Room#	Room Name	SERVED BY SYSTEM?	RESPOND TO SETPOINT YES/ NO	CO2 SENSOR INSTALLED YES/ NO	BAS CO2 READING (PPM)	WTB CO2 READING (PPM)	Notes
1	S11	Rourke	FCU	YES	YES	430	412	
1	S12	Antonelles	FCU	YES	YES	444	421	
1		Copy Center	FCU	NO	NO	---	---	
1	S19	Computer	FCU	YES	YES	440	452	
1	S15	Taylor	AHU-6	NO	NO	---	---	
1	S18	Criscuola	AHU-6	NO	NO	---	---	
1	S14	Krawel	FCU	YES	YES	424	419	
1	S22	Simoniello	FCU	YES	YES	439	404	
1	S21	Teach lounge	AHU-6	NO	NO	---	---	
1	S20	Mallor	AHU-6	NO	NO	---	---	
1		ROTUNDA	AHU-6	YES	YES	428	422	
1	ADD	Music Office	AHU-1	NO	NO	---	---	
1	E1	Acheson (Art)	FCU	YES	YES	427	424	
1	E2	Trofimklik (Science)	FCU	YES	YES	437	426	
1	E3	Saunders	FCU	YES	YES	433	430	
1	E4	Music	FCU	YES	YES	441	428	
1	E5	Recreation Office	FCU	No	No	---	---	
1	E6	Special Ed	FCU	YES	YES	437	418	
1	NEW Office	Special Ed Office	FCU	YES	YES	440	438	
1	E7	MUSIC	AHU-1	YES	YES	426	430	
1	AUD	ASSEMBLY ROOM	AHU-4	YES	YES	414	437	
1		SUPERINDENDANT	UV	NO	NO	---	---	
1	RECEPT.	M. DeGennro	UV	NO	NO	---	---	
1	KITCHEN	Kitchette	UV	NO	NO	---	---	
1	CONF	Conference	RTU-1	YES	YES	441	209	
1	B. MANAGER	D. Coonan	UV	NO	NO	---	---	
1	POOL	Pool Life Guard	Dektron	NO	NO	---	---	
1	OFFICE	Jimencz (Payroll)	RTU-1	YES	YES	429	209	
1	Office	Office	UV	NO	NO	---	---	
1	Boy	(1ST.) BOYS LOCKER	AHU-5	YES	YES	416	431	
1	Girl	(LL) GIRLS LOCKER	AHU-5	YES	YES	429	431	
1	OFFICE	OFFICE- Off Gym	AHU-5	YES	YES	433	431	
1	SOUTH	GYMNASIUM	AHU-5	YES	YES	440	431	
1	Office	Pool Life Guard	AHU-5	YES	YES	432	431	

Appendix 4

Unit and Room Take-Off Data



Project Name:	Woodbridge Public Schools RCx	<i>JM / RA</i>
Project Number:	2022231.00	
Scope	Room Take-Off Data	
Date	June 27, 2023	
Beecher Road School		

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height (FT)	Volume	People	Notes	Identified Deficiencies	Pictures
									Y / N
1	A1		822	10	8,220	20	Unit Ventilator, Honeywell CO2 Cntrl,	Room dehumidifier	
1	A2		825	10	8,250	20	Unit Ventilator, Honeywell CO2 Cntrl,		
1	A3		826	10	8,260	20	Unit Ventilator, Honeywell CO2 Cntrl,		
1	A4		820	10	8,200	20	Unit Ventilator, Honeywell CO2 Cntrl,		
1	A5		829	10	8,290	20	Unit Ventilator, Honeywell CO2 Cntrl,		
1	A6		818	10	8,180	20	Unit Ventilator, Honeywell CO2 Cntrl,		
1	A7	Art	1137	10	11,370	20	Unit Ventilator, Honeywell CO2 Cntrl,		
1	A8		1188	10	11,880				
1	A9	Speech	334	10	3,340				
1		CONFERENCE	248	9	2,232				
1		WAIT/MAIN OFFICE	723	9.5	6,869	6			
1		VICE PRINCIPLE	153	9.5	1,454				
1		PRINCIPLE	150	9.5	1,425				
1		KITCHEN	91	9.5	865				
1	B13	STOR. SALLY PORT	200	9.5	1,900				
1	B14	STAFF ROOM	780	9	7,020				
1	B12	STORAGE	288	8.9	2,563				
1	B11	NURSE	590	8.9	5,251	6		TEACHERS ROOM/HEALTH 113	
1	B10	CLASSROOM	823	8.9	7,325	20		LANGUAGE	
1	B1	CLASSROOM	827	10	8,270	20			
1	B2	CLASSROOM	819	10	8,190	20			

Project Name:	Woodbridge Public Schools RCx	<i>JM / RA</i>
Project Number:	2022231.00	
Scope	Room Take-Off Data	
Date	June 27, 2023	

Beecher Road School

Zone Identification

Floor	Room#	Room Name	Area (SF)	Ceiling Height (FT)	Volume	People	Notes	Identified Deficiencies	Pictures
									Y / N
1	B3	CLASSROOM	823	10	8,230	20			
1	B4	CLASSROOM	822	10	8,220	20			
1	B5	CLASSROOM	820	10	8,200	20			
1	B6	CLASSROOM	824	10	8,240	20			
1	B9	CLASSROOM	331	10	3,310	20			
1	B7	CLASSROOM	1194	10	11,940	20		(Folding partition)	
1	B8	CLASSROOM	1190	10	11,900	20		(Folding partition)	
1	NORTH	GYMNASIUM	2910	17	49,470				
1		COMMONS	2648	10.2	27,010			served by gym units	
1	K9	CLASSROOM	840	9	7,560	20			
1	K7	CLASSROOM	511	9	4,599			RESOURCE ROOM	
1	KP	CLASSROOM	997	9.4	9,372	20			
1	K1	CLASSROOM	1008	9.6	9,677	20			
1	K2	CLASSROOM	1037	9.5	9,852	20			
1	K8	CLASSROOM	776	9.5	7,372	20			
1	K3	CLASSROOM	1005	9.6	9,648	20			
1	ADD	Gym Teacher office	72	8	576	1			

Project Name:	Woodbridge Public Schools RCx	<i>JM / RA</i>
Project Number:	2022231.00	
Scope	Room Take-Off Data	
Date	June 27, 2023	

Beecher Road School

Zone Identification

Floor	Room#	Room Name	Area (SF)	Ceiling Height (FT)	Volume	People	Notes	Identified Deficiencies	Pictures
									Y / N
1	K4	CLASSROOM	1000	9.5	9,500				
1	K6	CLASSROOM	1041	9.7	10,098				
1	K5	CLASSROOM	1036	9.6	9,946				
1		Kitchen	1444	8.9	12,852				
1		Cafeteria	3777	10.5	39,659				
1		Library	5500	10.9	59,950				
1		Tech Center	1299	7.7	10,002				
1		Media Center	646	10.9	7,041				
1		Break Rm. Office	287	8	2,296				
1		Green Screen	197	7.6	1,497				
1		Tech Office	156	8	1,248				
1		Reading Room	161	7.9	1,272				
1	C6	Hutchinson	828	10	8,280	20			
1	C5	Meacham	808	10	8,080	20			
1	C4	CLASSROOM	817	10	8,170	20			
1	C3	?	823	10	8,230	20			
1	C2	Triplett	827	10	8,270	20			
1	C1	Ngov	814	10	8,140	20			
1	D5/D6	Office	129	8	1,032	1			
1	D5	Nurse	1009	9	9,081	6			
1	D6	Nolan	10098	9	90,882				

Project Name:	Woodbridge Public Schools RCx	<i>JM / RA</i>
Project Number:	2022231.00	
Scope	Room Take-Off Data	
Date	June 27, 2023	
Beecher Road School		

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height (FT)	Volume	People	Notes	Identified Deficiencies	Pictures
									Y / N
1	D4	Marcellino	855	10	8,550				
1	D3	Shepard	1349	10	13,490				
1	D2	Mumford	919	10	9,190				
1	D1	Lavigne	1270	10	12,700				
1	D7	Reading	433	9	3,897			Dwg. Altered	
1	D7-1	W/in Reading	116	8	928	1		Dwg. Altered	
1	D7-2	W/in Reading	132	8	1,056	1		Dwg. Altered	
1	D7-3	W/in Reading	110	8	880	1		Dwg. Altered	
1	S1	Rogers	1021	9	9,189				
1	S2	Glennon	1256	9	11,304				
1	S16	Resources	382	9	3,438				
1	S3	Irfan	1256	9	11,304				
1	S4	Chase	1021	9	9,189				
1	S17	Greene	561	9.6	5,386				
1	S5	Horvath	1024	9	9,216				
1	S6	Campbell	1256	9	11,304				
1	S7	Guerra	1256	8.9	11,178				
1	S8	Conroy	1024	8.9	9,114				
1	S9	Mulligan	1021	8.9	9,087				
1	S10	McHugh	1256	8.9	11,178				
1	S13	Resources	380	8.9	3,382				

Project Name:	Woodbridge Public Schools RCx	<i>JM / RA</i>
Project Number:	2022231.00	
Scope	Room Take-Off Data	
Date	June 27, 2023	
Beecher Road School		

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height (FT)	Volume	People	Notes	Identified Deficiencies	Pictures
									Y / N
1	S11	Rourke	1256	8.9	11,178				
1	S12	Antonelles	1021	8.9	9,087				
1		FAC Director Vito	144	7.2	1,037	1			
1	S19	Computer	830	9	7,470				
1	S15	Taylor	178	9	1,602				
1	S18	Criscuola	458	7.8	3,572				
1	S14	Krawel	830	9	7,470				
1	S22	Simoniello	830	9	7,470		Copy Room		
1	S21	Teach lounge	521	9	4,689				
1	S20	Mallor	178	9	1,602				
1		ROTUNDA	1665	22	36,630		Odd Shape		
1	ADD	Music Office	65	8	520	1	Room off music room within E-7		
1	E1	Acheson (Art)	1128	9	10,152	22			
1	E2	Trofimclik (Science)	905	8.6	7,783	21			
1	E3	Saunders	922	9	8,298				
1	E4	Summer Camp Office	529	9	4,761	17			
1	E5	Recreation Office	113	8	904	1			
1	E6	Special Ed	795	8	6,360				
1	NEW Office	Special Ed Office	105	8	840	1	Within E-6		
1	E7	MUSIC	1698	9.1	15,452				
1	AUD	ASSEMBLY ROOM	3160	12.1	38,236		Stage area and Assembly area		

Project Name:	Woodbridge Public Schools RCx	<i>JM / RA</i>
Project Number:	2022231.00	
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Date	June 27, 2023	
Beecher Road School		

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height (FT)	Volume	People	Notes	Identified Deficiencies	Pictures
									Y / N
1		SUPERINDENDANT	375	8.5	3,188	7			
1	RECEPT.		385.5	8.5	3,277				
1	KITCHEN		100	8.5	850				
1	CONF		192	8	1,536				
1	B. MANAGER		123	8.5	1,046	1			
1	POOL		4328	26	112,528				
1	OFFICE	Jimencz (Payroll)	355	8	2,840	3			
1	Office	Office	46	8	368		Within E-8		
1	Boy	(1ST.) BOYS LOCKER	931	7.8	7,262				
1	Girl	(LL) GIRLS LOCKER	1144	7.7	8,809				
1	OFFICE	OFFICE- Off Gym	212	7.9	1,675				
1	SOUTH	GYMNASIUM	4982	22.5	112,095				
1	Office	Pool Life Guard	165	7	1,155				

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

Unit Tag	AHU-1	Addition comments descriptions
Location:	MER	
Serving:	Music	
Mfr.	Trane	
Model #	-	
Serial #	K15G54994?????	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)		
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	Hot water	
Heating Coil Condition	OK	
Cooling Type	Chilled water	
Cooling Coil Condition	OK	
Drain Pan Status	OK	
Notes:		
Description	Photos Taken (Check All That Applies)	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

Unit Tag	AHU-2 No access available	Addition comments descriptions
Location:	Gym	
Serving:	North Gym & Common room	
Mfr.	Trane	
Model #	xxx	
Serial #	K15G54xxx	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	xxx	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	xx	
Heating Type	Hot water	
Heating Coil Condition	xx	
Cooling Type	Chilled water	
Cooling Coil Condition	xx	
Drain Pan Status	xx	
Notes: High in space, no access available		
Description	Photos Taken (Check All That Applies)	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

Unit Tag	AHU-3 No access available	Addition comments descriptions
Location:	Gym	
Serving:	North Gym & Common room	
Mfr.	Trane	
Model #	xxx	
Serial #	K15G54xxx	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	xxx	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	xx	
Heating Type	Hot water	
Heating Coil Condition	xx	
Cooling Type	Chilled water	
Cooling Coil Condition	xx	
Drain Pan Status	xx	
Notes: High in space, no access available		
Description	Photos Taken (Check All That Applies)	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

Unit Tag	AHU-4	Addition comments descriptions
Location:	MER	
Serving:	ASSEMBLY	
Mfr.	Trane	
Model #	UCCAG14C0A0RDN12000000FC872	
Serial #	K15G54994	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(2) 16x20x2 (1) 16x25x2 (2) 20x20x2 (1) 20x25x2 (2) 16x20x4 (1) 16x25x4 (2) 20x20x4 (1) 20x25x4	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	Hot water	
Heating Coil Condition	OK	
Cooling Type	Chilled water	
Cooling Coil Condition	OK	
Drain Pan Status	OK	
Notes: Newer installation, originally maintained by Emcor		
Description	Photos Taken (Check All That Applies)	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

Unit Tag	AHU-5	Addition comments descriptions
Location:	MER	
Serving:	South Gym	
Mfr.	Trane	
Model #		
Serial #		
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(2) 16x20x2 (2) 16x25x2 (2) 20x20x2 (2) 20x25x2 (2) 16x20x4 (2) 16x25x4 (2) 20x20x4 (2) 20x25x4	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	Hot water	
Heating Coil Condition	OK	
Cooling Type	Chilled water	
Cooling Coil Condition	OK	
Drain Pan Status	OK	
Notes:		
Description	Photos Taken (Check All That Applies)	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

<u>Unit Tag</u>	<u>ERV-1</u>	<u>Addition comments descriptions</u>
Location:	Roof	
Serving:		
Mfr.	XeteX	
Model #	IAQ-4000-RT-BP-SP	
Serial #	129521015-1/4	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(8) 16x24x2	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	N/A	
Heating Coil Condition	N/A	
Cooling Type	N/A	
Cooling Coil Condition	N/A	
Drain Pan Status	OK	
Notes: CUBE HEAT RECOVERY ONLY		
<u>Description</u>	<u>Photos Taken (Check All That Applies)</u>	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

Unit Tag	ERV-2	Addition comments descriptions
Location:	Roof	
Serving:		
Mfr.	XeteX	
Model #	IAQ-1000-RT-BP-SP	
Serial #	129521015-12/4	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)		
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	N/A	
Heating Coil Condition	N/A	
Cooling Type	N/A	
Cooling Coil Condition	N/A	
Drain Pan Status	OK	
Notes: CUBE HEAT RECOVERY ONLY		
Description	Photos Taken (Check All That Applies)	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

Unit Tag	ERV-3	Addition comments descriptions
Location:	Roof	
Serving:	Rotunda (Area - S wing)	
Mfr.	XeteX	
Model #	IAQ-4000-RT-BN-SP	
Serial #	129521015-3/4	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(8) 16x24x2	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	N/A	
Heating Coil Condition	N/A	
Cooling Type	N/A	
Cooling Coil Condition	N/A	
Drain Pan Status	OK	
Notes: CUBE HEAT RECOVERY ONLY		
Description	Photos Taken (Check All That Applies)	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

Unit Tag	ERV-4	Addition comments descriptions
Location:	Roof	
Serving:	Rotunda (Area - S wing)	
Mfr.	XeteX	
Model #	IAQ-3000-BP-PHW-HW	
Serial #	129521015-4/4	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(8) 20x24x2	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	N/A	
Heating Coil Condition	N/A	
Cooling Type	N/A	
Cooling Coil Condition	N/A	
Drain Pan Status	OK	
Notes: CUBE HEAT RECOVERY ONLY		
Description	Photos Taken (Check All That Applies)	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

<u>Unit Tag</u>	<u>RTU-1</u>	<u>Addition comments descriptions</u>
Location:	Roof	
Serving:	Main Office	
Mfr.	Trane	
Model #	CSAA006UBL00	
Serial #	K15G57521	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(2) 20x25x2 (2) 20x25x4	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	Hot water	
Heating Coil Condition	OK	
Cooling Type	Chilled water	
Cooling Coil Condition	OK	
Drain Pan Status	OK	
Notes:		
<u>Description</u>	<u>Photos Taken (Check All That Applies)</u>	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

<u>Unit Tag</u>	<u>RTU-2</u>	<u>Addition comments descriptions</u>
Location:	Roof	
Serving:	Main Office	
Mfr.	Trane	
Model #	CSAA006UBL00	
Serial #	K15G57531	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(2) 20x25x2 (2) 20x25x4	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	Hot water	
Heating Coil Condition	OK	
Cooling Type	Chilled water	
Cooling Coil Condition	OK	
Drain Pan Status	OK	
Notes:		
<u>Description</u>	<u>Photos Taken (Check All That Applies)</u>	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBRIIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

<u>Unit Tag</u>	<u>RTU-3</u>	<u>Addition comments descriptions</u>
Location:	Roof	
Serving:	Cafeteria	
Mfr.	Trane	
Model #	CSAA012UBL00	
Serial #	K15G55679	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(4) 16x25x2 (3) 20x25x2 (4) 16x25x4 (3) 20x25x4	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	Hot water	
Heating Coil Condition	OK	
Cooling Type	Chilled water	
Cooling Coil Condition	OK	
Drain Pan Status	OK	
Notes:		
<u>Description</u>	<u>Photos Taken (Check All That Applies)</u>	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

<u>Unit Tag</u>	<u>RTU-4</u>	<u>Addition comments descriptions</u>
Location:	Roof	
Serving:	Library/Media	
Mfr.	Trane	
Model #	CSAA012UBL00	
Serial #	K15G55690	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(2) 20x20x2 (4) 20x24x2 (2) 20x20x4 (4) 20x24x4	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	Hot water	
Heating Coil Condition	OK	
Cooling Type	Chilled water	
Cooling Coil Condition	OK	
Drain Pan Status	OK	
Notes:		
<u>Description</u>	<u>Photos Taken (Check All That Applies)</u>	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

<u>Unit Tag</u>	<u>RTU-5</u>	<u>Addition comments descriptions</u>
Location:	Roof	
Serving:	Tech Center	
Mfr.	Trane	
Model #	CSAA008UBL00	
Serial #	K15G57541	
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)	(1) 20x24x2 (1) 24x24x2 (1) 20x24x4 (1) 24x24x4	
Filter Condition	Changed 4/23 Filters are dirty, should be clean prior to balancing	Note: Filters were changed after our initial visit.
Utilize CO ₂ and/or DCV?	Yes	
Heating Type	Hot water	
Heating Coil Condition	OK	
Cooling Type	Chilled water	
Cooling Coil Condition	OK	
Drain Pan Status	OK	
Notes:		
<u>Description</u>	<u>Photos Taken (Check All That Applies)</u>	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

WOODBIDGE PUBLIC SCHOOLS – BEECHER ROAD SCHOOL EQUIPMENT DATA SHEET

<u>Unit Tag</u>	<u>DECTRON</u>	<u>Addition comments descriptions</u>
Location:	MER	
Serving:	POOL	
Mfr.	Dectron	
Model #		
Serial #		
Manufacture Date		
System CFM		By TAB
Min OA CFM		
Filter Data (Size, Qty)		
Filter Condition		
Utilize CO ₂ and/or DCV?		
Heating Type		
Heating Coil Condition		
Cooling Type		
Cooling Coil Condition		
Drain Pan Status		
Notes: Pool empty, Dectron still running		
<u>Description</u>	<u>Photos Taken (Check All That Applies)</u>	
Unit Tag Info		
Heating Coil		
Cooling Coil		
Filters		

Appendix 5

Floor Plans





Appendix 6

Photos









