Riverfield Elementary School

1625 Mill Plain Road
Fairfield, CT 06824

FAIRFIELD PUBLIC SCHOOLS

RIVERFIELD ELEMENTARY

Fairfield Public Schools Recommissioning (RCx) and Testing, Adjusting, & Balancing (TAB) Study

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VAN ZELM HEYWOOD & SHADFORD, INC.

1200 CONVERSE STREET
LONGMEADOW, MA 01106
P: 617.218.9976

10 TALCOTT NOTCH
FARMINGTON, CT 06032
P: 860.284.5064
www.vanzelm.com

862 BRAWLEY SCHOOL ROAD, SUITE 207
MOORESVILLE, NC 28117
P: 704-799-7275

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FAIRFIELD PUBLIC SCHOOLS RECOMMISSIONING (RCX) AND TESTING, ADJUSTING, & BALANCING (TAB) STUDY

EXECUTIVE SUMMARY

Riverfield Elementary School was deemed to be school priority number fourteen by Fairfield Public Schools. The following report will indicate the compliance or non-compliance of this school with current International Mechanical Code (2015 IMC) regarding Ventilation for Acceptable Indoor Air Quality.

Riverfield Elementary School is located at 1625 Mill Plain Road Fairfield, CT and serves as an educational facility for approximately 374 students as of the May 2022 census and up to 85 faculty and staff. The school is one of the newer buildings, having been constructed in 1958 and renovated in 1971 to add a classroom "pod" in the south and a gymnasium on the north side. HVAC and building envelope studies were performed at this school in the early 2000s, but there was a recent renovation starting in 2012 and finishing in 2015 of the building systems and some of the structure, where the school size increased by about 50% and the building was outfitted with new MEPFP equipment. Van Zelm was the Commissioning Agent for the work performed at that time, but there has been little done here since that effort. Particularly regarding HVAC, this involved a near complete removal of existing systems and replacing them with dedicated outside air systems with energy recovery for classrooms, and some demand control ventilation-capable equipment for larger spaces.

The school ventilation systems comprise mainly of six (6) Dedicated Outside Air Units with energy recovery (DOAS-1-4), three (3) Rooftop Air Handling Units (RTU-1-3), one (1) Energy Recovery Ventilator (ERV-1), and exhaust fans for various purposes including, but not limited to, toilet exhaust, kitchen exhaust, mechanical/electrical space ventilation, etc. Some spaces have operable windows, which might vary in use depending on the particular occupant or environmental conditions, but these are not directly tied into any monitoring system nor are expected to be used for the purposes of providing fresh outside air as a component of the building ventilation. The spaces also have VRF systems for cooling and radiant ceiling panels or fintube radiation for heating. The Building Automation (BAS) control system is an Alerton system managed by ABS, which was put in place as part of the most recent building renovation. ABS did not add new controls to every mechanical system, but they were involved with the air handling equipment.

We performed our on-site RCx inspection starting on April 27, 2022, and TAB review starting in July 2022. The goal of this study is primarily focused towards addressing the 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 occupancy totals of zero (actual or expected). These spaces typically do not affect building occupants since they are typically provided with some form of exhaust which drives these spaces negative to the surrounding area. At worst, improper levels of exhaust would drive a negative building further negative, but it does not introduce air from these locations to classroom or office spaces. Should the district pursue additional work for the building including recommissioning, balancing, and controls upgrades, these spaces would be addressed as a component of that process.

Overall, the performance of the building with regard to ventilation was found to be middling, with some clear means of improvement that hasn't been implemented. In some cases, there are clusters of rooms that were not satisfied with enough outside air, particularly DOAS-5 where the unit was not running at 100% outside air unlike the other DOAS units. Findings from the Retro-Commissioning (RCx) and air-side Testing Adjusting and Balancing (TAB) process found significant issues that should be addressed immediately to improve building environmental control, reduce energy usage, and improve building ventilation compliance with the 2015 version of the International Mechanical Code (2015 IMC). Although there are additional guidelines and recommendations put forward by organizations dedicated to the research and implementation of healthy buildings that have plenty of overlap with IMC 2015, these were not the driving factors for this assessment. Please be aware that many of these changes on their own will not reduce energy consumption, but rather will increase it; 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 Fairfield Public Schools.

EVALUATION

For the purposes of this study, the Fairfield Public Schools district had five primary questions about the capability and performance of each of the school buildings. Based on our findings, we have some insight into each of these below.

2015 International Mechanical Code (IMC) Compliance

As the accompanying spreadsheet indicates, many of the individual occupied spaces at this school do not fully comply with the applicable building codes or guidelines regarding indoor air quality and outdoor ventilation. The measured ventilation air being delivered into each occupied space would be considered a worst-case scenario only. However, there are some areas within the building that do meet and exceed these ventilation requirements by a significant amount.

The supply of outside air to interior occupied spaces is governed by the 2018 Connecticut Building Code, which is based on the 2015 International Mechanical Code. This code prescribes 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, some spaces like an office will not be indicated as being part of an "education" occupancy classification because the IMC does not distinguish between an office in an office building, a school, or anywhere else. 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.

As an alternative to providing outside air mechanically to occupied spaces, the building code 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. In any case, some sort of equipment is provided in every occupied space here including in spaces with operable windows, but whether it was supplying ventilation is a different question.

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 unhealthy levels. 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

The "Ventilation Data Calculations" Appendix contains the data from all RCx findings and TAB measurements regarding ventilation within occupied spaces. This data conforms to the requirements within IMC 2015 and the results are calculated based on individual space classification and category. Additionally, these readings rely on the "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 is capable of maintaining required outside air flow in this minimum ventilation mode, it will definitely 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. 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 correcting certain issues regarding outside airflow will cause different issues to be revealed, which in turn would need to be addressed.

For the occupied zones within this building, the total minimum required ventilation airflow came out to 14,815 CFM. The TAB process revealed that only 5,420 CFM of outside air is delivered to the spaces, resulting in a 9,395 CFM deficit or 36.6% of the required minimum flow. However, the total building airflow amounted to 43,959 CFM, indicating that there is room for opening outside air dampers to make up much of the missing ventilation. Additionally, the ventilation calculations reveal that only 47.2% of the occupied zones actually met the requirements (25 of 53). A significant portion of these underperforming rooms are due to unit DOAS-5 operating with less than 100% outside air (10 rooms) resulting in about 2000 CFM of the deficit alone, though there are other zones scattered throughout the school also short on ventilation. Most of the other rooms are only short a small quantity of air with the exception of the health suite, work/resource rooms, the gymnasium, all-purpose room, and media center. A further analysis of the rooms based on the associated air handling unit reveals additional reasons why clusters of rooms might have failed to meet code, which is expanded on within the Issues List appendix.

A common calculation used for measuring the amount of air flushed through the 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 ft^2 room with 10 ft ceilings will have a volume of 10,000 ft^3. If 250 CFM is delivered to this space, that results in 15,000 ft^3 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 space 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. Taking the entire building volume and air delivered cycled through the building, which includes outside air and filtered, return air, this building was capable of achieving 5.511 ACH. This is well beyond the recommended 3 ACH, and it could points to potential for the building to increase outside air where there is too little in order to meet the code requirements. Some spaces do

exceed ventilation requirements even now, so those can then have the outside air be reduced to save on energy lost on the other added outside air. This can be further broken out by spaces that meet or fail to meet code. Among the spaces that failed to meet code, the outside air ACH was 0.415; for spaces that at least met or exceeded code, the outside air ACH was 1.813; the combined outside air ACH for the entire building was 0.680. Special rooms such as a nurse's suite do require an outside air ACH of at least 2 and total ACH of 6, which was not met in this building since some of this space was completely starved of any ventilation air and what was served was barely measurable. This is in addition to other recommendations or requirements such as negative pressure relative to adjacent spaces, extra filtration requirements for recirculated air, space pressure profiles for nurse suite spaces, etc..

Total ACH (RA + OA)	**Total OACH (OA/EA)**	**OACH for zones that do not meet code**	**OACH for zones that meet code**
5.511	0.680	0.415	1.813

Outside Air Flow Improvement Recommendations

DOAS-5 should be corrected through the controls to have the unit run at 100% outside air during the occupied modes. DOAS-2 fan speed should be increased if possible as this unit also had a few rooms not meeting code, though they were largely provided with decent quantities of ventilation. The gym, all-purpose room, and media center units should be thoroughly reviewed for control sequences and minimum damper position operation. Aside from the issues with DOAS-5, these spaces made up the bulk of the missing ventilation for the building, but they are not constant use spaces. If their demand control ventilation sequences are not functioning, they should be brought back online with full sensor calibrations, otherwise they need to have a collective increase of about 2500 CFM to maintain the minimum required ventilation. The HVAC systems should holistically be rebalanced to current design requirements. This includes a general BAS review. Realistically, this is about when building retro-commissioning should be performed anyway, so it is in the district's best interest to pursue this course of action.

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". This report was provided in an Appendix to the FPS high school ventilation summary reports. 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 2015 IMC for compliance, ASHRAE's insight into addressing the code is invaluable. Their 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 so as to maintain temperature and humidity requirements in the occupied spaces.

- Filter changes should become more frequent. Current policy indicates a twice-annual filter change at all schools. Dirty filters decreases the filter's efficiency and forces the unit fans to run at higher speeds (more energy consumption) or to deliver less outdoor ventilation air to the space.
- Increase total air change rates to between 3 and 6 ACH where possible while still satisfying minimum OA ventilation.
- Flush or purge building before and after occupancy for at least two (2) hours, if possible.
- While all units appear to have MERV 13 filters now installed, units that have both final and pre-filters have MERV 13 filters in both positions. Having two of the same efficiency filters in series does not significantly improve the filtration efficiency and mostly just reduces total airflow. MERV 8 pre-filters can be used in double bank racks to act as an inexpensive shield for the more expensive MERV 13 or 14 filters.
- Consider installation of UV-C or bi-polar ionization to recirculating air systems where installation of these systems do 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. This might not be needed if DOAS-5 can be brought back to working order during occupied periods.
- Add low return / high supply airflow paths or utilize displacement ventilation where possible.
- Increase restroom exhaust where possible while maintaining a positive building pressurization to the exterior.
- Perform duct cleaning for existing systems.

Control Sequence Update Recommendations

Without a specific retro-commissioning of the BAS control system itself, it is not possible to tell exactly what systems and components of the BAS needs repair or upgrade, but a cursory review of what was available indicates great need to:

- Immediately address the issues that prevent the controls groups from manipulating the controls. This made testing the building difficult but it also means that the building is not well controlled, nor is it flexible in case adjustments do need to be made. Although this school is far from the worst in terms of controls, it was not benefitted by recent controls upgrades like at other buildings.
- Repair or replace all faulty equipment controllers and end Input/Output devices.
- Look to program units to provide a pre and post occupancy purge for all occupied spaces.
- 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 some zones

are being supplied with significantly more than 100% of what is required, so backing these down will help move air to where it needs to go. 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, where possible.
- Confirm that trending and alarms have been set up for all units and establish alarm points for units operating below required minimum ventilation levels during occupied modes
- Implement CO_2 and Demand Control Ventilation (DCV) sequences for units to adjust ventilation air being delivered automatically and efficiently based on actual individual space occupancy. Some spaces already utilize this sequence, but with additional CO_2 sensors this can be expanded to optimize performance. Not only will these sequences save a substantial amount of money in energy costs, but they remove the guesswork for facilities and control personnel for how much air each space needs, and code/guidelines incorporate these capabilities into exceptions for blanket minimum outside air flow rates. The implementation of this control strategy is especially vital since increased ventilation to the building will increase all energy costs as it has a direct impact on the heating and cooling systems as well.

Equipment Upgrade or Replacement Recommendations

Generally, the more outside air that can be supplied to occupied areas, the better. Each existing air handler should have outside air flow rates increased above current setpoints if they can be obtained. Even units that currently meet code requirements for ventilation flow rates could be increased, but should not be increased beyond the capacity of the unit to heat or cool the air. Total space air change rates 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 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 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 come in contact with 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 has the ability to 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. 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, recommendations discussed above should be enacted before humidification is considered.

In order to best confirm that the implementation of the above recommendations is met as well as other improvements, we recommend performing Recommissioning of the 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 any unit that operates *only* with 100% outside air (e.g., makeup air units, dedicated outside air units, etc.) MERV 8 filters can be used instead of MERV 13s. This will allow for fan energy savings and increased ventilation without sacrificing indoor air quality. Where any of these units need to be replaced, we recommend considering a unit with some form of energy recovery (either a wheel or cross-flow heat exchanger). This will conserve additional energy and will still allow for systems to operate with more outside air.

Most units allow for some amount of recirculation, so the following are recommendations for upgrading the air handling units:

- Where any unit has a two filter racks where the first has room for 2" filters and the second has room for 4" or greater filters, the 2" filters can be MERV 8 for pre-filtering, but the larger filters should remain MERV 13.
- Based upon our observations HVAC unit filter changes should be performed more frequently. The party responsible for changing the filters should note which unit filters become dirty quicker and should further increase the frequency of changes to those units.
- Consider adding Bi-polar ionization or another means of air disinfection wherever possible.
- Consider investigating the potential of increasing the ventilation air flow rate wherever possible.
- All of the items noted within the RCx and TAB field finding appendices should be addressed by the facilities personnel. These items are separated by category: IAQ/Ventilation items, Maintenance items, Control items, and Information Only. While these lists are not a substitute for a full-building commissioning service, these corrections contain many of the significant issues that will quickly improve indoor air quality and energy consumption rates. Some typical issues include, but are not limited to:
    - Cleaning all unit coils: Some are in worse shape than others. Cleaning the coils will improve airflow patterns through the coil, increasing coil effectiveness and preventing deterioration due to rust or corrosion.
    - Damper cleaning and lubrication: All unit dampers should be cleaned and lubricated and tested throughout their movement range from the BAS. As dampers age, lubrication fails and dirt builds up causing the actuator to need to push harder to move the damper. Too much build-up can result in control actuators failures or broken damper hardware, which would need to be replaced.

- General Unit Cleanliness: All units should be cleaned to remove any dirt or debris that has accumulated. Some units were observed with loose paper, cardboard, and other materials within the units that can become a breeding ground for bacteria and molds should those materials absorb moisture. Sections of units that have developed rust or corrosion should be kept dry and cleaned with appropriate chemicals for removing the build-up before repainting or repairs tasks.

CONCLUSIONS

Fairfield Public Schools has taken measures in the past to address identified deficiencies regarding the recommended proper filtration upgrades for indoor air quality (IAQ) improvements, but this study found that the Riverfield Elementary School is challenged to fully meet the current minimum ventilation requirements per 2015 IMC, but there is potential for the school to function better by addressing some low-hanging fruit issues. The van Zelm, Wings, and Fairfield Public Schools team will collectively discuss options and estimate costs for correcting issues and code deficiencies discovered as part of this study. The cost analysis portion will be a continual process.

While some recommendations will help improve performance, there are a number of key recommendations that should be implemented immediately since the school is currently occupied. These include bringing into proper operation the outside air dampers for all units and generally increasing outside airflow throughout the building. Given the results of this survey, we highly recommend further evaluation to be performed including whole-building Recommissioning, BAS controls review for operation and schedule verification, and rebalancing by a certified TAB contractor. There likely will not need to be any major overhauls to equipment, but for anything that needs to be change, it should possibly include engineered ventilation calculations/modifications to aid in code compliance.

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APPENDICES

APPENDIX 1 – Issues List

ISSUES LIST

Issue List General Discussion

The following sections within this appendix include observations we made as a part of the study. Some of these items directly impact Indoor Air Quality (IAQ) or Ventilation and, since this is the primary concern of the study, are recommended to be addressed immediately. Other items are overdue/improper maintenance, control system issues, or general observations. Just because an issue is not included in the IAQ/Ventilation sections does not necessarily mean that it will have no effect on improving the building environment, but it is more likely that the effects are minimal or would only indirectly address a concern. In some cases, these could potentially *reduce* overall building outside airflow, even if in such instances it would keep the associated spaces within code compliance. While this might seem counterintuitive, given the concerns, it is a way to manage a healthy, code-compliant building environment while also saving energy.

The nature of this process being one that affects almost the entire building means that a response to this issue list should be through a holistic approach. Any one issue correction on its own might locally improve the condition of the served areas, but if an adjacent, non-functioning unit is also not corrected then the positive effects will be diminished. The interconnectivity of the issues cannot be easily indicated due to the complexity of the built environment, but a thorough review of all issues and an implementation plan will provide better results overall for the building and its stakeholders.

It should be noted that the inspections we performed as part of this study were undertaken during the month of March 2022 , so it is possible that some noted concerns, particularly maintenance items or issues already known about could have been addressed prior to the distribution of this report. Ongoing discussions with Fairfield Public Schools will allow us to update these items as we continue through other schools and into the implementation phase later in the year.

To aid in the process of addressing and tracking these issues, we have included a column indicating when action has been taken by Fairfield Public Schools or a hired contractor to address any individual issues, and will allow the district to document and timestamp issues that have been corrected since the initial inspection.

Indoor Air Quality And Ventilation Issue Findings

Below is a compilation of findings from our commissioning indoor space evaluation, TAB verification effort, and the air handling equipment analysis that relate to indoor air quality or ventilation status of the building. These findings should be considered as a high priority for budgeting and action steps. Many of the listed issues might lend clarity as to why the ventilation findings of throughout were found to be deficient. Addressing these issues individually will not correct any systemic, unit, or building-wide issues related to the IAQ or ventilation of the building..

Action Taken	Status	Unit/Zone	Serving/Room Name	Indoor Air Quality And Ventilation Issue (23)
	Open	11A Custodian	Airflow	No Ventilation or exhaust is provided for this space
	Open	18A Women	Airflow	This room only has a transfer grille for air rather than any dedicated supply or exhaust
	Open	18B Girls	Airflow	Exhaust Fan not running - bad motor
	Open	18C Boys	Airflow	Exhaust Fan not running - bad motor
	Open	18D Men	Airflow	Exhaust Fan not running - bad motor
	Open	1D Office	Airflow	This space has a VRF for cooling but does not have any direct ventilation
	Open	1E Health Suite	Airflow	This space has a VRF for cooling but does not have any direct ventilation
	Open	28 Speech	Airflow	Only exhaust is provided for this space
	Open	Air Handling Equipment	Dampers	All dampers should be reviewed for cleaning, adjustment, and lubrication
	Open	CC1 Media Center/Computer Lab	Dampers	The outside air damper serving this space is disconnected
	Open	CC13 All Purpose Room	Dampers	The outside air damper for this space was only open 8% and was not tracking the BAS command
	Open	CC29 Gym Office/Storage	Airflow	The exhaust grille is not ducted
	Open	CC3 Resource	Airflow	This space has a VRF for cooling but does not have any direct ventilation

Action Taken	Status	Unit/Zone	Serving/Room Name	Indoor Air Quality And Ventilation Issue (23)
	Open	CC4 Work Room	Airflow	This space has a VRF for cooling but does not have any direct ventilation
	Open	DOAS-1	ERW	The energy recovery wheel is dirty and needs to be cleaned
	Open	DOAS-1	Operation	This unit was turned off prior to the site inspections, but it is not clear why
	Open	DOAS-3	Operation	This unit was not operating at the time of inspection
	Open	DOAS-4	Operation	This unit had not run since at least the previous filter changeout
	Open	RTU-2	Coils	The cooling coil was very dirty and needs to be cleaned
	Open	RTU-2	Filters	The outdoor air intake screen is missing
	Open	RTU-3	Coils	The cooling coil is dirty and needs to be cleaned
	Open	RTU-3	Coils	The condenser coil is dirty and needs to be cleaned
	Open	RTU-3	Filters	The outside air metal filters need to be cleaned

Maintenance Issue Findings

Below is a compilation of findings from our commissioning indoor space evaluation, TAB verification effort, and the air handling equipment analysis that relate to indoor air quality or ventilation status of the building. The priority level of these findings will vary, and correcting any of them could improve the associated unit's performance, which might have an incidental effect on the indoor air quality or ventilation in the spaces. These issues do not necessarily explain reasons why the ventilation findings of the associated spaces were found to be deficient but should be corrected, nonetheless.

Action Taken	Status	Unit/Zone	Serving/Room Name	Maintenance Issue (28)
	Open	17 Classroom	Noise	The grilles in this room are noticeably loud
	Open	19 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow
	Open	19B Toilet	Temperature	There is no heat provided to this space
	Open	22 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow
	Open	23 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow
	Open	24 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow
	Open	25 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow
	Open	26 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow
	Open	27 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow
	Open	3 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow
	Open	4 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow
	Open	5 Classroom	Temperature	The unit convector was blocked, which would prevent proper room heating and airflow

Action Taken	Status	Unit/Zone	Serving/Room Name	Maintenance Issue (28)
	Open	DOAS-1	ERW	The energy recovery wheel motor connection was unplugged
	Open	DOAS-2	Access	The door handles for this unit are rusted and need to be adjusted
	Open	DOAS-2	Cleaning	There is a significant amount of dirt and rust build up in the compressor cabinet on the unit casing. This should be cleaned
	Open	DOAS-2	Filters	There is a bracket missing a screw on the filter rack, which should be replaced
	Open	DOAS-3	Access	The door handles for this unit are rusted and need to be adjusted
	Open	DOAS-4	Access	The door handles for this unit are rusted and need to be adjusted
	Open	DOAS-4	Drain Pan	Sections of the drain pan are showing rust so this should be cleaned
	Open	Multi-Purpose Room	Water Damage	The Gymnasium/Multi-purpose room roof is leaking and in need of repair
	Open	Roof	Replacement	Much of the roof is generally in poor shape. The district should consider repairing or replacing the roof at this school soon to maintain a good
	Open	RTU-2	Belts	The fan belt seemed loose even with the tensioner in place
	Open	RTU-2	Drain Pan	After the coil has been cleaned, the drain pan should also be cleaned
	Open	RTU-2	Replacement	This unit is near the end of its useful life and its replacement should be scheduled soon
	Open	RTU-3	Coils	The cooling coil fins show signs of damage and should be combed straight.
	Open	RTU-3	Dampers	The seals are falling off the blades and need to be replaced

Action Taken	Status	Unit/Zone	Serving/Room Name	Maintenance Issue (28)
	Open	RTU-3	Drain Pan	After the coil has been cleaned, the drain pan should also be cleaned
	Open	RTUs	Access	Many of the RTU panel door handles are rusty and difficult to operate. This will discourage service and maintenance. If possible, these should be repaired or replaced

Control Issue Findings

Below is a compilation of findings from our commissioning indoor space evaluation, TAB verification effort, and the air handling equipment analysis that relate to the status of the control system within the building. The priority level of these findings will vary, and correcting any of them could improve the associated unit's performance, which might have an incidental effect on the indoor air quality or ventilation in the spaces. Some control issues do affect whether or not facilities or maintenance personnel are informed of issues at systems or equipment, which can result in delays to maintenance or repairs that would otherwise have been quick to correct. These issues do not necessarily explain reasons why the ventilation findings of the associated spaces were found to be deficient but should be corrected, nonetheless.

Action Taken	Status	Unit/Zone	Serving/Room Name	Control Issue (13)
	Open	10 Office	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	11 Office	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	12 Classroom	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	13 Classroom	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	14 Classroom	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	15 Classroom	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	15A Resource	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	16 Classroom	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	17 Classroom	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	18 Classroom	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	9 Office	BAS	The control contractor ABS was not able to view this through the building automation system
	Open	RTU-1	Dampers	There is only a single damper with multiple linkage segments for this larger damper. While it

Action Taken	Status	Unit/Zone	Serving/Room Name	Control Issue (13)
				works, it does provide a single point of failure situation should anything go wrong. Duplicated actuators for backup or torque generation could be considered if the means are present
	Open	RTU-1	Devices	The outdoor air pressure sensor is broken

Information Only Findings

Below is a list of the general "information only" findings from the room take-off measurements, TAB verification effort, and the air handling equipment analysis. If a correction can be made to these items, it will not affect improving the indoor air quality or ventilation for occupied spaces. Some of these items might actually speak to *reducing* outside airflow, particularly if a space is significantly overventilated or has inconsistent/large swings in occupancy, in which case their status has been indicated as "Energy Savings."

Action Taken	Status	Unit/Zone	Serving/Room Name	Information Only Findings (19)
	Open	1B Storage	Airflow	No Ventilation or exhaust is provided for this space
	Open	21A Elec	Airflow	No Ventilation or exhaust is provided for this space
	Open	27B Storage	Airflow	Only exhaust is provided for this space
	Open	28A Boys	Airflow	Only exhaust is provided for this space
	Open	28B Girls	Airflow	Only exhaust is provided for this space
	Open	37A Storage	Airflow	No Ventilation or exhaust is provided for this space
	Open	8B Storage	Airflow	No Ventilation or exhaust is provided for this space
	Open	CC12 Storage	Airflow	No Ventilation or exhaust is provided for this space
	Open	CC15 Boiler Room	Airflow	No Ventilation or exhaust is provided for this space
	Open	CC17 Storage	Airflow	Only exhaust is provided for this space
	Open	CC19A Toilet	Airflow	Only exhaust is provided for this space
	Open	CC27 Dry Storage	Airflow	Only return air is provided for this space

Action Taken	Status	Unit/Zone	Serving/Room Name	Information Only Findings (19)
	Open	CC30 Storage	Airflow	No Ventilation or exhaust is provided for this space
	Open	CC30 Storage	Storage	This room is filled with supplies/materials and entry could not be gained
	Info Only	CC32 Platform	Shared Space	Not separate from gym: see gym readings
	Open	DOAS-4	Access	There is not much clearance for maintenance procedures within this unit
	Open	ERV-1	Temperature	This unit has no supplemental cooling or heating. This is fine if the temperature differential can be maintained but could pose an issue during extreme weather if ventilation rates need to be maintained
	Open	IDF1	Airflow	No Ventilation or exhaust is provided for this space
	Open	RTU-3	Access	The gas piping interferes with the operation of the nearby unit door

APPENDIX 2 – Ventilation Data Calculations

Project Name:	Fairfield Public Schools RCx & TAB Study
Project Number:	2020102.00.14
Scope	Ventilation Calculation by Building
Date	October 7, 2022

Riverfield Elementary School

VANZELM ENGINEERS

Zone Identification													IMC 2015 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	Excess Ventilation Air (negative indicates deficit)	Excess Ventilation Air Percentage	PASS/FAIL	Ventilation ACH
					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)	(cfm)	(%)		(AC/hr)
1	1	Main Office	Offices	Reception Areas	57	100%	100%	DOA-1	520	8.2	4264	3	5.0	0.06	30	46	**57**	11	23.4%	**Meets**	**0.802**
1	1A	Principal	Offices	Office spaces	44	100%	100%	DOA-1	206	8.2	1689	5	5.0	0.06	5	37	**44**	7	17.8%	**Meets**	**1.563**
1	1A.1	Principal Storage	None	None	-69	---	---	---	13	8.2	107	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	1B	Storage	None	None	---	---	---	---	66	8	531	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	1C	Toilet	Public Spaces	Toilet rooms - public	-80	---	---	---	61	8.2	500	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	1D	Office	Offices	Office spaces	-62	---	---	---	105	7.9	830	2	5.0	0.06	5	16	**0**	-16	-100.0%	**Fails**	**0.000**
1	1E	Health Suite	Hospitals nursing and convalescent homes	Patient rooms	---	---	---	---	347	8	2776	4	25.0	0.00	10	100	**0**	-100	-100.0%	**Fails**	**0.000**
1	1G	Toilet	Public Spaces	Toilet rooms - public	-80	---	---	---	78	7.9	616	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	1F	Nurse	Hospitals nursing and convalescent homes	Patient rooms	31	100%	100%	DOA-1	115	8.2	943	2	25.0	0.00	10	50	**31**	-19	-38.0%	**Fails**	**1.972**
1	1H	OT/PT	Hospitals nursing and convalescent homes	Physical Therapy	150	100%	100%	DOA-1	374	8	2992	10	15.0	0.00	20	150	**150**	0	0.0%	**Meets**	**3.008**
1	CC10	Storage	None	None	-44	---	---	---	103	7.3	752	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	CC13	All Purpose Room	Education	Multiuse assembly	7558	7%	50% based on CO2	RTU-1	2596	17.6	45690	250	7.5	0.06	100	2031	**491**	-1540	-75.8%	**Fails**	**0.645**
1	CC12	Storage	None	None	---	---	---	---	38	7.3	277	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	2	Classroom	Education	Classroom (ages 5-8)	442	100%	100%	DOA-1	787	8	6296	20	10.0	0.12	25	294	**442**	148	50.1%	**Meets**	**4.212**
1	3	Classroom	Education	Classroom (ages 5-8)	346	100%	100%	DOA-1	783	8	6264	20	10.0	0.12	25	294	**346**	52	17.7%	**Meets**	**3.314**
1	CC5	MDF-155	None	None	95	100%	100%	ERV-1	92	8	736	1	0.0	0.00	0	0	**95**	95	0.0%	N/A	**7.745**
1	4	Classroom	Education	Classroom (ages 5-8)	397	100%	100%	DOA-1	786	8	6288	20	10.0	0.12	25	294	**397**	103	34.9%	**Meets**	**3.788**
1	CC1	Media Center/Computer Lab	Education	Media Center	4919	3%	100%	RTU-2	2915	11	32065	60	10.0	0.12	25	950	**127**	-823	-86.6%	**Fails**	**0.238**
1	CC2	Faculty Dining	Food and beverage service	Dining Rooms	60	100%	100%	ERV-1	546	7.6	4150	8	7.5	0.18	70	158	**60**	-98	-62.1%	**Fails**	**0.868**
1	CC3	Resource	Workrooms	Copy, printing rooms	0	---	---	---	197	7.6	1497	4	5.0	0.06	4	32	**0**	-32	-100.0%	**Fails**	**0.000**
1	CC4	Work Room	Workrooms	Copy, printing rooms	0	---	---	---	185	7.4	1369	2	5.0	0.06	4	21	**0**	-21	-100.0%	**Fails**	**0.000**
1	5	Classroom	Education	Classroom (ages 5-8)	377	100%	100%	DOA-1	769	8	6152	20	10.0	0.12	25	292	**377**	85	29.0%	**Meets**	**3.677**
1	6	Classroom	Education	Classroom (ages 5-8)	407	100%	100%	DOA-1	965	8	7720	12	10.0	0.12	25	236	**467**	231	98.0%	**Meets**	**3.630**
1	7	Office	Offices	Office spaces	57	100%	100%	DOA-1	108	7.6	821	1	5.0	0.06	5	11	**57**	46	396.5%	**Meets**	**4.167**
1	8	Lang Arts For 2	Education	Classroom (ages 5-8)	196	100%	100%	DOA-1	382	7.6	2903	4	10.0	0.12	25	86	**196**	110	128.3%	**Meets**	**4.051**
1	8A	Storage	None	None	-125	---	---	---	46	7.6	350	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	8B	Storage	None	None	---	---	---	m	46	7.6	350	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	

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Zone Identification													IMC 2015 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	Excess Ventilation Air (negative indicates deficit)	Excess Ventilation Air Percentage	PASS/FAIL	Ventilation ACH
					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)	(cfm)	(%)		(AC/hr)
1	9	Office	Offices	Office spaces	48	35%	15%	DOA-5	160	8.9	1424	4	5.0	0.06	5	30	**17**	-13	-42.6%	**Fails**	**0.716**
1	10	Office	Offices	Office spaces	137	35%	15%	DOA-5	157	8.9	1397	4	5.0	0.06	5	29	**48**	19	63.2%	**Meets**	**2.061**
1	11	Office	Offices	Office spaces	34	35%	15%	DOA-5	86	8	688	4	5.0	0.06	5	25	**12**	-13	-52.3%	**Fails**	**1.047**
1	11A	Cust	Storage	Warehouses	---	---	---	---	61	8	488	0	0.0	0.06	0	4	---	N/A		N/A	
1	12	Classroom	Education	Classroom (ages 5-8)	173	35%	15%	DOA-5	749	11	8239	26	10.0	0.12	25	350	**61**	-289	-82.6%	**Fails**	**0.444**
1	13	Classroom	Education	Classroom (ages 5-8)	182	35%	15%	DOA-5	749	11	8239	27	10.0	0.12	25	360	**64**	-296	-82.2%	**Fails**	**0.466**
1	14	Classroom	Education	Classroom (ages 5-8)	1030	35%	15%	DOA-5	749	11	8239	28	10.0	0.12	25	370	**361**	-9	-2.4%	**Fails**	**2.629**
1	15	Classroom	Education	Classroom (ages 5-8)	225	35%	15%	DOA-5	749	11	8239	29	10.0	0.12	25	380	**79**	-301	-79.2%	**Fails**	**0.575**
1	15A	Resource	Offices	Office spaces	61	35%	15%	DOA-5	442	7.9	3492	9	5.0	0.06	5	72	**21**	-51	-70.6%	**Fails**	**0.361**
1	16	Classroom	Education	Classroom (ages 5-8)	203	35%	15%	DOA-5	749	11	8239	29	10.0	0.12	25	380	**71**	-309	-81.3%	**Fails**	**0.517**
1	17	Classroom	Education	Classroom (ages 5-8)	155	35%	15%	DOA-5	749	11	8239	29	10.0	0.12	25	380	**54**	-326	-85.8%	**Fails**	**0.393**
1	18	Classroom	Education	Classroom (ages 5-8)	247	35%	15%	DOA-5	749	11	8239	29	10.0	0.12	25	380	**87**	-293	-77.1%	**Fails**	**0.634**
1	18A	Women	Public Spaces	Toilet rooms - public	---	----	---	---	44	7.9	348	1	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	18B	Girls	Public Spaces	Toilet rooms - public	0	----	---	EF-1	150	7.9	1185	3	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	18C	Boys	Public Spaces	Toilet rooms - public	0	----	---	EF-1	115	7.9	909	3	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	18D	Men	Public Spaces	Toilet rooms - public	0	----	---	EF-1	62	7.9	490	1	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	19	Classroom	Education	Classroom (ages 5-8)	203	100%	100%	DOA-2	890	8	7120	20	10.0	0.12	25	307	**203**	-104	-33.8%	**Fails**	**1.711**
1	19B	Toilet	Public Spaces	Toilet rooms - public	-91	---	---	---	94	8	752	1	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	19A	IDF1	None	None	---	---	---	AC	80	7.9	632	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	20	Classroom	Education	Classroom (ages 5-8)	330	100%	100%	DOA-2	910	8	7280	20	10.0	0.12	25	309	**330**	21	6.7%	**Meets**	**2.720**
1	37	Storage	None	None	56	100%	100%	DOA-2	296	8.1	2398	10	0.0	0.00	0	0	**56**	56	0.0%	N/A	**1.401**
1	37A	Storage	None	None	---	---	---	---	17	8.1	138	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	21	Math/Sci	Education	Classroom (ages 5-8)	92	100%	100%	DOA-2	181	8.1	1466	5	10.0	0.12	25	72	**92**	20	28.3%	**Meets**	**3.765**
1	21A	Elec	None	None	---	---	---	---	10	8.1	81	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	22	Classroom	Education	Classroom (ages 5-8)	731	100%	100%	DOA-2	844	8	6752	25	10.0	0.12	25	351	**317**	-34	-9.8%	**Fails**	**2.817**
1	22A	Toilet	Public Spaces	Toilet rooms - public	-99	---	---	---	48	8	384	1	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	23	Classroom	Education	Classroom (ages 5-8)	305	100%	100%	DOA-2	849	8	6792	25	10.0	0.12	25	352	**305**	-47	-13.3%	**Fails**	**2.694**

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Zone Identification													IMC 2015 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	Excess Ventilation Air (negative indicates deficit)	Excess Ventilation Air Percentage	PASS/FAIL	Ventilation ACH
					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)	(cfm)	(%)		(AC/hr)
1	24	Classroom	Education	Classroom (ages 5-8)	282	100%	100%	DOA-2	836	8	6688	25	10.0	0.12	25	350	**282**	-68	-19.5%	**Fails**	**2.530**
1	CC9	Storage	None	None	-72	---	---	---	75	7.2	540	0	0.0	0.00	0	0	**---**	N/A	0.0%	**N/A**	
1	CC8	Girls	Public Spaces	Toilet rooms - public	212	100%	100%	ERV-1	250	8	2000	3	0.0	0.00	0	0	**212**	212	0.0%	**N/A**	**6.360**
1	CC7	Boys	Public Spaces	Toilet rooms - public	222	100%	100%	ERV-1	250	8	2000	3	0.0	0.00	0	0	**222**	222	0.0%	**N/A**	**6.660**
1	CC6	Cust	Storage	Warehouses	-272	---	---	---	58	8	464	0	0.0	0.06	0	3	**---**	N/A		**N/A**	
1	25	Classroom	Education	Classroom (ages 5-8)	286	100%	100%	DOA-2	780	8	6240	25	10.0	0.12	25	344	**286**	-58	-16.8%	**Fails**	**2.750**
1	26	Classroom	Education	Classroom (ages 5-8)	282	100%	100%	DOA-2	786	8	6288	25	10.0	0.12	25	344	**282**	-62	-18.1%	**Fails**	**2.691**
1	27	Classroom	Education	Classroom (ages 5-8)	439	100%	100%	DOA-2	775	8	6200	25	10.0	0.12	25	343	**439**	96	28.0%	**Meets**	**4.248**
1	27A	Kiln	Storage	Warehouses	135	100%	100%	DOA-2	100	8	800	1	0.0	0.06	0	6	**135**	129	2150.0%	**Meets**	**10.125**
1	27B	Storage	None	None	-90	100%	100%	DOA-2	138	8.9	1228	1	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	28	Speech	Education	Classroom (ages 5-8)	44	100%	100%	DOA-2	128	7.9	1011	4	10.0	0.12	25	55	**44**	-11	-20.5%	**Fails**	**2.611**
1	28A	Boys	Public Spaces	Toilet rooms - public	-257	100%	100%	DOA-4	169	8	1352	3	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	28B	Girls	Public Spaces	Toilet rooms - public	-271	100%	100%	DOA-4	166	7.9	1311	3	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	29	Classroom	Education	Classroom (ages 5-8)	310	100%	100%	DOA-4	922	8.9	8206	20	10.0	0.12	25	310	**310**	0	0.0%	**Meets**	**2.267**
1	30	Classroom	Education	Classroom (ages 5-8)	321	100%	100%	DOA-4	715	8.9	6364	20	10.0	0.12	25	286	**321**	35	12.3%	**Meets**	**3.027**
1	31	Classroom	Education	Classroom (ages 5-8)	319	100%	100%	DOA-4	729	8.9	6488	18	10.0	0.12	25	267	**319**	52	19.3%	**Meets**	**2.950**
1	32	Classroom	Education	Classroom (ages 5-8)	335	100%	100%	DOA-4	740	8.9	6586	28	10.0	0.12	25	369	**335**	-34	-9.2%	**Fails**	**3.052**
1	33	Classroom	Education	Classroom (ages 5-8)	378	100%	100%	DOA-4	740	8.9	6586	25	10.0	0.12	25	339	**378**	39	11.6%	**Meets**	**3.444**
1	34	Classroom	Education	Classroom (ages 5-8)	375	100%	100%	DOA-4	742	8.9	6604	30	10.0	0.12	25	389	**375**	-14	-3.6%	**Fails**	**3.407**
1	35	Resource	Workrooms	Copy, printing rooms	190	100%	100%	DOA-4	318	8.9	2830	12	5.0	0.06	4	79	**190**	111	140.3%	**Meets**	**4.028**
1	35A	IDF1	None	None	---	---	---	AC	66	9	594	0	0.0	0.00	0	0	**---**	N/A	0.0%	**N/A**	
1	36	Classroom	Education	Classroom (ages 5-8)	243	100%	100%	DOA-4	847	8	6776	20	10.0	0.12	25	302	**243**	-59	-19.4%	**Fails**	**2.152**
1	29A	Resources	Workrooms	Copy, printing rooms	133	100%	100%	DOA-4	339	9	3051	6	5.0	0.06	4	50	**133**	83	164.2%	**Meets**	**2.616**
1	29B	Toilet	Public Spaces	Toilet rooms - public	-89	---	---	---	50	8	400	1	0.0	0.00	0	0	**---**	N/A	0.0%	**N/A**	
1	36A	Toilet	Public Spaces	Toilet rooms - public	-77	---	---	---	51	8.1	413	1	0.0	0.00	0	0	**---**	N/A	0.0%	**N/A**	
1	CC32	Platform	Theaters	Stages, studios	---	---	---	---	927	22	20394	20	10.0	0.06	70	256	**---**	N/A		**N/A**	
1	CC31	Gymnasium	Sports and amusement	Gym, stadium, arena (play area)	15055	6.5%	50% based on CO2	RTU-1	3675	23	84525	6	0.0	0.30	0	1358	**979**	-379	-27.9%	**Fails**	**0.695**

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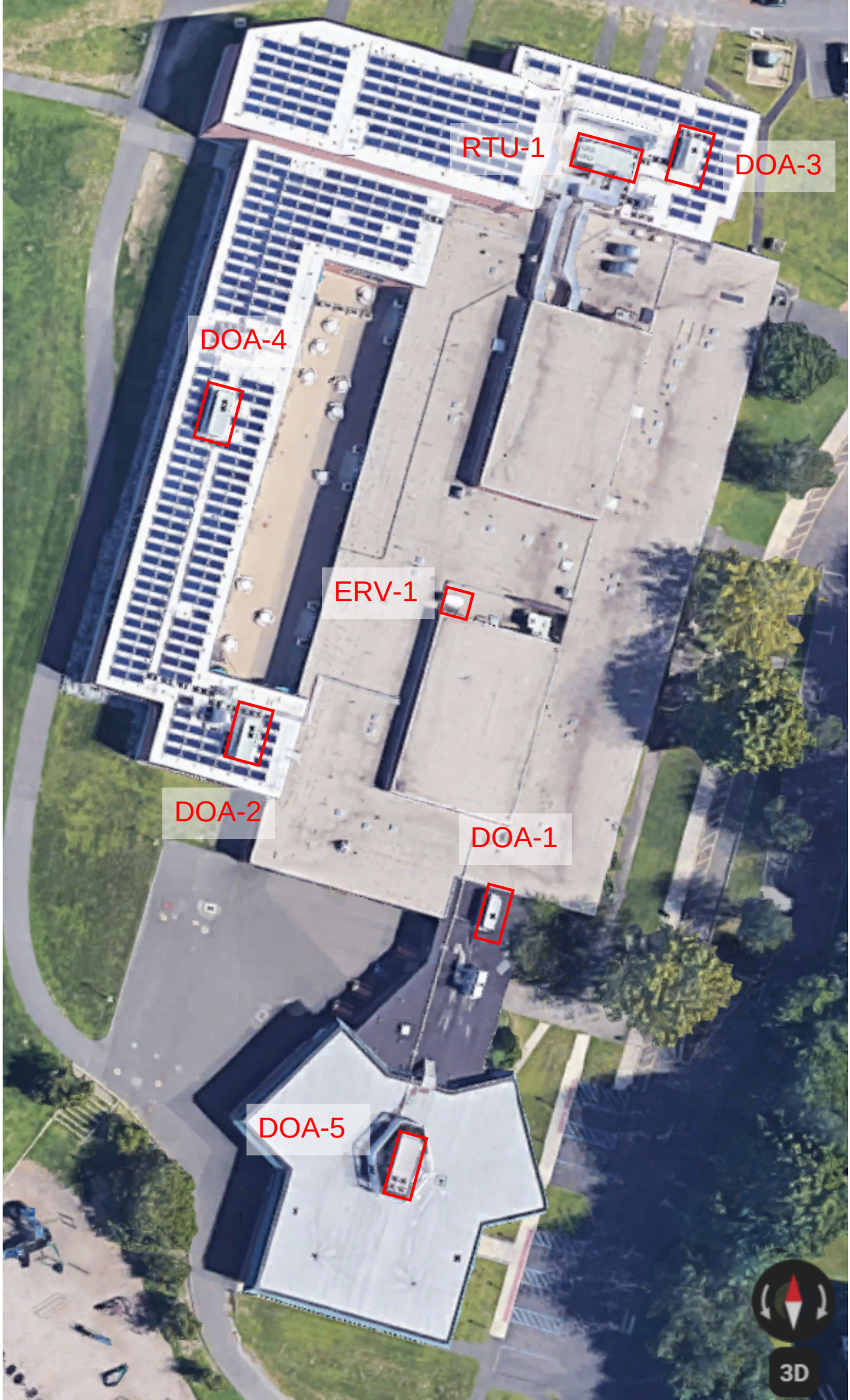
					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)	(cfm)	(%)		(AC/hr)
1	CC30	Storage	None	None	---	---	---	---	210	22	4620	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	CC29	Gym Office/Storage	Offices	Office spaces	170	100%	100%	DOA-3	288	9	2592	2	5.0	0.06	5	27	**170**	143	523.2%	**Meets**	**3.935**
1	CC29A	Toilet	Public Spaces	Toilet rooms - public	-96	---	---	---	51	8	408	1	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	CC26	Elec	None	None	70	100%	100%	DOA-3	236	13.8	3257	0	0.0	0.00	0	0	**70**	70	0.0%	N/A	**1.290**
1	CC25	Laundry	None	None	43	100%	100%	DOA-3	122	8.9	1086	0	0.0	0.00	0	0	**43**	43	0.0%	N/A	**2.376**
1	CC13	Kitchen	Food and beverage service	Kitchens (cooking)	1976	65%	50% based on CO2	RTU-1	871	8.3	7229	5	0.0	0.00	0	0	**128**	128	0.0%	N/A	**1.062**
1	CC27	Dry Storage	None	None	-71	65%	50%	RTU-1	165	8.3	1370	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	CC13A	REFR	None	None	---	---	---	---	143	7	1001	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	CC13B	FRZR	None	None	---	---	---	---	162	7	1134	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	CC21	Storage	None	None	73	100%	100%	DOA-3	255	8.9	2270	0	0.0	0.00	0	0	**73**	73	0.0%	N/A	**1.930**
1	CC22	Trash	None	None	58	100%	100%	DOA-3	70	8	560	0	0.0	0.00	0	0	**58**	58	0.0%	N/A	**6.214**
1	CC23	Fire Panel	None	None	71	100%	100%	DOA-3	81	9	729	0	0.0	0.00	0	0	**71**	71	0.0%	N/A	**5.844**
1	CC24	Water Room	None	None	---	---	---	---	110	9	990	0	0.0	0.00	0	0	---	N/A	0.0%	N/A	
1	CC19	Cust	Storage	Warehouses	324	100%	100%	DOA-3	204	9	1836	1	0.0	0.06	0	12	**324**	312	2547.1%	**Meets**	**10.588**
1	CC19A	Toilet	Public Spaces	Toilet rooms - public	-136	100%	100%	DOA-3	72	8	576	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	CC18	Conference	Offices	Conference rooms	96	100%	100%	DOA-3	263	9	2367	12	5.0	0.06	50	76	**96**	20	26.7%	**Meets**	**2.433**
1	CC17	Storage	None	None	-88	100%	100%	DOA-3	40	9	360	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	CC15	Boiler Room	None	None	0	100%	100%	DOA-3	683	13.8	9425	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**

APPENDIX 3 – Roof Map


RTU-1
DOA-3
DOA-4
ERV-1
DOA-2
DOA-1
DOA-5
3D

APPENDIX 4 – TAB Airflow Survey Data

WING'S TESTING & BALANCING CO., INC.

Fairfield Public Schools

Riverfield Elementary

Ventilation Survey

* * * *

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

July 18, 2022

94 North Branford Road • Suite One • Branford, CT 06405
(203) 481-4988 • Fax (203) 488-5634 • wings@wingstesting.com
SM-1 License #6803
www.wingstesting.com

WING'S TESTING & BALANCING CO., INC.

July 18, 2022

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

Re: Riverfield Elementary School HVAC / Fresh Air Ventilation Survey

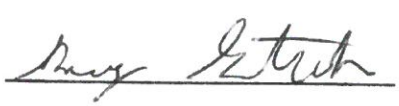
Dear Bill,

We have completed our HVAC/fresh sir ventilation survey for the above-mentioned site. The following pages reflect our findings. Through our testing we found that:

- IDF1: has no ventilation
- Storage 1B: has no ventilation
- Health Suite 1E: has no ventilation
- Storage Rooms CC10 + CC12: has no ventilation
- Resource CC3: has no ventilation
- Work Room CC4: has no ventilation
- Storage 8B: has no ventilation
- Custodial 11A: has no ventilation
- Women's Room: has no ventilation
- IDF2: has no ventilation
- Storage 37A: has no ventilation
- Elec 21A: has no ventilation
- Storage CC30: has no ventilation
- Refrigerator + Freezer Rooms: have no ventilation

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

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

VELOCITY PRESSURE READINGS

PROJECT:	Riverfield Elementary School					**DATE:**	07/13/2022	
AREA SERVED:	1st Floor					**TECH:**	MS, BS	
TRAVERSE LOCATIONS	**DUCT SIZE "**	**AREA SQ.FT.**	**DESIGN**		**CENT. STAT. PRESS."**	**TEST**		**NOTES**
			FPM	**CFM**		**FPM**	**CFM**	
Multipurpose Rm								
Branch #1	22"Ø	2.64	---	---	---	1380	3643	
Branch #2	22"Ø	2.64	---	---	---	1483	3915	
				8400		Total	7558	(2)
CC-2								
Faculty Dining	6"Ø	0.2	---	---	---	301	60	
RTU-1								
Total	78" x 66"	37.75	---	15,000	w/Velgrid	599	22,613	(2,3)
Min OA	67" x 36"	16.75	---	3750	w/Velgrid	88	1474	
RTU-2								
Toral								
Min OA	33" x 12"	2.75	---	N/D	w/Velgrid	46	127	(1)
DOA-1								
Total	39 1/2 "x 16"	4.4	---	2390	w/Velgrid	277	1219	(2)
DOA2								
Total	66" x 28"	12.83	---	3450	w/Velgrid	135	1732	(2)
DOA3								
Total	39 1/2" x 16"	4.4	---	1160	w/Velgrid	280	1232	(2)
DOA-4								
Total	66" x 28"	12.83	---	3440	w/Velgrid	231	2964	(2)
DOA-5								
Min OA	130 1/2" x 24	21.75	---	N/D	w/Velgrid	40	870	
ERV-1								
Total	35" x 18"	4.4	---	900	w/Velgrid	214	942	

REMARKS

(1) No intake screen
(2) Design taken from Balancing Report from 2016
(3) TCL - 24,300 CFM

NA Not Available | **ND** No Design | **DD** Direct Drive | **N/R** No Requirement

Project Name:	**Fairfield Public Schools RCx: Riverfield Elementary School**
Project Number:	*2020102.00.14*
Scope	**TAB Data**
Date	**July 14, 2022**

Zone Identification								
Floor	Room#	Room Name	TAB Measured (cfm)	Calc. OA CFM @ Min. (OA cfm)	Meas. unit OA % (OA cfm)	BAS Damper Command (pos. %)	Associated VAV & RTU/AHU Unit	Notes
1	1	Main Office	57	57	100%	100%	DOA-1	VRF
1	1A	Principal	44	44	100%	100%	DOA-1	VRF
1		Storage	EX 69	---	---	---	---	VRF
1	1B	Storage	---	---	---	---	---	No Ventilation or EX
1		Toilet	EX 80	---	---	---	---	
1	1D	Office	EX 62	---	---	---	---	VRF No Ventilation
1	1E	Health Suite	---	---	---	---	---	VRF No Ventilation
1		Toilet	EX 80	---	---	---	---	
1	1F	Nurse	31	31	100%	100%	DOA-1	
1	1H	OT/PT	150	150	100%	100%	DOA-1	VRF
1		Storage	Ex 44	---	---	---	---	
1	CC13	All Purpose Room	7558	491	6.50%	50% based on CO2	RTU-1	OA damper open 8% not tracking
1	CC10	Storage	---	---	---	---	---	No Ventilation or EX
1	CC12	Storage	---	---	---	---	---	No Ventilation or EX
1	2	Classroom	442	442	100%	100%	DOA-1	VRF - 2 Units
1	3	Classroom	346	346	100%	100%	DOA-1	VRF - 2 Units
1	CC5	MDF	95	95	100%	100%	ERV-1	VRF
1	4	Classroom	397	397	100%	100%	DOA-1	VRF - 2 Units
1	CC1	Media Center/Computer Lab	4919	127	2.50%	100%	RTU-2	OA Damper Disconnected
1	CC2	Faculty Dining	60	60	100%	100%	ERV-1	VRF
1	CC3	Resource	0	---	---	---	---	VRF No Ventilation
1	CC4	Work Room	0	---	---	---	---	VRF No Ventilation
1	5	Classroom	377	377	100%	100%	DOA-1	VRF - 2 Units
1	6	Classroom	407	467	100%	100%	DOA-1	VRF - 2Units
1	7	Office	57	57	100%	100%	DOA-1	VRF
1	8	Lang Arts For 2	196	196	100%	100%	DOA-1	VRF

Project Name:	**Fairfield Public Schools RCx: Riverfield Elementary School**
Project Number:	*2020102.00.14*
Scope	**TAB Data**
Date	**July 14, 2022**

Zone Identification								
Floor	Room#	Room Name	TAB Measured (cfm)	Calc. OA CFM @ Min. (OA cfm)	Meas. unit OA % (OA cfm)	BAS Damper Command (pos. %)	Associated VAV & RTU/AHU Unit	Notes
1	8A	Storage	EX 125	---	---	---	---	---
1	8B	Storage	---	---	---	---	m	No Ventilation or EX
1	9	Office	48	17	35%	15%	DOA-5	ABS not seeing unit on the system
							Total 2495	

Project Name:	**Fairfield Public Schools RCx: Riverfield Elementary School**
Project Number:	*2020102.00.14*
Scope	**TAB Data**
Date	**July 14, 2022**

Zone Identification								
Floor	Room#	Room Name	TAB Measured (cfm)	Calc. OA CFM @ Min. (OA cfm)	Meas. unit OA % (OA cfm)	BAS Damper Command (pos. %)	Associated VAV & RTU/AHU Unit	Notes
1	10	Office	137	48	35%	15%	DOA-5	ABS not seeing one on the system
1	11	Office	34	12	35%	15%	DOA-5	ABS not seeing one on the system
1	11a	Custodian	---	---	---	---	---	No ventilation or EX
1	12	Classroom	173	61	35%	15%	DOA-5	ABS not seeing one on the system
1	13	Classroom	182	64	35%	15%	DOA-5	ABS not seeing one on the system
1	14	Classroom	1030	361	35%	15%	DOA-5	ABS not seeing one on the system
1	15	Classroom	225	79	35%	15%	DOA-5	ABS not seeing one on the system
1	15A	Resource	61	21	35%	15%	DOA-5	ABS not seeing one on the system
1	16	Classroom	203	71	35%	15%	DOA-5	ABS not seeing one on the system
1	17	Classroom	155	54	35%	15%	DOA-5	ABS not seeing one on the system
1	18	Classroom	247	87	35%	15%	DOA-5	ABS not seeing one on the system
1		Women	---	---	---	---	---	Transfer grill only
1		Girls	EX 0	---	---	---	EF-1	Fan not running - bad motor
1		Boys	EX 0	---	---	---	EF-1	Fan not running - bad motor
1		Men	EX 0	---	---	---	EF-1	Fan not running - bad motor
1	19	Classroom	203 EX 343	203	100%	100%	DOA-2	VRF
1		Toilet	EX 91	---	---	---	---	
1	19A	IDF1	---	---	---	---	AC	Wall split unit
1	20	Classroom	330 EX 363	330	100%	100%	DOA-2	VRF
1	37	Storage	56 EX 95	56	100%	100%	DOA-2	VRF
1	37A	Storage	---	---	---	---	---	No ventilation or EX
1	21	Math/Sci	92 EX 101	92	100%	100%	DOA-2	VRf
1	21A	Elec	---	---	---	---	---	No ventilation or EX
1	22	Classroom	414 + 317	317	100%	100%	DOA-2	
1		Toilet	EX 99	---	---	---	---	
1	23	Classroom	-393 + 305	305	100%	100%	DOA-2	

Project Name:	**Fairfield Public Schools RCx: Riverfield Elementary School**
Project Number:	*2020102.00.14*
Scope	**TAB Data**
Date	**July 14, 2022**

Zone Identification								
Floor	Room#	Room Name	TAB Measured (cfm)	Calc. OA CFM @ Min. (OA cfm)	Meas. unit OA % (OA cfm)	BAS Damper Command (pos. %)	Associated VAV & RTU/AHU Unit	Notes
1	24	Classroom	-349 + 282	282	100%	100%	DOA-2	
1	CC9	Storage	EX 72	---	---	---	---	
1		Girls	212 EX 311	212	100%	100%	ERV-1	
1		Boys	222 EX 355	222	100%	100%	ERV-1	
1	CC6	Cust	EX 272	---	---	---	---	
1	25	Classroom	-301 + 286	286	100%	100%	DOA-2	
1	26	Classroom	-349 + 282	282	100%	100%	DOA-2	
1	27	Classroom	-680 + 439	439	100%	100%	DOA-2	
1	27A	Kiln	-210 + 135	135	100%	100%	DOA-2	
1	27B	Storage	-90	0	100%	100%	DOA-2	Space only has exhaust
1	28	Speech	+44	44	100%	100%	DOA-2	Space only has exhaust
1		Boys	-257	0	100%	100%	DOA-4	Space only has exhaust
1		Girls	-271	0	100%	100%	DOA-4	Space only has exhaust
1	29	Classroom	-432 + 310	310	100%	100%	DOA-4	
1	30	Classroom	-432 + 321	321	100%	100%	DOA-4	
1	31	Classroom	-342 + 319	319	100%	100%	DOA-4	
1	32	Classroom	-318 + 335	335	100%	100%	DOA-4	
1	33	Classroom	-319 + 378	378	100%	100%	DOA-4	
1	34	Classroom	-347 + 375	375	100%	100%	DOA-4	
1	35	Resource	-154 + 190	190	100%	100%	DOA-4	
1	35A	IDF1	---	---	---	---	AC	Wall split unit
1	36	Classroom	243 EX 255	243	100%	100%	DOA-4	VRF
1	29A	Resources	133 EX 166	133	100%	100%	DOA-4	VRF
1	Staff T	Toilet	EX 89	---	---	---	---	
1		Toilet	EX 77	---	---	---	---	
1	CC32	Platform	---	---	---	---	---	Not separate from gym: see gym readings

Project Name:	**Fairfield Public Schools RCx: Riverfield Elementary School**
Project Number:	*2020102.00.14*
Scope	**TAB Data**
Date	**July 14, 2022**

Zone Identification								
Floor	Room#	Room Name	TAB Measured (cfm)	Calc. OA CFM @ Min. (OA cfm)	Meas. unit OA % (OA cfm)	BAS Damper Command (pos. %)	Associated VAV & RTU/AHU Unit	Notes
	29A	Resource	-168 + 134	134	100%	100%	DOA-4	
		Adult Restroom	-86	0	100%	100%	DOA-4	Space only has exhaust
1	CC31	Gymnasium/Platform	15055	979	6.5%	50% based on CO2	RTU-1	
1	CC30	Storage	---	---	---	---	---	No ventilation or EX
1	CC29	Gym Office/Storage	170	170	100%	100%	DOA-3	EX grill not ducted
1		Toilet	EX 96	---	---	---	---	
1	CC26	Elec	+70 Ex-145	70	100%	100%	DOA-3	
1	CC25	Laundry	43 EX 53	43	100%	100%	DOA-3	
1	CC13	Kitchen	+1976 E-2553	128	65%	50% based on CO2	RTU-1	
1	CC27	Dry Storage	EX 71	0	65%	50%	RTU-1	Space has return only
1		REFR	---	---	---	---	---	
1		FRZR	---	---	---	---	---	
1	CC21	Storage	73 EX 26	73	100%	100%	DOA-3	
1	CC22	Trash	58 x 95	58	100%	100%	DOA-3	
1	CC23	Not Labeled	71 x 60	71	100%	100%	DOA-3	1 Room
1	CC24	Not Labeled	---	---	---	---	---	See above
1	CC19	Cust	324 EX 221	324	100%	100%	DOA-3	
1		Toilet	EX 136	0	100%	100%	DOA-3	Space has exhaust only
1	CC18	Conference	96 EX 95	96	100%	100%	DOA-3	
1	CC17	Storage	EX 88	0	100%	100%	DOA-3	Space has exhaust only
1	CC15	Boiler Room	0	0	100%	100%	DOA-3	Space has no active ventilation

APPENDIX 5 – RCx Unit and Room Take-Off Data

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.00.14*
Scope	**Room Take-Off Data**
Date	**April 26, 2022**
	Riverfield Elementary School

RCM, RA, JRK

M.D.=Mechanical documents
Some classroom students are estimated

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Deficiencies	Pictures Y /N
1	1	Main Office	520	8.2	4264	3	4- Supplies, 1-Return, Convector		
1	1A	Principal	206	8.2	1689.2	5	2- Supplies, 1-Return, Convector		
1	1A.1	Principal Storage	13	8.2	106.6	0			
1	1B	Storage	66.4	8	531.2	0	1-Exhaust	Time-Out	
1	1C	Toilet	61	8.2	500.2	1	1-Exhaust		
1	1D	Office	105	7.9	829.5	2	1-Supply, 2-Exhaust/Return		
1	1E	Health Suite	347	8	2776	4	1-Supply, 2-Exhaust/Return, Convector		
1	1G	Toilet	78	7.9	616.2	1	1-Exhaust		
1	1F	Nurse	115	8.2	943	2	2-Supplies		
1	1H	OT/PT	374	8	2992	10	3- Supplies, 1-Return, 1-Exh, Convector		
1	CC10	Storage	103	7.3	751.9	0	1-Exhaust		
1	CC13	All Purpose Room	2596	17.6	45689.6	250	Dedicated system		
1	CC12	Storage	38	7.3	277.4	0			
1	2	Classroom	787	8	6296	20	2-VRF Supplies, 1-Filtered return,2-O.A., 1- Exhaust, Convector		
1	3	Classroom	783	8	6264	20	2-VRF Supplies, 1-Filtered return,2-O.A., 1- Exhaust, Convector	Convector blocked	
1	CC5	MDF-155	92	8	736	1	DX Cooling, A/C-3, 1-Supply		
1	4	Classroom	786	8	6288	20	2-VRF Supplies, 1-Filtered return,2-O.A., 1- Exhaust, Convector	Convector blocked	
1	CC1	Media Center/Computer Lab	2915	11	32065	60		36 Tables/31 Computers	
1	CC2	Faculty Dining	546	7.6	4149.6	8	1- Supply, 1-Return, 1-Exhaust	As per MD	

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.00.14*
Scope	**Room Take-Off Data**
Date	**April 26, 2022**
	Riverfield Elementary School

RCM, RA, JRK

M.D.=Mechanical documents
Some classroom students are estimated

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Deficiencies	Pictures Y /N
1	CC3	Resource	197	7.6	1497.2	4	1- Supply, 1-Return		
1	CC4	Work Room	185	7.4	1369	2	1- Supply, 1-Return		
1	5	Classroom	769	8	6152	20	2-VRF Supplies, 1-Filtered return,2-O.A., 1- Exhaust, Convector	Conv. Blocked	
1	6	Classroom	965	8	7720	12	4-VRF Supplies, 1-Filtered return,2-O.A., 1- Exhaust, Convector	As per MD	
1	7	Office	108	7.6	820.8	1	1- Supply, 1-Return	Padded room	
1	8	Lang Arts For 2	382	7.6	2903.2	4	3-VRF Supplies, 1-Filtered return 1-O.A., 1- Exhaust, FTR	As per MD	
1	8A	Storage	46	7.6	349.6	0			
1	8B	Storage	46	7.6	349.6	0	Nothing		
1	9	Office	160	8.9	1424	4	2- Wall Grilles, FTR		
1	10	Office	157	8.9	1397.3	4	2- Wall Grilles, FTR		
1	11	Office	86	8	688	4	1- Supply, FTR		
1	11A	Cust	61	8	488	0			
1	12	Classroom	749	11	8239	26	2- Supplies, 3-Return, Convector		
1	13	Classroom	749	11	8239	27	2- Supplies, 3-Return, Convector		
1	14	Classroom	749	11	8239	28	2- Supplies, 3-Return, Convector		
1	15	Classroom	749	11	8239	29	2- Supplies, 3-Return, Convector		
1	15A	Resource	442	7.9	3491.8	9	1- Supplies, 1-Return,		
1	16	Classroom	749	11	8239	29	2- Supplies, 3-Return, Convector		
1	17	Classroom	749	11	8239	29	2- Supplies, 3-Return, Convector	Noisy Grilles	

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.00.14*
Scope	**Room Take-Off Data**
Date	**April 26, 2022**
	Riverfield Elementary School

RCM, RA, JRK

M.D.=Mechanical documents
Some classroom students are estimated

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Deficiencies	Pictures Y /N
1	18	Classroom	749	11	8239	29	2- Supplies, 3-Return, Convector		
1	18A	Women	44	7.9	347.6	1			
1	18B	Girls	150	7.9	1185	3			
1	18C	Boys	115	7.9	908.5	3			
1	18D	Men	62	7.9	489.8	1			
1	19	Classroom	890	8	7120	20	4-VRF Supplies, 2-Filtered return, 2-O.A., 1- Exhaust, Convector	Conv. Blocked, Per M.D.	
1	19B	Toilet	94	8	752	1	Exhaust	No heat	
1	19A	IDF1	80	7.9	632	0	LG Split DX		
1	20	Classroom	910	8	7280	20	4-VRF Supplies, 2-Filtered return, 2-O.A., 1- Exhaust,	Per M.D.	
1	37	Storage	296	8.1	2397.6	10	1-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust,	Resource Room Per M.D.	
1	37A	Storage	17	8.1	137.7	0			
1	21	Math/Sci	181	8.1	1466.1	5	1-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust,	Per M.D.	
1	21A	Elec	10	8.1	81	0			
1	22	Classroom	844	8	6752	25	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Convector	Conv. Blocked, Per M.D.	
1	22A	Toilet	48	8	384	1	Exhaust	Off classroom 22	
1	23	Classroom	849	8	6792	25	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Convector	Conv. Blocked, Per M.D.	
1	24	Classroom	836	8	6688	25	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Convector	Conv. Blocked, Per M.D.	
1	CC9	Storage	75	7.2	540	0			

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.00.14*
Scope	**Room Take-Off Data**
Date	**April 26, 2022**
	Riverfield Elementary School

RCM, RA, JRK

M.D.=Mechanical documents
Some classroom students are estimated

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Deficiencies	Pictures Y /N
1	CC8	Girls	250	8	2000	3			
1	CC7	Boys	250	8	2000	3			
1	CC6	Cust	58	8	464	0			
1	25	Classroom	780	8	6240	25	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Convector	Conv. Blocked, Per M.D.	
1	26	Classroom	786	8	6288	25	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Convector	Conv. Blocked, Per M.D.	
1	27	Classroom	775	8	6200	25	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Convector	Conv. Blocked, Per M.D.	
1	27A	Kiln	100	8	800	1	1- Supply, Kiln Exhaust, FTR		
1	27B	Storage	138	8.9	1228.2	1	1- Exhaust, Radiant panel		
1	28	Speech	128	7.9	1011.2	4	1-VRF Supplies, 1-Filtered return, 1-O.A., Radiant Panel		
1	28A	Boys	169	8	1352	3	1-Exhaust, 1-Transfer	Per M.D.	
1	28B	Girls	166	7.9	1311.4	3	1-Exhaust, 1-Transfer	Per M.D.	
1	29	Classroom	922	8.9	8205.8	20	2-VRF Supplies, 1-Filtered return, 2-O.A., 1- Exhaust, Radiant Panel	Per M.D.	
1	30	Classroom	715	8.9	6363.5	20	2-VRF Supplies, 1-Filtered return, 2-O.A., 1- Exhaust, Radiant Panel	Per M.D.	
1	31	Classroom	729	8.9	6488.1	18	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Radiant Panel	Per M.D.	
1	32	Classroom	740	8.9	6586	28	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Radiant Panel	Per M.D.	
1	33	Classroom	740	8.9	6586	25	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Radiant Panel	Per M.D.	
1	34	Classroom	742	8.9	6603.8	30	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Radiant Panel	Per M.D.	

Project Name:	**Fairfield Public Schools RCx**
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RCM, RA, JRK

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Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Deficiencies	Pictures Y /N
1	35	Resource	318	8.9	2830.2	12	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Radiant Panel	Per M.D.	
1	35A	IDF1	66	9	594	0			
1	36	Classroom	847	8	6776	20	4-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Radiant Panel	Per M.D.	
1	29A	Resources	339	9	3051	6	2-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Radiant Panel	Per M.D. Psychiatrist	
1	29B	Toilet	50	8	400	1	1-Exhaust		
1	36A	Toilet	51	8.1	413.1	1	1-Exhaust	Off classroom 36	
1	CC32	Platform	927	22	20394	20	2-Supply Roto jets	From Gym RTU	
1	CC31	Gymnasium	3675	23	84525	6	10-Supply Roto jets, 4 large wall returns	Gym RTU	
1	CC30	Storage	210	22	4620	0		packed with stuff, no entry	
1	CC29	Gym Office/Storage	288	9	2592	2	1-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Conv High on wall	Per M.D.	
1	CC29A	Toilet	51	8	408	1			
1	CC26	Elec	236	13.8	3256.8	0	1-Supply, 1-return		
1	CC25	Laundry	122	8.9	1085.8	0	1-Supply, 1-return	Washer/Dryer	
1	CC13	Kitchen	871	8.3	7229.3	5	6- Supplies, 1-Hood exhaust (KEF-1)		
1	CC27	Dry Storage	165	8.3	1369.5	0	Nothing		
1	CC13A	REFR	143	7	1001	0			
1	CC13B	FRZR	162	7	1134	0			
1	CC21	Storage	255	8.9	2269.5	0	1- Return		
1	CC22	Trash	70	8	560	0			

Project Name:	**Fairfield Public Schools RCx**
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RCM, RA, JRK

M.D.=Mechanical documents
Some classroom students are estimated

Zone Identification

Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Deficiencies	Pictures Y /N
1	CC23	Fire Panel	81	9	729	0			
1	CC24	Water Room	110	9	990	0			
1	CC19	Cust	204	9	1836	2	1-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Conv High on wall	Per M.D.	
1	CC19A	Toilet	72	8	576	1	1- Exhaust, part of Cust		
1	CC18	Conference	263	9	2367	12	1-VRF Supplies, 1-Filtered return, 1-O.A., 1- Exhaust, Convector	Per M.D.	
1	CC17	Storage	40	9	360	0			
1	CC15	Boiler Room	683	13.8	9425.4	0			

PROJECT: 2020102.14 FAIRFIELD PUBLIC SCHOOLS – RIVERFIELD ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Unit Tag	**DOA-1**	**Addition comments descriptions**
Location	South Roof	Unit Disconnect is off
Serving	Addition	
Config/Style	DOA with SF/EF, DX Cooling, Gas Heat, ERW	
Mfr.	Trane	
Model #	OABD096A3-D1B100BCA1C00AC6AC-C20C3A4A0	
Serial #	0A238171-1-1	
Age (years)	3/2015	
System CFM	2500	
Max OA CFM	2500	
V/Hz/Ph	208-230/60/3	
SF Qty/HP	3.04 KW ECM Direct drive	
SF VFD Data	ECM	
PE Qty/HP	3.25 KW ECM Direct drive, (Power exhaust)	
PE VFD Data	ECM	
Filter Data (Size Quantity)	(2) 20x24x2-Coil (4) 20x24x2 Wheel	
Filter Status	Clean 4/26/22	
Controls Type	Factory DDC	
Controls Mfr.	Trane	
Economizer	DOAS 100% O.A.	
CO_2 DCV		
Damper Styles	Parallel	
Damper Status	OK, performance unknown, Clean lubricate and adjust.	
Heating Type	Gas Burner	
Heating Coil Condition	OK	
Cooling Type	DX Copeland Scroll	
Cooling Coil Condition	OK	
Wheel Mfr.	Semco, wheel appears dirty	Wheel unplugged, not functional, no Heat recovery, unit disc. off, problems
Drain Pan Status	Clean	
Notes:	Unit off	

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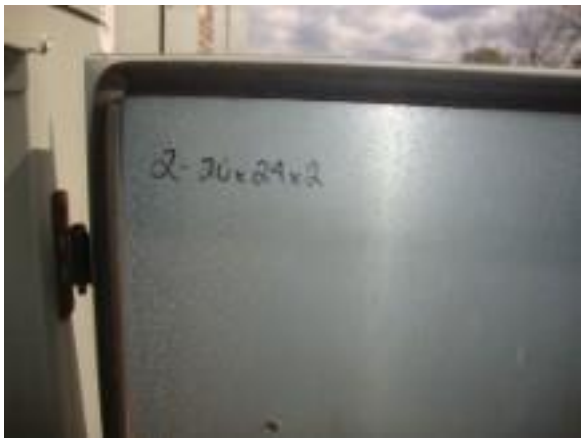
Photos



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Unit Tag	**DOA-2**	**Addition comments descriptions**
Location	Roof	System appears to operate as required
Serving	Addition	
Config/Style	DOA with SF/EF, DX Cooling, Gas Heat, ERW	
Mfr.	Trane	
Model #	OAGD120A3-C1B100BC-A1E0C6BC-C30C3A4A0	
Serial #	0A238171-2-1	
Age (years)	4/2015	
System CFM		
Max OA CFM		
V/Hz/Ph	208-230/60/3	
SF Qty/HP	3.04 KW ECM Direct drive	
SF VFD Data	ECM	
PE Qty/HP	2.8 KW ECM Direct drive, (Power exhaust)	
PE VFD Data	ECM	
Filter Data (Size Quantity)	(4) 15x25x2 (2) 16x20x2 -Coil (8) 16x25x2 (4) 16x20x2 Wheel	Bracket missing screw on filter rack
Filter Status	Clean 4/26/22	
Controls Type	Factory ELECTRONIC DDC	
Controls Mfr.	Trane	
Economizer	DOAS 100% O.A.	
CO_2 DCV		
Damper Styles	Parallel, Belimo Actuator	
Damper Status	OK, performance unknown, Clean lubricate and adjust.	
Heating Type	Gas Burner	
Heating Coil Condition	OK	
Cooling Type	Twin DX Copeland Scroll	
Cooling Coil Condition	OK	
Wheel Mfr.	Semco, Model-VCPERP-0040/238171-2-1, Ser-64872-1	
Drain Pan Status	Clean	
Notes:	Door latches are rusted and need adjustment	

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Unit Tag	**DOA-3**	**Addition comments descriptions**
Location	Roof	System not running?
Serving	Administration	
Config/Style	DOA with SF/EF, DX Cooling, Gas Heat, ERW	
Mfr.	Trane	
Model #	OABD48A3-C1B100AB-A1A00C6AB-C10C3A4A0	
Serial #	0A238171-3-1	
Age (years)	4/2015	
System CFM		
Max OA CFM		
V/Hz/Ph	208-230/60/3	
SF Qty/HP	ECM Direct drive	
SF VFD Data	ECM	
PE Qty/HP	ECM Direct drive, (Power exhaust)	
PE VFD Data	ECM	
Filter Data (Size Quantity)	(2) 20x24x2 -Coil (4) 20x24x2 Wheel	
Filter Status	Clean 4/26/22	
Controls Type	Factory ELECTRONIC DDC	
Controls Mfr.	Trane	
Economizer	DOAS 100% O.A.	
CO_2 DCV		
Damper Styles	Parallel, Belimo Actuator	
Damper Status	OK, performance unknown, Clean lubricate and adjust.	
Heating Type	Gas Burner	
Heating Coil Condition	OK	
Cooling Type	DX Copeland Scroll	
Cooling Coil Condition	OK	
Wheel Mfr.	Semco, Model-VCPERP-0040/238171-2-1, Ser-64872-1	
Drain Pan Status	Clean	
Notes:	Door latches are rusted and need adjustment	

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Unit Tag	**DOA-4**	**Addition comments descriptions**
Location	Roof	System not running?
Serving	Classrooms	
Config/Style	DOA with SF/EF, DX Cooling, Gas Heat, ERW	
Mfr.	Trane	
Model #	OAGD144A3-C1B100CC-A1E00AC6BC-C30C3A4A0	
Serial #	0A238171-4-1	
Age (years)	4/2015	
System CFM		
Max OA CFM		
V/Hz/Ph	208-230/60/3	
SF Qty/HP	ECM Direct drive	
SF VFD Data	ECM	
PE Qty/HP	3.04 KW ECM Direct drive, (Power exhaust)	
PE VFD Data	ECM	
Filter Data (Size Quantity)	(4) 16x25x2 (2) 16x20x2 -Coil (8) 16x25x2 (4) 16x20x2 Wheel	
Filter Status	Clean **Filters not changed as unit has not run!	
Controls Type	Factory ELECTRONIC DDC	
Controls Mfr.	Trane	
Economizer	DOAS 100% O.A.	
CO_2 DCV		
Damper Styles	Parallel, Belimo Actuator	
Damper Status	OK, performance unknown, Clean lubricate and adjust.	
Heating Type	Gas Burner	
Heating Coil Condition	OK	
Cooling Type	Twin DX Copeland Scroll	
Cooling Coil Condition	OK	
Wheel Mfr.	Semco, Model-VCPERP-0040/238171-2-1, Ser-64872-1	
Drain Pan Status	Clean, casing rusted	
Notes:	Door latches are rusted and need adjustment	Not much clearance for PM

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Photos






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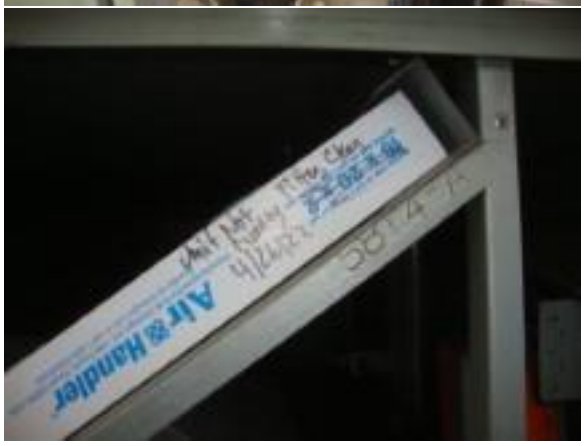

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Unit Tag	**ERV-1**	**Addition comments descriptions**
Location	Middle Roof	
Serving		
Config/Style	Crossflow ERV no additional cooling/heating	
Mfr.	RenewAire	
Model #	HE2XRT	
Serial #		
Age (years)		
System CFM	900 (1200 EA)	
Max OA CFM	900	
V/Hz/Ph	208-230/60/3	
SF Qty/HP	(1) X.X (1) A-35	
SF VFD Data	VFD ADD	
EF Qty/HP	(1) X.X (1) A-35	
EF VFD Data	VFD ADD	
Filter Data (Size Quantity)	(4) 20x20x2	
Filter Status	Clean 4-26-22	
Controls Type	Electronic DDC Modbus	
Controls Mfr.		
Economizer	100% O.A.	
CO_2 DCV		
Damper Styles	Flat Panel	
Damper Status	OK	
Heating Type	N/A	
Heating Coil Condition	N/A	
Cooling Type	N/A	
Cooling Coil Condition	N/A	
CU Mfr.	N/A	
CU Model	N/A	
CU Serial	N/A	
Drain Pan Status	N/A	
Notes:	Unit was operational.	

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Unit Tag	**RTU-1**	**Addition comments descriptions**
Location	North Roof	
Serving	Gym/Cafeteria/Kitchen-	
Config/Style	Gas-fired rooftop unit with DX cooling	
Mfr.	Trane	
Model #	YCH480BETM603MH5ABC-0000H0B00R0	
Serial #	C15B00581	
Age (years)	2/2015	
System CFM	15000	
Max OA CFM	15000	3750 min OA cfm
V/Hz/Ph	208-230/60/3	
SF Qty/HP	15.0 (2) BX-97	Belts mis-matched
SF VFD Data	VFD	
RF Qty/HP	Twin prop fans w/actuators, Power exhaust 1.5 HP	
RF VFD Data	N/A	
Filter Data (Size Quantity)	(16) 16x20x4	
Filter Status	Clean 4-26-22	
Controls Type	Electronic DDC Factory	
Controls Mfr.	Trane	
Economizer	Available with Power exhaust, not witnessed	
CO_2 DCV		
Damper Styles	Parallel, and BDD	
Damper Status	OK, clean adjust and lubricate, big damper single actuator, lots of linkage	
Heating Type	Gas	
Heating Coil Condition	Burner	
Cooling Type	DX	
Cooling Coil Condition	Twin Compressors	
CU Mfr.		
CU Model		
CU Serial		
Drain Pan Status	OK	
Notes:	Outdoor air pressure sensor broken	

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Unit Tag	**RTU-2**	**Addition comments descriptions**
Location	Roof	Unit is old and should be considered for replacement
Serving	Media Center	
Config/Style	Gas-fired rooftop unit with DX cooling-Voyager	
Mfr.	Trane	
Model #	YCH150C3H0CA	
Serial #	R331015202	
Age (years)	2000	
System CFM		
Max OA CFM		
V/Hz/Ph	208-230/60/3	
SF Qty/HP	3.0 (1) BX-62	
SF VFD Data	N/A	
RF Qty/HP	N/A	
RF VFD Data	N/A	
Filter Data (Size Quantity)	(4) 20x25x2	
Filter Status	Clean 4-26-22	
Controls Type	Electronic DDC Factory	
Controls Mfr.	Trane-Allerton	
Economizer	Available, not witnessed	
CO_2 DCV		
Damper Styles	Parallel	
Damper Status	Clean adjust and lubricate,	
Heating Type	Gas	
Heating Coil Condition	Burner	
Cooling Type	DX Twin Compressors	
Cooling Coil Condition	Very Dirty	
Drain Pan Status	Dirty	
Notes:	Old and tired	

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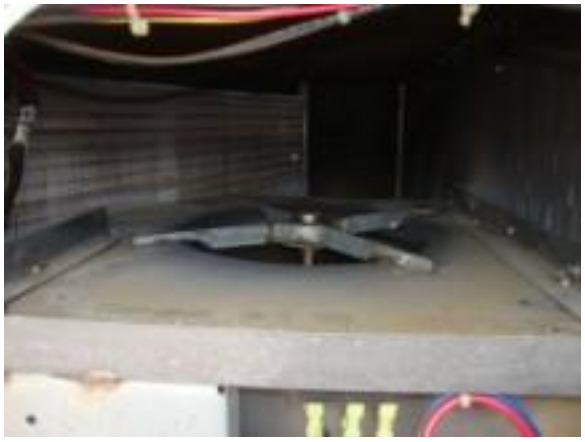
Photos



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Unit Tag	**RTU-3**	**Addition comments descriptions**
Location	Roof	
Serving	Classrooms	
Config/Style	Gas-fired rooftop unit with DX cooling-	
Mfr.	Johnson Controls (JCI)	
Model #	V33AT52C6KDVAK0002A	
Serial #	N1H4043202	
Age (years)	Unknown	
System CFM		
Max OA CFM		
V/Hz/Ph	208-230/60/3	
SF Qty/HP	15 (2) Belts, size unknown	
SF VFD Data	VFD Danfoss	
RF Qty/HP	7.5-5.0	
RF VFD Data	VFD Danfoss	
Filter Data (Size Quantity)	(6) 20x25x2 (4) 16x25x2	
Filter Status	Clean 4-26-22	
Controls Type	Electronic DDC Factory	
Controls Mfr.	JCI	
Economizer	Available, Power Exhaust fans on VFD, Danfoss	
CO_2 DCV		
Damper Styles	Parallel, seals falling off blades	
Damper Status	Clean adjust and lubricate,	
Heating Type	Gas	
Heating Coil Condition	Twin Burners	
Cooling Type	DX Four Compressors, 4-Expansion valves	
Cooling Coil Condition	Dirty needs cleaning, Condense coils dirty	
Drain Pan Status	S.S. cleans after coils	
Notes:	8-Ruskin Zone dampers with internal by-pass, appears to operate well. Fan speed tracks D.P.	FYI- Gas piping interferes with door operation

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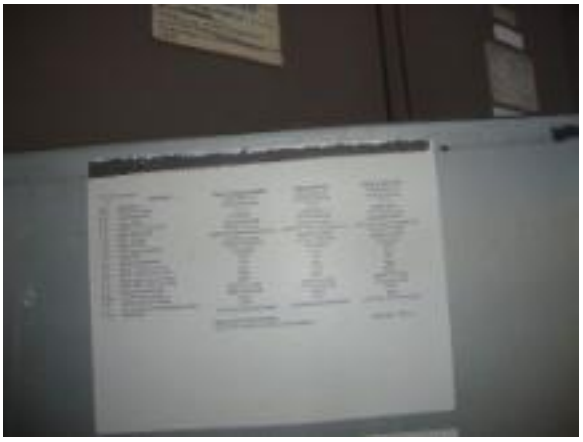

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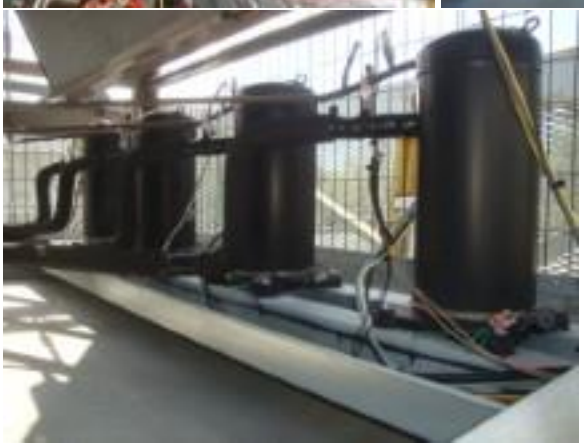

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