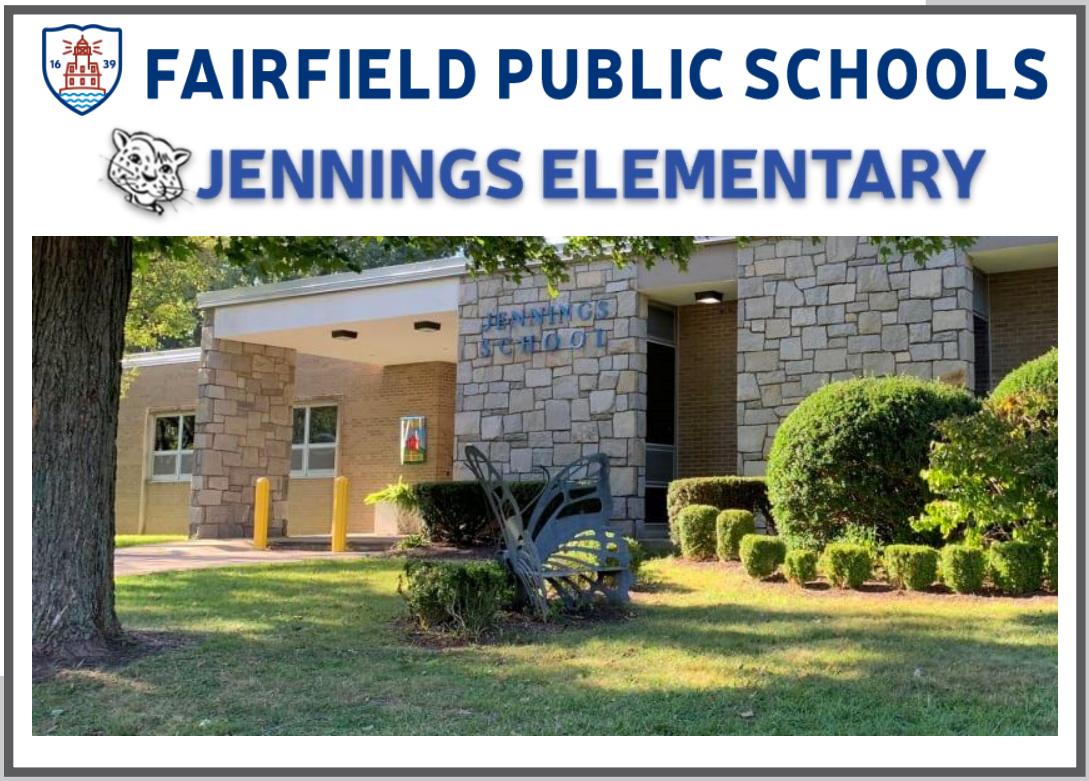
Jennings Elementary School

31 Palm Drive
Fairfield, CT 06825



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

van Zelm Project # 2020102.00 (10-JES)
October 07, 2022

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

TABLE OF CONTENTS

Jennings Elementary School

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

EXECUTIVE SUMMARY

Jennings Elementary School was deemed to be school priority number ten 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.

Jennings Elementary School is located at 31 Palm Drive Fairfield, CT and serves as an educational facility for approximately 260 students as of the May 2022 census and up to 81 faculty and staff. The school is one of the newer buildings, having been constructed in 1966-67, with little done to the building over the course of its life. Fairfield contracted engineering firms to perform an HVAC analysis and building envelope survey alongside other schools in the district, and those findings outlined a few key issues but were more concerned with performance of existing systems, with some exceptions. In these cases, the improvements were not targeted at addressing modern code compliance, also in large part to updated requirements since those studies took place.

The school ventilation systems comprises two (2) AC units for the main offices and library, two (2) heating and ventilation units for the Cafeteria and All-Purpose room, one (1) heating and ventilation makeup air unit interlocked with the kitchen exhaust hood, and one (1) modular rooftop unit for the portable classrooms. For the main building classrooms, these are served exclusively by exhaust fans, however none of these fans were operable during our investigation and, as such, the classrooms received neither direct nor indirect ventilation. Otherwise, there are exhaust fans for various purposes including, but not limited to, toilet exhaust, kitchen exhaust, mechanical/electrical space ventilation, etc. Many 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. Their use would be necessary if the current mechanical equipment arrangement remained to be used for the purposes of providing fresh outside air as a component of the building ventilation, but without the exhaust fans running it will do little to help. The Building Automation (BAS) control system contains older pneumatics, an unreliable setup in the age of DDC controls. These are tied into a JCI system with control over most of the building, but some units like the modular RTU for the portables are standalone with a local thermostat.

We performed our on-site RCx inspection starting on May 5, 2022, and TAB review starting in August 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 usually 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 very poor. Entire sections of the building, particularly classroom spaces, were not satisfied with any outside air due to the only means of ventilation, the associated exhaust fan, being inoperable. 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, much 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 is measured during a "worst-case" scenario only, and even at such, there are some areas within the building that do meet and exceed these ventilation requirements, few that they are.

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. This school *would* qualify under these IMC code alternative paths if the exhaust fans had been operational.

Since they are not, we have considered the building "as is" for the sake of this report, since we have no way of appropriately calculating the actual amount of exhaust from each of the spaces. Other schools in the district do operate with exhaust being the primary source of ventilation, but this is an outdated practice for buildings not specifically designed with natural ventilation in mind, and those control methods are more complex than turning on an exhaust fan and opening windows. Additionally, this arrangement requires the occupants to be well-informed about building operation and open or close the windows based on outside air conditions, occupancy modes, or special events. This cannot typically be relied on and complicates the matter of having an effective system.

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 12,139 CFM. The TAB process revealed that only 3,259 CFM of outside air is delivered to the spaces, resulting in a 8,880 CFM deficit or 26.8% of the required minimum flow. Additionally, the ventilation calculations reveal that only 17.8% of the occupied zones actually met the requirements (8 of 45), among the lowest of all schools. Most of these spaces like the classrooms are receiving no ventilation at all, though a small handful are due to a balancing issue. Even if the classroom exhaust fans were operating, it is not clear that they would meet the requirements for ventilation based on that arrangement. An 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 only 1.934 ACH. This is significantly below the recommended 3 ACH, and it indicates that this school could not meet ventilation goals even if all of the units were operating at maximum flow rates. With a change in equipment, there is potential for the building to increase outside air where there is too little in order to meet the code requirements, but this cannot be easily accomplished like a control sequence change could manage. 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 0.111; for spaces that at least met or exceeded code, the outside air ACH was 2.236; the combined outside air ACH for the entire building was 0.487. 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 but did get close (2.332 OACH and 5.432 Total ACH). This space was a bit shy on minimum ventilation flow as well, falling short 15% (85 cfm of 100 cfm required), so it is possible that slightly increasing total airflow to this zone would help meet the requirements. It has the benefit of being served by the main office unit AC-1, which does function rather well. 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**
1.934	0.487	0.111	2.236

Outside Air Flow Improvement Recommendations

Immediate action should be taken for classroom spaces. The exhaust fans need to be repaired to provide *some* ventilation in the occupied zones, even though this arrangement is not ideal. After repairs are complete, the district should promptly focus on designing out the exhaust system for a fully direct-ventilation air handling unit arrangement. Ideally these replacement units are ERVs, which are expanded on more below. Any adjustments to mechanical equipment should be reviewed with the assistance of a control technician and TAB Contractor to confirm proper control operation and positioning of all unit dampers. The HVAC systems should holistically be rebalanced to current design requirements. This includes a general BAS repair to get the system working properly to begin with while any upgrades are implemented so that full control over OA dampers can be regained, including control work necessary for new air handling units. Pneumatic controls should be removed or abandoned and replaced with a full DDC control system for all building sections including monitoring and control of the portables. The unit serving those currently operates 24/7, which wastes energy overnight. Existing units on the main building are in various states of repair, even if they are currently providing enough ventilation air, and might need to be replaced soon. If a unit fails, then the required ventilation naturally fails as well.

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. This should be done through direct ventilation rather than indirect, if possible.
- 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.
- Though difficult to implement, consider providing humidification to maintain 40% RH during the heating seasons and dehumidification in the summer to maintain room RH below 60%.
- 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.
- 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:

- Remove pneumatic controls and upgrade the existing system to full DDC control
- 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. 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

Where any building areas are not meeting ventilation requirements due to a lack of mechanical ventilation, undersized units or those that are otherwise are in a state of disrepair, or for any units that need to be replaced, we recommend considering Energy Recovery Ventilators (ERV). The is especially important for rooms that are only served by exhaust, as the renovation into an ERV is a bit more straightforward than a conversion from an existing unit. ERVs also do not need to be directly associated with a nearby unit and can often come standalone with additional coils for heating and cooling. Energy Recovery Ventilators are packaged heat recovery units that mostly utilize an air to air heat exchanger to recover waste heat from the exhaust air and transfer it to the outside air, powered by supply and exhaust air fans. ERVs require ducted outside and exhaust air to the outside of the building; the inlet and exhaust air openings should be at least 10 feet apart to comply with the Building Code. Depending on the location, general exhaust fan ductwork could be repurposed for these units. There are two main types of air-to-air energy recovery units: energy wheel and cross-flow heat exchangers. Energy wheel units tend to be more expensive and have some additional operating costs due to the wheel motor, but they have higher heat transfer efficiency than cross-flow units. Both styles of units require filters to protect the heat exchanger media and operate best during peak load conditions. Sometimes an existing unit can be retro-fit with some form of heat recovery system, but it is highly dependent on the unit configuration and requires engineering calculations to determine sizing, including if the current unit fans can accommodate the increased static pressure losses that would be incurred.

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 each 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 or base filter changes on individual units. 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.
- For any defunct units or disabled units needing serious repair or replacement, consider replacing with a unit that has energy recovery (either a wheel or cross-flow heat exchanger). This might require changes to the ductwork or balance of the air system since replacing a mixed air unit with a 100% OA unit might result in less total airflow required. This is especially important for any occupied spaces served only by exhaust fans.
- 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.
    - Fan Belt Tension and Wheel Alignment: All fan motor pulley's, sheaves and belts should be reviewed for proper alignment and tension. Some motors might need to be repositioned in the unit to fix the tension or adjust for alignment. Some fan wheels also wobble or pulleys could be misaligned. Consider adjust motor positions if out of alignment and installing belt tensioners where possible to extend intervals between belt changes without compromising unit efficiency as the belt wears.

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 Jennings Elementary School does not meet the current minimum ventilation requirements per 2015 IMC mainly due to the original building setup of exhaust-only for classroom spaces and defunct or non-operational units. 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 repairing the classroom section exhaust fans, providing supplemental in-room filtration units, establishing window opening protocol for occupants, developing a plan for renovating the HVAC for classroom spaces to swap exhaust fans for energy recovery ventilators, and updating the building controls verified with balancing procedures. Given the results of this survey, we highly recommend further evaluation to be performed including whole-building Recommissioning, possibly including engineered ventilation calculations/modifications aid in code compliance and generally better working order.

T:\2020\2020102.00\z_CX_Department\Schools Working Folder\10 Jennings Elementary\07 Report\Report Pieces\10 - JES RCx & TAB Report Narrative.docx

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 May 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 (24)
	Open	0.11A Office	Airflow	The room air was noticeably stuffy
	Open	0.13B Office / ST	Airflow	There is no ventilation to this space
	Open	0.14A Library Storage	Airflow	The room air was noticeably stuffy
	Open	04 Classroom	Filters	The Sanyo PCAT Filter was dirty and needs to be changed
	Open	07 Classroom	Airflow	The room air was noticeably stuffy
	Open	08 Conference 8	Airflow	The room air was noticeably stuffy
	Open	25A Kiln/Storage	RGDs	This room only had one small air vent and it likely needs more to adequately ventilate the space
	Open	AC-1	Dampers	The dampers were not operable at the time of inspection
	Open	AC-1	Filters	Although the filters are in good condition in this unit, the filter access panel was removed and the unit section was filled with dirt and leaves. This needs to be cleaned out and the access panel needs to be sealed
	Open	AC-2	Filters	The metal pre-filters are plugged and need to be thoroughly cleaned

Action Taken	Status	Unit/Zone	Serving/Room Name	Indoor Air Quality And Ventilation Issue (24)
	Open	EF-2	Airflow	This unit does not run and should be replaced. At the moment, it is the only means of ventilating the spaces it serves
	Open	EF-4	Airflow	This unit does not run and should be replaced. At the moment, it is the only means of ventilating the spaces it serves
	Open	EF-6	Airflow	This unit does not run and should be replaced. At the moment, it is the only means of ventilating the spaces it serves
	Open	EF-7	Airflow	This unit does not run and should be replaced. At the moment, it is the only means of ventilating the spaces it serves
	Open	General	Classrooms	Classrooms in the main building are only served by exhaust fans, all of which are currently inoperable. Not only is exhaust-only ventilation not ideal, but these spaces being also completely unventilated is not acceptable. These fans should be returned to operation immediately, and alternative means of providing adequate ventilation and air quality control should be reviewed
	Open	HV-1	Coils	Unit coil is in poor condition and should be cleaned
	Open	HV-1	Dampers	The outside air damper was closed off
	Open	HV-1	Fans	Separate return inline fans do not seem to be functional.
	Open	HV-2	Coils	Unit coil is in poor condition and should be cleaned
	Open	HV-2	Fans	Separate return inline fans do not seem to be functional.
	Open	HV-3	Coils	Unit coil is in poor condition and should be cleaned
	Open	MAU-1	Building Pressure	If this unit runs, the building pressure swings negative, introducing unfiltered air and humidity

Action Taken	Status	Unit/Zone	Serving/Room Name	Indoor Air Quality And Ventilation Issue (24)
	Open	MAU-1	Filters	The filters were dirty and need to be cleaned or replaced
	Open	Modular Classroom	Airflow	This a standalone unit with a preset minimum outside air position, not adjustable through the BAS

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 (22)
	Open	13 Computer Classroom	Temperature	Although there are 27 computers in this room, the room was noted as being warmer than expected.
	Open	14 Classroom	Temperature	The room was warmer than expected
	Open	19 Classroom	Temperature	The room was warmer than expected
	Open	25.04 Office (Storage)	Temperature	The room was warmer than expected
	Open	26 Modular Classroom	Fire Hazard	The electric baseboard heater had papers pressed up against it. This is a fire hazard concern and should be addressed prior to heating season
	Open	AC-1	Coils	The cooling coil is showing signs of external rust and corrosion
	Open	AC-1	Replacement	This is an old York unit which is past the end of its useful life and should be scheduled for replacement
	Open	AC-2	Cleaning	There was debris in the condensing unit section. This should be cleaned
	Open	HV-1	Access	This is an original Trane unit with poor accessibility and in poor condition.
	Open	HV-1	Access	Access is not only difficult, but it is very unsafe. Adequate means of access should be provided to encourage proper, frequent maintenance procedures

Action Taken	Status	Unit/Zone	Serving/Room Name	Maintenance Issue (22)
	Open	HV-1	EF	The stage has a decoupled EF on the roof but did not seem to be operative.
	Open	HV-1	Replacement	Replacement of this unit may not be an option as there is only a hatch in the ceiling to service.
	Open	HV-1	Replacement	This unit is past the end of its useful life and should be scheduled for replacement
	Open	HV-2	Access	This is an original Trane unit with poor accessibility and in poor condition.
	Open	HV-2	Belts	The return fan belt is rusted in place
	Open	HV-2	Casing	Sheet metal is missing on this unit
	Open	HV-2	Replacement	Replacement of this unit may not be an option as there is only a hatch in the ceiling to service.
	Open	HV-2	Replacement	This unit is past the end of its useful life and should be scheduled for replacement
	Open	MAU-1	Gas	The gas was found valved off at the unit
	Open	MAU-1	Motor	This unit is interlocked with the kitchen hood. The hood runs, but the MAU does not. There is power all the way to the motor of MAU-1, so this motor should be replaced.
	Open	MAU-1	Operation	The unit was not operating at the time of inspection and it is not clear if it is able to run
	Open	Portable RTU	Access	There was no adequate means of access to this unit, which could indicate possible deterrence for maintenance procedures.

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 (05)
	Open	14 Classroom	FTR	The valve for the fintube radiation appears to be leaking by when there isn't a hot call.
	Open	General	Pneumatics	It appears that much of this building is still served by pneumatic controls. Swapping these to a DDC control system will improve system efficiency and communication
	Open	HV-1	Devices	The pneumatic actuator for this unit has been disconnected
	Open	Portable RTU	Schedule	Portable building heat pump thermostat had not schedule keeping unit at set temperatures 24/7. This should be adjusted to match actual occupancy to save energy
	Open	Portable RTU	Temperature	This unit is controlled by an isolated, residential thermostat. While this is fine for space temperature control, it is not integrated into the building system at all and cannot be remotely monitored

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 (08)
	Info Only	0.06 Storage	Airflow	There is no ventilation to this space
	Info Only	01 Classroom	Partition	Foldable partition (closed) shared with Classroom 02 and 03
	Info Only	02 Classroom	Partition	Foldable partition (closed) shared with Classroom 01 and 03
	Info Only	03 Classroom	Partition	Foldable partition (closed) shared with Classroom 01 and 02
	Info Only	20 Classroom	Partition	Foldable partition (open) shared with Classroom 21
	Info Only	21 Classroom	Partition	Foldable partition (open) shared with Classroom 20
	Open	HV-1	Old Components	Old pneumatic controls abandoned in place. If these are no longer in use, they should be removed.
	Open	HV-2	Old Components	Old pneumatic controls abandoned in place. If these are no longer in use, they should be removed.

APPENDIX 2 – Ventilation Data Calculations

Project Name:	**Fairfield Public Schools RCx & TAB Study**
Project Number:	**2020102.00.10**
Scope	**Ventilation Calculation by Building**
Date	**October 7, 2022**

Jennings Elementary School

VAN ZELM 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	0.01	Main Office	Offices	Office spaces	425	43%	20%	AC--1	330	10	3300	2	5.0	0.06	5	30	**183**	153	514.1%	**Meets**	**3.327**
1	0.01A	Waiting Area	Offices	Reception Areas	435	43%	20%	AC--1	204	10	2040	4	5.0	0.06	30	32	**187**	155	480.0%	**Meets**	**5.500**
1	0.01B	Storage	None	None	0	43%	20%	AC--1	72	10	720	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.01C	Assistant Principal	Offices	Office spaces	291	43%	20%	AC--1	120	10	1200	4	5.0	0.06	5	27	**125**	98	359.6%	**Meets**	**6.250**
1	0.01D	Principal	Offices	Office spaces	173	43%	20%	AC--1	161	10	1610	5	5.0	0.06	5	35	**74**	39	113.5%	**Meets**	**2.758**
1	0.04	Health Suite	Hospitals nursing and convalescent homes	Patient rooms	198	43%	20%	AC--1	243	9	2187	4	25.0	0.00	10	100	**85**	-15	-15.0%	**Fails**	**2.332**
1	0.04A	Toilet	Public Spaces	Toilet rooms - public	-241	---	---	EF-3	26	7.3	190	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.02	Office	Offices	Office spaces	82	43%	AC-1	AC-1	84	9.3	781	3	5.0	0.06	5	20	**35**	15	74.7%	**Meets**	**2.688**
1	0.03	Conference	Offices	Conference rooms	181	43%	AC-1	AC-1	87	9	783	2	5.0	0.06	50	15	**78**	63	412.5%	**Meets**	**5.977**
1	0.05	Faculty Room	Food and beverage service	Dining Rooms	511	43%	AC-1	AC-1	527	9	4743	8	7.5	0.18	70	155	**220**	65	42.1%	**Meets**	**2.783**
1	0.06	Storage	None	None	0	---	---	---	127	9.3	1181	8	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.07	Men	Public Spaces	Toilet rooms - public	0	---	---	EF-2	70	9	630	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.08	Women	Public Spaces	Toilet rooms - public	0	---	---	EF-2	104	9	936	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.09	Custodial Closet	Storage	Warehouses	0	---	---	EF-2	75	93	6975	1	0.0	0.06	0	5	**---**	N/A		N/A	
1	01	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-4	974	9.3	9058	23	10.0	0.12	25	347	**0**	-347	-100.0%	**Fails**	**0.000**
1	01A	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF-4	15	7.3	110	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	01B	Storage	None	None	0	---	---	EF-4	81	9.3	753	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	01.01	Exterior Storage door 14	None	None	0	---	---	EF-4	112	9.3	1042	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	02	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-4	950	9.3	8835	14	10.0	0.12	25	254	**0**	-254	-100.0%	**Fails**	**0.000**
1	02A	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF-4	15	7.3	110	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	02B	Storage	None	None	0	---	---	EF-4	84	9.3	781	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**

Project Name:	**Fairfield Public Schools RCx & TAB Study**
Project Number:	**2020102.00.10**
Scope	**Ventilation Calculation by Building**
Date	**October 7, 2022**

Jennings 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	03	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-4	956	9.3	8891	26	10.0	0.12	25	375	**0**	-375	-100.0%	**Fails**	**0.000**
1	03A	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF-4	16	7.3	117	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	03B	Storage	None	None	0	---	---	EF-4	62	9.3	577	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	03.01	TV Storage Room	None	None	0	---	---	EF-4	79	9.3	735	5	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	04	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-4	799	8.8	7031	18	10.0	0.12	25	276	**0**	-276	-100.0%	**Fails**	**0.000**
1	04A	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF-4	15	7.3	110	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	05	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-4	803	8.8	7066	23	10.0	0.12	25	326	**0**	-326	-100.0%	**Fails**	**0.000**
1	05A	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF-4	15	7.3	110	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	Mod Class Rm	Modular Classroom	Education	Classroom (ages 5-8)	996	10%	10%	Mod Class RTU	757	8	6056	20	10.0	0.12	25	291	**103**	-188	-64.6%	**Fails**	**1.020**
1	06	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF4	803	8.8	7066	21	10.0	0.12	25	306	**0**	-306	-100.0%	**Fails**	**0.000**
1	06A	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF4	15	7.3	110	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	07	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF4	436	8.8	3837	6	10.0	0.12	25	112	**0**	-112	-100.0%	**Fails**	**0.000**
1	07A	Teaching Room	Education	Classroom (ages 5-8)	0	---	---	EF4	378	8.8	3326	10	10.0	0.12	25	145	**0**	-145	-100.0%	**Fails**	**0.000**
1	07B	Storage 7	None	None	0	---	---	EF4	440	8.8	3872	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	08	Conference 8	Offices	Conference rooms	0	---	---	EF4	238	8.8	2094	3	5.0	0.06	50	29	**0**	-29	-100.0%	**Fails**	**0.000**
1	09	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF4	807	8.8	7102	17	10.0	0.12	25	267	**0**	-267	-100.0%	**Fails**	**0.000**
1	10	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF4	795	8.8	6996	19	10.0	0.12	25	285	**0**	-285	-100.0%	**Fails**	**0.000**
1	10A	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF4	15	7.3	110	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	11	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF4	767	8.8	6750	23	10.0	0.12	25	322	**0**	-322	-100.0%	**Fails**	**0.000**
1	11A	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF4	15	7.3	110	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	12	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF4	795	8.8	6996	21	10.0	0.12	25	305	**0**	-305	-100.0%	**Fails**	**0.000**

Project Name:	**Fairfield Public Schools RCx & TAB Study**
Project Number:	**2020102.00.10**
Scope	**Ventilation Calculation by Building**
Date	**October 7, 2022**

Jennings 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	12A	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF4	15	7.3	110	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.10	Cafeteria	Food and beverage service	Cafeteria, fast food	0	---	---	EF4	2544	11	27984	168	7.5	0.18	100	1718	**0**	-1718	-100.0%	**Fails**	**0.000**
1	0.10A	Cafeteria Storage (B)	None	None	0	---	---	EF4	121	9.3	1125	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.11	Kitchen	Food and beverage service	Kitchens (cooking)	0	---	---	EF4	1080	10.5	11340	5	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.11A	Office	Offices	Office spaces	0	---	---	EF4	119	8	952	3	5.0	0.06	5	22	**0**	-22	-100.0%	**Fails**	**0.000**
1	0.11B	Dishwashing	Food and beverage service	Kitchens (cooking)	0	---	---	EF4	266	10.5	2793	2	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.11C	Lockers	Education	Locker/dressing room	0	---	---	EF4	58	8	464	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.11D	Toilet	Public Spaces	Toilet rooms - public	0	---	---	EF4	18	8	144	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.12A	Men	Public Spaces	Toilet rooms - public	0	---	---	EF4	67	8	536	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.12	Custodial	Storage	Warehouses	0	---	---	EF4	241	8	1928	1	0.0	0.06	0	14	**0**	-14	-100.0%	**Fails**	**0.000**
1	0.13	All Purpose Room	Education	Multiuse assembly	3895	44%	15%	All Purpose AHU	3242	17.2	55762	50	7.5	0.06	100	570	**1715**	1145	201.1%	**Meets**	**1.845**
1	0.13A	Stage/Music	Education	Music/theater/dance	-3456	---	---	EF-5	1090	14.8	16132	30	10.0	0.06	35	365	**0**	-365	-100.0%	**Fails**	**0.000**
1	0.14	Library	Education	Media Center	1415	22%	10%	AC-2	1583	11.3	17888	40	10.0	0.12	25	590	**311**	-279	-47.3%	**Fails**	**1.043**
1	0.14A	Library Storage	None	None	652	22%	10%	AC-2	425	10	4250	0	0.0	0.00	0	0	**143**	143	0.0%	N/A	**2.019**
1	0.13B	Office / ST	Offices	Office spaces	0	---	---	---	451	10	4510	3	5.0	0.06	5	42	**0**	-42	-100.0%	**Fails**	**0.000**
1	13	Computer Classroom	Education	Computer lab	0	---	---	EF-7	770	9	6930	27	10.0	0.12	25	362	**0**	-362	-100.0%	**Fails**	**0.000**
1	13A	Computer 13 Storage	None	None	0	---	---	EF-7	38	9	342	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	14	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-7	779	9	7011	12	10.0	0.12	25	213	**0**	-213	-100.0%	**Fails**	**0.000**
1	15	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-7	773	9	6957	12	10.0	0.12	25	213	**0**	-213	-100.0%	**Fails**	**0.000**
1	16	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-7	775	9	6975	28	10.0	0.12	25	373	**0**	-373	-100.0%	**Fails**	**0.000**
1	17	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-7	778	9	7002	26	10.0	0.12	25	353	**0**	-353	-100.0%	**Fails**	**0.000**

Project Name:	**Fairfield Public Schools RCx & TAB Study**
Project Number:	**2020102.00.10**
Scope	**Ventilation Calculation by Building**
Date	**October 7, 2022**

Jennings 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	0.15	Boiler Room	None	None	0	---	---	EF-7	996	12	11952	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	26.01	Boys	Public Spaces	Toilet rooms - public	0	---	---	EF-7	75	9	675	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	26.02	Girls	Public Spaces	Toilet rooms - public	0	---	---	EF-7	75	9	675	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	0.13C	FACP Storage (D)	None	None	0	---	---	EF-7	209	8	1672	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	26.03	Women	Public Spaces	Toilet rooms - public	0	---	---	EF-7	90	9	810	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	26.04	Men	Public Spaces	Toilet rooms - public	0	---	---	EF-7	90	9	810	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	26	Guidance	Offices	Office spaces	0	---	---	EF-7	799	9	7191	20	5.0	0.06	5	148	**0**	-148	-100.0%	**Fails**	**0.000**
1	26A	Guidance Storage	None	None	0	---	---	EF-7	43	9	387	0	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	18	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-7	844	9	7596	25	10.0	0.12	25	351	**0**	-351	-100.0%	**Fails**	**0.000**
1	19	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-7	750	9	6750	23	10.0	0.12	25	320	**0**	-320	-100.0%	**Fails**	**0.000**
1	20	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-6	800	9	7200	25	10.0	0.12	25	346	**0**	-346	-100.0%	**Fails**	**0.000**
1	21	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-6	800	9	7200	25	10.0	0.12	25	346	**0**	-346	-100.0%	**Fails**	**0.000**
1	22	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-6	800	9	7200	26	10.0	0.12	25	356	**0**	-356	-100.0%	**Fails**	**0.000**
1	23	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-6	797	9	7173	26	10.0	0.12	25	356	**0**	-356	-100.0%	**Fails**	**0.000**
1	24	Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-6	800	9	7200	24	10.0	0.12	25	336	**0**	-336	-100.0%	**Fails**	**0.000**
1	25	Art Classroom	Education	Art Classroom	0	---	---	EF-6	800	9	7200	24	10.0	0.18	20	384	**0**	-384	-100.0%	**Fails**	**0.000**
1	25A	Kiln/Storage	Storage	Warehouses	0	---	---	EF-6	59	8	472	1	0.0	0.06	0	4	**0**	-4	-100.0%	**Fails**	**0.000**
1	25.01	Girls	Public Spaces	Toilet rooms - public	0	---	---	EF-7	175	9	1575	2	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	25.02	Boys	Public Spaces	Toilet rooms - public	0	---	---	EF-7	175	9	1575	2	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	25.03	Cust	Storage	Warehouses	0	---	---	EF-7	83	9.3	772	1	0.0	0.06	0	5	**---**	N/A		N/A	
1	25.04	Office (Storage)	None	None	0	---	---	EF-7	160	9.3	1488	3	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**

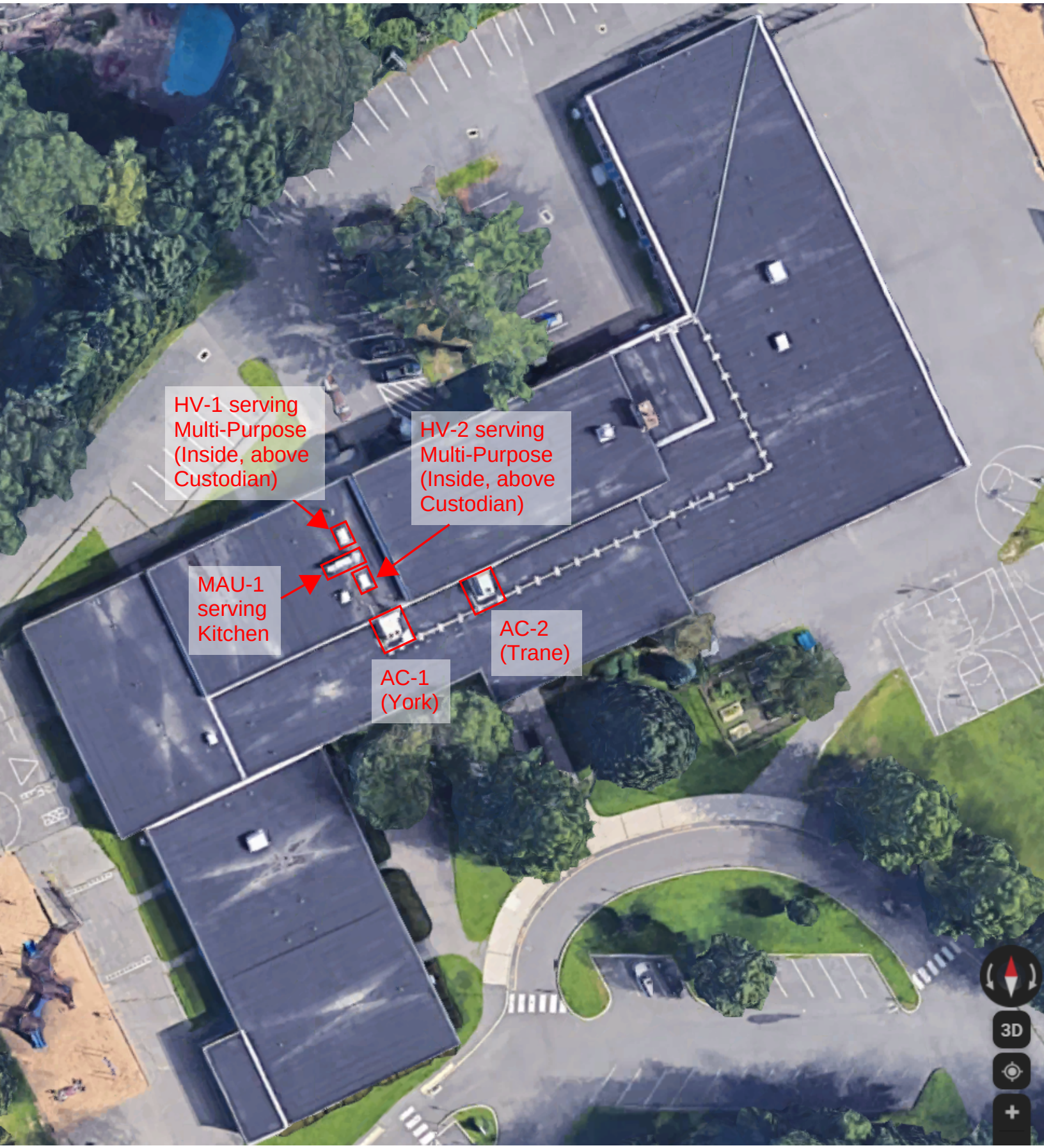
Project Name:	**Fairfield Public Schools RCx & TAB Study**
Project Number:	**2020102.00.10**
Scope	**Ventilation Calculation by Building**
Date	**October 7, 2022**

Jennings 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	26	Modular Classroom	Education	Classroom (ages 5-8)	0	---	---	EF-7	757	8	6056	20	10.0	0.12	25	291	**0**	-291	-100.0%	**Fails**	**0.000**

APPENDIX 3 – Roof Map


HV-1 serving Multi-Purpose (Inside, above Custodian)
HV-2 serving Multi-Purpose (Inside, above Custodian)
MAU-1 serving Kitchen
AC-2 (Trane)
AC-1 (York)
3D

APPENDIX 4 – TAB Airflow Survey Data

WING'S TESTING & BALANCING CO., INC.

Fairfield Public Schools

Jennings Elementary School

* * * *

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

August 16, 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.

August 16, 2022

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

Re: Jennings Elementary School HVAC/Fresh Air Ventilation Survey

Dear Bill,

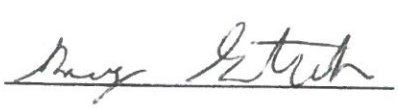
We have completed our HVAC/fresh air ventilation survey for the above-mentioned school. The modular classroom RTU is a pre-set stand-alone RTU with an original OA setting from the manufacturer. We are estimating that the position is around 10%. Through our testing we found that:

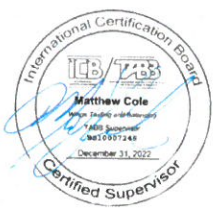
- EF-2: Does not run and should be replaced.
- EF-4: Does not run and should be replaced.
- EF-6: Does not run and should be replaced.
- EF-7: Does not run and should be replaced.
- MAU-1: This unit is interlocked with the kitchen hood. The hood runs, the MAU does not. There is power all the way to the motor of MAU-1. This motor should be replaced.

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.

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 • Fax (203) 488-5634 • wings@wingstesting.com
SM-1 License #6803
www.wingstesting.com

VELOCITY PRESSURE READINGS

PROJECT: FPS - Jennings Elementary School | **DATE:** 8/16/2022

AREA SERVED: | **TECH:** BS

TRAVERSE LOCATIONS	DUCT SIZE "	AREA SQ.FT.	DESIGN		CENT. STAT. PRESS."	TEST		NOTES
			FPM	CFM		FPM	CFM	
AC-1								
Min OA	46" x 23"	7.35	---	ND	Velgrid	140	1029	
AC-2								
Min OA	36" x 16"	4.0	---	ND	Velgrid	116	464	
Modular RTU								
Min OA	14" x 12"	1.17	---	ND	Velgrid	88	103	
Cafeteria AHU								
Min OA	102" x 19"	13.5	---	ND	Velgrid	0	0	(1)
All Purpose AHU								
Min OA	117" x 19"	22.6	---	ND	Velgrid	76	1715	

REMARKS

(1) The pnuematic actuator for this unit has been disconnected.

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

AIR DEVICE REPORT

PROJECT: FPS - Jennings Elementary School | **DATE:** 8/16/2022

SYSTEM / AREA: | **TECH:** BS

LOCATION	NO.	SIZE	A K	DESIGN		TEST		FINAL		NOTES
				FPM	CFM	FPM	CFM	FPM	CFM	
AC-1										
Waiting	1		FH	---	ND	---	435			
Main Office	2		FH	---	ND	---	425			
Assit. Principle	3		FH	---	ND	---	291			
Principle	4		FH	---	ND	---	173			
Office	5		FH	---	ND	---	86			
Conference	6		FH	---	ND	---	191			
Health Suite	7		FH	---	ND	---	198			
Faculty Room	8		FH	---	ND	---	348			
Faculty Room	9		FH	---	ND	---	226			
							2373			
AC-2										
Library	1		FH	---	ND	---	336			
Library	2		FH	---	ND	---	316			
Library	3		FH	---	ND	---	388			
Library	4		FH	---	ND	---	375			
Library Storage	5		FH	---	ND	---	336			
Library Storage	6		FH	---	ND	---	316			
							2067			
Cafeteria AHU										
Cafeteria	1	22"x22"	FH	---	ND	---	212			
Cafeteria	2	22"x22"	FH	---	ND	---	200			
Cafeteria	3	22"x22"	FH	---	ND	---	208			
Cafeteria	4	22"x22"	FH	---	ND	---	207			
							827			
Modular RTU										
Modular Classroom	1	8" R	FH	---	ND	---	125			
Modular Classroom	2	8" R	FH	---	ND	---	129			
Modular Classroom	3	8" R	FH	---	ND	---	112			
Modular Classroom	4	8" R	FH	---	ND	---	119			
Modular Classroom	5	8" R	FH	---	ND	---	115			
Modular Classroom	6	8" R	FH	---	ND	---	111			
Modular Classroom	7	8" R	FH	---	ND	---	145			
Modular Classroom	8	8" R	FH	---	ND	---	140			
							996			

REMARKS

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

AIR DEVICE REPORT

PROJECT: FPS - Jennings Elementary School **DATE:** 8/16/2022

SYSTEM / AREA: **TECH:** BS

LOCATION	NO.	SIZE	A K	DESIGN		TEST		FINAL		NOTES
				FPM	CFM	FPM	CFM	FPM	CFM	
All Purpose Rm AHU										
All Purpose Rm	1	22"x22"	FH	---	ND	---	683			
All Purpose Rm	2	22"x22"	FH	---	ND	---	670			
All Purpose Rm	3	22"x22"	FH	---	ND	---	526			
All Purpose Rm	4	22"x22"	FH	---	ND	---	715			
All Purpose Rm	5	22"x22"	FH	---	ND	---	689			
All Purpose Rm	6	22"x22"	FH	---	ND	---	612			
							3895			

REMARKS

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

Project Name:	**Fairfield Public Schools RCx: Jennings Elementary School**
Project Number:	*2020102.00.10*
Scope	**TAB Data**
Date	**[DATE]**

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	0.01	Main Office	425	183	43%	20%	AC--1	
1	0.01A	Waiting Area	435	187	43%	20%	AC--1	
1	0.01B	Storage	0	0	43%	20%	AC--1	
1	0.01C	Assistant Principal	291	125	43%	20%	AC--1	
1	0.01D	Principal	173	74	43%	20%	AC--1	
1	0.04	Health Suite	198	85	43%	20%	AC--1	
1	0.04A	Toilet	-241	---	---	---	EF-3	
1	0.02	Office	82	35	43%	AC-1	AC-1	
1	0.03	Conference	181	78	43%	AC-1	AC-1	
1	0.05	Faculty Room	511	220	43%	AC-1	AC-1	
1	0.06	Storage	0	---	---	---	---	There is no ventilation to this space
1	0.07	Men	0	---	---	---	EF-2	
1	0.08	Women	0	---	---	---	EF-2	
1	0.09	Custodial Closet	0	---	---	---	EF-2	
1	01	Classroom	0	---	---	---	EF-4	
1	01A	Toilet	0	---	---	---	EF-4	
1	01B	Storage	0	---	---	---	EF-4	
1	01.01	Exterior Storage door 14	0	---	---	---	EF-4	
1	02	Classroom	0	---	---	---	EF-4	
1	02A	Toilet	0	---	---	---	EF-4	
1	02B	Storage	0	---	---	---	EF-4	
1	03	Classroom	0	---	---	---	EF-4	
1	03A	Toilet	0	---	---	---	EF-4	
1	03B	Storage	0	---	---	---	EF-4	

Project Name:	**Fairfield Public Schools RCx: Jennings Elementary School**
Project Number:	*2020102.00.10*
Scope	**TAB Data**
Date	**[DATE]**

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	03.01	TV Storage Room	0	---	---	---	EF-4	
1	04	Classroom	0	---	---	---	EF-4	
1	04A	Toilet	0	---	---	---	EF-4	
1	05	Classroom	0	---	---	---	EF-4	
1	05A	Toilet	0	---	---	---	EF-4	
1	Mod Class Rm	Modular Classroom	996	103	10%	10%	Mod Class RTU	This a stand alone unit with a preset min. OA

Project Name:	**Fairfield Public Schools RCx: Jennings Elementary School**
Project Number:	*2020102.00.10*
Scope	**TAB Data**
Date	**[DATE]**

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	06	Classroom	0	---	---	---	EF4	
1	06A	Toilet	0	---	---	---	EF4	
1	07	Classroom	0	---	---	---	EF4	
1	07A	Teaching Room	0	---	---	---	EF4	
1	07B	Storage 7	0	---	---	---	EF4	
1	08	Conference 8	0	---	---	---	EF4	
1	09	Classroom	0	---	---	---	EF4	
1	10	Classroom	0	---	---	---	EF4	
1	10A	Toilet	0	---	---	---	EF4	
1	11	Classroom	0	---	---	---	EF4	
1	11A	Toilet	0	---	---	---	EF4	
1	12	Classroom	0	---	---	---	EF4	
1	12A	Toilet	0	---	---	---	EF4	
1	0.10	Cafeteria	0	---	---	---	EF4	
1	0.10A	Cafeteria Storage (B)	0	---	---	---	EF4	
1	0.11	Kitchen	0	---	---	---	EF4	
1	0.11A	Office	0	---	---	---	EF4	
1	0.11B	Dishwashing	0	---	---	---	EF4	
1	0.11C	Lockers	0	---	---	---	EF4	
1	0.11D	Toilet	0	---	---	---	EF4	
1	0.12A	Men	0	---	---	---	EF4	
1	0.12	Custodial	0	---	---	---	EF4	
1	0.13	All Purpose Room	3895	1715	44%	15%	All Purpose AHU	
1	0.13A	Stage/Music	-3456	---	---	---	EF-5	

Project Name:	**Fairfield Public Schools RCx: Jennings Elementary School**
Project Number:	*2020102.00.10*
Scope	**TAB Data**
Date	**[DATE]**

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	0.14	Library	1415	311	22%	10%	AC-2	
1	0.14A	Library Storage	652	143	22%	10%	AC-2	
1	0.13B	Office / ST	0	---	---	---	---	No ventilation to this space
1	13	Computer Classroom	0	---	---	---	EF-7	
1	13A	Computer 13 Storage	0	---	---	---	EF-7	

Project Name:	**Fairfield Public Schools RCx: Jennings Elementary School**
Project Number:	*2020102.00.10*
Scope	**TAB Data**
Date	**[DATE]**

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	14	Classroom	0	---	---	---	EF-7	
1	15	Classroom	0	---	---	---	EF-7	
1	16	Classroom	0	---	---	---	EF-7	
1	17	Classroom	0	---	---	---	EF-7	
1	0.15	Boiler Room	0	---	---	---	EF-7	
1	26.01	Boys	0	---	---	---	EF-7	
1	26.02	Girls	0	---	---	---	EF-7	
1	0.13C	FACP Storage (D)	0	---	---	---	EF-7	
1	26.03	Women	0	---	---	---	EF-7	
1	26.04	Men	0	---	---	---	EF-7	
1	26	Guidance	0	---	---	---	EF-7	
1	26A	Guidance Storage	0	---	---	---	EF-7	
1	18	Classroom	0	---	---	---	EF-7	
1	19	Classroom	0	---	---	---	EF-7	
1	20	Classroom	0	---	---	---	EF-6	
1	21	Classroom	0	---	---	---	EF-6	
1	22	Classroom	0	---	---	---	EF-6	
1	23	Classroom	0	---	---	---	EF-6	
1	24	Classroom	0	---	---	---	EF-6	
1	25	Art Classroom	0	---	---	---	EF-6	
1	25A	Kiln/Storage	0	---	---	---	EF-6	
1	25.01	Girls	0	---	---	---	EF-7	
1	25.02	Boys	0	---	---	---	EF-7	
1	25.03	Cust	0	---	---	---	EF-7	

Project Name:	**Fairfield Public Schools RCx: Jennings Elementary School**
Project Number:	*2020102.00.10*
Scope	**TAB Data**
Date	**[DATE]**

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	25.04	Office (Storage)	0	---	---	---	EF-7	
1	26	Modular Classroom	0	---	---	---	EF-7	

APPENDIX 5 – RCx Unit and Room Take-Off Data

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.10*
Scope	**Room Take-Off Data**
Date	**May 5, 2022**
	Jennings Elementary School

RCM, RA, JRK

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	0.01	Main Office	330	10	3300	2			
1	0.01A	Waiting Area	204	10	2040	4			
1	0.01B	Storage	72	10	720	0	Roof Hatch Located Here		
1	0.01C	Assistant Principal	120	10	1200	4	1 SA		
1	0.01D	Principal	161	10	1610	5	1 SA		
1	0.04	Health Suite	243	9	2187	4	1 SA, FTR		
1	0.04A	Toilet	26	7.3	190	1	1 Exh		
1	0.02	Office	84	9.3	781	3	1 SA, 1 RA		
1	0.03	Conference	87	9	783	2	1 SA, 1 RA		
1	0.05	Faculty Room	527	9	4743	8	2 SA, 1 RA, FTR		
1	0.06	Storage	127	9.3	1181	8	2 SA. 1 RA		
1	0.07	Men	70	9	630	1			
1	0.08	Women	104	9	936	1			
1	0.09	Custodial Closet	75	93	6975	1	Exh		
1	01	Classroom	974	9.3	9058	23	FTR, Exh, foldable partion (closed) shared with Classroom 02 and 03		
1	01A	Toilet	15	7.3	110	1	Exh		
1	01B	Storage	81	9.3	753	0	Exh		
1	01.01	Exterior Storage door 14	112	9.3	1042	0	Exh		
1	02	Classroom	950	9.3	8835	14	FTR, Exh, foldable partion (closed) shared with Classroom 01 and 03		
1	02A	Toilet	15	7.3	110	1	Exh		

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.10*
Scope	**Room Take-Off Data**
Date	**May 5, 2022**
	Jennings Elementary School

RCM, RA, JRK

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	02B	Storage	84	9.3	781	0			
1	03	Classroom	956	9.3	8891	26	FTR, Exh, foldable partion (closed) shared with Classroom 01 and 02		
1	03A	Toilet	16	7.3	117	1	Exh		
1	03B	Storage	62	9.3	577	0			
1	03.01	TV Storage Room	79	9.3	735	5			
1	04	Classroom	799	8.8	7031	18	FTR, Exh, Sanyo PCAT	PCAT Filter Dirty	X
1	04A	Toilet	15	7.3	110	1	Exh		
1	05	Classroom	803	8.8	7066	23	FTR, Exh		
1	05A	Toilet	15	7.3	110	1	Exh		
1	06	Classroom	803	8.8	7066	21	FTR, Exh		
1	06A	Toilet	15	7.3	110	1	Exh		
1	07	Classroom	436	8.8	3837	6	FTR. Exh, Mitsubishi	Room Very Stuffy	X
1	07A	Teaching Room	378	8.8	3326	10	FTR, Exh Sayno		
1	07B	Storage 7	440	8.8	3872	0		Need to verify	
1	08	Conference 8	238	8.8	2094	3	FTR	Stuffy	
1	09	Classroom	807	8.8	7102	17	FTR. Exh, Sanyo		X
1	10	Classroom	795	8.8	6996	19	FTR, Exh		
1	10A	Toilet	15	7.3	110	1	Exh		
1	11	Classroom	767	8.8	6750	23	FTR, Exh	All Operable windows	
1	11A	Toilet	15	7.3	110	1	Exh		

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.10*
Scope	**Room Take-Off Data**
Date	**May 5, 2022**
	Jennings Elementary School

RCM, RA, JRK

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	12	Classroom	795	8.8	6996	21	FTR, Exh		
1	12A	Toilet	15	7.3	110	1	Exh		
1	0.10	Cafeteria	2544	11	27984	168	FTR, 4 SA,	Return into Kitchen	
1	0.10A	Cafeteria Storage (B)	121	9.3	1125	0			
1	0.11	Kitchen	1080	10.5	11340	5	FTR, Conv, (2 Hood)		
1	0.11A	Office	119	8	952	3	Exh	Stuffy	
1	0.11B	Dishwashing	266	10.5	2793	2			
1	0.11C	Lockers	58	8	464	1	Exh		
1	0.11D	Toilet	18	8	144	1			
1	0.12A	Men	67	8	536	1			
1	0.12	Custodial	241	8	1928	1			
1	0.13	All Purpose Room	3242	17.2	55762	50	6 SA, 3 RA		
1	0.13A	Stage/Music	1090	14.8	16132	30	2 RA		
1	0.14	Library	1583	11.3	17888	40	4 SA, 2 RA		
1	0.14A	Library Storage	425	10	4250	0		Very Stuffy	
1	0.13B	Office / ST	451	10	4510	3	2 SA, 1 RA, FTR		
1	13	Computer Classroom	770	9	6930	27	FTR, Exh, Sanyo PCAT	27 PC's, Room Warm	X
1	13A	Computer 13 Storage	38	9	342	0			
1	14	Classroom	779	9	7011	12	FTR, Exh	FTR Leaky with Hot Room	
1	15	Classroom	773	9	6957	12	FTR, Exh		

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.10*
Scope	**Room Take-Off Data**
Date	**May 5, 2022**
	Jennings Elementary School

RCM, RA, JRK

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	16	Classroom	775	9	6975	28	FTR, Exh, Sanyo PCAT		X
1	17	Classroom	778	9	7002	26	FTR, Exh		
1	0.15	Boiler Room	996	12	11952	0	Newer Boilers		X
1	26.01	Boys	75	9	675	1			
1	26.02	Girls	75	9	675	1			
1	0.13C	FACP Storage (D)	209	8	1672	0	Exh		
1	26.03	Women	90	9	810	1			
1	26.04	Men	90	9	810	1			
1	26	Guidance	799	9	7191	20	FTR, Exh		
1	26A	Guidance Storage	43	9	387	0	Exh		
1	18	Classroom	844	9	7596	25	FTR, Exh Sanyo PCAT		
1	19	Classroom	750	9	6750	23	FTR, Exh	Very Hot	
1	20	Classroom	800	9	7200	25	FTR, 2 Exh, Foldable partition (open) shared with Classroom 21		
1	21	Classroom	800	9	7200	25	FTR, 2 Exh, Foldable partition (open) shared with Classroom 20		
1	22	Classroom	800	9	7200	26	FTR, Exh		
1	23	Classroom	797	9	7173	26	FTR, Exh, Sanyo PCAT		
1	24	Classroom	800	9	7200	24	FTR, Exh, Carrier PCAT		X
1	25	Art Classroom	800	9	7200	24	FTR, Exh		
1	25A	Kiln/Storage	59	8	472	1	Small Vent Only	Needs more Ventilation	X
1	25.01	Girls	175	9	1575	2			

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.10*
Scope	**Room Take-Off Data**
Date	**May 5, 2022**

RCM, RA, JRK

Jennings Elementary School

Zone Identification

Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	25.02	Boys	175	9	1575	2			
1	25.03	Cust	83	9.3	772	1	Exh		
1	25.04	Office (Storage)	160	9.3	1488	3		Hot	
1	26	Modular Classroom	757	8	6056	20	6 small SA and 1 RRA under unit	Electril baseboar had papers up against	

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Unit Tag	**AC-1**	**Addition comments descriptions**
Location	Office Area Roof	
Serving	Main Offices	
Config/Style	Gas / Air Conditioning Unit	
Mfr.	York	
Model #	D4CG890N16525ECA	
Serial #	NNGM168131	
Age (years)	+15	
System CFM		
Max OA CFM	Minimum	
V/Hz/Ph	208/230 3 Phase	
SF Qty/HP	2 HP	Belt AX 48
SF VFD Data	NA	
Filter Data (Size Quantity)	(30 12 x 16 x 2, (3) 16 x 16 x 2	Changed 4-27
Filter Status	Filters have leaves on media due to side panel left off while changing filters	
Controls Type	Conventional with BAS interface	
Controls Mfr.	JCI	
Economizer	NA Inoperative	
CO_2 DCV	No	
Damper Styles	Mfg. Flapper	
Damper Status	Dampers not operative	
Heating Type	Gas	
Heating Coil Condition	Average	
Cooling Type	DX 1 stage	
Cooling Coil Condition	Moderately dirty. Unit showing signs of external rust and corrosion	
CU Mfr.		
CU Model		
CU Serial		
Drain Pan Status	Should be cleaned	
Notes:	Generally, not in good operational condition. Unit need good internal cleaning as filter access side panel was not fastened and leaves entered unit	

Photos

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

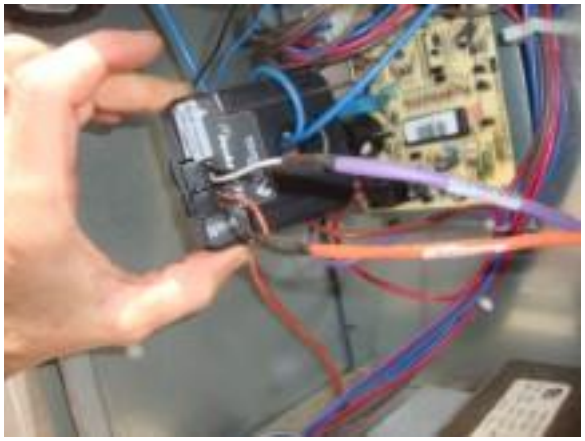
PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Unit Tag	**AC-2**	**Addition comments descriptions**
Location	Library Roof	
Serving	Library/Media Center	
Config/Style	Gas DX	
Mfr.	Trane Precedent	
Model #	YHC092F3RHAOH0	
Serial #	161311106L	
Age (years)	3/20/2018	
System CFM		
Max OA CFM		
V/Hz/Ph	208-230/60/3	
SF Qty/HP	3.8	
SF VFD Data	ECM	
RF Qty/HP	N/A	
RF VFD Data	N/A	
Filter Data (Size Quantity)	(4) 20x25x2	
Filter Status	Clean 4/11/22	
Controls Type	Factory DDC Metasys	
Controls Mfr.	Trane	
Economizer	Available	
CO_2 DCV		
Damper Styles	Factory Flap	
Damper Status	OK	
Heating Type	Gas	
Heating Coil Condition	Burner	
Cooling Type	DX Twin compressor	
Cooling Coil Condition	Could use a wash	
Drain Pan Status	OK	
Notes:	O.A. Hood metal filters very dirty, large PD. Debris in condensing unit section	Photos

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Photos

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET



PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Unit Tag	**HV-1**	**Addition comments descriptions**
Location	Kitchen Roof	
Serving	All-Purpose Room	
Config/Style	Heating and Ventilation Unit	
Mfr.	Trane	
Model #	L-17	
Serial #		
Age (years)	Very Old	
System CFM		
Max OA CFM		
V/Hz/Ph		
SF Qty/HP	Not able to safely access	
SF VFD Data	NA	
RF Qty/HP	Fan housing apart and no longer operational	
RF VFD Data		
Filter Data (Size Quantity)	Not safely Accessible	
Filter Status		
Controls Type	Pneumatics with BAS interface	
Controls Mfr.	JCI	
Economizer	NA	
CO_2 DCV		
Damper Styles		
Damper Status	Disconnected, OAD closed	
Heating Type	Hot water Coil	
Heating Coil Condition	Not accessible	
Cooling Type	NA	
Notes:	Unit not operating and RF/EF section open up and fan section in disrepair	Stage has decoupled EF on roof but did not seem to be operative. Many portable fans stored on stage

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Photos

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

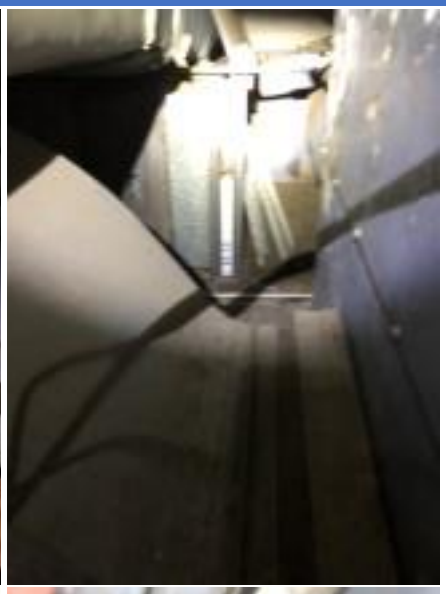
PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Unit Tag	**HV-2**	**Addition comments descriptions**
Location	Mezzanine	
Serving	Main Office	
Config/Style	Heating and Ventilation Unit, Climate Changer	
Mfr.	Trane	
Model #	Type L-17	
Serial #	K1003693	
Age (years)		
System CFM		
Max OA CFM		
V/Hz/Ph	208-230/60/3	
SF Qty/HP	(1) Unknown	
SF VFD Data	N/A-Starter constant speed	
RF Qty/HP	(1) Unknown	
RF VFD Data	N/A-Starter constant speed	
Filter Data (Size Quantity)	(XX) 16x22x12	
Filter Status	Clean, difficult to access	
Controls Type	Pneumatic	
Controls Mfr.		
Economizer		
CO_2 DCV		
Damper Styles	Duct Mounted, no access	
Damper Status	Unknown	
Heating Type	Hot Water	
Heating Coil Condition	Dirty	
Cooling Type	N/A	
Cooling Coil Condition	N/A	
Drain Pan Status	N/A	
Notes:	Units are beyond their useful life and should be replaced. Inline return fan appears to have not run in a long time. Belt rusted in place	

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Photos

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET



PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Unit Tag	**MAU-1**	**Addition comments descriptions**
Location	Kitchen Roof	Unit Gas OFF
Serving	Kitchen Make-up	
Config/Style	Heating and Ventilation Unit	
Mfr.	Captive Aire Systems	
Model #	NRTP-A-NHMUA1-12-G10-NCA16FA	
Job #	267088	
Age (years)	7-30-2004	
System CFM		
Max OA CFM		
V/Hz/Ph	230/60/1	
SF Qty/HP	(1) 1.5	
SF VFD Data	Unknown	
RF Qty/HP	Unknown	
RF VFD Data	Unknown	
Filter Data (Size Quantity)	(3) 16x16-2 Aluminum Filters	
Filter Status	Dirty	
Controls Type	Factory	
Controls Mfr.		
Economizer	N/A	
CO_2 DCV	N/A	
Damper Styles	Parallel	
Damper Status	Unknown	
Heating Type	Gas	Gas Valved off
Heating Coil Condition	Burner	
Cooling Type	N/A	
Cooling Coil Condition	N/A	
Drain Pan Status		
Notes:	Functionality unknown	

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Photos

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Unit Tag	**RTU X**	**Addition comments descriptions**
Location	Temp Building Roof	
Serving	Temp Classroom	
Config/Style	Heat pump Unit	
Mfr.		
Model #		
Serial #		
Age (years)	+10	
System CFM		
Max OA CFM		
V/Hz/Ph		
SF Qty/HP		
SF VFD Data		
RF Qty/HP		
RF VFD Data		
Filter Data (Size Quantity)		
Filter Status		
Controls Type	Conventional thermostat	
Controls Mfr.		
Economizer		
CO_2 DCV		
Damper Styles		
Damper Status		
Heating Type		
Heating Coil Condition		
Cooling Type		
Cooling Coil Condition		
CU Mfr.		
CU Model		
CU Serial		
Drain Pan Status		
Notes:	No ladder available for access but space was being mechanically cooled	Seemed a bit stuffy in space

PROJECT: 2020102.10 FAIRFIELD PUBLIC SCHOOLS – JENNINGS ELEMENTARY SCHOOL EQUIPMENT DATA SHEET

Photos