Holland Hill Elementary School

105 Meadowcroft Road
Fairfield, CT 06824

FAIRFIELD PUBLIC SCHOOLS
HOLLAND HILL ELEMENTARY

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

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

EXECUTIVE SUMMARY

Holland Hill Elementary School was deemed to be school priority number fifteen by Fairfield Public Schools, just ahead of the recently-renovated Mill Hill Elementary School. 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.

Holland Hill Elementary School is located at 105 Meadowcroft Road Fairfield, CT and serves as an educational facility for approximately 372 students as of the May 2022 census and up to 97 faculty and staff. The school is relatively newer, having been replaced in 1956 when the old Holland Hill school needed to be demolished for the construction of the new expressway (I-95) going through Fairfield. This school increased classrooms available from eight to twenty, alleviating some of the large class size issues Fairfield was facing at the time due to rapid population growth. The building has since seen major renovations, including the addition of the gymnasium, all-purpose room, and library media center in 1978, portable classroom spaces brought in during 1990 and 2000, and additional storage spaces added on in 2001. The most recent renovation was a major system overhaul that started in 2017/18 and concluded in 2020, which brought a new Alerton DDC Building Automation System and MEP equipment to the school, primarily HVAC.

The school ventilation systems comprise three (3) Rooftop Air Handling Units (RTU-1 – 3 serving the Gymnasium, All-Purpose Room, and Library Media Center respectively), three (3) Dedicated Outside Air Systems (DOAS-1 – 3 serving 5th and 4th grades; 3rd and 2nd grades; and 1st grade, kindergarten, and administrative areas respectively). Each of these units comes with natural gas for heating, direct expansion (DX) refrigerant systems for cooling, and energy recovery with an energy wheel, though the DOAS units operate in a 100% outside air state during occupied modes. Additional space cooling is provided by mostly ducted VRF fan coil units in each classroom, with air provided by the associated DOAS and served by four condensing unit loops. These VRF FCUs can circulate air directly in the space or add additional outside air from the unit as needed. Some other spaces utilize cassette style VRF units. Other equipment includes exhaust fans for various purposes including, but not limited to, toilet exhaust, kitchen exhaust, mechanical/electrical space ventilation, etc., Split AC units for electrical/IDF rooms, radiant panels (hydronic and electric), unit heaters (electric, hydronic, steam, and cabinet hydronic), fintube radiation, and a heat exchanger used to convert steam from the boilers into hydronic hot water. These systems largely seem to be in relatively decent condition though the building itself shows signs of the envelope not being in as good of condition as we hoped. Evidence of previous studies indicate that Fairfield Public Schools has performed inspections of the building envelope at least back in 2003 with Hoffmann Architects. While the envelope does not directly influence how the HVAC system performs, a leaky building could lead to infiltration of contaminants and humidity, which makes it more difficult to manage indoor air quality.

Overall, the performance of the building with regard to ventilation was found to be average with some sections of the building struggling to meet code requirements *particularly* in areas served by DOAS-3, where 22 of the 31 spaces that did not meet code were located. Findings from the Retro-Commissioning (RCx) and air-side Testing Adjusting and Balancing (TAB) process found issues that should be addressed

immediately that would 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, there are many individual occupied spaces at this school that 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, and even at such, 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.

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 **13,101 CFM**. The TAB process revealed that **12,961 CFM** of outside air is delivered to the spaces, resulting in a mere **140 CFM** deficit or **98.9%** of the required minimum flow. However, the ventilation calculations reveal that only **44.6%** of the occupied zones actually met the requirements. This is largely attributed to three units failing to provide adequate ventilation: DOAS-3, RTU-2, and RTU-3. For DOAS-3, the return air damper was observed to be open approximately 20% during occupied mode and stuck in this position. Normally, a DOAS system will operate in 100% outside air during occupied mode, only reverting to a 100% recirculation mode during unoccupied setback heating or cooling in order to save energy. With this damper open, outside air that would normally be going to the space as designed is instead replaced by return air, boosted by positive building pressurization of the occupied mode demands. This in turn reduces total ventilation flow to the spaces and caused rooms to fail that might have otherwise passed. RTU-2 was not operating at all during the time of testing, with facilities personnel stating that the unit control fuses were burnt out and needed replacement; these were already on order. As for RTU-3, the outside air damper was only open 20% and delivered only about half of the required flow for the Media Center. It should be noted that this is assuming the Media Center is "full" at about 42 people, though the space technically passes if occupancy is limited to 14 people without changing anything. Still, an adjustment of the minimum position could easily make up for the missing ventilation here. Otherwise, a handful of spaces fed by the other units did not meet code but there is little in particular indicating why. Further investigation with full system balancing should be considered to discover all issues.

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 only capable of achieving

2.637 ACH. This is does not quite reach the recommended 3.000 ACH, though it does not necessarily mean that spaces with proper quantities of ventilation are not able to meet IAQ requirements. This could potentially be increased through raising the air handling unit fan speeds, though doing so would increase energy consumption. As far as this study goes, the primary recommendation remains as increasing outside air rather than recirculated air, and at least for the DOAS units the total ACH is equal to the OA ACH anyway. This total ACH can be further broken out by spaces that meet or fail to meet code regarding ventilation. Among the spaces that failed to meet code, the outside air **ACH was 1.128**; for spaces that at least met or exceeded code, the outside air **ACH was 2.481**; for the entire building the combined outside air **ACH was 1.616**. 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. Not only that, but the nurse office, being served by DOAS-3, was one of the many rooms affected by the lack of outside air delivered by that unit. 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
2.637	1.616	1.128	2.481

Outside Air Flow Improvement Recommendations

Immediate action should be taken to correct the malfunctioning damper on DOAS-3. These DOAS units are designed for specific operation during occupied periods and rely on functional control devices to meet those ends. This alone will bring some extra outside air to spaces that currently have none and will necessarily improve building performance as a result. Upon receiving the control fuses for RTU-2, the unit should be repaired and checked for operation prior to the start of the school year or any pre-year activities. The HVAC systems should be holistically reviewed for potential rebalancing to meet as-built design requirements after DOAS-3 and RTU-2 repairs have been made in order to satisfy the remaining spaces that did not meet code, including the few fed by DOAS-1, 2, and RTU-3.

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 previous 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. The recommendations relevant to this building 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,

specifically RTUs. 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. Running the units with loaded filters decreases the filter 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 is not necessarily possible for the DOAS systems but that is acceptable since they generally provide significantly more than minimum ventilation requirements when operating properly.
- Flush or purge building before and after occupancy for at least two (2) hours, if possible.
- For any units that have both MERV 13 final and pre-filters in both positions, replace pre-filters with MERV 8. 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.
- Provide humidification to maintain 40% RH during the heating seasons, if possible.
- Provide dehumidification in the summer to maintain room RH below 60%, if possible.
- 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 if it has not been done recently.

Control Sequence Update Recommendations

This building utilizes an Alerton BAS interfaced to Rooftop equipment and Samsung VRF system. The control system is feature rich and seems to be relatively reliable, providing good control to the units and spaces. Overall, we would suggest a recommissioning check of the Trane Units and integration with the BAS as operation and adjustments might be useful for improving space comfort and optimizing the IAQ. A cursory review of the control systems indicates the following should be considered:

- Repair or replace any faulty equipment controllers and end Input/Output devices including calibration checks of all temperature and airflow monitoring devices.
- Unit schedules should be reviewed to reduce runtime during low or no occupancy conditions while optimizing flow and temperature output during occupied modes.

- 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
- Some older fintube radiation control valves might have been reused in the original building section, leading to possible flow while the BAS command is closed. Some of these classrooms were overheated even without a BAS heat call.
- Address the FCU mixing damper operation to prevent any restrictions on outside air being delivered to the spaces. The ductwork and unit arrangement are such that the duct pressures need to be balanced appropriately between the DOAS and the FCUs in each room otherwise the FCU can end up mostly just recirculating the air.
- Perform recommissioning of all Trane units including the BAS as operational adjustments could be made to further improve space comfort while optimizing IAQ.
- We received complaints from gym occupants that they are not getting warm air to floor, which might be a combination of a balancing and controls issue. This could be due to a lower than needed DAT setpoint (if the air is cooling off too fast at the ceiling) or a higher than needed DAT setpoint (if the air is too warm and floats above the cooler room air). Additional controls investigation would be required to assess this issue.
- 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. It has a greater return on investment for units serving fewer, larger spaces with inconsistent occupancy.

Equipment Upgrade or Replacement Recommendations

For any units that eventually need to be replaced, we recommend considering Energy Recovery Ventilators (ERV). These do not need to be directly associated with a nearby unit, however, 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.

A consideration should be made for modifying the ductwork in classroom spaces with coupled fresh air to ensure that ventilation air from the associated DOAS unit gets delivered to the space rather than short cycling back. The ductwork and damper arrangement allows for this if pressures in the ductwork are not maintained at specific levels in a constantly fluctuating system. Since these DOAS units bring in 100% outside air, it means that they also exhaust everything that returns to them. Although they come equipped with energy recovery devices, any air that is not used for the benefit of the occupants is considered "wasted". The heating and cooling of the outside air is often one of, if not the, greatest HVAC expense even factoring in energy recovery, so it is vital that this is looked into further.

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 within the next few years. 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. Since the recent construction concluded in 2020, around 2025 should be considered. Though this could be put off, any issues not uncovered during this deep dive will only become further exacerbated.

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.

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.
- For any units in the future in need of 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.
- 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: 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, 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.

- Exterior Insulation: ductwork and piping insulation should have a continuous vapor barrier with UV-resistant coating or shields. Typically, foil-faced aluminum insulation or banded aluminum jacketing works for this. For exposed refrigerant piping, these should be reinsulated with elastomeric insulation and coated with a UV-resistant paint. This will prevent deterioration from the sun and avoid costly repairs since almost all air handling and refrigerant equipment is located on the roof.
- General Unit Cleanliness: All units should be cleaned to remove any dirt or debris that has accumulated. Any 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, and this study found that the Holland Hill Elementary School has the potential to meet the current minimum ventilation requirements per 2015 IMC but needs to address some major obstacles first. Given the recent renovation of the school, this process should be a bit easier than other schools to achieve this. 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 before the school is once again occupied. These include bringing into proper operation the outside air dampers for all units, component repairs, and generally increasing outside airflow throughout the building. Given the results of this survey, we recommend further evaluation to be performed particularly regarding the spaces served by DOAS-3 after damper repairs have been made, including any associated balancing and controls adjustments necessary to perform this task. Additionally, any spaces provided with ventilation by a DOAS and served by an FCU should have the ductwork reviewed for potential modifications in an attempt to prevent any outside air short cycling. These measures will help save some energy and improve IAQ throughout the building.

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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 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. Unlike other schools, FPS managed to get filters changed and perform basic annual inspections on every unit here so we encountered few standard maintenance concerns. However, 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 (16)
	Open	Building	Envelope	The building envelope, particularly in the older building sections, is not as weathertight as should be expected. This could lead to unnecessary humidity or unfiltered air infiltration.
	Open	DOAS-1	Dampers	The FCU ductwork configuration coupled with the DOAS damper position control is creating negative pressure, and this is presumed to be a possible root cause.
	Open	DOAS-1	Dampers	Outside air damper is nearly closed as is the Return Air Damper with the Exhaust Fan operating, which is generating a negative space pressure condition. This could result in a reduction of ventilation air delivered by each room's associated FCU.
	Open	DOAS-1	133 OT/PT	This space was not provided with adequate ventilation. It was the only space served by DOAS-1 that did not meet code.
	Open	DOAS-2	Dampers	Outside air damper is nearly closed as is the Return Air Damper with the Exhaust Fan operating, which is generating a negative space pressure condition. This could result in a reduction of ventilation air delivered by each room's associated FCU.
	Open	DOAS-2	Airflow	There were a few rooms that did not meet code-required ventilation: 117 Office, 015 Classroom, 153B Office, 118 Office, 018 Classroom, and 016 Classroom. Some reading indicate system imbalance as well
	Open	DOAS-2	Cleaning	The reheat coil is dirty but both coils should get washed

Action Taken	Status	Unit/Zone	Serving/Room Name	Indoor Air Quality And Ventilation Issue (16)
	Open	DOAS-3	Cleaning	The unit interior needs to be cleaned
	Open	DOAS-3	FCUs	FCUs served by DOAS-3 do not have Automated Control Dampers on OA supply, Manual Volume Dampers only.
	Open	DOAS-3	Airflow	Numerous spaces served by DOAS-3 did not receive adequate ventilation. It is suspected that the unit is pulling the outside air back through the exhaust, which is robbing the FCUs of outside air and preventing distribution to the spaces.
	Open	FCU-3-11	105 Spanish	The volume damper associated with the OA for the FCU was observed 0% open
	Open	General	Ventilation	Report of rooms not getting designed ventilation primarily in the 4th Grade wing.
	Open	RTU-1	Cleaning	The reheat coil is dirty but both coils should get washed
	Open	RTU-2	Airflow	The unit was not running during testing. There were bad control fuses and replacements were said to be on order. This would need to be retested at a later date
	Open	RTU-2	All Purpose Room	The All Purpose room received no ventilation due to RTU-2 being off in a failed state. When the unit is repaired, it is recommended to review this space again
	Open	RTU-3	Media Center	The Media Center did not receive adequate ventilation, only being supplied 395 CFM of the required 678 minimum CFM.

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 (9)
	Open	133	OT/PT	There was a roof leak observed in this location
	Open	004	Art	This room is noticeably hotter than nearby spaces
	Open	012	Classroom	There is water staining on some of the ceiling tiles in this room. Roof or piping leaks should be investigated
	Open	DOAS-3	Condensate	Condensate Trap broken off needs replacement
	Open	K1	Kindergarten	There is a loud fan noise audible in this space. One of the two Samsung VRFs might have a bad bearing or out of balance wheel.
	Open	RTU-1	Cleaning	The condensate drain pan is rusty and should be cleaned out or repaired
	Open	RTU-2	Access	Unit access doors are very heavy and are not hinged. The unit is elevated above the roof, set up on steel dunnage. This makes access difficult and unsafe as it requires standing on ductwork. A permanent means of access should be considered, including adding hinges to the unit doors if possible.
	Open	RTU-2	Safety	The electrical non-metallic conduit to unit is not fastened securely, which makes it subject to damage as well as becoming a potential trip hazard
	Open	RTU-3	Cleaning	The cooling coil piping has some minor corrosion near the header

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 (8)
	Open	General	Schedules	Unit schedules should be reviewed to reduce runtime during low or no occupancy conditions while optimizing flow and temperature output during occupied modes.
	Open	FTR	Classrooms	Some older fintube radiation control valves might have been reused in the original building section, leading to possible flow while the BAS command is closed. Some of these classrooms were overheated even without a BAS heat call.
	Open	DOAS-1	Dampers	Trane and Alerton need to investigate the damper concerns and mitigate to decouple outside air delivered to rooms.
	Open	DOAS-1	Dampers	Some FCUs have a mixing damper in OA connection but this was not in the sequence of operations to determine operation. After speaking with ABS, it was determined that in Economizer mode with ERW=Off, ERW Bypass=Open, Exhaust=On, ODA=<10%, RA <10%. We would have thought the outside air damper would have been open more, and the Exhaust fan running at <40%
	Open	DOAS-1	Dampers	Return air damper on DOAS-1 was approximately 20% open during testing and never modulated. According to sequence of operation, the damper should be closed during occupied operation.
	Open	DOAS-3	Dampers	In Economizer mode with ERW=Off, ERW Bypass=Open, Exhaust=On, ODA=100%, RA <10%

Action Taken	Status	Unit/Zone	Serving/Room Name	Control Issue (8)
	Open	RTU-1	Airflow	We received complaints from gym occupants that they are not getting warm air to floor, which might be a combination of a balancing issue and lower than needed DAT setpoint (if the air is cooling off too fast at the ceiling) or higher than needed DAT (if the air is too warm and floats above the cooler room air). Additional controls investigation would be required to assess this issue.
	Open	RTU-3	Calibration	Although the unit is only sized for 1430 CFM, the AFMS display was reading 1758 CFM while the unit was operating at 65% speed. The AFMS needs to be recalibrated

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 (3)
	Open	General	Recommissioning	We recommend recommissioning of all Trane units and the BAS as operational adjustments could be made to further improve space comfort while optimizing IAQ.
	Open	126	Boiler Room	There is no supply air brought to this space, only emergency exhaust
	Open	FCUs	Measurement	A majority of spaces served by the FCUs, which have OA ducted to the FCU return ductwork supplied by dedicated OA systems. TAB directly measure the OA to all FCUs by traverse

APPENDIX 2 – Ventilation Data Calculations

Project Name:	**Fairfield Public Schools RCx & TAB Study**
Project Number:	**2020102.00.15**
Scope	**Ventilation Calculation by Building**
Date	**August 3, 2022**

Holland Hill 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 Cmd**	**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	110	Main Office	Offices	Office spaces		0%	0%	DOAS-3/ FCU 3-7	470	8.5	3995	6	5.0	0.06	5	58	**43**	-15	-26.1%	**Fails**	**0.646**
1	109	Psych	Offices	Office spaces		0%	0%	DOAS-3/ FCU 3-8	152	8.5	1292	5	5.0	0.06	5	34	**0**	-34	-100.0%	**Fails**	**0.000**
1	108	Office	Offices	Office spaces		0%	0%	DOAS-3/ FCU 3-15	112	8.6	963	4	5.0	0.06	5	27	**6**	-21	-77.5%	**Fails**	**0.374**
1	107	Principal	Offices	Office spaces		0%	0%	DOAS-3/ FCU 3-9	178	8.6	1531	5	5.0	0.06	5	36	**0**	-36	-100.0%	**Fails**	**0.000**
1	106A	Health Suite	Hospitals, nursing and convalescent homes	Patient rooms		0%	0%	DOAS-3/ FCU 3-7	297	8.6	2554	4	25.0	0.00	10	100	**13**	-87	-87.0%	**Fails**	**0.305**
1	106D	Storage	Storage	Warehouses	3333	0%	0%	DOAS-3 EXH Only	55	8.6	473	0	0.0	0.06	0	3	**---**	N/A		**N/A**	
1	106C	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	43	8	344	1	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	106B	Nurse	Hospitals, nursing and convalescent homes	Patient rooms		0%	0%	DOAS-3/ FCU 3-13B	89	8.6	765	2	25.0	0.00	10	50	**18**	-32	-64.0%	**Fails**	**1.411**
1	104	Boys	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	50	8	400	1	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	103	Girls	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	52	8	416	1	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	105	Spanish	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU3-11	138	8.6	1187	4	10.0	0.12	25	57	**0**	-57	-100.0%	**Fails**	**0.000**
1	009	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU3-11	807	8.4	6779	25	10.0	0.12	25	347	**340**	-7	-2.0%	**Fails**	**3.009**
1	009A	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	53	8	424	1	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	007	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU 4-9	807	8.4	6779	25	10.0	0.12	25	347	**257**	-90	-25.9%	**Fails**	**2.275**
1	007A	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	53	8	424	1	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	005	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU 4-7	807	8.4	6779	15	10.0	0.12	25	247	**160**	-87	-35.2%	**Fails**	**1.416**
1	005A	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	53	8	424	1	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	003	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU-3	830	8.4	6972	25	10.0	0.12	25	350	**341**	-9	-2.5%	**Fails**	**2.935**
1	003A	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	53	8	424	1	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**
1	K1	Kindergarten	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU-2A	1053	8.4	8845	26	10.0	0.12	25	386	**88**	-298	-77.2%	**Fails**	**0.597**
1	K1a	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	53	8	424	1	0.0	0.00	0	0	**0**	0	0.0%	**N/A**	**0.000**

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Zone Identification												IMC 2015 Ventilation Calculations									
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					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)	(cfm)	(%)		(AC/hr)
1	101	Cust	Storage	Warehouses	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	45	10	450	1	0.0	0.06	0	3	**0**	-3	-100.0%	**Fails**	**0.000**
1	K2	Kindergarten	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU 4-1	1044	8.6	8978	24	10.0	0.12	25	365	**410**	45	12.2%	**Meets**	**2.740**
1	K2A	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	53	8	424	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	102	Office	Offices	Office spaces		0%	0%	DOAS-3/ FCU 4-4	120	8.6	1032	0	5.0	0.06	5	10	**65**	55	537.3%	**Meets**	**3.779**
1	004	Art	Education	Art Classroom		0%	0%	DOAS-3/ FCU 4-5	828	8.6	7121	25	10.0	0.18	20	399	**235**	-164	-41.1%	**Fails**	**1.980**
1	004A	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	55	8	440	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	006	Kindergarten	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU 4-8	826	8.6	7104	23	10.0	0.12	25	329	**428**	99	30.0%	**Meets**	**3.615**
1	006A	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	53	8	424	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	008	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU 4-10	825	8.6	7095	24	10.0	0.12	25	339	**199**	-140	-41.3%	**Fails**	**1.683**
1	008A	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	53	8	424	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	010	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU 3-2	852	8.6	7327	25	10.0	0.12	25	352	**298**	-54	-15.4%	**Fails**	**2.440**
1	011	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-3/ FCU 3-3	895	8.6	7697	26	10.0	0.12	25	367	**368**	1	0.2%	**Meets**	**2.869**
1	112	Conference	Offices	Conference rooms		0%	0%	DOAS-3/ FCU 3-4	278	8.5	2363	12	5.0	0.06	50	77	**22**	-55	-71.3%	**Fails**	**0.559**
1	113	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	50	8	400	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	114	Lavatory	Public Spaces	Toilet rooms - public	No OA, EXH Only	0%	0%	DOAS-3 EXH Only	50	8	400	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	115	Work Room	Workrooms	Copy, printing rooms		0%	0%	DOAS-3/ FCU 3-6	129	9	1161	4	5.0	0.06	4	28	**0**	-28	-100.0%	**Fails**	**0.000**
1	116	Faculty	Offices	Office spaces		0%	0%	DOAS-3/ FCU 3-5	436	8.6	3750	10	5.0	0.06	5	76	**42**	-34	-44.9%	**Fails**	**0.672**
1	120	All Purpose Room	Education	Multiuse assembly	5170	0%	0%	RTU-2 (Not Running)	2570	21	53970	80	7.5	0.06	100	754	**0**	-754	-100.0%	**Fails**	**0.000**
1	121	Cust	Storage	Warehouses		0%	0%	DOAS-2/ FCU 2-16	147	7.3	1073	2	0.0	0.06	0	9	**85**	76	863.7%	**Meets**	**4.753**
1	123	Kitchen	Food and beverage service	Kitchens (cooking)	No OA, EXH Only	0%	0%	---	632	178.5	8398	4	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	123A	Locker	Education	Locker/dressing room	No Ventilation	0%	0%	---	50	7.6	380	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**

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					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)	(cfm)	(%)		(AC/hr)
1	123B	Lavatory	Public Spaces	Toilet rooms - public	No Ventilation	0%	0%	---	40	7.6	304	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	123C	Office	Offices	Office spaces		0%	0%	DOAS-2/ FCU 2-17	115	8.6	989	2	5.0	0.06	5	17	**25**	8	47.9%	**Meets**	**1.517**
1	124	Elec	Storage	Warehouses	3958	0%	0%	DOAS-2 EXH Only	150	10.2	1530	0	0.0	0.06	0	9	**---**	N/A		N/A	
1	117	Office	Offices	Office spaces		0%	0%	DOAS-2/ FCU 2-1	208	9	1872	5	5.0	0.06	5	37	**22**	-15	-41.3%	**Fails**	**0.705**
1	118	Office	Offices	Office spaces		0%	0%	DOAS-2/ FCU 2-2	214	9	1926	6	5.0	0.06	5	43	**23**	-20	-46.3%	**Fails**	**0.717**
1	119	Office	Offices	Office spaces		0%	0%	DOAS-2/ FCU 2-3	200	9	1800	5	5.0	0.06	5	37	**41**	4	10.8%	**Meets**	**1.367**
1	125	Cust	Storage	Warehouses		0%	0%	DOAS-2 SUP+EXH No FCU	71	7.3	518	1	0.0	0.06	0	4	**36**	32	745.1%	**Meets**	**4.167**
1	126	Boiler Room	Storage	Warehouses	No Supply, Emergency Exh Only	0%	0%	---	901	29	26129	0	0.0	0.06	0	54	**---**	N/A		N/A	
1	127	Boys	Public Spaces	Toilet rooms - public		0%	0%	DOAS-2/FCU 2-13/ EF-1	254	8	2032	3	0.0	0.00	0	0	**95**	95	0.0%	N/A	**2.805**
1	128	Girls	Public Spaces	Toilet rooms - public		0%	0%	DOAS-2/FCU 2-13/ EF-1	252	8	2016	3	0.0	0.00	0	0	**90**	90	0.0%	N/A	**2.679**
1	013	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-2/ FCU 2-11	885	8.6	7611	25	10.0	0.12	25	356	**623**	267	74.9%	**Meets**	**4.911**
1	015	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-2/ FCU 2-10	863	8.6	7422	25	10.0	0.12	25	354	**344**	-10	-2.7%	**Fails**	**2.781**
1	017	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-2/ FCU 2-9	861	8.6	7405	25	10.0	0.12	25	353	**424**	71	20.0%	**Meets**	**3.436**
1	020	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-2/ FCU 2-4	877	8.6	7542	25	10.0	0.12	25	355	**414**	59	16.5%	**Meets**	**3.293**
1	019	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-2/ FCU 2-5	878	8.6	7551	25	10.0	0.12	25	355	**388**	33	9.2%	**Meets**	**3.083**
1	018	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-2/ FCU 2-6	895	8.6	7697	25	10.0	0.12	25	357	**344**	-13	-3.7%	**Fails**	**2.682**
1	016	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-2/ FCU 2-7	881	8.6	7577	25	10.0	0.12	25	356	**308**	-48	-13.4%	**Fails**	**2.439**
1	014	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-2/ FCU 2-8	890	8.6	7654	20	10.0	0.12	25	307	**364**	57	18.6%	**Meets**	**2.853**
1	012	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-2/ FCU 2-12	880	8.6	7568	16	10.0	0.12	25	266	**442**	176	66.4%	**Meets**	**3.504**
1	129	Storage	Storage	Warehouses	No Ventilation	0%	0%	---	155	8	1240	0	0.0	0.06	0	9	**---**	N/A		N/A	
1	130	Elec	Storage	Warehouses	No Ventilation	0%	0%	---	12	8	96	0	0.0	0.06	0	1	**---**	N/A		N/A	

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					(cfm)	(%)	(%)		(sq.ft)	(ft)	(cu.ft)	Adult	(cfm/ person)	(cfm/sf)	(#/1000sf)	(cfm)	(cfm)	(cfm)	(%)		(AC/hr)
1	131	Storage	Storage	Warehouses	No Ventilation	0%	0%	---	24	8	192	0	0.0	0.06	0	1	---	N/A		N/A	
1	132	Library/Media Center	Education	Media Center	1430	35%	20%	RTU-3	2152	10	21520	42	10.0	0.12	25	678	**395**	-283	-41.8%	**Fails**	**1.101**
1	132A	IT	Offices	Telephone/data entry	FCU not running	0%	0%	DOAS-3/ FCU 3-14	106	9	954	2	5.0	0.06	60	16	**0**	-16	-100.0%	**Fails**	**0.000**
1	132AA	MDF	Storage	Warehouses	No OA Ventilation	0%	0%	AC-2 Split, No OA	91	8.6	783	0	0.0	0.06	0	5	---	N/A		N/A	
1	132B	Special Ed	Education	Classroom (ages 5-8)	FCU not running	0%	0%	DOAS-3/ FCU 3-10	218	8.6	1875	2	10.0	0.12	25	46	**0**	-46	-100.0%	**Fails**	**0.000**
1	132C	Special Ed	Education	Classroom (ages 5-8)	FCU not running	0%	0%	DOAS-3/ FCU 3-10	171	9.6	1642	4	10.0	0.12	25	61	**0**	-61	-100.0%	**Fails**	**0.000**
1	133	OT/PT	Hospitals, nursing and convalescent homes	Physical Therapy		0%	0%	DOAS-1/ FCU 1-10	246	9	2214	5	15.0	0.00	20	75	**24**	-51	-68.0%	**Fails**	**0.650**
1	133A	Storage	Storage	Warehouses	No Ventilation	0%	0%	---	31	8	248	0	0.0	0.06	0	2	---	N/A		N/A	
1	135	Special Ed	Education	Classroom (ages 5-8)		0%	0%	DOAS-1/ FCU 1-9	236	8.8	2077	5	10.0	0.12	25	78	**127**	49	62.2%	**Meets**	**3.669**
1	136	Ext Storage	Storage	Warehouses	No Access	0%	0%	DOAS-1 No FCU	100	10	1000	0	0.0	0.06	0	6	---	N/A		N/A	
1	137	Special Ed	Education	Classroom (ages 5-8)		0%	0%	DOAS-1/ FCU 1-8	238	8.8	2094	6	10.0	0.12	25	89	**117**	28	32.1%	**Meets**	**3.352**
1	157	Storage	Storage	Warehouses	No Ventilation	0%	0%	---	38	8	304	0	0.0	0.06	0	2	---	N/A		N/A	
1	138	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-1/ FCU 1-7	746	8.9	6639	25	10.0	0.12	25	340	**381**	41	12.2%	**Meets**	**3.443**
1	139	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-1/ FCU 1-6	745	8.9	6631	25	10.0	0.12	25	339	**523**	184	54.1%	**Meets**	**4.733**
1	140	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-1/ FCU 1-5	747	8.9	6648	26	10.0	0.12	25	350	**386**	36	10.4%	**Meets**	**3.484**
1	141	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-1/ FCU 1-4	747	8.9	6648	25	10.0	0.12	25	340	**364**	24	7.2%	**Meets**	**3.285**
1	142	Classroom	Education	Classroom (ages 5-8)		0%	0%	DOAS-1/ FCU 1-3	757	8.9	6737	25	10.0	0.12	25	341	**522**	181	53.2%	**Meets**	**4.649**
1	143	Girls	Public Spaces	Toilet rooms - public		0%	0%	DOAS-1/ FCU 1-15	235	8.9	2092	3	0.0	0.00	0	0	**58**	58	0.0%	N/A	**1.664**
1	144	Boys	Public Spaces	Toilet rooms - public		0%	0%	DOAS-1/ FCU 1-15	243	8.9	2163	3	0.0	0.00	0	0	**110**	110	0.0%	N/A	**3.052**
1	152	Elec	Storage	Warehouses	No Ventilation Installed	0%	0%	---	61	12.6	769	0	0.0	0.06	0	4	---	N/A		N/A	
1	151	Lavatory	Public Spaces	Toilet rooms - public	No Supply	0%	0%	Served by DOAS-1 Exhaust	67	8	536	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**

Project Name:	**Fairfield Public Schools RCx & TAB Study**
Project Number:	**2020102.00.15**
Scope	**Ventilation Calculation by Building**
Date	**August 3, 2022**

Holland Hill 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 Cmd**	**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	150	Lavatory	Public Spaces	Toilet rooms - public	No Supply	0%	0%	Served by DOAS-1 Exhaust	67	8	536	1	0.0	0.00	0	0	**0**	0	0.0%	N/A	**0.000**
1	146	Storage	Storage	Warehouses	3300	0%	0%	Direct from DOAS-1 No FCU	86	12.6	1084	0	0.0	0.06	0	5	---	N/A		N/A	
1	147	Gifted	Education	Classroom (ages 5-8)		0%	0%	DOAS-1/ FCU 1-2	337	8.8	2966	10	10.0	0.12	25	140	**150**	10	6.8%	**Meets**	**3.035**
1	148	Music	Education	Music/theater/dance		0%	0%	DOAS-1/ FCU -1-	746	8.8	6565	20	10.0	0.06	35	245	**292**	47	19.3%	**Meets**	**2.669**
1	155	Storage	Storage	Warehouses	No Ventilation Installed	0%	0%	---	23	8.6	198	0	0.0	0.06	0	1	---	N/A		N/A	
1	149	Platform	Education	Music/theater/dance		0%	0%	DOAS-1/ FCU 1-13	813	8.6	6992	20	10.0	0.06	35	249	**330**	81	32.6%	**Meets**	**2.832**
1	149A	Storage	Storage	Warehouses		0%	0%	Direct from DOAS-1 No FCU	131	81	10611	0	0.0	0.06	0	8	---	N/A		N/A	
1	153	Gymnasium	Sports and amusement	Gym, stadium, arena (play area)	3960	0%	0%	RTU-1	4035	22.6	91191	50	0.0	0.30	0	1211	**1781**	571	47.1%	**Meets**	**1.172**
1	153A	Storage	Storage	Warehouses		0%	0%	Direct from DOAS-2 No FCU	412	10	4120	0	0.0	0.06	0	25	---	N/A		N/A	
1	153B	Office	Offices	Office spaces		0%	0%	DOAS-2/ FCU 2-15	131	8	1048	2	5.0	0.06	5	18	**0**	-18	-100.0%	**Fails**	**0.000**
1	153C	IDF	Storage	Warehouses	No Ventilation Installed	0%	0%	---	109	10	1090	0	0.0	0.06	0	7	---	N/A		N/A	

APPENDIX 3 – Roof Map


RTU-1
DOAS-2
RTU-2
DOAS-1
RTU-3
DOAS-3
3D

APPENDIX 4 – TAB Airflow Survey Data

WING'S TESTING & BALANCING CO., INC.

Fairfield Public Schools
Holland Hill Elementary

* * * *

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

June 02, 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.

June 02, 2022

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

Re: Holland Hill

Dear Bill,

The airflow testing at the above-referenced location has been completed as noted on our attached data sheets. The following are our results:

- Majority of spaces served by Fan Coil Units which have Outside Air ducted to FCU return ductwork supplied by dedicated OA systems. We directly measured OA to all FCU's by traverse.
- DOAS units have Supply/ Exhaust with a heat recovery wheel, but there is a return damper which can modulate to return air back to unit instead of exhausting 100%. This damper is not supposed to open in occupied mode, but it was found to be approximately 20% open on DOAS-3. The damper may be stuck in this position as it never changed over the 3 days of testing (see photo).
- RTU-2 serving Multi-Purpose Room/ Café wasn't operational at time of testing.

Recommendations:

- Investigate Return Damper on DOAS-3 and ensure it's operating properly. When it is closed, have Wing's spot check pervious OA readings to document any change.
- Have Wing's return to test RTU-2 when it is operational.

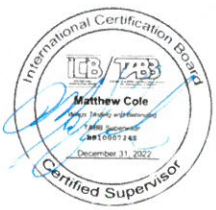
The following pages are your record of current operating conditions. If you have any questions, or if we can be of further service, please do not hesitate to call.

Very truly yours,

Wing's Testing & Balancing Co., Inc.
ICB Certified Contractor for:
TABB—Commissioning—Fire/Life Safety L1&L2—Sound & Vibration

Nick Carrano

Nicholas Carrano
Certified TABB Technician #BB1160780T
CT SM-2 License 7484



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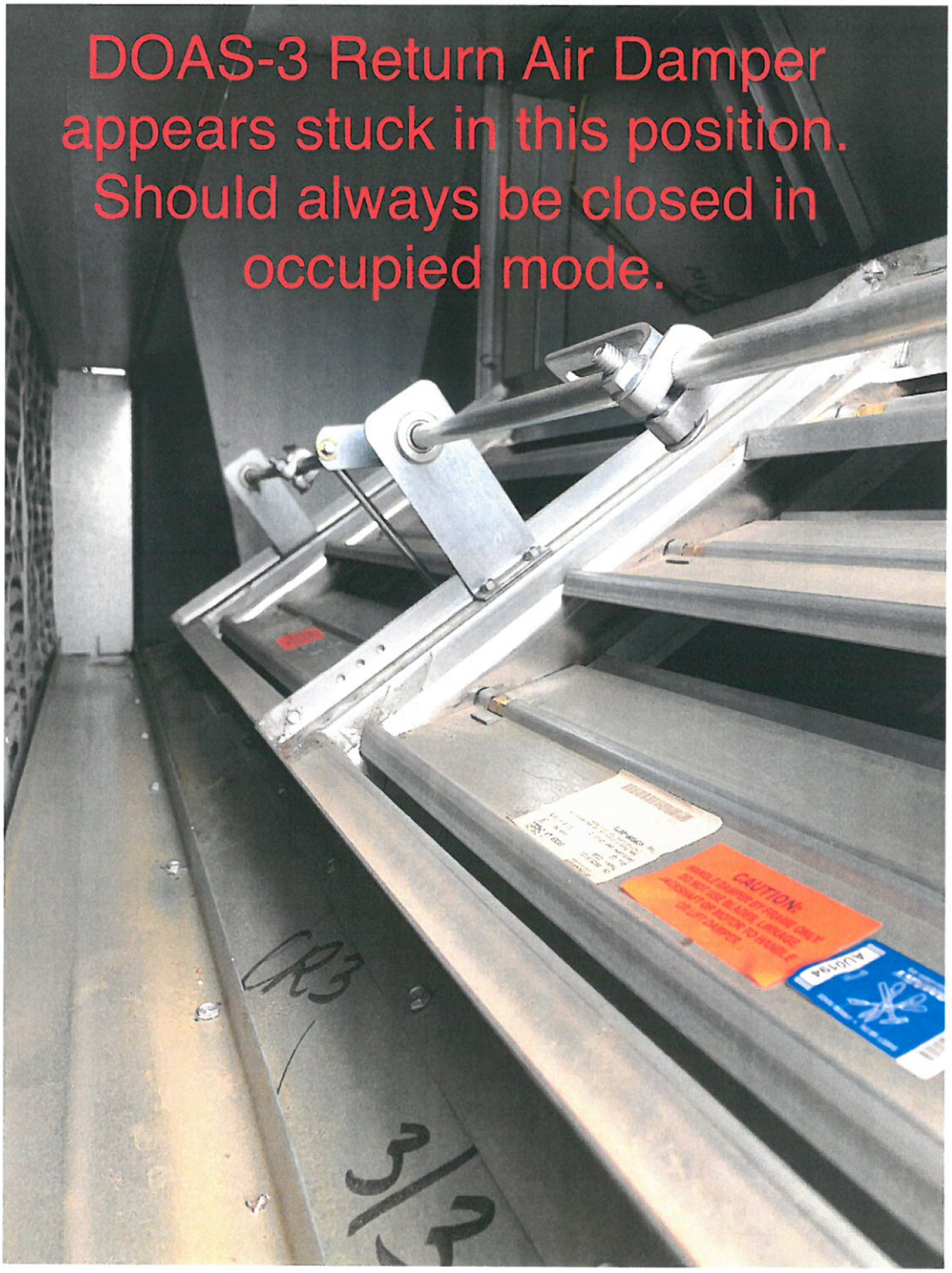

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VELOCITY PRESSURE READINGS

PROJECT: Holland Hill **DATE:** 06/02/2022

AREA SERVED: FCU OA DOAS - 1 **TECH:** NC, BS

TRAVERSE LOCATIONS	DUCT SIZE "	AREA SQ.FT.	DESIGN FPM	DESIGN CFM	CENT. STAT. PRESS."	TEST FPM	TEST CFM	NOTES
Rm 148 FCU 1-1	14" x 6"	0.58	543	315	+0.17"	575	334	(1)
Rm 147 FCU 1-2	10" x 6"	0.42	310	130	+0.18"	358	150	
Rm 149 FCU 1-13	14" x 6"	0.58	388	225	+0.21"	569	330	
Rm 149A No FCU	4" Ø	0.09	167	15	+0.04"	470	42	
Rm 142 FCU 1-3	22" x 6"	0.92	408	375	+0.27"	567	522	
Rm 141 FCU 1-4	22" x 6"	0.92	408	375	+0.29"	396	364	
Rm 140 FCU 1-5	22" x 6"	0.92	408	375	-0.01"	420	386	
Rm 139 FCU 1-6	22" x 6"	0.92	408	375	+0.39"	568	523	
Rm 138 FCU 1-7	22" x 6"	0.92	408	375	+0.38"	414	381	
Rm 137 FCU 1-8	8" x 6"	0.33	273	90	+0.41"	356	117	
Rm 135 FCU 1-9	8" x 6"	0.33	273	90	+0.41"	386	127	
Rm 133 FCU 1-10	5"Ø	0.14	179	25	+0.42"	172	24	

REMARKS

(1) This includes take off to room 149A, OA to FCU 1-1 is 292 CFM. Return air damper on DOAS-1 was approximately 20% open during testing and never modulated. According to sequence of operation, the damper should be closed during occupied operation.

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

VELOCITY PRESSURE READINGS

PROJECT: Holland Hill **DATE:** 06/02/2022

AREA SERVED: FCU OA DOAS - **2** **TECH:** NC, BS

TRAVERSE LOCATIONS	DUCT SIZE "	AREA SQ.FT.	DESIGN FPM	DESIGN CFM	CENT. STAT. PRESS."	TEST FPM	TEST CFM	NOTES
Rm 12 FCU -12	20" x 6"	0.83	392	325	+0.34"	533	442	
Rm 12 FCU 2-12 DOAS-REA	16" x 6"	0.67	ND	ND	-0.06"	165	111	(1)
Rm 14 FCU 2-8	20" x 6"	0.83	392	325	+0.41"	438	364	
Rm 16 FCU 2-7	20" x 6"	0.83	392	325	-0.06"	371	308	
Rm 18 FCU 2-6	20" x 6"	0.83	392	325	-0.07"	415	344	
Rm 13 FCU 2-11	20" x 6"	0.83	392	325	+0.19"	750	623	
Rm 15 FCU 2-10	20" x 6"	0.83	392	325	+0.15"	414	344	
Rm 19 FCU 2-5	20" x 6"	0.83	392	325	-0.07"	467	388	
Rm 20 FCU 2-4	20" x 6"	0.83	392	325	-0.02"	499	414	
Rm 17 FCU 2-9	20" x 6"	0.83	392	325	+0.11"	511	424	
Gym Off 153B FCU 2-15	4"Ø	0.09	167	15	0.0"	0	0	
Rm 119 FCU 2-3	6"Ø	0.2	125	25	+0.39"	206	41	
Rm 118 FCU 2-2	6"Ø	0.2	100	20	-0.03"	115	23	
Rm 117 FCU 2-1	6"Ø	0.2	125	25	-0.01"	112	22	
Rm 121 FCU 2-16	4"Ø	0.09	167	15	+0.18"	940	85	
Rm 123C FCU 2-17	4"Ø	0.09	167	15	+0.008"	281	25	

REMARKS

(1) DOAS-2 Exhaust from FCU 2-12 tested for reference.

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

VELOCITY PRESSURE READINGS

PROJECT: Holland Hill **DATE:** 06/02/2022

AREA SERVED: FCU OA DOAS - 3 **TECH:** NC, BS

TRAVERSE LOCATIONS	DUCT SIZE "	AREA SQ.FT.	DESIGN FPM	DESIGN CFM	CENT. STAT. PRESS."	TEST FPM	TEST CFM	NOTES
Rm 11 FCU 3-3	20" X 6"	0.83	392	325	-0.02"	443	368	
Rm 10 FCU 3-2	20" X 6"	0.83	392	325	-0.04"	359	298	
Rm 9 FCU 3-1	20" X 6"	0.83	380	315	-0.6"	410	340	
Rm 8 FCU 4-10	20" X 6"	0.83	361	300	-0.05"	240	199	
Rm 7 FCU 4-9	20" X 6"	0.83	361	300	-0.06"	310	257	
Rm 6 FCU 4-8	20" X 6"	0.83	361	300	-0.06"	516	428	
Rm 5 FCU 4-7	20" X 6"	0.83	361	300	-0.03"	193	160	
Rm 4 FCU 4-5	20" X 6"	0.83	392	325	-0.06"	283	235	
Rm 3 FCU 4-3	20" X 6"	0.83	361	300	-0.05"	411	341	
Rm K2 FCU 4-1	24" X 6"	1.0	400	400	-0.05"	410	410	
Rm K1 FCU 4-2A	24" X 6"	1.0	400	400	-0.003"	88	88	
Rm 102 FCU 4-4	6"Ø	0.2	75	15	-0.06"	323	65	
Admin Areas								
105 FCU 3-11	5"Ø	0.14	429	60	-0.03"	0	0	(1)
106B FCU 3-13B	5"Ø	0.14	107	15	-0.03"	125	18	
106A FCU 3-13A	6"Ø	0.2	150	30	-0.02"	64	13	
107 FCU 3-9	5"Ø	0.14	143	20	-0.05"	0	0	
108 FCU 3-15	6"Ø	0.2	75	15	-0.05"	32	6	
109 FCU 3-8	6"Ø	0.2	75	15	-0.05"	0	0	
110 FCU 3-7	6"Ø	0.2	250	50	-0.03"	213	43	
115 FCU 3-6	6"Ø	0.2	75	15	0.0"	0	0	
116 FCU 3-5	10" X 6"	0.42	357	150	-0.003"	100	42	
112 FCU 3-4	6"Ø	0.2	500	100	-0.004"	112	22	

REMARKS

FCU's served by DOAS-3 do not have Automated Control Dampers on OA supply, Manual Volume Dampers only.
(1) VD 100% closed

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

AIR DEVICE REPORT

PROJECT: Holland Hill **DATE:** 05/31/22

SYSTEM / AREA: Exhaust Fans + DOAS Exhaust **TECH:** NC, BS

LOCATION	NO.	SIZE	A K	DESIGN		TEST		FINAL		NOTES
				FPM	CFM	FPM	CFM	FPM	CFM	
EF-1										
Boys 144	E1	6" x 6"	FH	---	150	---	161			
Girls 143	E2	6" x 6"	FH	---	150	---	146			
					300		307			
EF-2										
Boys 127	E1	10" x 10"	FH	---	350	---	264			
Girls 128	E2	10" x 10"	FH	---	300	---	292			
					650					
DOAS-1 Exhaust										
Restroom 150	E1-1	6" x 6"	FH	---	50	---	82			
Restroom 151	E1-2	6" x 6"	FH	---	50	---	96			
DOAS-2 Exhaust										
Cust. 125	E2-1	6" x 6"	FH	---	ND	---	36			
DOAS-3 Exhaust										
Staff RR 114	E3-1	6" x 6"	FH	---	50	---	31			
Staff RR 113	E3-2	6" x 6"	FH	---	50	---	34			
Nurse Stor 106D	E3-3	6" x 6"	FH	---	50	---	31			
Nurse RR 106C	E3-4	6" x 6"	FH	---	50	---	40			
Boys 104	E3-5	6" x 6"	FH	---	50	---	0			
Girls 103	E3-6	6" x 6"	FH	---	50	---	22			
Nurse Isolation 105	E3-7	6" x 6"	FH	---	60	---	34			
Toilet 009A	E3-8	6" x 6"	FH	---	50	---	0			
Toilet 008A	E3-9	6" x 6"	FH	---	50	---	0			
Toilet 007A	E3-10	6" x 6"	FH	---	50	---	0			
Toilet 006A	E3-11	6" x 6"	FH	---	50	---	0			
Toilet 005A	E3-12	6" x 6"	FH	---	50	---	0			
Toilet 004A	E3-14	6" x 6"	FH	---	50	---	26			
Toilet 003A	E3-14	6" x 6"	FH	---	50	---	0			
Toilet K2A	E3-15	6" x 6"	FH	---	ND	---	0			
Toilet K1A	E3-16	6" x 6"	FH	---	ND	---	0			
Jan Clst 101	E3-17	6" x 6"	FH	---	ND	---	0			

REMARKS

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

VELOCITY PRESSURE READINGS

PROJECT: Holland Hill **DATE:** 06/02/2022

AREA SERVED: RTU's **TECH:** NC

TRAVERSE LOCATIONS	DUCT SIZE "	AREA SQ.FT.	DESIGN FPM	DESIGN CFM	CENT. STAT. PRESS."	TEST FPM	TEST CFM	NOTES
RTU-1 Total	57" x 36"	14.25	278	3960	Velgrid	253	3605	
RTU-1 Min OA	57" x 36"	14.25	88	1250	Velgrid	125	1781	
RTU-2 Total	57" x 36"	14.25	363	5170	NA	NA	NA	(1)
RTU-2 Min OA	57" x 36"	14.25	119	1700	NA	NA	NA	(1)
RTU-3 Total	40" x 16"	4.44	322	1430	Velgrid	255	1132	
RTU-3 Min OA	40" x 16"	4.44	177	785	Velgrid	89	395	20% OAD

REMARKS

(1) RTU-2 Control Fuses on order, not operational at time of testing

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

Project Name:	**Fairfield Public Schools RCx: Holland Hill Elementary School**
Project Number:	*2020102.00.15*
Scope	**TAB Data DOAS-1, RTU-1**
Date	**06/01/22, 06/02/22**

Zone Identification								
Floor	Room#	Room Name	Design Min CFM (cfm)	Actual OA at Min (OA cfm)	Unit Actual OA % (OA% of Total)	BAS OA Damper Cond (pos. %)	Space Served By RTU/AHU Unit	Notes
1	110	Main Office		43 CFM	NA	NA	DOAS-3/ FCU 3-7	
1	109	Pysch		0 CFM	NA	NA	DOAS-3/ FCU 3-8	
1	108.00	Office		6 CFM	NA	NA	DOAS-3/ FCU 3-15	
1	107	Principal		0 CFM	NA	NA	DOAS-3/ FCU 3-9	
1	106A	Health Suite		13 CFM	NA	NA	DOAS-3/ FCU 3-7	
1	106D	Storage		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	106C	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	106B	Nurse		18 CFM	NA	NA	DOAS-3/ FCU 3-13B	
1	104	Boys		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	103	Girls		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	105	Spanish		0 CFM	NA	NA	DOAS-3/ FCU3-11	Volume damper observed to be 100% closed
1	009	Classroom		340 CFM	NA	NA	DOAS-3/ FCU3-11	
1	009A	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	007	Classroom		257 CFM	NA	NA	DOAS-3/ FCU 4-9	
1	007A	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	005	Classroom		160 CFM	NA	NA	DOAS-3/ FCU 4-7	
1	005A	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	003	Classroom		341 CFM	NA	NA	DOAS-3/ FCU-3	
1	003A	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	K1	Kindergarten		88 CFM	NA	NA	DOAS-3/ FCU-2A	
1	K1a	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1		Storage		No Ventilation	NA	NA	NA	
1	101	Cust		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	K2	Kindergarten		410 CFM	NA	NA	DOAS-3/ FCU 4-1	
1	K2A	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	102	Office		65 CFM	NA	NA	DOAS-3/ FCU 4-4	
1	004	Art		235 CFM	NA	NA	DOAS-3/ FCU 4-5	
1	004A	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	004B	Kiln		NA, Elec Heat	NA	NA	NA	

Project Name:	**Fairfield Public Schools RCx: Holland Hill Elementary School**
Project Number:	*2020102.00.15*
Scope	**TAB Data DOAS-1, RTU-1**
Date	**06/01/22, 06/02/22**

Zone Identification								
Floor	Room#	Room Name	Design Min CFM (cfm)	Actual OA at Min (OA cfm)	Unit Actual OA % (OA% of Total)	BAS OA Damper Cond (pos. %)	Space Served By RTU/AHU Unit	Notes
1	004C	Storage		No Ventilation	NA	NA	NA	
1	006	Kindergarten		428 CFM	NA	NA	DOAS-3/ FCU 4-8	
1	006A	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	008	Classroom		199 CFM	NA	NA	DOAS-3/ FCU 4-10	
1	008A	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	010	Classroom		298 CFM	NA	NA	DOAS-3/ FCU 3-2	
1	011	Classroom		368 CFM	NA	NA	DOAS-3/ FCU 3-3	
1	112	Conference		22 CFM	NA	NA	DOAS-3/ FCU 3-4	
1	113	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	114	Lavatory		No OA, EXH Only	NA	NA	DOAS-3 EXH Only	
1	115	Work Room		O CFM	NA	NA	DOAS-3/ FCU 3-6	
1	116	Faculty		42 CFM	NA	NA	DOAS-3/ FCU 3-5	
1	120	All Purpose Room		RTU-2 Not Running	NA	NA	RTU-2	Bad control fuses were on order. Couldn't test.
1	121	Cust		85 CFM	NA	NA	DOAS-2/ FCU 2-16	
1	122	Storage		No Ventilation	NA	NA	NA	
1	123	Kitchen		No OA, EXH Only	NA	NA	NA	
1	123A	Locker		No Ventilation	NA	NA	NA	
1	123B	Lavatory		No Ventilation	NA	NA	NA	
1	123C	Office		25 CFM	NA	NA	DOAS-2/ FCU 2-17	
1	123E	REFR		No Ventilation	NA	NA	NA	
1	123F	FRZR		No Ventilation	NA	NA	NA	
1	124	Elec		DOAS-2 Exhaust only, No OA	NA	NA	DOAS-2 EXH Only	
1	156	Fire Pump		No OA, EXH Only	NA	NA	EXH Only, Interlocked with fire pump	
1	117	Office		22 CFM	NA	NA	DOAS-2/ FCU 2-1	
1	118	Office		23 CFM	NA	NA	DOAS-2/ FCU 2-2	
1	119	Office		41 CFM	NA	NA	DOAS-2/ FCU 2-3	
1	125	Cust		36 CFM	NA	NA	DOAS-2 SUP+EXH No FCU	
1	126	Boiler Room		No Supply, Emergency Exh Only	NA	NA	None	
1	127	Boys		95 CFM	NA	NA	DOAS-2/FCU 2-13/ EF-1	100% OA FCU

Project Name:	**Fairfield Public Schools RCx: Holland Hill Elementary School**
Project Number:	*2020102.00.15*
Scope	**TAB Data DOAS-1, RTU-1**
Date	**06/01/22, 06/02/22**

Zone Identification								
Floor	Room#	Room Name	Design Min CFM (cfm)	Actual OA at Min (OA cfm)	Unit Actual OA % (OA% of Total)	BAS OA Damper Cond (pos. %)	Space Served By RTU/AHU Unit	Notes
1	128	Girls		90 CFM	NA	NA	DOAS-2/FCU 2-13/ EF-1	100% OA FCU
1	013	Classroom		623 CFM	NA	NA	DOAS-2/ FCU 2-11	
1	015	Classroom		344 CFM	NA	NA	DOAS-2/ FCU 2-10	
1	017	Classroom		424 CFM	NA	NA	DOAS-2/ FCU 2-9	
1	020	Classroom		414 CFM	NA	NA	DOAS-2/ FCU 2-4	
1	019	Classroom		388 CFM	NA	NA	DOAS-2/ FCU 2-5	
1	018	Classroom		344 CFM	NA	NA	DOAS-2/ FCU 2-6	
1	016	Classroom		308 CFM	NA	NA	DOAS-2/ FCU 2-7	
1	014	Classroom		364 CFM	NA	NA	DOAS-2/ FCU 2-8	
1	012	Classroom		442 CFM	NA	NA	DOAS-2/ FCU 2-12	
1	129	Storage		No Ventilation	NA	NA	NA	
1	130	Elec		No Ventilation	NA	NA	NA	
1	131	Storage		No Ventilation	NA	NA	NA	
1	132	Library/Media Center		395 CFM	35%	20%	RTU-3	
1	132A	IT		FCU not running	NA	NA	DOAS-3/ FCU 3-14	
1	132AA	MDF		No OA Ventilation	NA	NA	AC-2 Split, No OA	
1	132B	Special Ed		FCU not running	NA	NA	DOAS-3/ FCU 3-10	
1	132C	Special Ed		FCU not running	NA	NA	DOAS-3/ FCU 3-10	
1	133	OT/PT		24 CFM	NA	NA	DOAS-1/ FCU 1-10	
1	133A	Storage		No Ventilation	NA	NA	NA	
1	135	Special Ed		127 CFM	NA	NA	DOAS-1/ FCU 1-9	
1	136	Ext Storage		No Access	NA	NA	DOAS-1 No FCU	No Access - Locked
1	137	Special Ed		117 CFM	NA	NA	DOAS-1/ FCU 1-8	
1	157	Storage		No Ventilation	NA	NA	NA	
1	138	Classroom		381 CFM	NA	NA	DOAS-1/ FCU 1-7	
1	139	Classroom		523 CFM	NA	NA	DOAS-1/ FCU 1-6	DOAS-1 OA Supply Duct +0.16" w.c.
1	140	Classroom		386 CFM	NA	NA	DOAS-1/ FCU 1-5	
1	141	Classroom		364 CFM	NA	NA	DOAS-1/ FCU 1-4	
1	142	Classroom		522 CFM	NA	NA	DOAS-1/ FCU 1-3	

Project Name:	**Fairfield Public Schools RCx: Holland Hill Elementary School**
Project Number:	*2020102.00.15*
Scope	**TAB Data DOAS-1, RTU-1**
Date	**06/01/22, 06/02/22**

Zone Identification								
Floor	Room#	Room Name	Design Min CFM (cfm)	Actual OA at Min (OA cfm)	Unit Actual OA % (OA% of Total)	BAS OA Damper Cond (pos. %)	Space Served By RTU/AHU Unit	Notes
1	143	Girls		58 CFM	NA	NA	DOAS-1/ FCU 1-15	100% OA FCU
1	144	Boys		110 CFM	NA	NA	DOAS-1/ FCU 1-15	100% OA FCU
1	152	Elec		No Ventilation Installed	NA	NA	None	
1	151	Lavatory		No Supply	NA	NA	Served by DOAS-1 Exhaust	
1	150	Lavatory		No Supply	NA	NA	Served by DOAS-1 Exhaust	
1	146	Storage		0 CFM	NA	NA	Direct from DOAS-1 No FCU	
1	147	Gifted		150 CFM	NA	NA	DOAS-1/ FCU 1-2	
1	148	Music		292 CFM	NA	NA	DOAS-1/ FCU -1-	
1	155	Storage		No Ventilation Installed	NA	NA	NA	
1	149	Platfordm		330 CFM	NA	NA	DOAS-1/ FCU 1-13	
1	149A	Storage		42 CFM	NA	NA	Direct from DOAS-1 No FCU	
1	153	Gymnasium		1781 CFM	NA	NA	RTU-1	
1	153A	Storage		30 CFM	NA	NA	Direct from DOAS-2 No FCU	
1	153B	Office		0 CFM	NA	NA	DOAS-2/ FCU 2-15	
1	153C	IDF		No Ventilation Installed	NA	NA	None	

APPENDIX 5 – RCx Unit and Room Take-Off Data

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.00.15*
Scope	**Room Take-Off Data**
Date	**May 26, 2022**
	Holland Hill Elementary School

RCM, RA, JRK

Zone Identification

Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	110	Main Office	470	8.5	3995	6	3 SA, 1 RA		
1	109	Pysch	152	8.5	1292	5	VRF, 1 RA, FTR		
1	108.00	Office	112	8.6	963.2	4	VRF, 1 RA, FTR		
1	107	Principal	178	8.6	1530.8	5	VRF, 1 RA, FTR		
1	106A	Health Suite	297	8.6	2554.2	4	2 SA. 1 RA, FTR		
1	106D	Storage	55	8.6	473	0	1 RA		
1	106C	Lavatory	43	8	344	1	1 Exh		
1	106B	Nurse	89	8.6	765.4	2	1 VRF, FTR		
1	104	Boys	50	8	400	1	1 Exh		
1	103	Girls	52	8	416	1	1 Exh		
1	105	Resource Rm	138	8.6	1186.8	4	1 VRF, FTR		
1	009	Classroom	807	8.4	6778.8	25	4 SA, 1 RA, FTR, VRF		
1	009A	Lavatory	53	8	424	1	1 Exh		
1	007	Classroom	807	8.4	6778.8	25	4 SA, 1 RA, FTR, VRF		
1	007A	Lavatory	53	8	424	1	1 Exh		
1	005	Classroom	807	8.4	6778.8	15	4 SA, 1 RA, FTR, VRF		
1	005A	Lavatory	53	8	424	1	1 Exh		
1	003	Classroom	830	8.4	6972	25	4 SA, 1 RA, FTR, VRF		
1	003A	Lavatory	53	8	424	1	1 Exh		
1	K1	Kindergarten	1053	8.4	8845.2	26	7 SA, 2 RA, FTR, 2 VRF	Loud Fan Noise	

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.00.15*
Scope	**Room Take-Off Data**
Date	**May 26, 2022**
	Holland Hill Elementary School

RCM, RA, JRK

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	K1a	Lavatory	53	8	424	1	1 Exh		
1	101	Cust	45	10	450	1	1 Exh	Roof Hatch	
1	K2	Kindergarten	1044	8.6	8978.4	24	4 SA, 1 RA, FTR, VRF		
1	K2A	Lavatory	53	8	424	1	1 Exh		
1	102	Office Storage	120	8.6	1032	0	1 VRF		
1	004	Art	828	8.6	7120.8	25	4 SA, 1 RA, FTR, VRF	Room Very Hot	
1	004A	Lavatory	55	8	440	1	1 Exh		
1	006	Kindergarten	826	8.6	7103.6	23	4 SA, 1 RA, FTR, VRF		
1	006A	Lavatory	53	8	424	1	1 EXH		
1	008	Classroom	825	8.6	7095	24	4 SA, 1 RA, FTR, VRF		
1	008A	Lavatory	53	8	424	1	1 EXH		
1	010	Classroom	852	8.6	7327.2	25	4 SA, 1 RA, FTR, VRF		
1	011	Classroom	895	8.6	7697	26	4 SA, 1 RA, FTR, VRF		
1	112	Conference	278	8.5	2363	12	2 SA, 1 RA, Conv. VRF		
1	113	Lavatory	50	8	400	1			
1	114	Lavatory	50	8	400	1			
1	115	Work Room	129	9	1161	4	Samsung VRF Wall		X
1	116	Faculty	436	8.6	3749.6	10	2 SA, 1 RA, (2) Conv. VRF		
1	120	All Purpose Room	2570	21	53970	80	On 64' Wall slope 18' - 23'		
1	121	Cust	147	7.3	1073.1	2	1 VRF		

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.00.15*
Scope	**Room Take-Off Data**
Date	**May 26, 2022**
	Holland Hill Elementary School

RCM, RA, JRK

Zone Identification									
Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	123	Kitchen	356 276	17 8.5	8398	4			
1	123A	Locker	50	7.6	380	1			
1	123B	Lavatory	40	7.6	304	1			
1	123C	Office	115	8.6	989	2	1 VRF		
1	124	Elec	150	10.2	1530	0			
1	117	Office	208	9	1872	5	1 VRF. 1 SA, 1 RA		
1	118	Office	214	9	1926	6	1 VRF. 1 SA, 1 RA		
1	119	Office	200	9	1800	5	1 VRF. 1 SA, 1 RA		
1	125	Cust	71	7.3	518.3	1	1 SA		
1	126	Boiler Room	901	29	26129	0			
1	127	Boys	254	8	2032	3	SA, RA		
1	128	Girls	252	8	2016	3	SA, RA		
1	013	Classroom	885	8.6	7611	25	4 SA, 1 RA, FTR, VRF		
1	015	Classroom	863	8.6	7421.8	25	4 SA, 1 RA, FTR, VRF		
1	017	Classroom	861	8.6	7404.6	25	4 SA, 1 RA, FTR, VRF		
1	020	Classroom	877	8.6	7542.2	25	4 SA, 1 RA, FTR, VRF		
1	019	Classroom	878	8.6	7550.8	25	4 SA, 1 RA, FTR, VRF		
1	018	Classroom	895	8.6	7697	25	4 SA, 1 RA, FTR, VRF		
1	016	Classroom	881	8.6	7576.6	25	4 SA, 1 RA, FTR, VRF		
1	014	Classroom	890	8.6	7654	20	4 SA, 1 RA, FTR, VRF		

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.00.15*
Scope	**Room Take-Off Data**
Date	**May 26, 2022**
	Holland Hill Elementary School

RCM, RA, JRK

Zone Identification

Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	012	Classroom	880	8.6	7568	16	4 SA, 1 RA, FTR, VRF	Water Leak on Tiles	X
1	129	Storage	155	8	1240	0			
1	130	Elec	12	8	96	0			
1	131	Storage	24	8	192	0			
1	132	Library/Media Center	2152	10	21520	42	9 SA, 1 RA, FTR (X) VRF		
1	132A	IT	106	9	954	2	1 VRF		X
1	132AA	MDF	91	8.6	782.6	0	Samsung VRF Wall		X
1	132B	Special Ed	218	8.6	1874.8	2	1 SA, 1 RA, VRF		
1	132C	Special Ed	171	9.6	1641.6	4	1 SA, 1 RA, VRF		
1	133	OT/PT	246	9	2214	5	1 SA, 1 RA, VRF	Roof Leak	
1	133A	Storage	31	8	248	0			
1	135	Special Ed	236	8.8	2076.8	5	2 Sa, 1 RA, VRF		
1	136	Ext Storage	100	10	1000	0			
1	137	Special Ed	238	8.8	2094.4	6	2 Sa, 1 RA, VRF		
1	157	Storage	38	8	304	0			
1	138	Classroom	746	8.9	6639.4	25	4 SA, 1 RA, FTR, VRF		
1	139	Classroom	745	8.9	6630.5	25	4 SA, 1 RA, FTR, VRF		
1	140	Classroom	747	8.9	6648.3	26	4 SA, 1 RA, FTR, VRF		
1	141	Classroom	747	8.9	6648.3	25	4 SA, 1 RA, FTR, VRF		
1	142	Classroom	757	8.9	6737.3	25	4 SA, 1 RA, FTR, VRF		

Project Name:	**Fairfield Public Schools RCx**
Project Number:	*2020102.00.15*
Scope	**Room Take-Off Data**
Date	**May 26, 2022**
	Holland Hill Elementary School

RCM, RA, JRK

Zone Identification

Floor	Room#	Room Name	Area (SF)	Ceiling Height	Volume	People	Notes	Identified Defficiencies	Pictures Y /N
1	143	Girls	235	8.9	2091.5	3	1 SA, 1 RA		
1	144	Boys	243	8.9	2162.7	3	1 SA 1 RA		
1	152	Elec	61	12.6	768.6	0			
1	151	Lavatory	67	8	536	1	1 Exh		
1	150	Lavatory	67	8	536	1	1 Exh		
1	146	Storage	86	12.6	1083.6	0	1 Sa with VRF	Roof Hatch	
1	147	Gifted	337	8.8	2965.6	10	2 SA, RP		
1	148	Music	746	8.8	6564.8	20	4 SA, 1 RA, RP, VRF		
1	155	Storage	23	8.6	197.8	0			
1	149	Platform	813	8.6	6991.8	20	3 SA		
1	149A	Storage	131	81	10611	0	1 SA		
1	153	Gymnasium	4035	22.6	91191	50	RTU		
1	153A	Storage	412	10	4120	0	1 SA		
1	153B	Office	131	8	1048	2	1 VRF		
1	153C	IDF	109	10	1090	0	Wall Hung VRF		X

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

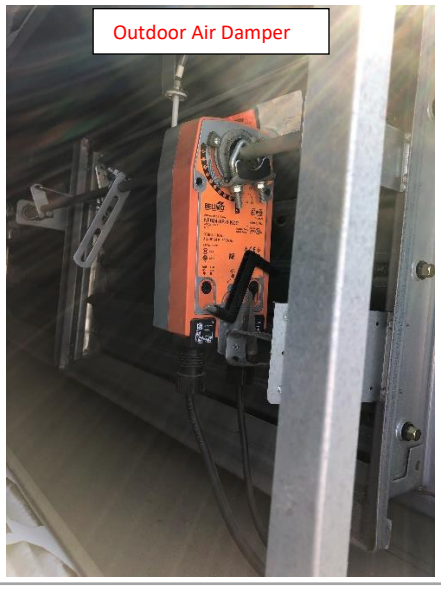
Unit Tag	**DOAS-1**	**Addition comments descriptions**
Date: 5-5-22	Auditor: RCM	
Location	East 5th Grade Roof	
Serving	5th Grade	
Config/Style	Rooftop SF/RF Gas Heat, DX cooling, ERW	
Mfr.	Trane	
Model #	OAGD-20A3-C1B400CC-A1H00AL6BC-D32B0C5B0	
Serial #	0A276188-1-1	
Age (years)	2019	
System CFM	3600	
Max OA CFM	3600	
V/Hz/Ph	208/6+0/3	
SF Qty/HP	(2) @ 4 HP rating	
SF VFD Data	ECM	
RF Qty/HP	4 HP rating	
RF VFD Data	ECM	
Filter Data (Size Quantity)	(6) 16 X 20 X 2, (4) 16 X 25 X 2 (6) 16 X 25 X .5 Metal Pre	ERW ODA Same Size & Quantity ERW EXH Same Size & Quantity
Filter Status	Clean	Changed 4-27-21
Controls Type	Packaged Trane with BAS BACnet interface	
Controls Mfr.	Alerton BAS	
Economizer	100% OA Capable	
CO_2 DCV	No	
Damper Styles		
Damper Status		ODA is nearly closed as is RAD with Exhaust Fan operating creating a space negative pressure
Heating Type		
Heating Coil Condition	Gas Heat 240 MBH Heating Output	
Cooling Type	DX Scroll (2)	
Cooling Coil Condition	Clean	
Drain Pan Status	Clean	
Notes:	Report of rooms not getting designed ventilation primarily in the 4rth Grade wing. FCU ductwork	

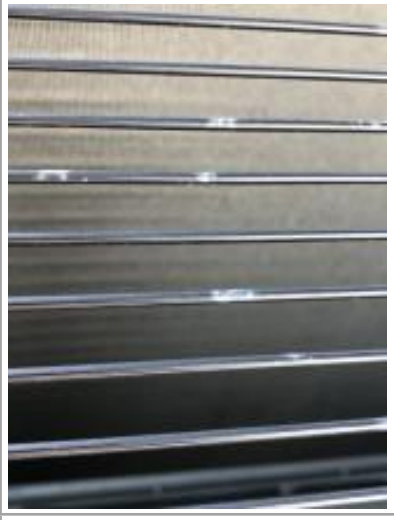
	configuration on to of DOAS damper position control creating negative pressure possible root cause. Suggest Trane and Alerton investigate and mitigate and to decouple OA to rooms, Some FCU have MD in OA connection but not SOO to determine operation. Call into ABS 5-6-22. In Economizer mode with ERW=Off, ERW Bypass=Open, Exhaust=On, ODA=<10%, RA <10%. Would have thought OAD would have been open more but Exhaust fan running at <40%	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

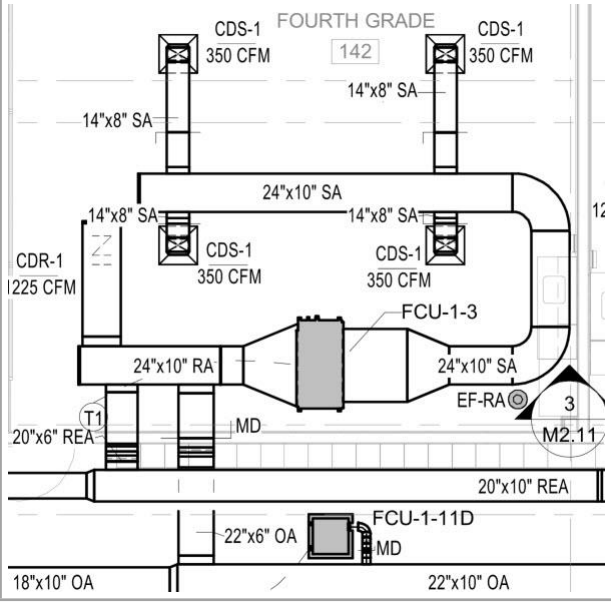
Description	**Photos**
Unit Tag Info	
Unit from afar	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Cooling Coil	 
Condensate Pan	 
Control Dampers	 

	
Filters	   

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

	
Typical FCU Ductwork 4rth Grade Classrooms where OA is short cycling to REA as DOAS-1 Exhausting with limited OA	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Unit Tag	**DOAS-2**	**Addition comments descriptions**
Date: 5-5-22	Auditor: REA	
Location	West 3rd Grade Roof	
Serving	3rd Grade	
Config/Style	Rooftop SF/RF Gas Heat, DX cooling, ERW	
Mfr.	Trane	
Model #	OAGD180A3-C1B400CC-A1G00AL6CC-D42B0C5BO	
Serial #	OA276188-2-1	
Age (years)	10/2018	
System CFM	4350	
Max OA CFM	4350	
V/Hz/Ph	208/60/3	
SF Qty/HP	(2) 4.08	
SF VFD Data	ECM Direct drive	
PE Qty/HP	(2) 4.08	
RF VFD Data	ECM Direct drive	
Filter Data (Size Quantity)	(2) 16x20x2 (4) 16x25x2 (2) 16x20x2 (4) 16x25x2 (4) 16x20x2	
Filter Status	Clean 4/27/22	
Controls Type	Factory DDC	
Controls Mfr.	Trane	
Economizer	100% OA	
CO_2 DCV	No	
Damper Styles	Parallel blade	
Damper Status	Good Belimo actuators	
Heating Type	Gas	
Heating Coil Condition	Burner	
Cooling Type	DX Twin Compressors	
Cooling Coil Condition	Reheat dirty, both coils should get washed	
Wheel	Semco Mod. UWCH-46-1-0-1-B-0-0	
Ser.	72954-2/PJ49128 9/17/2018	
Drain Pan Status	OKxdr5	
Notes:		

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Description	**Photos**
Unit Tag Info	
Unit from afar	 
Unit SF Tag Info	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

	 
Heating Coil	
Cooling Coil	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

	 
Control Dampers	 

	
Filters	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Controls	 
Electrical / Misc.	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Unit Tag	**DOAS-3**	**Addition comments descriptions**
Date: 5-5-22	Auditor RCM	
Location	South Kindergarten Roof	
Serving	Kindergarten/Admin	
Config/Style	Rooftop SF/RF Gas Heat, DX cooling, ERW	
Mfr.	Trane	
Model #	OAGD-210A3-C1B400CC-A1G00AF6CC-D41B0C5B0	
Serial #	0A276188-3-1	
Age (years)	2019	
System CFM	4940	
Max OA CFM	4940	
V/Hz/Ph	208/60/3	
SF Qty/HP	(2) 4 HP Equivalent	
SF VFD Data	ECM<	
RF Qty/HP	4 HP Equivalent	
RF VFD Data	ECM	
Filter Data (Size Quantity)	(6) 16 X 20 X 2, (4) 16 X 25 X 2 (6) 16 X 25 X .5 Metal Pre	ERW ODA Same Size & Quantity ERW EXH Same Size & Quantity
Filter Status	Clean	Changed 4-27-21
Controls Type	Packaged Trane with BAS BACnet interface	
Controls Mfr.	Alerton BAS	
Economizer	100% OA	
CO_2 DCV	No	
Damper Styles		
Damper Status		
Heating Type	Gas	
Heating Coil Condition	Gas Heat 250 MBH Heating Output	
Cooling Type	DX Scroll (2)	
Cooling Coil Condition	Clean	
Drain Pan Status	Clean	Condensate Trap broken off needs replacement
Notes:	In Economizer mode with ERW=Off, ERW Bypass=Open, Exhaust=On, ODA=100%, RA <10%.	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Description	**Photos**
Unit Tag Info	
Unit from afar	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Unit SF Tag Info	 
Cooling Coil	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Condensate Pan	
Control Dampers	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Filters	 
Controls	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Electrical / Misc.	  

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Unit Tag	**RTU-1**	**Addition comments descriptions**
Date: 5-5-22	Auditor: REA	
Location	North Roof	
Serving	153 Gymnasium	
Config/Style	Rooftop SF/RF Gas Heat, DX cooling, ERW	
Mfr.	Trane	
Model #	OADG010C1-CAB10AF00-G1AGC1AD1-41A40B03A-A00C00AB0-AA1A000A0-0	
Serial #	OA276188-4-2	
Age (years)	10/2018	
System CFM	3960	
Max OA CFM	1250	
V/Hz/Ph	208-230/60/3	
SF Qty/HP	(1) 3.0 Direct Drive	
SF VFD Data	VFD	
PE Qty/HP	(1) 1.5 Direct Drive	
RF VFD Data	VFD	
Filter Data (Size Quantity)	(4) 24x24x2 (2) 12x24x2 DX (6) 20x20x2 ODA (6) 20x20x2-RA Wheel	
Filter Status	OK 4/27/22	
Controls Type	Factory DDC	
Controls Mfr.	Trane	
Economizer	Available	
CO_2 DCV		
Damper Styles	Parallel	
Damper Status	OK	
Heating Type	Gas	
Heating Coil Condition	Burner	
Cooling Type	DX Dual Compressors 1 Scroll digital	
Cooling Coil Condition	Grease on Reheat, wash coils	
Wheel	Semco	
Drain Pan Status	Rusty color	
Notes:		

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Description	**Photos**
Unit Tag Info	
Unit from afar	 

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EQUIPMENT DATA SHEET

Unit SF Tag Info	 
Unit RF/EF Tag Info	

	
Heating Coil	
Cooling Coil	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Condensate Pan	
Control Dampers	
Filters	
Electrical / Misc.	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Unit Tag	**RTU-2**	**Addition comments descriptions**
Date: 5-5-22	Auditor: RCM	
Location	Middle Roof	
Serving	120 All-Purpose Room	
Config/Style	Rooftop SF/RF Gas Heat, DX cooling, ERW	
Mfr.	Trane	
Model #	0ADG012F1-CAB10AG00-J1AJC1AC1-41A40B03A-A00C00AB0-AA1A00A0	
Serial #	0A276188-5-1	
Age (years)	2019	
System CFM	5170	
Max OA CFM	1700	
V/Hz/Ph	208/60/3	
SF Qty/HP	5 HP	
SF VFD Data		
RF Qty/HP	1.5 HP Exh	
RF VFD Data		
Filter Data (Size Quantity)	(6) 18 X 24 X 2 SA, (6) 20 X 20 X 2 RA & ODA	
Filter Status	Clean 4-27-22	
Controls Type	Trane with BAS integration	
Controls Mfr.	Alerton BAS	
Economizer	Yes	
CO_2 DCV	No	
Damper Styles		
Damper Status	Clean	
Heating Type	Gas Modulating	
Heating Coil Condition	250 MBH Output Modulation	
Cooling Type	DX Digital Scroll and Dx	
Cooling Coil Condition	Clean	
Drain Pan Status	Clean	
Notes:	Unit access doors very heavy and not hinged set up on dunnage. Access requires standing on Ductwork. Noted Electrical non-metallic conduit	

	to unit (not Main) not fastened and subject to damage and trip hazard	

Description	**Photos**
Unit Tag Info	
Unit from afar	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Unit SF Tag Info	 
Heating Coil	

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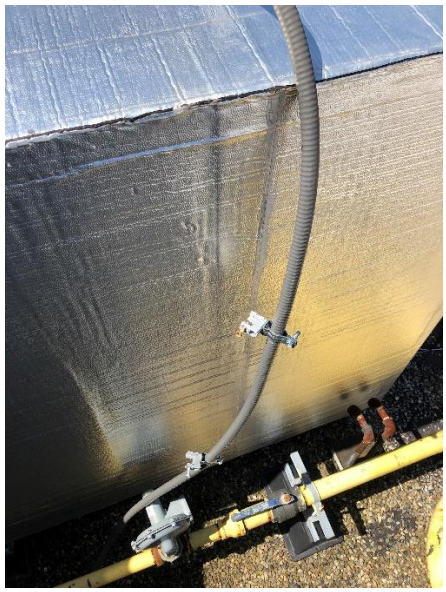
Cooling Coil	
Controls	 

	 
Electrical / Misc.	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Trane® Horizon™ Dedicated Outdoor Air Unit Startup Form

Date :	January 25, 2019
Job Name :	Holland Hill Elementary School
Address :	105 Meadowcroft Rd
City, State:	Fairfield, CT
Tag:	RTU-2
Model #:	OADG012F1-CAB10AG00-J1AJC1AC0-11A40B03A-A00C00AB0
Serial Number:	276188-5-1
Startup Contractor :	Trane
Address :	716 Brook St. Ste 130
City, State:	Rocky Hill, CT
MC Technician :	

Pre Startup Checklist	
Installing Contractor should verify the following items:	
	Y/N/na
1. Is there any visible shipping damage?	N
2. Is the unit level?	Y
3. Are the unit clearances adequate for service and operation?	Y
4. Do all access doors open freely and are the handles operational?	Y
5. Have all electrical connections been tested for tightness?	Y
6. Does the electrical service correspond to the unit nameplate?	Y
7. On 208/230V units, has transformer tap been checked?	Y
8. Have the damper assemblies been inspected?	Y
9. Are the air filters installed with proper orientation?	Y
10. Have condensate drain and p-trap been connected?	Y
11. Have the crankcase heaters been on for 24 hrs?	Y

Factory Supplied - Field Installed Sensors		
	Y/N	**Duct or Space**
Discharge Temp	Y	
Supply Duct Pressure Transducer	Y	
Space Temp / Humidity	Y	
Return Duct or Space Pressure Transducer	Y	

Trane Technician :	Roger Laneuville
Start Up Date :	1/25/19

Ambient Temperature	
Dry Bulb Temperature (°F)	**Wet Bulb Temperature (°F)**
27	18

Filters

Quantity	***Location***	***Size***	***Orientation***	***Clean***
6	SA	18X24X2	X	X
6	RA	20X20X2	X	X
6	ODA	20X20X2	X	X

Program Control

	Discharge (Y/N)	**Space (Y/N)**	**SZ VAV (Y/N)**	**MZ VAV (Y/N)**
Non Heat Pump:	Y	N	N	N
Heat Pump:	N	N	N	N

Compressors			Voltage			Current		
#	**Model**	**Serial**	**L1-L2**	**L2-L3**	**L1-L3**	**L1-L2**	**L2-L3**	**L1-L3**
1	ZO61KCE-TF5	181191AD	210V	210V	209V	14@	14@	15@
2	ZPD61KCE-TF	17K7516AD	201V	210V	209V	11@	11@	12@
3								
4								

Supply Fan Assembly					
	Alignment	***Name Plate Amps***	***Actual Amps***	***Rotation***	***Hz***
Fan 1:	CHECK	13.3@	8.3	CW	30
Fan 2:	N/A	N/A	N/A	N/A	N/A

Energy Recovery Wheel					
Wheel Spins Freely:	YES	**Check Rotation**	CW	**FLA**	.03@

Voltage			**Current**			
L1-L2	**L2-L3**	**L1-L3**	**L1-L2**	**L2-L3**	**L1-L3**	**HP**
210V	210V	209V	.24	.24	.24	.07

Power Exhaust Fan Assembly					
	Alignment	***Name Plate Amps***	***Actual Amps***	***Rotation***	***Hz***
Fan 1:	CHECK	4.8@	4.3@	CW	1.5
Fan 2:	N/A	N/A	N/A	N/A	N/A

Dampers	
Modulating OR Two Position	**Operation Check**
X	X

Condensor Configuration

Water Cooled (Y/N):			
Water Leaks (Y/N):	N/A	***Inlet Pressure (PSI):***	N/A
Water Inlet Temp (°F):	N/A	***Water Outlet Temp (°F):***	N/A
Water Flow(GPM):	N/A		

Air Cooled (Y/N):						
	Voltage			Current		
#	**L1-L2**	**L2-L3**	**L1-L3**	**L1-L2**	**L2-L3**	**L1-L3**
1	410V	410V	409V	3.8@	3.8@	3.8@
2	410V	410V	409V	3.7@	3.7@	3.8@
3						
4						

Refrigeration System - Circuit 1					
	Pressure	**SAT Temp**	**Line Temp**	**Subcooling**	**Super Heat**
Discharge	325	101	140		
Suction	120	40	55		
Liquid	90	26	48		

Refrigeration System - Circuit 2					
	Pressure	**SAT Temp**	**Line Temp**	**Subcooling**	**Super Heat**
Discharge	330	103	136		
Suction	115	38	58		
Liquid	89	26	56		

HEATING -- Refrigeration System (Heat Pump Only) -- Circuit 1					
	Pressure	**SAT Temp**	**Line Temp**	**Subcooling**	**Super Heat**
Discharge	N/A	N/A	N/A		
Suction	N/A	N/A	N/A		N/A
Liquid	N/A	N/A	N/A	N/A	

HEATING -- Refrigeration System (Heat Pump Only) -- Circuit 2					
	Pressure	**SAT Temp**	**Line Temp**	**Subcooling**	**Super Heat**
Discharge	N/A	N/A	N/A		
Suction	N/A	N/A	N/A		N/A
Liquid	N/A	N/A	N/A	N/A	

Water / Glycol System	Y/N
1. Has the entire system been flushed and pressure checked?	N/A
2. Has the entire system been filled with fluid?	N/A
3. Has air been bled from the heat exchangers and piping?	N/A
4. Is the glycol the proper type and concentration (N/A if water)?	N/A
6. Has the water piping been insulated?	N/A
7. What is the freeze point of the glycol (N/A if water)?	N/A

Heat Section

Gas Heat (Y/N):					Y
	Y/N		Y/N		Y/N
Natural Gas	Y	Propane	N	Air purged from the line	Y

	Low Fire	High Fire
Heat 1	X	X
Heat 2		N/A
Heat 3		N/A

Electric Heat (Y/N):				N
	Amps:			
	L1-L2	**L2-L3**	**L1-L3**	
Pre Heat:	N/A	N/A	N/A	
Primary:	N/A	N/A	N/A	

NOTES:

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Unit Tag	**RTU-3**	**Addition comments descriptions**
Date: 5-5-22	Auditor: RCM	
Location	South Roof	
Serving	132 Library/Media Center	
Config/Style	Rooftop SF/RF Gas Heat, DX cooling, ERW	
Mfr.	Trane	
Model #	0ABD036A3-C1B400AB-A1C00BG6AB-D12B0C4B0	
Serial #	0A276188-6-1	
Age (years)	2019	
System CFM	1430	Display reading 1,758 CFM @ 65%
Max OA CFM	785	
V/Hz/Ph	208-60/3	
SF Qty/HP	2	
SF VFD Data	ECM	
PE Qty/HP	2	
PE VFD Data	Mitsubishi D700 Series	
Filter Data (Size Quantity)	Main / OA / Exh.: (2) 20 X 24 X 2	
Filter Status	Clean	
Controls Type	Trane Package with BAS interface	
Controls Mfr.	Alerton BAS	
Economizer	Yes	
CO_2 DCV	No	
Damper Styles		
Damper Status	Good 20% Min setpoint	
Heating Type	Gas Heat Modulating 100 MBH Output	
Heating Coil Condition		
Cooling Type	DX single scroll compressor	
Cooling Coil Condition	Clean	
Drain Pan Status		
Notes:	ERW Semco UWCH-30-1-0-1-B00	

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Description	**Photos**
Unit Tag Info	
Unit from afar	
Unit SF Tag Info	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Unit RF/EF Tag Info	 
Cooling Coil	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Condensate Pan	
Control Dampers	 

PROJECT: 2020102.15 FAIRFIELD PUBLIC SCHOOLS – HOLLAND HILL ELEMENTARY SCHOOL
EQUIPMENT DATA SHEET

Filters	
Controls	

Electrical / Misc.