Ventilation Assessment

Farmington Public Schools
5 Year Reporting Requirements

FARMINGTON PUBLIC SCHOOLS
Empowering Global Citizens

CES

Prepared by:
Consulting Engineering Services, Inc.
811 Middle Street, Middletown, CT 06457
CES PN 2024443.00

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Farmington Public Schools Ventilation Assessment

Overview

CES was hired by Farmington Public Schools to comply with recently passed State of Connecticut legislation requiring all schools to conduct periodic evaluations of their HVAC equipment, with particular attention to ventilation performance. The scope of this year's assessment focuses on the four elementary schools in Farmington.

The primary goal of this effort is to evaluate the HVAC systems at each school within the scope, to understand their operation and identify where repairs or replacements may be needed to achieve improved indoor air quality and ventilation rates. While our original contract was limited to providing the assessments and measurements, CES provided follow-up on two separate occasions — in April and October 2025 — at the Town's request, as they aimed to demonstrate their commitment to addressing open issues in the best interest of the district.

Objectives and Goals

Objectives

The process for evaluating each school consisted of two main components:

1. HVAC Assessment: A thorough review of equipment that introduces outside air, filters air, and systems that exhaust air. This includes but is not limited to: Air Handlings Units (AHUs), Rooftop Units (RTUs), Exhaust Fans (EFs), Energy Recovery Units (ERVs), and Make-up Air Units (MAUs).

    - CES requested and received any documents pertaining to air moving systems such as building HVAC drawings and, where applicable, building automation system documentation / access. Various levels of documentation were available for each school given the difference in building age. Where documentation was scarce or incomplete, CES worked with facilities staff to understand and document systems.

2. Measurements - Documenting airflow (supply, return, outside air, exhaust) by taking comprehensive air measurements in each school. These readings will show actual system performance.

    - CES took air measurements at all supply diffusers, return and exhaust grills, and outside air intakes. This information is then used to compare design system performance against actual system performance. For schools that do not have adequate documentation of the original design, this information can be compared against current code requirements for ventilation.

Goals

1. Document the current operating condition for HVAC systems; including damper function, filter status, overall equipment condition and system controls. The specific scope for HVAC systems was to review equipment which brings in outside air or exhausts air from any space, in order to fully evaluate the efficiency of ventilation. Air change rates and outdoor air delivery rates were calculated for each applicable space.
2. Compare and report findings from the equipment evaluation performed by CES with those outlined by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers, or ASHRAE.

3. Compile a list of deficiencies of items that require correction, and recommendations for how to fix them, in order to return the equipment to proper working condition. A priority level (1-3) will be assigned to each deficiency, in regards to ventilation priority.

5 Year Reporting Requirements Met

1. HVAC Assessment

- Review of maximum filter efficiency, quantity, condition, and last date of change
- Verification of ventilation components operation including fans, dampers, filters, etc.
  - Detailed review of fan operation /damper operation / filter condition
  - Applies to RTUs, AHUs, HVs, MAUs, EFs, UVs, FCUs with OA
  - Document sheave sizes, motor nameplate information, belt information, etc. when possible
- Verification of unit operation and performance of required maintenance, as it pertains to ventilation
- Verification of control sequences
  - Any applicable controls builts available shall be provided to CES for review
  - The controls review will be based on what is available
- Verification of carbon dioxide sensors (where applicable)
- Collection of field data for the potential of installation of mechanical ventilation if none exists
- Review of current maintenance practices including setpoints and schedules

2. Measurements Assessment

- Measurement of all air distribution inlets and outlets that are accessible for our review
- Air Handling Equipment total airflow readings (when possible - total Supply Air, Return Air, Outdoor Air, and Exhaust Air readings are taken directly at the units)
- Static Pressure Profile of each accessible unit
- Airflow measurement of outside air rate at each unit that delivers outdoor air
- Physical measurements of each accessible space (to calculate air change rates)
- Calculate ventilation rates and outdoor air delivery rates for each space

Schools Assessed

1. East Farms Elementary School
2. Noah Wallace Elementary School
3. Union School
4. West District Elementary School

Systems Evaluated

1. Roof Top Units – RTUs
2. Air Handling Units – AHUs
3. Unit Ventilators – UVs
4. Energy Recovery Units – ERVs
5. Kitchen Make Up Air Unit
6. Fan Operation – Supply Fans, Exhaust Fans, Return Fans
7. Associated Dampers
8. Unit Interiors and Filters - Cleanliness
9. BMS Schedules (where applicable)

Systems by School

East Farms Elementary School

School Description

East Farms Elementary School is a public school located at 25 Wolf Pit Rd in Farmington, CT. The school houses just under 500 students, grades Kindergarten through fourth, and employs approximately 35 full time teachers.

The two story school is approximately 50,260 square feet and was originally constructed in 1965. A building addition was made in 1989.

Dedicated Outdoor Air System – DOAS Units

Two DOAS units are located on the roof of East Farms Elementary School. These units are comprised of supply and exhaust fans and serve as the main source of ventilation for the Library / Media Center, as well as the Art Room / Work Room. Both of these units were observed operable and in fair condition at the time of our onsite review. It is recommended that controls function / setpoints are further reviewed and verified. For example, DOAS-1 supply fan seemed to be constantly hunting during the review, and not operating at a steady or constant fan speed. Fan speeds and damper positions should be reviewed to maximize ventilation efficiency, and minimize energy waste.

Energy Recovery Ventilator – ERV

There is one Energy Recovery Ventilator (ERV) located above the ceiling in the Main Office area of East Farms Elementary School. There was limited access to this unit at the time of the onsite review, and limited information on the Building Management System regarding this unit. Outdoor Air intake and exhaust relief was observed on the roof for this ERV unit. This unit is designed and intended to provide ventilation for the Main Office and surrounding spaces. Supply distribution was not located for this unit in the Main Office area. Further investigation of this unit should be performed to make sure it is operating properly and discharging supply air into the appropriate space.

Exhaust Fans

There are a variety of Exhaust Fans located at East Farms Elementary School. Exhaust Fans are generally viewable and able to be manipulated through the school's BMS. Generally, there is an exhaust grille that provides minimum ventilation in each classroom. Larger Pennbarry exhaust fan units exhaust air from most classroom spaces. Other mushroom style rooftop exhaust fans are used to ventilate bathrooms, storage closets, and other support spaces.

Overall, most exhaust fans were observed operable, but in fair to poor condition, and past their useful service life. Routine general maintenance should be performed on all fans to repair broken belts and components. Belts, tension, motor bearings, etc… should be checked on a regular schedule to prevent breakdown of equipment.

Gymnasium Air Handler – Gym AHU

CES was not able to gain access to the East Farms Elementary School gymnasium at the time of our onsite review. Gym floors were being finished at the time and access was not possible. Air Handling Unit is suspended from the gym ceiling and serves as a main source of heating, cooling, and ventilation.

Condition of this unit and components could not be verified.

Unit Ventilators – UVs

Unit Ventilators are located in most classrooms, and serve as the main source of heat and ventilation. Unit Ventilators can be viewed and manipulated through the BMS. All UV outdoor air dampers were set to a 15% minimum before airflow measurements were taken. These units are ducted directly through the wall to the outside and draw in fresh air for ventilation purposes.

Most units were observed operable, but in fair to poor condition, and past their useful service life. Filter media in these units should be changed routinely, as plugged filters can reduce Ventilator efficiency.

Update 4-24-2025: Filter changes have all been addressed following the site visit and continue to be maintained throughout the year. The facilities staff has been actively correcting issues listed on the issues and resolution log to maximize ventilation.

Update 10-6-2025: All 23 items noted on the issues and recommendations log have been reviewed by facilities staff and have been corrected or are actively being reviewed and coordinated for correction. Of the 23 items on the log, 20 have been closed out with the remaining items were listed for record only. Farmington Public Schools Facilities staff was helpful and responsive to efforts for a properly operating building.

Noah Wallace Elementary School

School Description

Noah Wallace Elementary School is located at 2 School St in Farmington, CT. The school houses just over 300 students, from Kindergarten to fourth grade, and has a student to teacher ratio of 12:1. No Building Management System (BMS) was available at the time of our onsite review / airflow measurements.

The building is 52,000 square feet and was originally constructed in 1904. Building additions were made in 1926, 1939, and again in 1977.

Air Handling Units – AHUs

There are a few Air Handling Units at Noah Wallace Elementary School that serve various spaces. These units were observed to be past their useful service life, and some were not able to be operated at the time of our onsite review.

AHUs serving the Gymnasium space and the Music Rm were not able to be started or reviewed while on site. The AHU serving the basement classrooms and surrounding spaces (located outside on the ground) was operational, but in poor condition, and past its useful service life.

Functionality of these Air Handling Units should be investigated further. Permanent labels should be applied for ease of identification.

Exhaust Fans – EFs

Various Exhaust Fans serve as the primary source of ventilation for Noah Wallace Elementary School, and the classroom spaces. A combination of rooftop mushroom style exhaust fans and inline exhaust fans are used in the building. Rooftop exhaust fans were observed to be direct drive with speed controllers.

There is a dedicated exhaust fan for the gymnasium space, with a local switch, that was not operating at the time of our onsite review. Exhaust fans at this school were observed operable, but past their useful service life. Speed setpoints should be reviewed and adjusted to improve ventilation efficiency, as well as minimize energy waste.

Update 4-24-2025: Filter changes have all been addressed following the site visit and continue to be maintained throughout the year. The facilities staff has been actively correcting issues listed on the issues and resolution log to maximize ventilation.

Update 10-6-2025: All 5 items noted on the issues and recommendations log have been reviewed by facilities staff and have been closed out. Farmington Public Schools Facilities staff was helpful and responsive to efforts for a properly operating building.

Union School

School Description

Union School building is located at 173 School Street in Unionville, CT. The building's three levels house just over 300 students and provide schooling for children in Kindergarten through fourth grade. The school has a student to teacher ratio of 11:1. Union School does have a BMS system with graphics that was utilized during our onsite review. The building is 43,000 square feet and was originally constructed in 1938, with an addition built in 1977.

Gymnasium Air Handling Units – AHUs

Two Air Handling Units are positioned on each side of the Stage, in the Gymnasium space. These units were found to be operable, but in fair to poor condition, and past their useful service life. Access to the physical units was limited by large items stored on the stage area, in front of the unit access panels.

These units are the main source of ventilation and heating for the gymnasium space. Unit filters, belts, motor pulley assembly, coils, etc… could not be verified at this time. There are active CO2 sensors associated with the gymnasium space and are designed to control the position of the outdoor air dampers.

Exhaust Fans – EFs

A mix of mushroom style rooftop exhaust fans (x15) and above ceiling inline exhaust fans make up the exhaust system for Union School.

Rooftop exhaust fans were observed to be direct drive fans with speed controllers. Speed setpoints should be reviewed to maximize ventilation, while minimizing energy loss. Currently, the building is under a very negative pressure, compared to atmosphere, and could potentially benefit from slowing down some exhaust fans (where possible), while still maintaining minimum ventilation rates.

Above ceiling inline exhaust fans have local switches with a special key needed for operation. Overall, exhaust fans were noted to be operable and in fair condition. Routine general maintenance should be performed on all fans.

Art Room Rooftop Unit – RTU

One rooftop air handling unit is located at Union School, and serves as the main source of ventilation for the Art Rm, in the basement level. This unit was found to be providing 27% outdoor air to the space. Outdoor air damper is under packaged controls and will economize when commanded.

Overall, this unit was noted to be operable, but past its useful service life. The outdoor air scoop bird screen was observed very dirty, and becoming plugged. Routine maintenance should be performed on this unit. As dirt and debris begin to build up on coils, screens, and filters, the unit will become more restricted and deliver less air to the space.

Unit Ventilators – UVs

Two Unit Ventilators are located in the Cafeteria, on the basement level of Union School. These UVs are viewable on the BMS and serve as the main source of ventilation and heating for the space. It was noted that outdoor air dampers could not be manipulated / tested through the Building Management System.

These units are ducted directly through the wall to the outside and draw in fresh air for ventilation purposes. UVs were observed operable, but in fair to poor condition, and past their useful service life. Filter media in these units should be changed routinely, as plugged filters can reduce Ventilator efficiency.

Update 4-24-2025: Filter changes have all been addressed following the site visit and continue to be maintained throughout the year. The facilities staff has been actively correcting issues listed on the issues and resolution log to maximize ventilation.

Update 10-6-2025: All 14 items noted on the issues and recommendations log have been reviewed by facilities staff and have been corrected or are actively being reviewed and coordinated for correction. Of the 14 items on the log, 11 have been closed out with the remaining items were listed for record only. Farmington Public Schools Facilities staff was helpful and responsive to efforts for a properly operating building.

West District ES

School Description

West District Elementary School was built in 1961 and is located at 114 W District Rd in Unionville, CT. The building is 44,860 square feet and houses just under 400 students, with a student to teacher ratio of 13:1. Students attending West District Elementary School are in grades Kindergarten through fourth.

A Building Management System was not available for use during the onsite review or is not in place at this location.

Air Handling Units – AHUs

There are two air handling units associated with West District Elementary School.

Library AHU is located in Supply Rm #51 and serves the Library / Media Center space. This unit was found to be older (installed in 2013), but operable and in fair to good condition. Filter media was in fair condition and stock filter media was located in the mechanical space above the stage. Library AHU associated piping, ductwork, and other components were observed to be in fair to good condition.

A dedicated AHU serves the Cafeteria space, and is located in the mechanical space above the stage. This unit is ducted to bring in fresh air, but the outdoor air damper was 100% closed at the time airflow measurements were taken. The outdoor damper controls should be reviewed, and a minimum damper position should be selected to ensure minimum ventilation of the space.

The Cafeteria AHU was observed to be operable, but older and past its useful service life. Filter media condition was fair, and an extra stock of replacement filters was located near the unit. Associated AHU components were noted to be in similar condition, operable but antiquated.

Exhaust Fans – EFs

A variety of mushroom style rooftop exhaust fans serve as the primary source of ventilation for West District Elementary School. Overall, the rooftop exhaust fans were noted to be older, but operable and in fair condition. These EFs are a mix of belt drive and direct drive and mainly serve general exhaust grilles in each classroom space, as well as bathrooms, storage rooms, and support spaces.

There is a notable condition concerning the ducting of classroom exhaust grilles, typical throughout various areas of the building. Sidewall exhaust grilles in many cases are located above the room ceiling grid. Open grates are installed in the ceiling near the exhaust grilles, but not directly ducted to the grille. The impact being a majority of the total air being exhausted is being pulled from above the ceiling plenum, and not from the classroom space, resulting in wasted ventilation capacity.

Gymnasium Unit Ventilators – UVs

There are two Unit Ventilators located in the Gymnasium, which serve as the main source of ventilation for the space. These units are older but operable, and observed to be in fair condition. The filters in these units should be routinely changed to ensure unit efficiency.

Update 4-24-2025: Filter changes have all been addressed following the site visit and continue to be maintained throughout the year. The facilities staff has been actively correcting issues listed on the issues and resolution log to maximize ventilation.

Update 10-6-2025: All 15 items noted on the issues and recommendations log have been reviewed by facilities staff and have been corrected or are actively being reviewed and coordinated for correction. Of the 15 items on the log, 12 have been closed out with the remaining items were listed for record only. Farmington Public Schools Facilities staff was helpful and responsive to efforts for a properly operating building.

Commissioning Process

CES worked on site with the facilities staff to review all of the equipment within the scope of this work. The schools had various levels of building automation system integration while most had a mixture of systems on the BAS and others operated manually.

The Commissioning Team performed an onsite inspection of the equipment at each school, including a physical verification of filter condition, damper operation, and overall unit cleanliness. The systems at each school typically had a combination of standalone and building management system (BMS) controls. We reviewed the following: Rooftop Units, Air Handling Units, Heat Recovery Units, Heating/Ventilating Units, Unit Ventilators, Exhaust Fans and Fan Coil Units. This equipment was reviewed for this assessment as this equipment is a part of ventilation of spaces bringing in outside air or exhausting air out of the building. Working both on our own and directly with the facilities staff, we reviewed and tested all associated equipment in each school. Included in the “Airflow Measurements Workbook” for each school is a tab dedicated to issues found and correction recommendations, called “Issues & Recommendations Log”.