GOVERNMENT OF THE DISTRICT OF COLUMBIA
DEPARTMENT OF GENERAL SERVICES

SCHOOL PREPAREDNESS MEMO

The Department of General Services (DGS), in coordination with District of Columbia Public Schools developed this memo to document and articulate the measures taken surrounding general school preparedness efforts, specifically focusing on Heating, Ventilation, and Air Conditioning (HVAC) augmentations and updates completed to ensure all DCPS facilities are safe for return-to-in-person schooling during COVID-19.

This memo is designed to share with stakeholders (School Union Partners, the District Council, DCPS parents, students, and partner affiliates) both the overall school preparedness efforts, and technical details of HVAC work completed.

SCHOOL PREPAREDNESS

A safe and healthy environment for in-person learning is the District's top priority.
To deliver on DCPS's health and safety commitment and begin to offer in-person learning in Term 2, the District is focused on facility readiness, operational augmentations for health and safety protocols, and building systems for ongoing monitoring.

Specifically, to prepare for offering in-person learning, the District sought the input of a nationally accredited specialists for guidance on ensuring the air quality of our schools meets the highest standards of safety and reflect the health communities latest understanding of COVID-19. The American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) Epidemic Task Force School Team has done extensive work in developing practices and standards in this area. The licensed professional engineer (PE) brought on to design our program for safe return to school amid COVID-19 is a standing member of the ASHRAE Task Force Team. He is responsible for overseeing respected contractors carrying out all work. Before opening, all work will be inspected by the specialists with the District's Department of General Services and DCPS, and finally the PE who will ensure compliance with the ASHRAE standards.

The District is utilizing a set of building readiness standards to ensure every facility is ready to welcome students back to a safe learning environment. This checklist includes HVAC enhancements to increase fresh air filtration. These standards align with public health guidance issued by DC Health, the Office of the State Superintendent of Education (OSSE), and Centers for Disease Control and Prevention (CDC) to mitigate the spread of COVID-19 when schools reopen.

GENERAL PREPAREDNESS

Schools are receiving detailed guidance and intensive technical assistance to guide the development of individualized operational plans prior to reopening. After these are implemented, school leadership, operations staff, and relevant central office teams will conduct building walk throughs, alongside parent and community leaders, to confirm that each school has received the committed to supplies and improvements. Additionally, the monitoring of new routines and safety protocols will take place on a regular basis after students and staff return to in-person learning.

SCHOOL BUILDING READINESS CHECKLIST

DCPS is committed to reopening safely. DCPS' full building readiness checklist can be found at: https://dcpsreopenstrong.com/health/buildings/. Each school's principal will organize a site-based walkthrough team to include members from parent and teacher school-based groups. The site-based walkthrough team will verify all items on the building readiness checklist prior to individual school openings.

In addition, DCPS is completing site-specific operational plans for each school in accordance with guidelines from DC Health, the Centers for Disease Control, and the Office of the State Superintendent of Education. Each school's operational plan will be posted online.

- **Personal Protective Equipment (PPE) & Hygiene Supplies:** Schools have the necessary general and enhanced PPE and hygiene supplies and are prepared to utilize the standardized inventory monitoring protocol established by central office to ensure timely supply replenishment.
- **Cleaning Supplies & Procedures:** Schools have the necessary cleaning supplies and are prepared to utilize the standardized inventory monitoring protocol established by central office to ensure timely supply replenishment. All cleaning supplies are from the EPA-registered list in the CDC guidance. School custodial staff have been trained to implement enhanced and deep cleaning protocols.
- **Socially Distant Space Arrangement:** Schools are set up to facilitate social distancing among staff and students, using resources provided by central office.
- **Signage:** Schools have COVID-19 health signage (in English and other languages) posted in arrival spaces, hallways, and classrooms. Signage will address key COVID-19 public health and safety practices.
- **Water Access:** Schools have safe and reliable access to water in a manner that prevents risk of virus transmission.
- **HVAC Enhancements:** Schools are equipped with either a Direct Outside Air System (DOAS) with MERV-13/MERV-14 filters or High-Efficiency Particulate Air (HEPA) filters.
- **Plumbing Systems:** School plumbing work orders related to bathrooms, sinks, and water supply systems are prioritized so that schools are ready to welcome students and staff.

HVAC PREPAREDNESS

Part of the DCPS reopening plan is ensuring HVAC and air quality in school facilities is properly suited to welcome back students and staff. DCPS in coordination with the Department of General services has taken on this initiative.

DGS was charged with the design and construction of a stabilization project that would improve HVAC operations for both non-modernized and modernized schools. With the onset of the COVID-19 public health emergency, the decision was made that a more comprehensive assessment and retrofit of the existing systems was mandatory to ensure an optimal HVAC/air quality environment conducive for students, faculty, and visitors to all 117 active public-school buildings. The work is being carried out by numerous HVAC contractors under the guidance and direction of a licensed PE and in accordance with recommendations provided by the American Society of Heating and Air-Conditioning Engineers (ASHRAE). A school-specific plan to meet the goals outlined by the assessments has been developed by the PE, Raj Setty—a nationally recognized expert and team member of Epidemic Task Force School Team at ASHRAE—and is being implemented by the HVAC contractors.

DESIGN APPROACH

The District sought the input of the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) Epidemic Task Force School Team. The team consolidated recommendations into solutions that maximize the air quality across all facility types and associated HVAC systems throughout the DCPS portfolio. The portfolio is classified in three types;

- Type A Facilities with 100% outside air capability
- Type B Facilities with partial outside air capability.
- Type C Facilities with no outside air capability.

Once the building types were identified Setty & Associates was hired to do the mechanical electrical and plumbing (MEP) designs for each school. Setty & Associates based their analysis & design of each school on the following principles.

- The air change rates throughout a building. Filter levels and appropriate technology was selected based on the individual School's HVAC unit's ability to handle the changes. In most schools with the larger units, acceptable changes can be accomplished from the system itself. In schools that do not have larger units and rely on smaller classroom level units, the recommended approach is to install portable units with **filtration levels that exceed MERV 13** through HEPA and **ultraviolet light** to disinfect the air. (This methodology using HEPA filters and UV Light is used in hospital settings and provides a

high level of particulate filtration). The design improves indoor air quality, hereby mitigating the probability of infection.

- The second principal is to ensure the indoor air quality is monitored by the building control systems and by a secondary sensors system that runs in parallel with the existing Building Automation System (BAS). This sensing system will take samples across the school and monitor for particulate level (PM 2.5), CO2 levels, Temperature, Humidity, VOC's. As people occupy the space and the time element increases, efficiency of the filtration and dilution via fresh air must be monitored. After various solutions were vetted, the best solution was Senseware. This platform will allow us to answer the most basic question—is it working and what we can do to continue to improve the indoor air quality.
- The design strategy for individual classrooms used the Wells-Riley model for transmission rates.

SPECIFICS ON HVAC ENHANCEMENTS UNDERWAY

One of two paths will be taken for HVAC enhancements determined by each school's current infrastructure.

1. For schools receiving outside air from central HVAC systems—Type A Facilities and components of Type B Facilities—, the followings steps occur:
    - Perform visual inspection of air distribution mechanisms in walls and ceilings.
    - Confirm registers and diffusers are not blocked or closed.
    - Evaluation of air handling equipment for proper operation.
    - Energize all HVAC systems and confirm proper indoor air temperature and humidity.
    - Disinfection and cleaning of air handling equipment.
    - Review equipment control sequences to verify systems are operating in accordance with issued guidance and maintaining required ventilation, temperature, and humidity conditions to occupied areas.
    - Integrate new sequences into existing controls to run systems before and after occupancy helping to flush zones, increasing filtration and dilution.
    - Expansion of central HVAC equipment monitoring for real-time system health checks and critical alarming.
    - For HVAC equipment compatible with higher rated air filters, install one to two weeks prior to re-opening.
    - Placement of a mobile HEPA filter in learning spaces (see below for more details).
2. Schools without central air systems—Type C Facilities and components of Type B Facilities—will receive portable medical grade true **HEPA filters** to cover all instructional spaces and additional 10 units for other centralized and shared spaces such as lobbies and welcome centers, nurse suites, and the health isolation rooms. These are mobile units that will be placed in classrooms and run continuously to increase air changes in rooms and filter the air. True HEPA filters are proven to filter particulates down to .3

microns at a 99.99% efficiency. All of the HEPA filter units are equipped with a UVC light kit to provide an additional level of protection.

As shown in the image below, the HEPA filters are designed to bring in air from the room and put it through a 3-step filtration process. First, the air goes through a preliminary filter to catch particulates, then through a UV light to treat and deactivate microorganisms and pathogens, then finally through the HEPA filter, which captures small particulates at a 99.99% efficiency. After the air has gone through those steps, it exits the unit as clean air.

In addition to HVAC enhancements, domestic hot and cold-water systems will be fully flushed before a building reopens per DC Health guidelines. This will remove any metals (e.g. lead) that may have leached into the water and minimize the risk of Legionnaires' disease and other diseases associated with water. Water closets, lavatories, faucets, and soap dispensers will be surveyed for proper operations.

The following steps are being taken prior to re-opening:

- Flush domestic hot and cold-water systems after confirming all valves are operational.
- Open all fixtures on branch of piping simultaneously for a period of not less than 5 minutes. Perform this flush for both hot and cold-water systems.
- Turn hot water heaters to a target of 150˚ F or higher for at least one hour. Return to normal temperature prior to flushing systems.
- If water discoloration is found after the flush, remove, clean, and sanitize faucet aerators.
- Check all lavatories and sinks for proper operations, document substandard conditions. Ensure soap dispensers are functional and supplied.
- Remove and sanitize all drinking fountain bubblers.
- Complete all work in accordance with ASHRAE Guideline 188.

CONTRACTORS SCOPE OF WORK:

Once the initial design strategy was complete, the final HVAC scope of work was developed; see outline below.

Phase 1: Assessment and System Modification.

- Delivery by Early October.
    - Fill in HVAC unit sheets.
    - Note any deferred maintenance or broken equipment/non-functioning equipment.
    - Document central spreadsheet with Building Management System (BMS) work station and native BMS software usernames and passwords, screen shots of system.
- Delivery by November 7, 2020.
    - Gather and upload HVAC plans, including any recent renovations, into the Setty online portal.
    - Generate HVAC site visit field assessments from the Setty online portal.
    - Provide and complete HVAC start-up and diagnostic of each school.
        - Review air distribution conditions of existing spaces (look for covered diffusers, blocked return grilles, overly close supply diffusers/registers and return/exhaust grilles.
        - Perform initial air flush of all spaces prior to occupants re-entering building: Energize HVAC systems 5 days before occupancy and maintain proper indoor air temperature and humidity to maintain human comfort, reduce potential for spread of airborne pathogens and limit potential for mold growth in building structure and finishes (refer to ASHRAE Standard 55, recommended temperature ranges of 68-78 degrees F dry bulb depending on operating condition and other factors, recommend limiting maximum RH to 60%).
        - Clean HVAC intakes.
        - Verify proper separation between outdoor air intakes and exhaust discharge outlets to prevent/limit re-entrainment of potentially contaminated exhaust air (generally minimum of 10-foot separation - comply with local code requirements).
        - Change all filters 1 week before occupancy – MERV 13 upgrades to facilities with full or partial outside air HVAC capability.
        - Disinfect with bleach/cleaning solution that cleaners are using inside of the air handlers and mechanical rooms. Maintain cleaning logs with products.
        - Conduct any Testing and Balancing reports and submit to Setty for review.
        - Review pre-existing Indoor Air Quality abnormalities provided through the work order system, Enteliweb, or other documents available.

        - General inspection of HVAC systems and surrounding spaces to identify any potential concerns for water leaks or mold growth that could negatively impact occupant health.
        - Review control sequences to verify systems are operating according to this guidance to maintain required ventilation, temperature and humidity conditions to occupied areas.
        - Test sequence of operation to run 2 hours before and 2 hours after occupancy. This will help increase filtration and dilution of specific zones.
    - Procure and install portable air filtration units to be placed in nurse's suite, administrative areas, and assembly areas (exact locations to be determined by DGS and directed by the contracting officer's technical representative).
        - General Unit Specifications:
            - UV-C light – minimum of 1200 microwatts/cm^2
            - HEPA filter
            - CFM adjustable from 200 cfm to 400 cfm
            - Noise sound level under NC 35
            - Power 110 volt plug in
            - Portable unit
- Provide and complete plumbing start-up and diagnostic for each school as follows:
    - Flush Building Main – In coordination with the local water supplier, flush the service line that runs from the water main to the building.
    - Flush Building Domestic Water System – following one of the options below, fully flush the building's hot & cold-water lines. Prior to flushing it is important to exercise all system valves (close and open all valves, repeating the exercise at least twice for each valve).
    - Domestic water systems shall be prepared for use before school occupancy: Domestic cold-water systems should be flushed with all fixtures on a branch of piping opened simultaneously for a minimum period of five minutes – preferred approach is to have all building fixtures open at same time if possible – if not, care should be taken to ensure adequate flow rate to flush piping mains and branch lines.
    - Domestic hot water systems should be flushed with all fixtures on a branch of piping opened simultaneously for a minimum period of fifteen minutes – preferred approach is to have all building fixtures open at same time if possible – if not, care should be taken to ensure adequate flow rate to flush piping mains and branch lines.
    - Turn hot water heater to maximum temperature, target 150 F plus for 1 hour. Then turn system down to normal operating temperatures and flush hot water tank.
    - Flush all water closets.

- Turn on all faucets for a minimum of 5 minutes – if there is any water discoloration then being water quality sampling. Remove, clean, sanitize all faucet aerators and reinstall.
- Check all lavatories and sinks for correct operation and ensure soap dispensers are functional and adequate supply of soap is available to allow for proper handwashing and notify onsite DCPS janitorial staff of the deficiency.
- Start and turn on all gas appliances for at least 5 minutes.
- Drinking fountain bubblers should be removed sanitized and reinstalled.
- Remove and sanitize all aerators and shower heads and reinstall.
- Any questions and concerns refer to ASHRAE Guideline 188.

PROJECT MANAGEMENT & QUALITY CONTROL TEAM

The project management & quality control team is a partnership of two local firms and a nationally recognized engineering firm. The Project management team oversees the daily operation at each school as well as provides inspectors to ensure that the contractor's work complies with designs and specifications and ensure any deficiencies in work are corrected.

Process:

The work would be performed in stages to complete work at all 117 facilities. However, before reopening starts on November 9th, DGS would complete the following:

1. Increase the level of fresh exchange air in all schools to its maximum capacity.
2. Install mobile HEPA filter units in all elementary schools.
3. Upgrade Filters to MERV 13 or 14 supplement with mobile HEPA units where necessary.
4. Install the recommended minimum of 3 monitoring sensors in all elementary schools.
5. HVAC & plumbing start-up and sanitization.

Phase Two of the work to occur after November 9th would include the following:

1. Modify and install remaining MERV 13 & 14 filters if necessary, based on supply chain or other mitigating factors.
2. Complete upgrade to the sequence of operation per engineer's designs and MEP contractor's observations.
3. Install IntelliWeb on outdoor HVAC units to allow for remote monitoring and adjustment to ensure safe operation across the portfolio of school facilities.

SEE EXHIBIT B FOR A SAMPLE DRAFT REPORT CREATED FOR EVERY SCHOOL OUTLINING FINAL DESIGN RECOMMENDATION.

Ongoing Maintenance:

1. DGS will maintain cadre of HVAC contractors to ensure timely filter replacement and repair.

2. DGS will monitor air quality sensors installed in all schools and will prioritize filter replacement and equipment repairs when indicated by sensors. Per manufacturer guidance, filters will be checked every six months.

FREQUENTLY ASKED QUESTIONS: HVAC ENHANCEMENTS

Do HEPA filters work and how do they compare to MERV filters?

- Yes, HEPA filters are proven method of cleaning the air and are consistently used in hospital settings. HEPA filters filter small particulates at a higher efficiency than a MERV filter and both are included in the ASHRAE guidance.

What happens if the building's system cannot accept a MERV 13 filter?

- Prior to November 9, if the building's HVAC evaluation determines the current HVAC system is not able to accommodate a MERV 13 filter, additional work will be completed to retrofit the system to accommodate the increased filtration. Portable HEPA filters will be provided while the work is ongoing.
- If it is determined that retrofits are not possible, the system will be upgraded to the highest-level filter possible and portable HEPA filters will be put in place throughout the building to achieve improved air quality. Portable HEPA filters will stay in place throughout the school year with routine filter maintenance.

Can we open windows as well? Windows don't open, so can those work orders be expedited?

- HVAC updates are based on a closed-window model to ensure safe air quality regardless of weather impacts. School by school guidance will be provided on when and if windows should be opened in each facility. For buildings where opening windows is recommended, DCPS and DGS will evaluate work orders to address known issues.

How will you monitor the air in the building?

- Prior to November 2, all schools will receive indoor air quality (IAQ) sensors to monitor, in real time, particulate matter, temperature, carbon dioxide, volatile organic compounds, ozone, and carbon dioxide levels for measurement and verification purposes. While there is no air quality check for COVID-19, monitors will ensure systems are working properly and give important information to help identify solutions if modifications are required.

How will schools be notified if a system stops working, and there isn't proper air filtration in the school?

- In addition to the indoor air quality sensors, which will provide a significant amount of data to measure effectiveness, DCPS and DGS are building in the capability to monitor and adjust the HVAC systems remotely. Additions in elementary schools will be complete by November 6; remaining schools in the DCPS portfolio are slated for completion by December 31, 2020

Will this HVAC work ensure that people in the building remain safe?

- The HVAC work is part of a comprehensive plan to keep children and adults safe in school buildings, but it is not the only solution. Other health and safety measures, like social distancing, mask wearing, cohorting, and hygiene measures all contribute to a healthy environment.

How do I know what system my building has and how will I know what work has been done?

- A school level summary will be posted and shared with school communities in the coming weeks after all HVAC evaluations have been reviewed by the professional engineer.

By when should I expect these updates to be made?

- Work will be continuing through October and into early November at some elementary schools. If there are system challenges that cannot be addressed by November 9th, additional portable HEPA filters will installed.

DESIGNER BACKGROUND

Mr. Raj Setty is President & Principal of SETTY, a full-service Mechanical, Electrical, and Plumbing Consulting Engineering Firm headquartered in Washington, DC, with 8 additional offices nationwide. He has over 25 years of experience in the Architecture/Engineering field and is a registered Professional Engineer, Certified Commissioning Agent and LEED Accredited Professional. He is on three American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) technical and research committees. ASHRAE is an American professional non-profit organization that seeks to advance heating, ventilation, air conditioning and refrigeration systems design and construction. He is currently on the ASHRAE Epidemic Task Force on the Schools team. The Task Force was established to respond to the current global pandemic and provide guidance on how to ensure that buildings are prepared for future epidemics. He is a leader in the HVAC industry and on re-opening schools safely, an ASHRAE Instructor and has presented on various national stages for the built environment. He has recently appeared in NPR advising schools and businesses on how to reopen safely as well as in the Washington Post on how KIPP DC is implementing SETTY's reopening and long term solutions to mitigate infections in their schools. His focus on education has always been a priority starting from his Peace Corp days as a volunteer as a High School teacher in Namibia. The safety and education of today's youth is paramount. His children currently attend DCPS schools.

In response to COVID-19 and based on Raj's work with the ASHRAE epidemic task force, Raj has presented to 1000's of practitioners across the country as an instructor for commissioning agents, EPA, Dept of Energy, GSA, dozens of schools systems, ASHRAE engineers, commercial building owners, DDOE, several universities and dozens of building managers on planning how to adapt their current buildings to safeguard against future disruptions to occupancy.

Is a "Deep Clean" enough? Do "Six Feet Spaces" makes sense? What's in the Air? A critical part of the conversation needs to be the Indoor Air Quality and reducing transmissions through the air. Implementing a strategic risk-based blueprint for the building systems will help your recovery readiness team define its priorities, establish the right safeguards, and ensure occupant confidence.

Furthermore, the team at Setty has developed a risk infection calculator that is basis for helping to improve indoor air quality in rooms. This document is used by many practitioners to reduce the risk of infection in rooms. This calculator is based on the Wells Riley Equation for infection probability. The approach is to look at the building's HVAC system holistically and ensuring the three main tools to improve indoor air quality are used.

RETURN TO SCHOOL
DGS COVID RETROFIT ASSESSMENT REPORT

District of Columbia Public Schools

JANNEY ELEMENTARY SCHOOL

4130 Albemarle ST NW, Washington, DC 20016, USA

November 3, 2020

Mechanical ◆ Electrical ◆ Plumbing ◆ Fire Protection ◆ Energy ◆ Sustainable Design
Project Management ◆ Construction Management ◆ Consultant Design Engineers

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1. Introduction and Key Concepts

The American Society of Heating and Air-Conditioning Engineers (ASHRAE) has put out the following statements:

Statement on the airborne transmission of SARS-CoV-2:

Transmission of SARS-CoV-2 through the air is sufficiently likely that airborne exposure to the virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures.

Current evidence suggests that SARS-CoV-2, the virus that causes COVID-19, is predominantly spread from person-to-person.

Statement on the operation of heating, ventilating, and air-conditioning systems to reduce SARS-CoV-2 transmission:

Ventilation and filtration provided by heating, ventilating, and air-conditioning systems can reduce the airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air. Unconditioned spaces can cause thermal stress to people that may be directly life-threatening and that may also lower resistance to infection. In general, disabling of heating, ventilating, and air-conditioning systems is not a recommended measure to reduce the transmission of the virus.

The goal of this plan is to give building operators and contractors a road map and HVAC direction for the opening of their facilities. The recommendations in this report have been prepared by a licensed professional engineer (PE) and are to be used in conjunction with occupant changes and remote learning. Social distancing for entries, corridors, and classrooms are not addressed in this report.

The primary focus of this document is to analyze the specific building systems to see what can readily be addressed in the short term to improve the indoor air quality of the spaces. No solution will guarantee a virus-free environment, but this report will address the best practices for indoor air quality improvement.

2. Summary of Actions to be Performed

Janney Elementary School is a 84,400-SF school located at 4130 Albemarle ST NW, Washington, DC 20016, USA.

Summary of Actions:

Phase 1

1. Start-up all HVAC and Plumbing systems per Setty checklists.
2. Change to a new filter at the existing MERV rating.
3. Provide a list of any deferred maintenance or non-functioning systems after start-up.
4. Fill in HVAC unit verification sheets for each piece of airside equipment and submit to Setty.

Phase 2

1. Change filters per revised guidance in this report.
2. Install indoor air quality sensors per floor plans and integrate into the IAQ dashboard.
3. Change Building Management Sequence of Operations per new sequence per unit type.
4. Integrate new BMS sequences with Enteliweb.
5. Furnish and Install UV-C and HEPA filtration units in classrooms - 40 locations.
6. Furnish and Install UV-C and HEPA filtration units in bathrooms - 8 locations.
7. Furnish and Install UV-C and HEPA filtration units in large assembly spaces - 5 locations (1 in L21 Reading room, 2 in 145 Multipurpose/Phy Edu./Auditorium and 2 in 128 Cafeteria).

Phase 3

1. Monitoring of IAQ and adjustments.
2. Monitoring of air handlers and motors and adjustments.

Photo 2.1: Janney Elementary School Campus

3. Filter Change and Motor Chart

The building is being served by the following HVAC systems:

Classrooms, work room and resource rooms ventilation are being served by RTU-3, RTU-4, RTU-5 and DOAS-1 (Dedicated Outside Air System) and Variable Refrigerant Volume System (VRF units) for building heating and cooling requirements.

Cafeteria is being served by roof mounted air handling units (RTU-1 and RTU-2) for space cooling, heating and ventilation requirements. Multipurpose/Phy Edu./Auditorium is being served by roof mounted air handling units (RTU-6 and RTU-7) for space cooling, heating and ventilation requirements. Refer below for HVAC system schedule.

BUILDING EXISTING HVAC SYSTEM SCHEDULE							FILTER CHANGE AND MOTOR SIZING							
				MIN OA				SUPPLY FAN DATA						
TAG NO	LOCATION	SERVICE	TOTAL SUPPLY CFM	%	CFM	EXISTING FILTER MERV	PROPOSED FILTER MERV	CFM (EACH)	QTY	(EXT.) TSP* IN WG	(CAL.) TSP IN WG	MOTOR (EXT.) HP	MOTOR (CAL.) BHP	FILTER RECOM.
RTU-1	ROOF	CAFETERIA	7,500	33	2,500	MERV 8	MERV 10	-	-	-	-	-	-	NOTE #2, CHANGE FILTER
RTU-2	ROOF	CAFETERIA	7,500	33	2,500	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-3	ROOF	EXISTING BUILDING	8,300	100	8,300	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-4	ROOF	EXISTING BUILDING	5,600	100	5,600	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-5	ROOF	ADDITIONAL BUILDING	10,650	100	10,650	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-6	ROOF	MULTI-PURPOSE	7,500	33	2,500	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-7	ROOF	MULTI-PURPOSE	7,500	33	2,500	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
DOAS-1	ROOF	CLASSROOMS	3,500	100	3,500		MERV 8	-	-	-	-	-	-	NOTE #2, CHANGE FILTER
AC-1	CEILING	ADMINISTRATION	-	-	-	-	-	-	-	-	-	-	-	PROVIDE PORTABLE HEPA
AC VRF (TYP)	CEILING	CLASSROOMS	-	-	-	-	-	-	-	-	-	-	-	PROVIDE PORTABLE HEPA

NOTES:
1) PROVIDE VALUES FOR FINAL SUBMISSION TO THE OWNER BASED ON TESTING AND BALANCING DATA. THESE VALUES MUST BE FROM FIELD MEASURED RESULTS AND NOT DESIGN VALUES FROM THE ORIGINAL DESIGN.
2) PROVIDE FIELD VERIFICATION SHEETS.

Figure 3.1: Mechanical Schedule

4. Sensor Locations and Specifications

The intent of the sensors is to take a sampling of the air across the entire school. Sensors should not be located near induction units, floor fans, or personal heaters, and should be located out of direct sunlight. Sensors should be installed in the "breathable zone", where students are occupying. Sensors should not be in kitchens, bathrooms or entryways.

The Contractor to install IAQ sensors in the designated areas shown below. Name each sensor after the room where it is installed in the school. The sensor locations can be adjusted by the contractor in the field and there should be no additional electrical wiring. If there is not a 110 V plug close by, contractor can move the sensor at their discretion and provides a new location to DC schools.

The Contractor to furnish and install sensors as indicated on plans below, gateway, and cell router. Contractor to locate the gateway in the data closet of the school and then to the admin office. Note all sensors need to be within 200 feet of the gateway or coordinate with manufacturer.

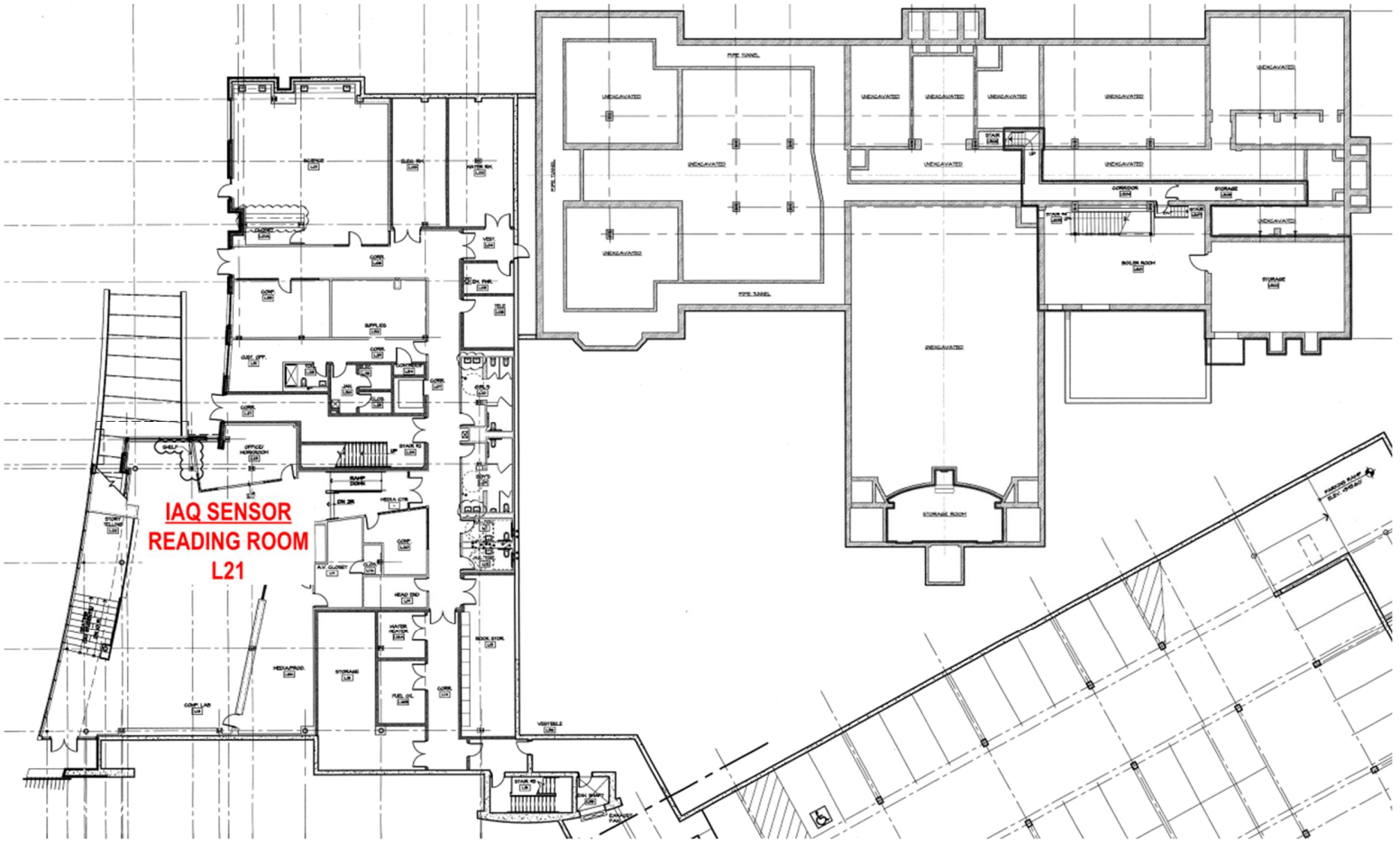


Figure 4.1: IAQ sensor plan – Basement Plan

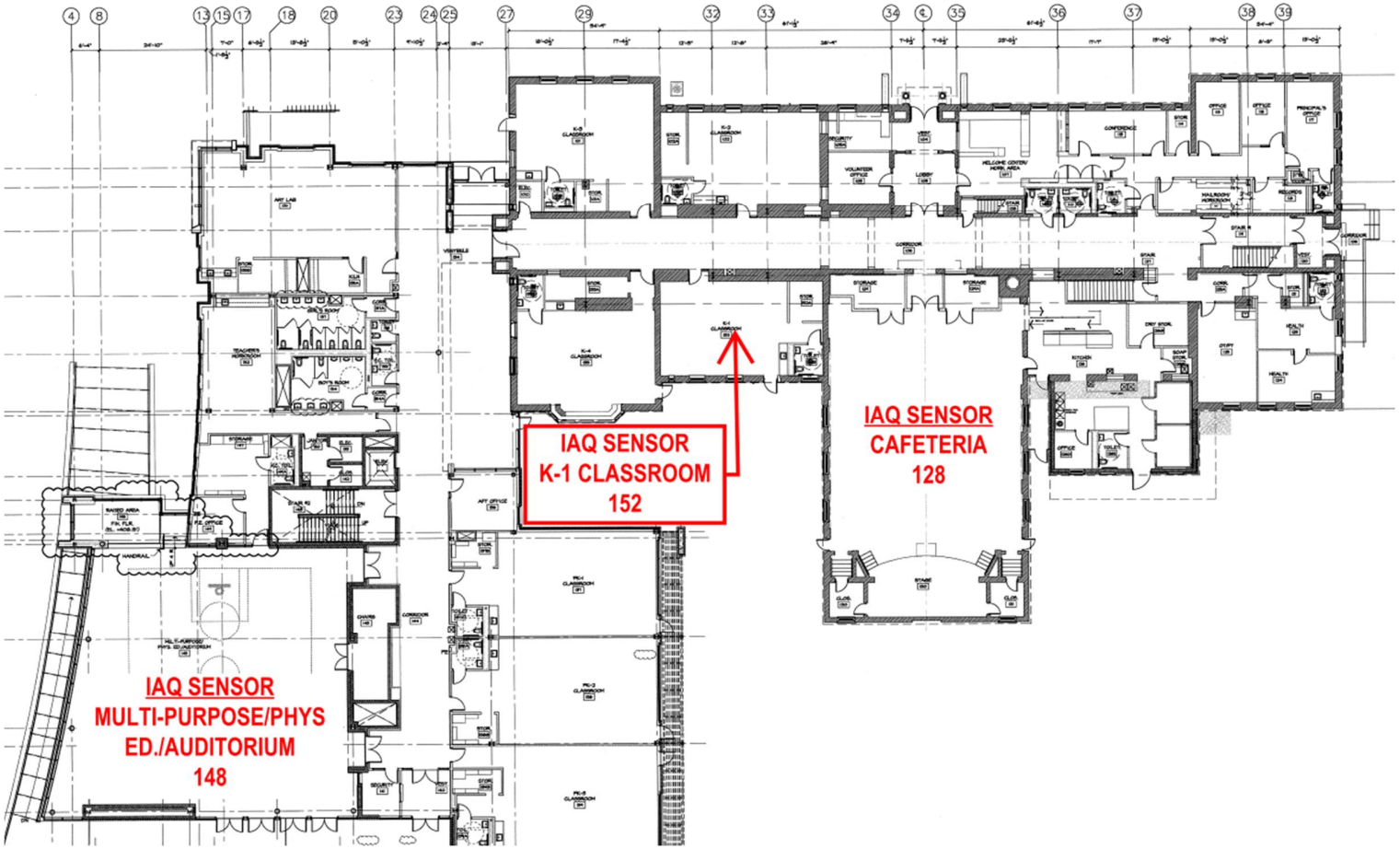


Figure 4.2: IAQ sensor plan – First floor plan

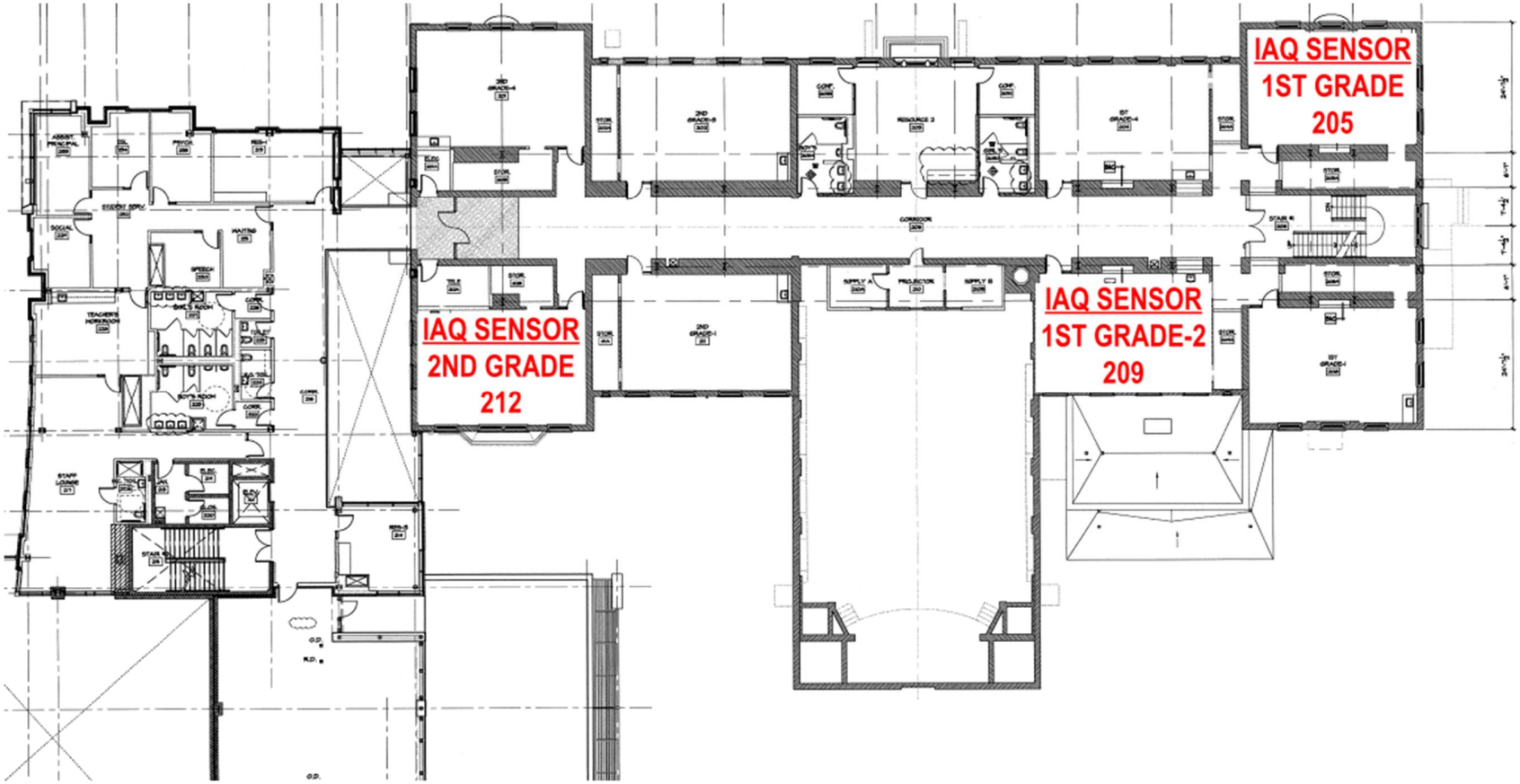


Figure 4.3: IAQ sensor plan – Second floor plan

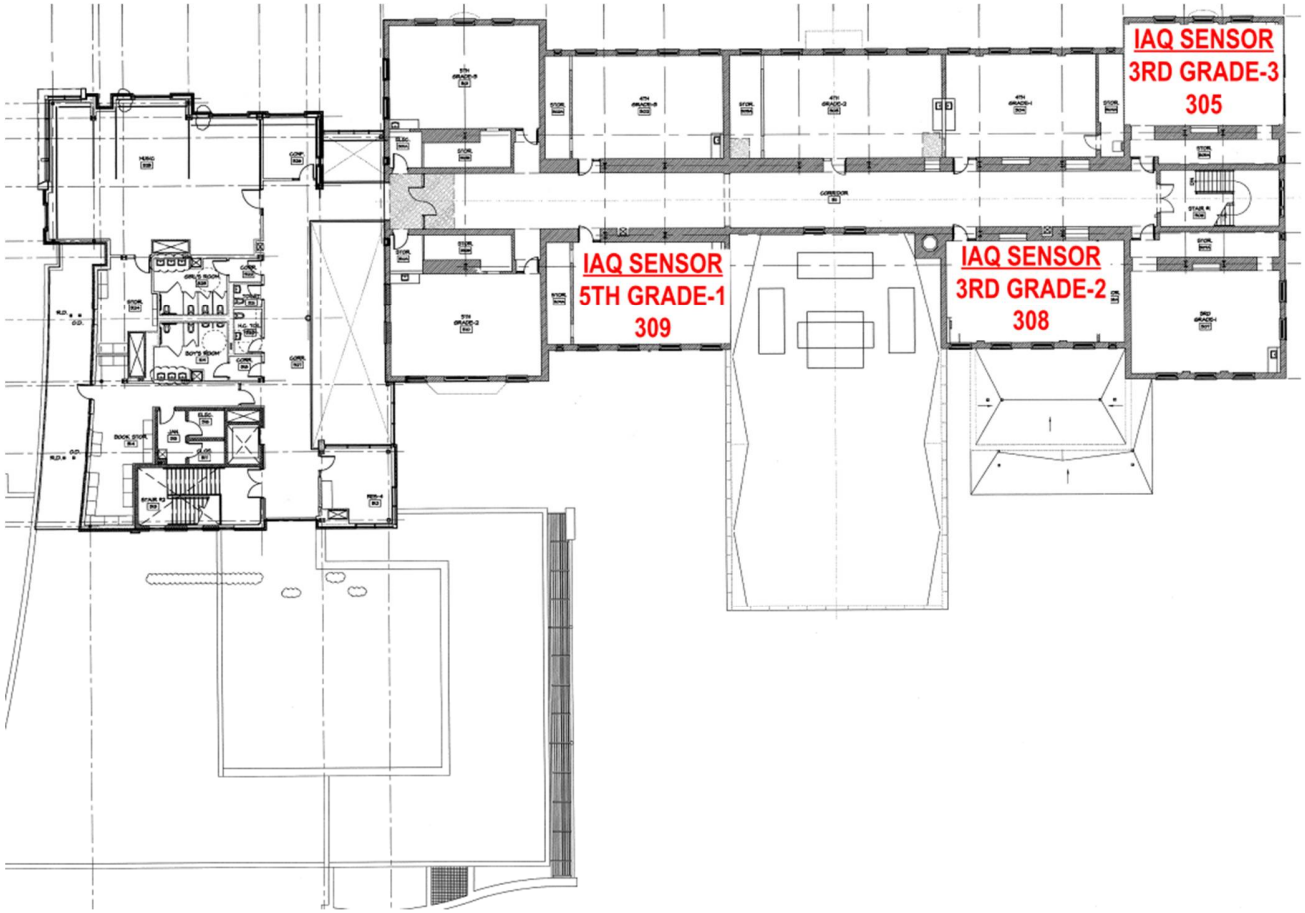


Figure 4.4: IAQ sensor plan – Third floor plan

Indoor Air Quality – Senseware:

Senseware's Indoor Air Quality (IAQ) makes it easy to deploy and monitor a variety of environmental conditions in seconds. These packages can quickly and easily alert users of potentially hazardous on-site conditions via text and/or email alerts.

Standard sensor options include Temperature, Relative Humidity, Total Volatile Organic Compounds (TVOC), CO2, and Particulate Matter (mass and number concentration for PM1.0, PM2.5, PM4, and PM10).

Floor plans allow users to quickly locate and analyze problematic areas, and the intuitive Senseware user interface enables trending of historical data and comparison with other data points, even local weather data.

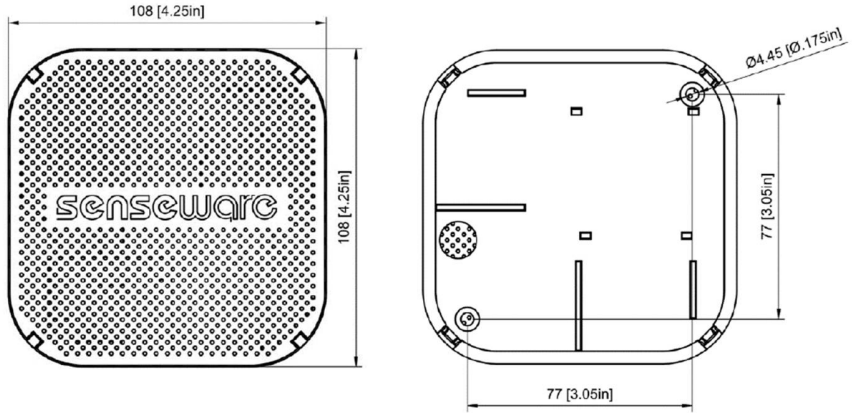


Figure 4.5: Senseware Sensor Picture (Dimensions in mm)

Technical Specifications:

a) Power (max.): 1.65 W
b) Supply Voltage: 5 VDC via micro-USB with standard 110V AC plug

c) Sensor Accuracy & Measurement Range:
   a. Temperature (°F/°C) / Relative Humidity (%): T/RH: ± 0.3°C, RH: ± 2%
   b. Carbon Dioxide (CO2): 400-5000 ppm ± 30 ppm, ± 3% of reading, extended range up to 10000 ppm ± 10% of reading
   c. Volatile Organic Compounds (TVOC): 0-60000 ppb
   d. Particulate Matter:
      i. Mass concentration accuracy: 0 to 100 (µg/m³): +/- 10 µg/m³, 100 to 1,000 µg/m³: +/- 10%
      ii. Mass concentration range: 0 to 1,000 µg/m³
      iii. Mass concentration resolution: 1 µg/m³
      iv. Mass concentration size range: PM1.0: 0.3 to 1.0 µm, PM2.5: 0.3 to 2.5 µm, PM4: 0.3 to 4.0 µm, PM10: 0.3 to 10 µm
      v. Number concentration range: 0 to 3,000 1/cm3
      vi. Number concentration size range: PM0.5: 0.3 to 0.5 µm, PM1.0: 0.3 to 1.0 µm, PM2.5: 0.3 to 2.5 µm, PM4: 0.3 to 4.0 µm, PM10: 0.3 to 10 µm

d) Size (inches): 3.4 x 3.4 x 0.94 Weight, standard configuration (T/RH/VOC/CO2/PM) with power supply (ounces): 7.6

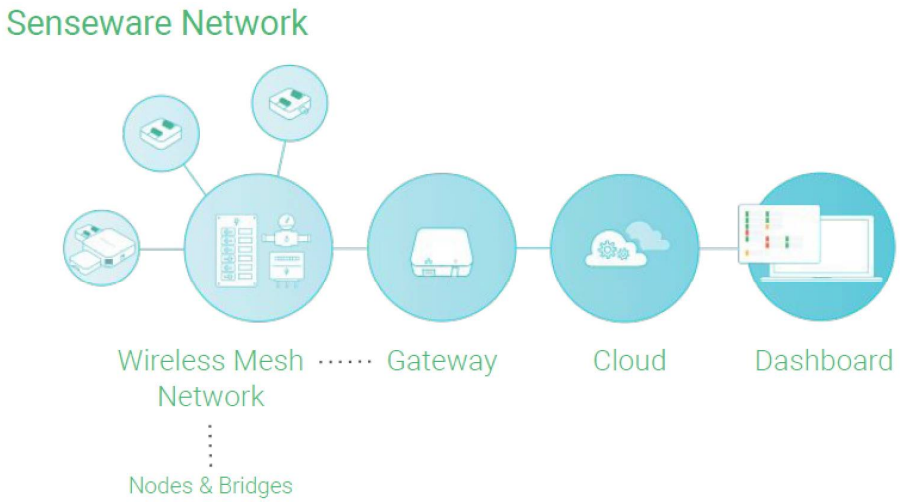


Figure 4.6: Senseware Network Architecture

5. Air Changes and Portable Unit Overview

School Name =	JANNEY ELEMENTARY SCHOOL
School Area, SF =	84400
Avg Bldg. Height, FT =	10.0
School Population =	739
No. of Classrooms =	40
No. of Bathrooms =	8 (over 2 water closets)

Space Category	Area, SF	Height, FT	PER 1000 SF from ASHRAE 62.1	OA CFM per SF from ASHRAE 62.1	OA CFM per Person from ASHRAE 62.1	# PEOPLE per ASHRAE 62.1	Total OA required CFM according to ASHRAE 62.1
TYP. CLASSROOM (5-8 AGES)	800	9	25	0.12	10	20	296
GYM, SPORTS ARENA	4015	15	7	0.18	20	28	1285
CAFETERIA	3550	20	100	0.18	7.5	355	3302
LIBRARY	3110	10	10	0.12	5	31	529

Building Existing Air Changes per Hour:

Building total OA capacity from existing units =	38,050	cfm
Building total supply air from existing units =	58,050	cfm
Building percentage of OA =	66%	
Total ACH =	4.1	

Engineering Guide	Target ACH
OA btw 0 to 10% =	6
OA btw 10 to 30% =	5
OA above 30% =	4.5

Classrooms: Portable units

Quantity	5
Unit CFM	400
Adjusted Total cfm	60050
Building ACH	4.3

Classrooms: UV-C / HEPA Portable

Quantity	40
Unit CFM	400
Adjusted Total cfm	76,050
Building ACH	5.4

Bathrooms Local UV-C / HEPA Ceiling or Portable

Quantity	8
Unit CFM	400
Adjusted Total cfm	79,250
Building ACH	5.6

Gym/Assembly Large UV-C / HEPA Portable

Quantity	5
Unit CFM	2000
Adjusted Total cfm	89,250
Building ACH	6.3

Note: Large portable unit

Central AHU UV-C or Ducted UV-C

Quantity Unit	0
Unit CFM	0
Adjusted Total cfm	89,250
Building ACH	6.3

Portable Unit Specifications:

a) UV-C light – a minimum of 1200 microwatts/cm^2
b) HEPA filter
c) CFM adjustable from 200 cfm to 400 cfm
d) Noise sound level under NC 35
e) Power 110-volt plugin
f) Portable unit types
   - Ceiling removable
   - Surface wall-mounted
   - Free-standing

g) Basis of Design
   1. Price
   2. EnviroKlenz Air System
   3. Critical Systems or equal

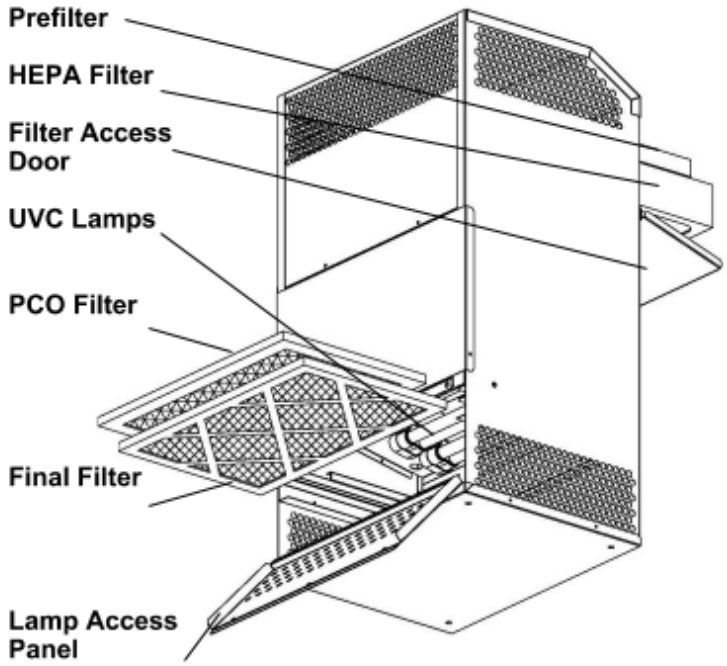


Photo 5.1: Typical Room Portable units

Large Area Guidance

In large areas over 2,000 SF it will be difficult to stop the transmission. The only safe way is to drastically limit occupancy. However, there are systems like portable units below which can be deployed to provide a level of filtration and disinfection.

a. The units need to have both UV-C in the 254 nm wavelength and HEPA filtration.
b. Provide 1500 to 2000 cfm units with 120 Volt plug-in power.
c. Install in larger spaces such as gymnasiums, cafeterias, and multipurpose rooms.
d. Basis of Design-MultiStack or equal

Photo 5.2: Assembly Areas - Basis of Design Units

6. Building Management Control Sequence

The following sequences of operations are intended to increase the amount of fresh air into the building via the existing equipment. The existing building HVAC controls logic and sequences should be adjusted to increase the outside air via longer run times and demand control ventilation overrides. Due to the varied nature of the building controls status for each building and unique HVAC unit, the contractor shall apply the logic as shown below and if need be request clarification via the RFI process.

For large assembly areas that have their own units such as gyms and auditoriums, they should run the new sequences when unoccupied, doors to the main building need to be propped open and allow for transfer of the outside air to the main building.

Sequence of Operations - Air Handling Units (AHU)

1. Outside Air (OSA) Modulation:

    a) Disable the Demand Control Modulation (DCV) routine and Economizer routine (if so equipped).
    b) During the Occupied mode, compare the room (or return air duct) CO2 sensor measurement with the Outside air sensor. If lower by 100 ppm and Outside Air is less than 600 ppm, proceed with Step c. Otherwise, maintain minimum outside air percentage.
    c) Modulate the Outside Air Damper open in 5% increments while decreasing the Mixed Air damper in the AHU. Maintain required supply air CFM either set by airflow measurement or supply air duct work static pressure.
    d) After a 5 minute waiting period, confirm that AHU supply air temperature and relative humidity meet set points and are stable.
    e) Further increase the percentage of outside repeating the above sequence until either of the following conditions occur:
        i. Air handling Unit required supply air conditions are not met
        ii. Outdoor air CO2 level exceeds Room level or Return Air CO2 sensor levels
    f) Decrease outside air percentages in 5% increments until both Step e. conditions are met.
    g) Hold conditions until either condition is not met. Then further reduce outside air percentages until again, conditions are met.
    h) Stop the reduction in outside air sequence when scheduled minimum outside air percentage is achieved.
    i) Repeat the above process, starting with b. on a two hour time increment (adjustable).
    j) Humidity override – On a rise in relative humidity above 60% in any of the spaces, OA dampers shall modulate closed in 5% increments every 3 mins (adj.) until relative humidity in all spaces being monitored decreases to 55% or lower.
    k) Unoccupied Mode - Extend the Occupied mode 2 hours (adjustable) beyond the programmed time unless the Outside air levels exceed 600 ppm. During the Unoccupied mode of operation (setback temperatures), maintain minimum outside air CFMs during the period when the temperature in any spaces drops below 55F in heating mode and over 85F in cooling mode and the system is energized. If unoccupied temperatures cannot be maintained, then the OA dampers shall modulate closed in 5% increments

until temperatures in all spaces being monitored are either above 55F in heating mode or below 85F in cooling mode.

Sequence of Operations – Terminal Units with Other Outside Air Source

1. Outside Air Modulation
    a) Disable the Demand Control Modulation to the terminal unit.
    b) Increase or modify internal unit program to provide a 30% (adjustable) outside air percentage versus room return air.
    c) If terminal unit is purely a fixed outside air percentage, manually increase outside air percentage while still maintaining supply air conditions from the unit.

Sequence of Operation – Air Handling Unit Flushing

1. Outside Air Room Flushing
    a) At the beginning of the Unoccupied mode or by a time clock feature, initiate an Air Handling Unit flush with Outside Air following the below sequence:
        i. Open Outside Air Damper and Return Air/Relief Air Damper 100% open. Close mixed air damper.
        ii. Override any VAV boxes/ fan powered boxes in the system to full OAS air.
        iii. Increase fan(s) speed to provide maximum unit airflow (CFM) with the only restriction of supply air temperature between the limits of 55F and 85F (adjustable).
        iv. After a duration of 2 hours (adjustable), return air handling unit operation to the Unoccupied mode.
        v. Repeat the above sequence on a daily cycle (adjustable) or feature an owner enabled weekly schedule.

Sequence of Operations – Air Filtration – Max Motor Loading

1. With the new filters installed, increase fan speed incrementally while measuring and recording motor amperage and filter pressure drop. Record maximum motor amp draw and airflow at various speeds. Max current at rated motor horsepower becomes the benchmark for Step 2 below.
2. During occupied mode for all the above sequences, VFD shall modulate the fan as normal to meet static pressure set point but shall also monitor motor amps and shall override the fan to ramp down to not exceed benchmark max amps from step 1.
3. Send alarm to BAS if motor operations exceed 12 hours of constant run time per cyclic day.

Sequence of Sanitizing

During un-occupied mode of operation, clean and sanitize the air handling unit following the below procedure:

1. De-energize the unit and close isolating dampers.

2. Wipe down all reachable internal surfaces and clean all coils with products meeting the following requirements:
    a. Product's application is for evaporator coils.
    b. No-rinse application i.e. rinsing not required.
    c. Product provides a detergent, degreaser, and deodorizer cleaning.
    d. Products must be biodegradable and alkaline i.e. not acidic.
    e. Products are USDA approved.
    f. Products are NSF certified.
3. Any/all products used must be Owner approved prior to use.
4. Do not run the unit for a minimum of one hour after cleaning.
5. Run the unit a minimum of one hour prior to occupancy.

7. Bathroom Installation:

a) Limit usage to (1) student per bathroom or disable alternate stalls.
b) Provide (1) ceiling mounted air disinfection unit UV-C light troffer per 100 SF of area.

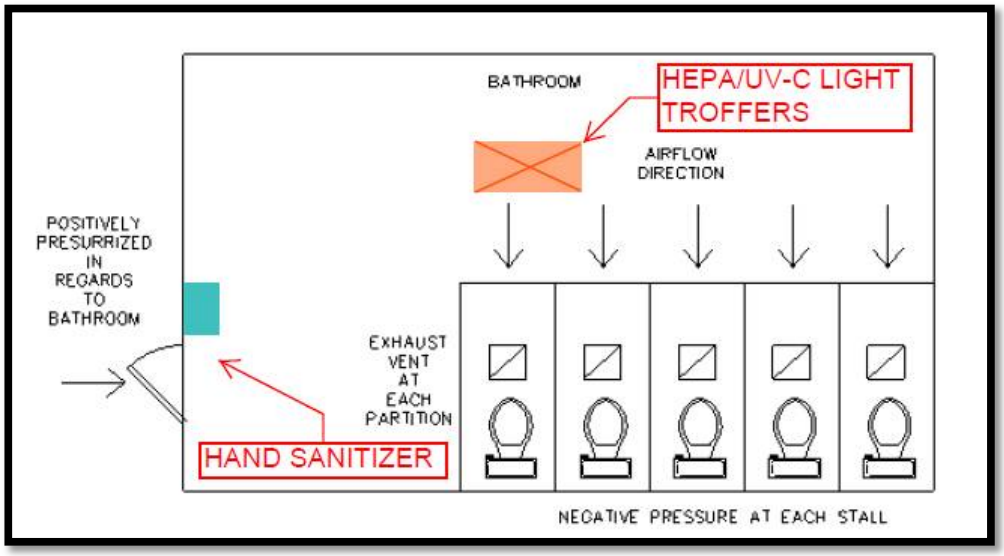


Figure 7.1: Typical Bathroom Layout

Figure 7.2: HEPA / UV light troffer

Specification for Bathroom Troffers

a. Provide in ceiling troffers in bathrooms identified in Section 5 of the DGS Retrofit Assessment Report.
b. Provide no more than 10 troffers per school.
c. Priority for placement:
    - Bathrooms with multiple stalls
    - Do not install in single bathrooms
    - Do not install in bathrooms adjacent to gymnasiums
    - Do not place in Teacher private bathrooms

Specification requirements for troffers:

a. HEPA filtration
b. UV-C internal light for sanitation (253.7 nanometer wavelength, minimum 1200 microwatts/cm^2)
c. Flush ceiling mounted
d. 50 CFM Air Flow rate per unit
e. 277 volt electrical power (120 volt acceptable if 277 Volt power source not in room)
f. Unit to be energized 24/7. No wall switch nor remote control
g. Lights (see below) are to be LED with minimum 3000 lumens output
h. Unit weight not to exceed 45 lbs.

Installation:

a. Provide one unit per 100 SF of restroom area. Two units max per bathroom.
b. If replacing existing lighting troffer, provide unit with light option.

Approved Manufacturers:

a. Healthe by Lighting Science
b. SK Series Model LSH Cleanse
c. Vidashield
d. VS01(with light) VS03(without light)

Approved product links:

https://healtheinc.com/product/healthe-air
https://vidashield.com/products.html

8. Field Verification Sheets:

Summary:

Contractor field verification sheets are enclosed for the following units:

1. RTU-2
2. RTU-3
3. RTU-4
4. RTU-5
5. RTU-6
6. RTU-7

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #3**
Unit Address/DCPS Location	**3rd floor out window**
Unit Manufacturer	**VALENT**
Unit Model Number	**VPRE-310-30A-401C-1AA**
Unit Serial Number	**123407869**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **VPRE-310-30A-401C-1AA, 123407869**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
YES	**Temperature Differential -** Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} (entering) $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify Heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

	Filtration		
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **VPRE-310-30A-401C-1AA, 123407869**		
	MERV Filter Manufacturer:		
	Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.		
Pre-Filters **20X24X4** Pre-Filters 24X24X2 Size:16X25X2	Depth:	Quantity: (1) 9 (2) 15 (3) 4	MERV: 8
Final Filters **20X24X4** Final Filters 24X24X2 Size:16X25X2	Depth:	Quantity: (1)9 (2) 15 (3) 4	MERV: 13
	Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*		YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer = BALDOR	Model = EM3311T	Phase = 3
HP = 7.5	Frame =215T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps =20.4-19.4/9.7
Volts =208-230/460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =			
Motor Sheave	Model:	Shaft Size: 1.125 IN	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **VDRE-310-30A-40LC-1AA, 123407869**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zones actual Use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #2**
Unit Address/DCPS Location	**3rd floor out window (East Bldg)**
Unit Manufacturer	**Lennox**
Unit Model Number	**LGH240H4BS2G**
Unit Serial Number	**5611D02700**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS2G, 5011D2700**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
YES	**Temperature Differential -** Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} (entering) $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify Heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **LGH240HUBS2G, 5611D02700**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters Pre-Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 8
Final Filters Final Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer =	Model = 102972-02	Phase = 3
HP = 10	Frame =215T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps =12.5
Volts =460	ECM = Y/N	

Drive Assembly		Belt Driven	Direct Drive YES
Belt(s) Number=		Belt Type=	Belt Length:
Center to Center =			
Motor Sheave	Model:	Shaft Size: 3.38	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	52,000	

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **LGH240HYBS2G, 5011DO02700**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zones actual Use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #5**
Unit Address/DCPS Location	**3rd floor (MAIN ROOF)**
Unit Manufacturer	**VALENT**
Unit Model Number	**VPRE-310-40A-C1AA**
Unit Serial Number	**12407871**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **VPRE-310-40A-C1AA, 12407871**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
YES	**Temperature Differential -** Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} (entering) $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify Heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **VPRE-310-40A-C1AA, 12407871**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **20X24X4(1)** **Pre-Filters** 20X24X2(2) Size:16X25X2(3)	Depth:	Quantity: (1) 9 (2) 15 (3) 4	MERV: 8
Final Filters **20X24X4** **20X24X2** Final Filters 16X25X2 Size:	Depth:	Quantity: (1) 9 (2) 15 (3) 4	MERV: 13

	Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor			
Manufacturer = BALDOR		Model = EM3311T	Phase = 3
HP = 7.5		Frame =213T	RPM = 1770
HZ =60		Service Factor = 1.15	Amps = 20.4 - 19.4/ 9.7
Volts =208-230/460		ECM = Y/N	
Drive Assembly		Belt Driven	Direct Drive YES
Belt(s) Number=		Belt Type=	Belt Length:
Center to Center =		1.125IN	
Motor Sheave	Model:	Shaft Size:	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	
Variable Frequency Drive (VFD)		No	
Manufacturer =		Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **VPRE-310-40A-C1AA, 12407871**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zones actual Use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #4**
Unit Address/DCPS Location	**3rd floor out window**
Unit Manufacturer	**VALENT**
Unit Model Number	**VPRE-210-20D-201-C1AA**
Unit Serial Number	**12307870**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **VPRE-210-20D-201-C1AA, 12407870**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
YES	**Temperature Differential -** Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} (entering) $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify Heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **VPRE-210-20D-201-C1AA, 12407870**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **16X25X4** **Pre-Filters** 16X25X2 Size:	Depth:	Quantity: (1) 6 (2) 15	MERV: 8
Final Filters **16X25X4** Final Filters 16X25X2 Size:	Depth:	Quantity: (1)6 (2) 15	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer = BALDOR	Model = EM3218T	Phase = 3
HP = 5	Frame =183T	RPM = 1750
HZ =60	Service Factor = 1.15	Amps =14-13.2/6.6
Volts =208-230/460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =		1.125IN	
Motor Sheave	Model:	Shaft Size:	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	40,000	

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **VPRE-210-20D-201-C1AA, 12407870**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zones actual Use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #6**
Unit Address/DCPS Location	**3rd floor out window (MAIN ROOF)**
Unit Manufacturer	**LENNOX**
Unit Model Number	**LGH240H4B5S29**
Unit Serial Number	**5011D02699**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
	Temperature Differential - Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} (entering) $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify Heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **LGH240H4BS29, 5611DO2699**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **Pre-Filters** 24X24X2(2) Size:	Depth:	Quantity: 6	MERV: 8
Final Filters Final Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer = LENNOX	Model = 102972 - 02	Phase = 3
HP = 10	Frame =215T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps = 12.5
Volts =460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =		1.125IN	
Motor Sheave	Model:	Shaft Size:	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **VPRE-310-40A-C1AA, 12407871**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zones actual Use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #6**
Unit Address/DCPS Location	**3rd floor out window (MAIN ROOF)**
Unit Manufacturer	**Lennox**
Unit Model Number	**LGH240H4BS29**
Unit Serial Number	**5611DO2699**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
	Temperature Differential - Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} (entering) $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify Heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **LGH240H4BS29, 5611DO2699**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **Pre-Filters** 24X24X2 Size:	Depth:	Quantity: 6	MERV: 8
Final Filters Final Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer =LENNOX	Model =102972 - 02	Phase = 3
HP = 10	Frame =213T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps = 12.5
Volts =460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =			
Motor Sheave	Model:	Shaft Size: 3.38	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zones actual Use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #6**
Unit Address/DCPS Location	**3rd floor out window (MAIN ROOF)**
Unit Manufacturer	**Lennox**
Unit Model Number	**LGH240H4BS29**
Unit Serial Number	**5611DO2699**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
	Temperature Differential - Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} (entering) $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify Heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **LGH240H4BS29, 5611DO2699**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **Pre-Filters** 24X24X2 Size:	Depth:	Quantity: 6	MERV: 8
Final Filters Final Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer =LENNOX	Model =102972 - 02	Phase = 3
HP = 10	Frame =213T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps = 12.5
Volts =460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =			
Motor Sheave	Model:	Shaft Size: 3.38	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zones actual Use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #7**
Unit Address/DCPS Location	**3rd floor out window MAIN ROOF (ALRIUM)**
Unit Manufacturer	**Lennox**
Unit Model Number	**LGH240H4BS26**
Unit Serial Number	**5611DO2698**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS2G, 5611DO2698**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
	Temperature Differential - Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} (entering) $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify Heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **LGH240H4BS2G, 5611DO2698**		
	MERV Filter Manufacturer:		
	Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.		
Pre-Filters **Pre-Filters** 24X24X2 Size:	Depth:	Quantity: 6	MERV: 8
Final Filters Final Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 13
	Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*		YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer =LENNOX (BALDOR)	Model =102972 - 02	Phase = 3
HP = 10	Frame =215T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps = 12.5
Volts =460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =			
Motor Sheave	Model:	Shaft Size: 3.38	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.

	80,000

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **LGH240H4BS2G, 5611DO2698**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zones actual Use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

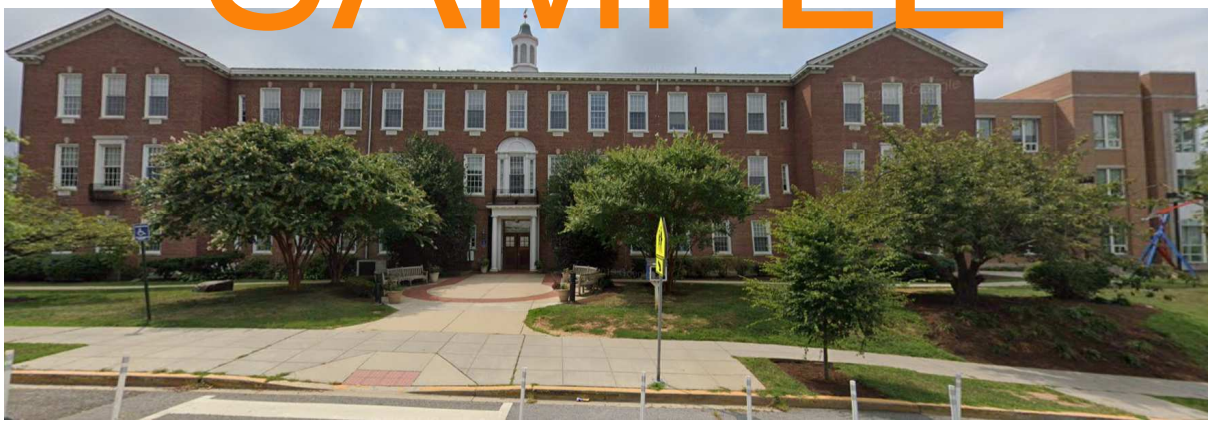
RETURN TO SCHOOL
DGS COVID RETROFIT ASSESSMENT REPORT

District of Columbia Public Schools

JANNEY ELEMENTARY SCHOOL

4130 Albemarle ST NW, Washington, DC 20016, USA

November 3, 2020



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8. **Field Verification Sheets** 21

1. Introduction and Key Concepts

The American Society of Heating and Air-Conditioning Engineers (ASHRAE) has put out the following statements:

Statement on the airborne transmission of SARS-CoV-2:

Transmission of SARS-CoV-2 through the air is sufficiently likely that airborne exposure to the virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures.

Current evidence suggests that SARS-CoV-2, the virus that causes COVID-19, is predominantly spread from person-to-person.

Statement on the operation of heating, ventilating, and air-conditioning systems to reduce SARS-CoV-2 transmission:

Ventilation and filtration provided by heating, ventilating, and air-conditioning systems can reduce the airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air. Unconditioned spaces can cause thermal stress to people that may be directly life threatening and that may also lower resistance to infection. In general, disabling of heating, ventilating, and air-conditioning systems is not a recommended measure to reduce the transmission of the virus.

The goal of this plan is to give building operators and contractors a road map and HVAC direction for the opening of their facilities. The recommendations in this report have been prepared by a licensed professional engineer (PE) and are to be used in conjunction with occupant changes and remote learning. Social distancing for entries, corridors, and classrooms are not addressed in this report.

The primary focus of this document is to analyze the specific building systems to see what can readily be addressed in the short term to improve the indoor air quality of the spaces. No solution will guarantee a virus-free environment, but this report will address the best practices for indoor air quality improvement.

2. Summary of Actions to be Performed

Janney Elementary School is a 84,400-SF school located at 4130 Albemarle ST NW, Washington, DC 20016, USA.

Summary of Actions:

Phase 1

1. Start-up all HVAC and Plumbing systems per Setty checklists.
2. Change to a new filter at the existing MERV rating.
3. Provide a list of any deferred maintenance or non-functioning systems after start-up.
4. Fill in HVAC unit verification sheets for each piece of airside equipment and submit to Setty.

Phase 2

1. Change filters per revised guidance in this report.
2. Install indoor air quality sensors per floor plans and integrate into the IAQ dashboard.
3. Change Building Management Sequence of Operations per new sequence per unit type.
4. Integrate new BMS sequences with Enteliweb.
5. Furnish and install UV-C and HEPA filtration units in classrooms - 4 locations.
6. Furnish and install UV-C and HEPA filtration units in bathrooms - 8 locations.
7. Furnish and Install UV-C and HEPA filtration units in large assembly spaces - 5 locations (1 in L21 Reading room, 2 in 145 Multipurpose/Play Blu./Auditorium and 1 in 138 Cafeteria).

Phase 3

1. Monitoring of IAQ and adjustments.
2. Monitoring of air handlers and motors and adjustments.

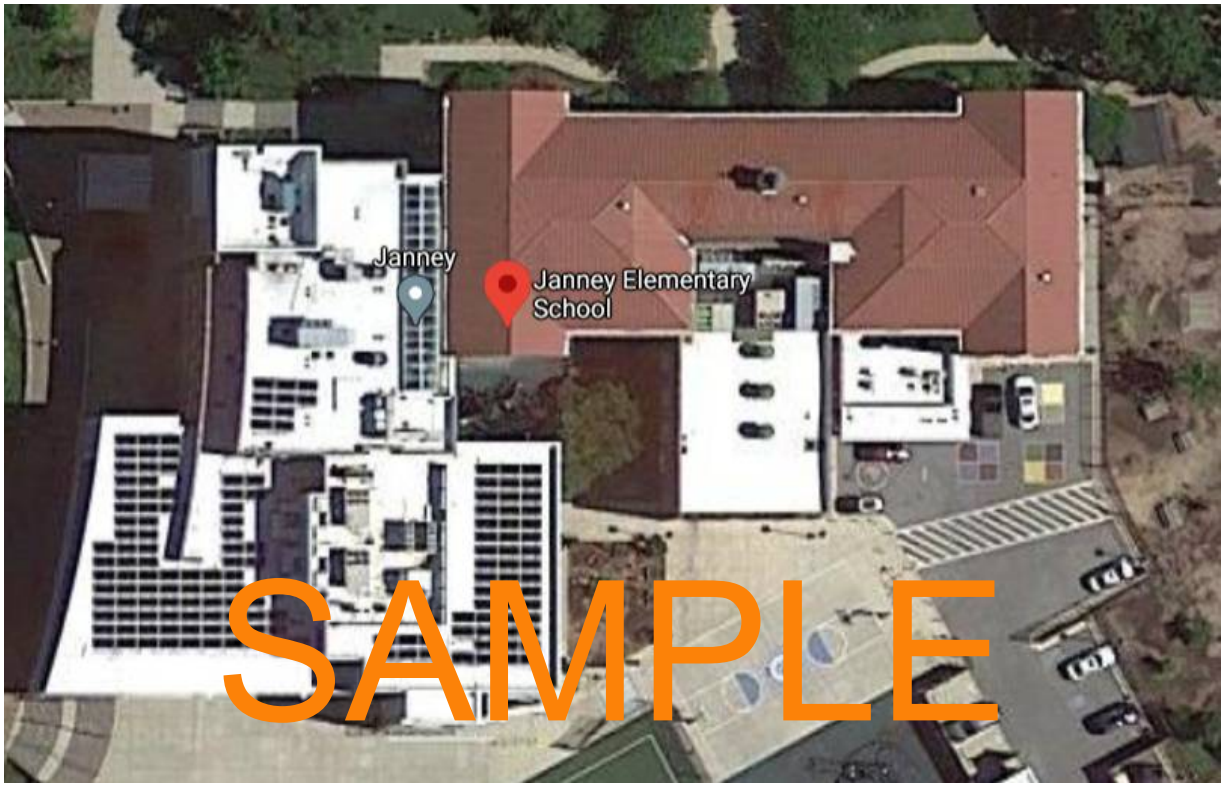

Photo 2.1: Janney Elementary School Campus

3. Filter Change and Motor Chart

The building is being served by the following HVAC systems:

Classrooms, work room and resource rooms ventilation are being served by RTU-3, RTU-4, RTU-5 and DOAS-1 (Dedicated Outside Air System) and Variable Refrigerant Volume System (VRF units) for building heating and cooling requirements.

Cafeteria is being served by roof mounted air handling units (RTU-1 and RTU-2) for space cooling, heating and ventilation requirements. Multipurpose/Phy Edu./Auditorium is being served by roof mounted air handling units (RTU-6 and RTU-7) for space cooling, heating and ventilation requirements. Refer below for HVAC system schedule.

BUILDING EXIS NG HVAC S STEM SC DULE							FILT R CHANGE ANI OTOR SIZING							
				MIN OA						SU PLY FAN DATA				
TAG NO	LOCATION	SERV E	SUPPL FM	%	C	STING R MER	ROPO LTER M V	C EACH)	QTY	(E TSP* IN VG	(CAL.) TSP I WG	MOTOR (EXT.) HP	(CAL.) BHP	FILTER RECOM.
RTU-1	ROOF	CAFETERIA	7,500	33	2,500	ERV 8	MERV	-	-		-		-	NOTE #2, CHANGE FILTER
RTU-2	ROOF	CAFETERIA	7,500	33	2,500	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-3	ROOF	EXISTING BUILDING	8,300	100	8,300	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-4	ROOF	EXISTING BUILDING	5,600	100	5,600	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-5	ROOF	ADDITIONAL BUILDING	10,650	100	10,650	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-6	ROOF	MULTI-PURPOSE	7,500	33	2,500	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
RTU-7	ROOF	MULTI-PURPOSE	7,500	33	2,500	MERV 13	NO CHANGE	-	-	-	-	-	-	KEEP EXISTING MERV
DOAS-1	ROOF	CLASSROOMS	3,500	100	3,500		MERV 8	-	-	-	-	-	-	NOTE #2, CHANGE FILTER
AC-1	CEILING	ADMINISTRATION	-	-	-	-	-	-	-	-	-	-	-	PROVIDE PORTABLE HEPA
AC VRF (TYP)	CEILING	CLASSROOMS	-	-	-	-	-	-	-	-	-	-	-	PROVIDE PORTABLE HEPA

NOTES:
1) PROVIDE VALUES FOR FINAL SUBMISSION TO THE OWNER BASED ON TESTING AND BALANCING DATA. THESE VALUES MUST BE FROM FIELD MEASURED RESULTS AND NOT DESIGN VALUES FROM THE ORIGINAL DESIGN.
2) PROVIDE FIELD VERIFICATION SHEETS.

Figure 3.1: Mechanical Schedule

4. Sensor Locations and Specifications

The intent of the sensors is to take a sampling of the air across the entire school. Sensors should not be located near induction units, floor fans, or personal heaters, and should be located out of direct sunlight. Sensors should be installed in the "breathable zone", where students are occupying. Sensors should not be in kitchens, bathrooms or entryways.

The Contractor to install IAQ sensors in the designated areas shown below. Name each sensor after the room where it is installed in the school. The sensor locations can be adjusted by the contractor in the field and there should be no additional electrical wiring. If there is not a 110 V plug close by, contractor can move the sensor at their discretion and provides a new location to DC schools.

The Contractor to furnish and install sensors as indicated on plans below, gateway, and cell router. Contractor to locate the gateway in the data closet of the school and the[illegible] to the [illegible]dmin offic[illegible]. Note all s[illegible]ors need [illegible]e w[illegible]n 200[illegible]t of [illegible]e gateway c[illegible] coordinate with manufacturer.

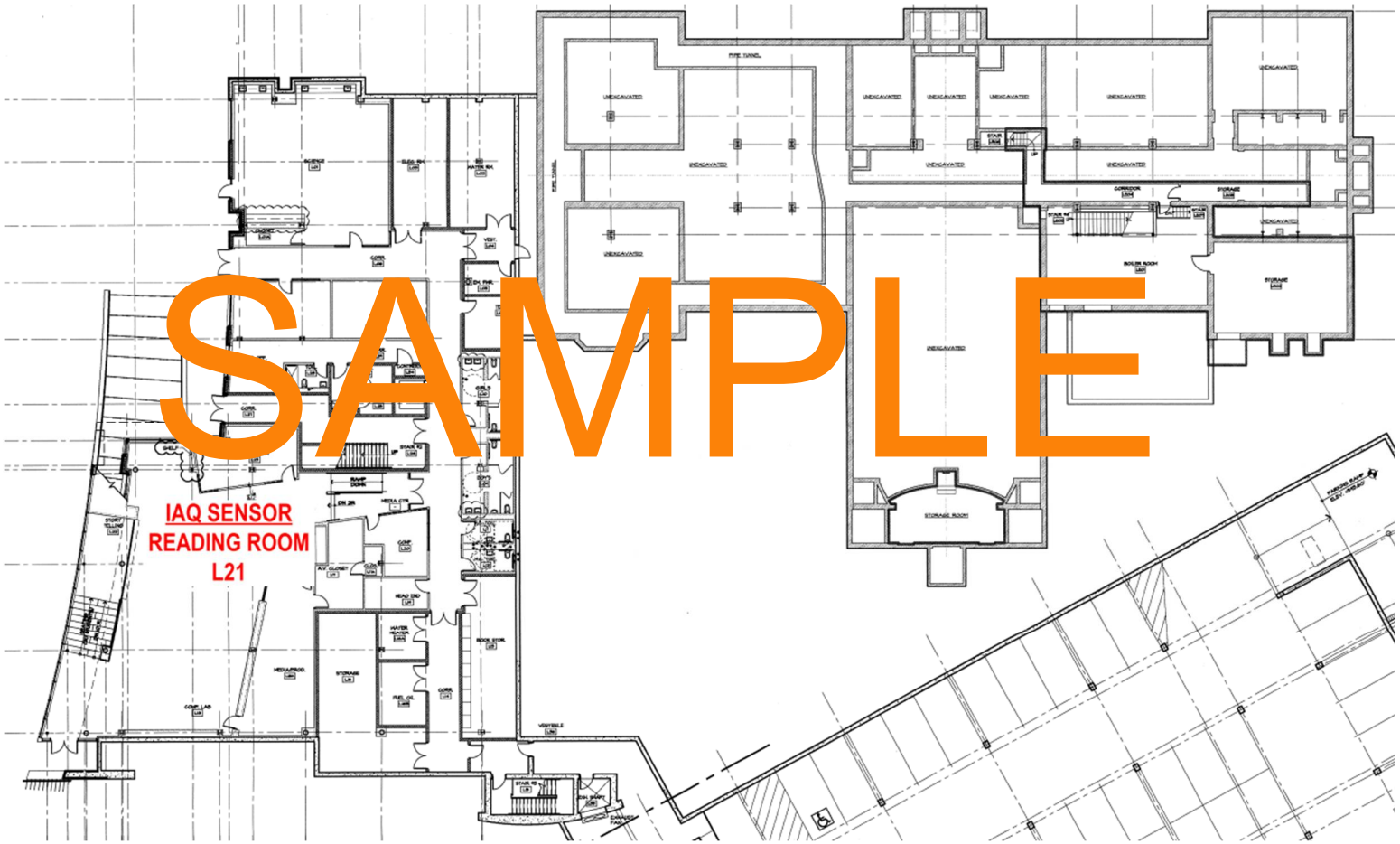

Figure 4.1: IAQ sensor plan – Basement Plan

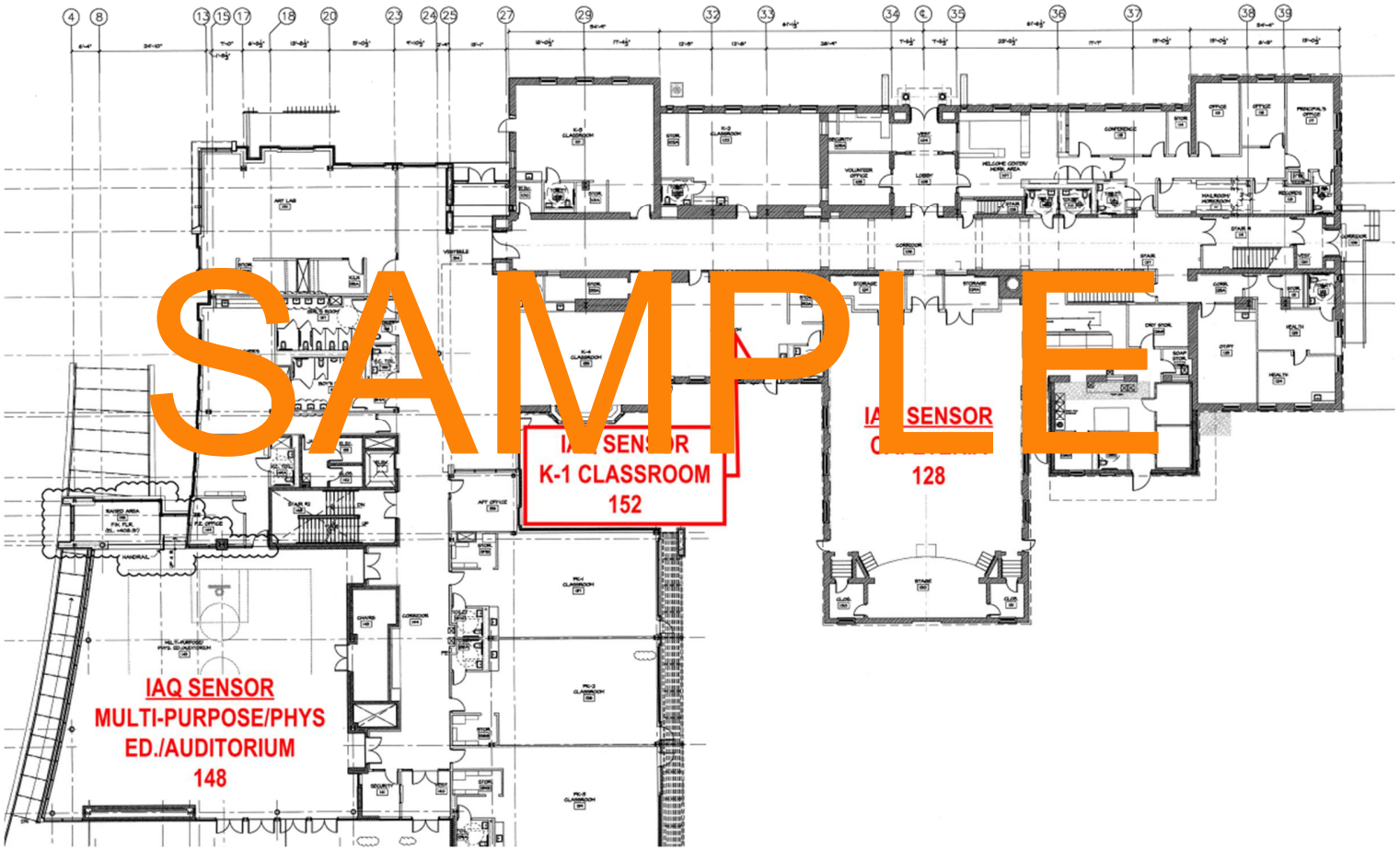

Figure 4.2: IAQ sensor plan – First floor plan

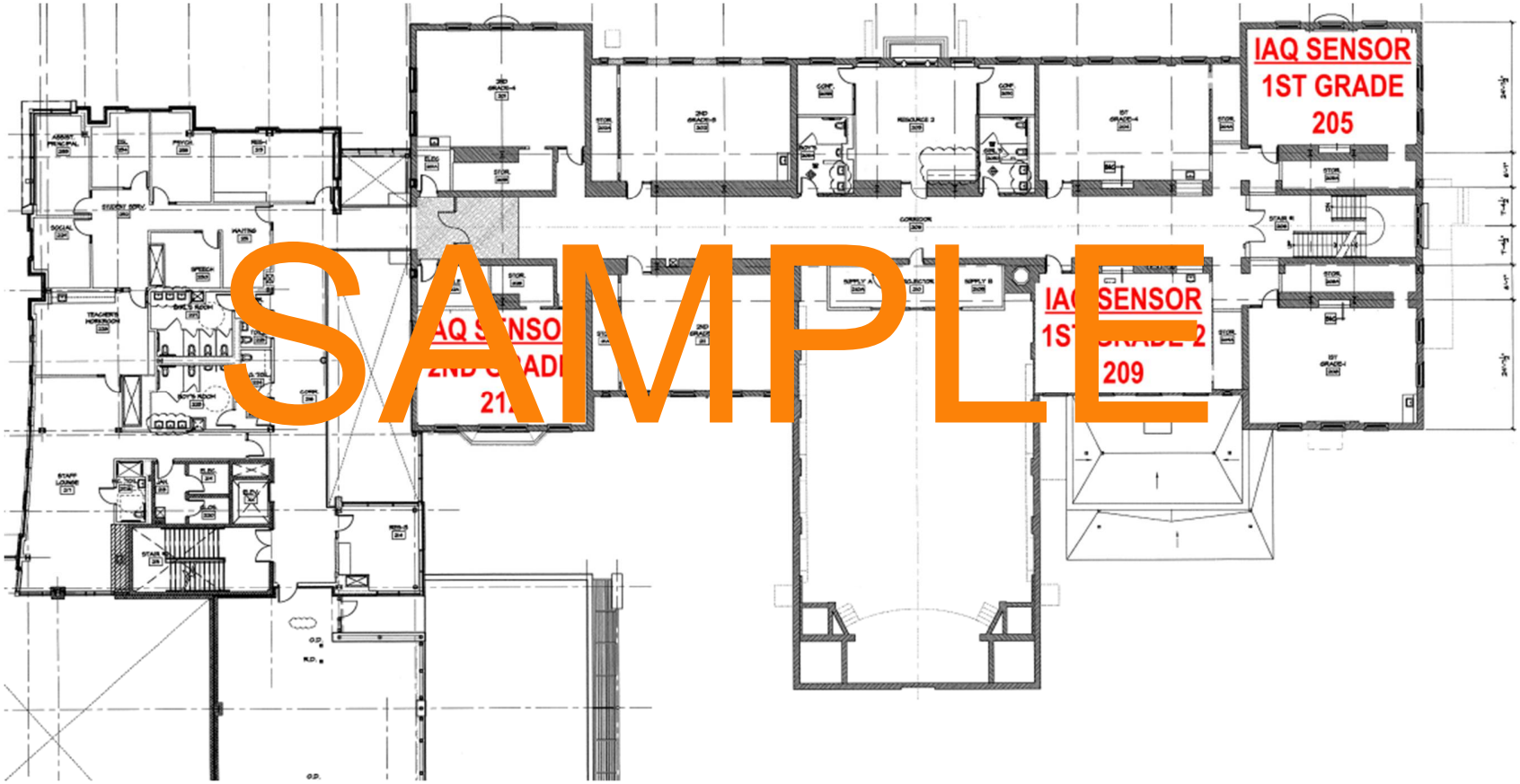

Figure 4.3: IAQ sensor plan – Second floor plan

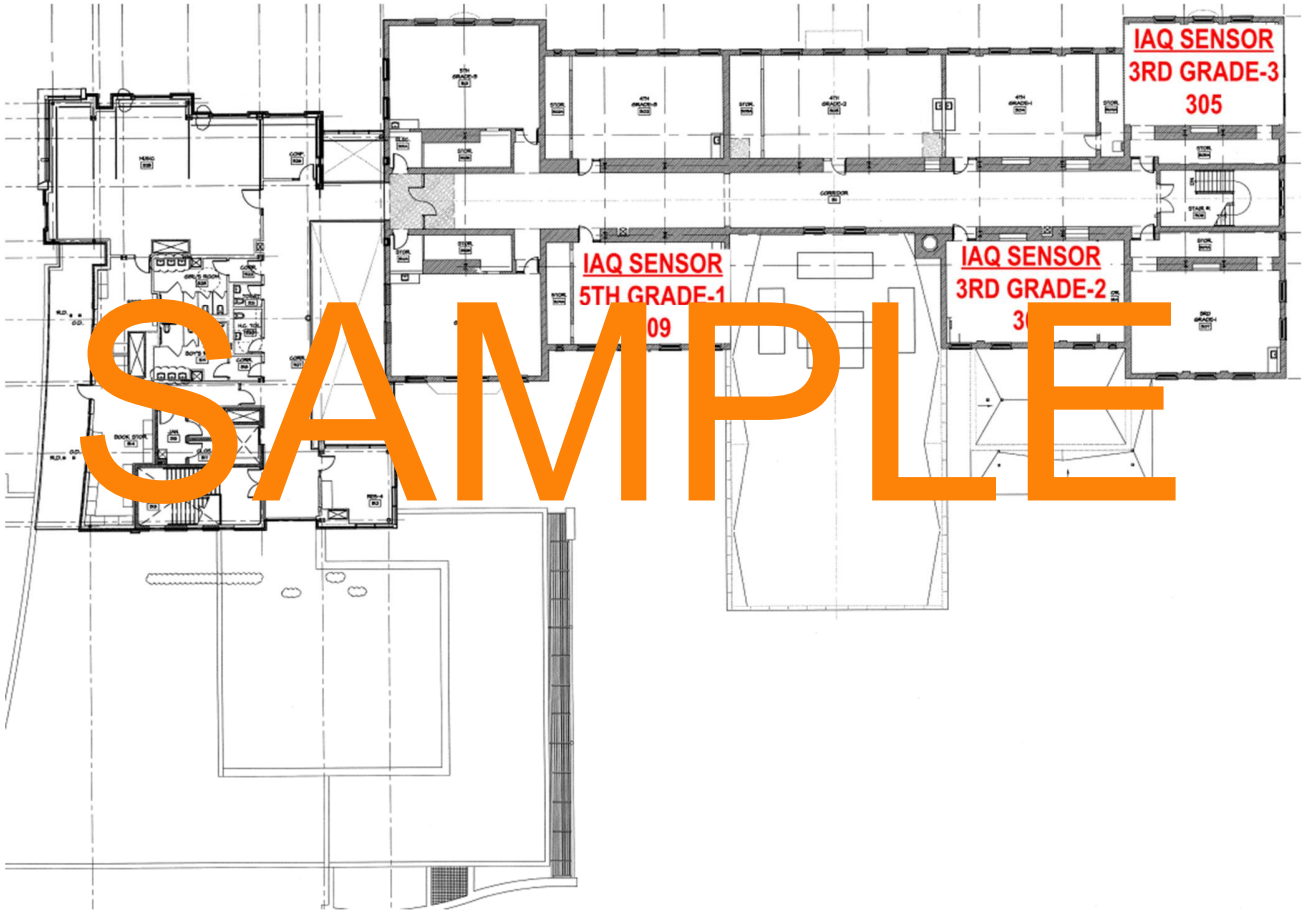

Figure 4.4: IAQ sensor plan – Third floor plan

Indoor Air Quality – Senseware:

Senseware's Indoor Air Quality (IAQ) makes it easy to deploy and monitor a variety of environmental conditions in seconds. These packages can quickly and easily alert users of potentially hazardous on-site conditions via text and/or email alerts.

Standard sensor options include Temperature, Relative Humidity, Total Volatile Organic Compounds (TVOC), CO2, and Particulate Matter (mass and number concentration for PM1.0, PM2.5, PM4, and PM10).

Floor plans allow users to quickly locate and analyze problematic areas, and the intuitive Senseware user interface enables trending of historical data and comparison with other data points, even local weather data.

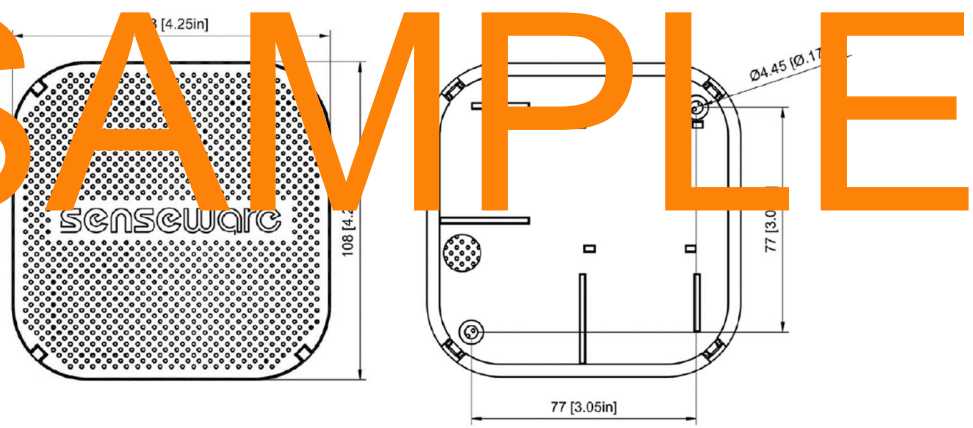

Figure 4.5: Senseware Sensor Picture (Dimensions in mm)

Technical Specifications:

a) Power (max.): 1.65 W
b) Supply Voltage: 5 VDC via micro-USB with standard 110V AC plug

c) Sensor Accuracy & Measurement Range:
   a. Temperature (°F/°C) / Relative Humidity (%): T/RH: ± 0.3°C, RH: ± 2%
   b. Carbon Dioxide (CO2): 400-5000 ppm ± 30 ppm, ± 3% of reading, extended range up to 10000 ppm ± 10% of reading
   c. Volatile Organic Compounds (TVOC): 0-60000 ppb
   d. Particulate Matter:
      i. Mass concentration accuracy: 0 to 100 (µg/m³): +/- 10 µg/m³, 100 to 1,000 µg/m³: +/- 10%
      ii. Mass concentration range: 0 to 1,000 µg/m³
      iii. Mass concentration resolution: 1 µg/m³
      iv. Mass concentration size range: PM1.0: 0.3 to 1.0 µm, PM2.5: 0.3 to 2.5 µm, PM4: 0.3 to 4.0 µm, PM10: 0.3 to 10 µm
      v. Number concentration range: 0 to 3,000 1/cm3
      vi. Number concentration size range: PM0.5: 0.3 to 0.5 µm, PM1.0: 0.3 to 1.0 µm, PM2.5: 0.3 to 2.5 µm, PM4: 0.3 to 4.0 µm, PM1[illegible] to 10 µm

d) Size (inches): 3.4 [illegible]3.4 x 0.9[illegible] Weight[illegible]standard co[illegible]uration [illegible]H/V[illegible]C/CO2/[illegible]M) w[illegible]h power su[illegible]ly (ounces): 7.6

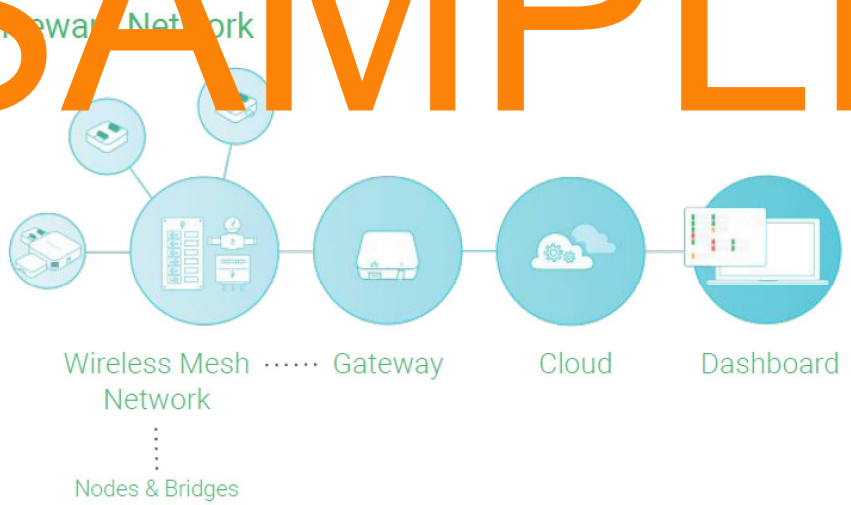

Figure 4.6: Senseware Network Architecture

5. Air Changes and Portable Unit Overview

School Name =	JANNEY ELEMENTARY SCHOOL
School Area, SF =	84400
Avg Bldg. Height, FT =	10.0
School Population =	739
No. of Classrooms =	40
No. of Bathrooms =	8

(over 2 water closets)

Space Category	Area, SF	Height, FT	PER 1000 SF from ASHRAE 62.1	OA CFM per SF from ASHRAE 62.1	OA CFM per Person from ASHRAE 62.1	# PEOPLE per ASHRAE 62.1	Total OA required CFM according to ASHRAE 62.1
TYP. CLASSROOM (5 -8 AGES)	800	9	25	0.12	10	20	296
GYM, SPORTS ARENA	4015	15	7	0.18	20	28	1285
	3550	20	100	0.	7.5	355	
LIBRA	3110	10	10	0.		31	529

Building Ex g Air ges per Hour

Building total OA acity fro isting units =	38,050
Building total ply air from ting units =	58,050
ge of OA =	6%
tal ACH =	1

Engineering Guide	Target ACH
OA btw 0 to 10% =	6
OA btw 10 to 30% =	5
OA above 30% =	4.5

Classrooms:
Portable units

Quantity	5
Unit CFM	400
Adjusted Total cfm	60050
Building ACH	4.3

Classrooms:
UV-C / HEPA Portable

Quantity	40
Unit CFM	400
Adjusted Total cfm	76,050
Building ACH	5.4

Bathrooms
Local UV-C / HEPA Ceiling or Portable

Quantity	8
Unit CFM	400
Adjusted Total cfm	79,250
Building ACH	5.6

Large UV-C / HEPA Portable

Quantity	5
Unit CFM	2000
Adjusted Total cfm	89,250
Building ACH	6.3

Note: Large portable unit

Central AHU UV-C or Ducted UV-C

Quantity Unit	0
Unit CFM	0
Adjusted Total cfm	89,250
Building ACH	6.3

Portable Unit Specifications:

a) UV-C light – a minimum of 1200 microwatts/cm^2
b) HEPA filter
c) CFM adjustable from 200 cfm to 400 cfm
d) Noise sound level under NC 35
e) Power 110-volt plugin
f) Portable unit types
   - Ceiling removable
   - Surface wall-mounted
   - Free-standing

g) Basis of Design
   1. Price
   2. EnviroKlenz Air System
   3. Critical Systems or equal

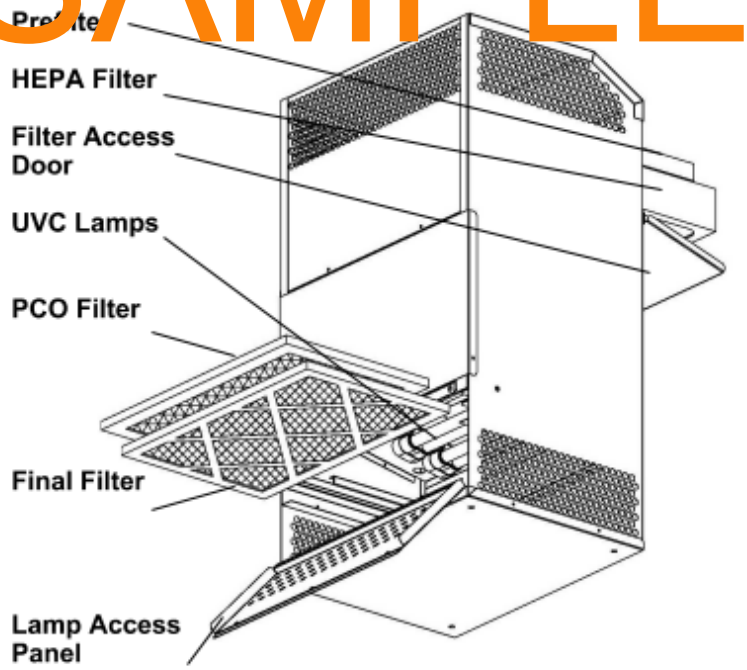

Photo 5.1: Typical Room Portable units

Large Area Guidance

In large areas over 2,000 SF it will be difficult to stop the transmission. The only safe way is to drastically limit occupancy. However, there are systems like portable units below which can be deployed to provide a level of filtration and disinfection.

a. The units need to have both UV-C in the 254 nm wavelength and HEPA filtration.
b. Provide 1500 to 2000 cfm units with 120 Volt plug-in power.
c. Install in larger spaces such as gymnasiums, cafeterias, and multipurpose rooms.
d. Basis of Design-MultiStack or equal

Photo 5.2: Assembly Areas - Basis of Design Units

6. Building Management Control Sequence

The following sequences of operations are intended to increase the amount of fresh air into the building via the existing equipment. The existing building HVAC controls logic and sequences should be adjusted to increase the outside air via longer run times and demand control ventilation overrides. Due to the varied nature of the building controls status for each building and unique HVAC unit, the contractor shall apply the logic as shown below and if need be request clarification via the RFI process.

For large assembly areas that have their own units such as gyms and auditoriums, they should run the new sequences when unoccupied, doors to the main building need to be propped open and allow for transfer of the outside air to the main building.

Sequence of Operations - Air Handling Units (AHU)

1. Outside Air (OSA) Modulation:

   a) Disable the Demand Control Modulation (DCV) routine and Economizer routine (if so equipped).
   b) During the Occupied mode compare the room (or return air duct) CO2 sensor measurement with the Outside air sensor. If lower by 100 ppm and Outside Air is less than 600 ppm, proceed with Step c. Otherwise, maintain minimum outside air percentage.
   c) Modulate the Outside Air Damper open in 5% increments while decreasing the Mixed Air damper in the AHU. Maintain required supply air CFM either set by airflow measurement or supply air duct work static pressure.
   d) After a 5 minute waiting period, confirm that AHU supply air temperature and relative humidity meet set points and are stable.
   e) Further increase the percentage of outside repeating the above sequence until either of the following conditions occur:
      i. Air handling Unit required supply air conditions are not met
      ii. Outdoor air CO2 level exceeds Room level or Return Air CO2 sensor levels
   f) Decrease outside air percentages in 5% increments until both Step e. conditions are met.
   g) Hold conditions until either condition is not met. Then further reduce outside air percentages until again, conditions are met.
   h) Stop the reduction in outside air sequence when scheduled minimum outside air percentage is achieved.
   i) Repeat the above process, starting with b. on a two hour time increment (adjustable).
   j) Humidity override – On a rise in relative humidity above 60% in any of the spaces, OA dampers shall modulate closed in 5% increments every 3 mins (adj.) until relative humidity in all spaces being monitored decreases to 55% or lower.
   k) Unoccupied Mode - Extend the Occupied mode 2 hours (adjustable) beyond the programmed time unless the Outside air levels exceed 600 ppm. During the Unoccupied mode of operation (setback temperatures), maintain minimum outside air CFMs during the period when the temperature in any spaces drops below 55F in heating mode and over 85F in cooling mode and the system is energized. If unoccupied temperatures cannot be maintained, then the OA dampers shall modulate closed in 5% increments

until temperatures in all spaces being monitored are either above 55F in heating mode or below 85F in cooling mode.

Sequence of Operations – Terminal Units with Other Outside Air Source

1. Outside Air Modulation
    a) Disable the Demand Control Modulation to the terminal unit.
    b) Increase or modify internal unit program to provide a 30% (adjustable) outside air percentage versus room return air.
    c) If terminal unit is purely a fixed outside air percentage, manually increase outside air percentage while still maintaining supply air conditions from the unit.

Sequence of Operation – Air Handling Unit Flushing

1. Outside Air Room Flushing
    a) At the beginning of the Unoccupied mode or by a time clock feature, initiate an Air Handling Unit flush with Outside Air following the below sequence:
        i. Open Outside Air Damper and Return Air/Relief Air Damper 100% open. Close mixed air damper.
        ii. Override any VAV boxes/fan powered boxes in the system to full OAS air.
        iii. Increase fan speed to provide maximum unit airflow (CFM) with the only restriction of supply air temperature between the limits of 55F and 85F (adjustable).
        iv. After a duration of 2 hours (adjustable), return air handling unit operation to the Unoccupied mode.
        v. Repeat the above sequence on a daily cycle (adjustable) or feature an owner enabled weekly schedule.

Sequence of Operations – Air Filtration – Max Motor Loading

1. With the new filters installed, increase fan speed incrementally while measuring and recording motor amperage and filter pressure drop. Record maximum motor amp draw and airflow at various speeds. Max current at rated motor horsepower becomes the benchmark for Step 2 below.
2. During occupied mode for all the above sequences, VFD shall modulate the fan as normal to meet static pressure set point but shall also monitor motor amps and shall override the fan to ramp down to not exceed benchmark max amps from step 1.
3. Send alarm to BAS if motor operations exceed 12 hours of constant run time per cyclic day.

Sequence of Sanitizing

During un-occupied mode of operation, clean and sanitize the air handling unit following the below procedure:

1. De-energize the unit and close isolating dampers.

2. Wipe down all reachable internal surfaces and clean all coils with products meeting the following requirements:
    a. Product's application is for evaporator coils.
    b. No-rinse application i.e. rinsing not required.
    c. Product provides a detergent, degreaser, and deodorizer cleaning.
    d. Products must be biodegradable and alkaline i.e. not acidic.
    e. Products are USDA approved.
    f. Products are NSF certified.
3. Any/all products used must be Owner approved prior to use.
4. Do not run the unit for a minimum of one hour after cleaning.
5. Run the unit a minimum of one hour prior to occupancy.

7. Bathroom Installation:

a) Limit usage to (1) student per bathroom or disable alternate stalls.
b) Provide (1) ceiling mounted air disinfection unit UV-C light troffer per 100 SF of area.

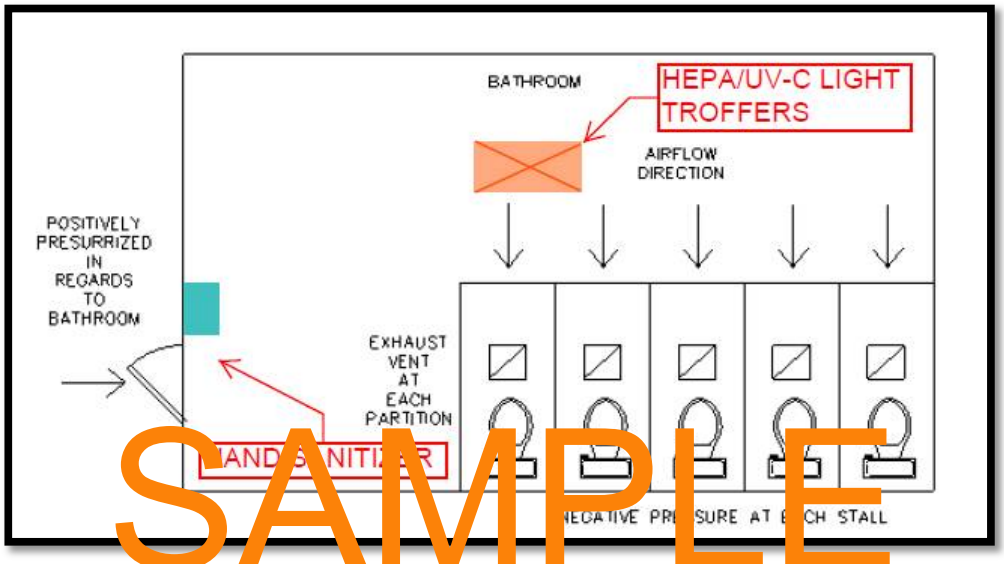

Figure 7.1: Typical Bathroom Layout

Figure 7.2: HEPA / UV light troffer

Specification for Bathroom Troffers

a. Provide in ceiling troffers in bathrooms identified in Section 5 of the DGS Retrofit Assessment Report.
b. Provide no more than 10 troffers per school.
c. Priority for placement:
    - Bathrooms with multiple stalls
    - Do not install in single bathrooms
    - Do not install in bathrooms adjacent to gymnasiums
    - Do not place in Teacher private bathrooms

Specification requirements for troffers:

a. HEPA filtration
b. UV-C internal light for sanitation (253.7 nanometer wavelength, minimum 1200 microwatts/cm^2)
c. Flush ceiling mounted
d. 50 CFM Air Flow rate per unit
e. 277 volt electrical power (120 volt acceptable in 277 Volt power source not in room)
f. Unit to be energized 24/7. No wall switch nor remote control
g. Lights (see below) are to be LED with minimum 3000 lumens output
h. Unit weight not to exceed 15 lbs

Installation:

a. Provide one unit per 100 SF of restroom area. Two units max per bathroom.
b. If replacing existing lighting troffer, provide unit with light option.

Approved Manufacturers:

a. Healthe by Lighting Science
b. SK Series Model LSH Cleanse
c. Vidashield
d. VS01(with light) VS03(without light)

Approved product links:

https://healtheinc.com/product/healthe-air
https://vidashield.com/products.html

8. Field Verification Sheets:

Summary:

Contractor field verification sheets are enclosed for the following units:

1. RTU-2
2. RTU-3
3. RTU-4
4. RTU-5
5. RTU-6
6. RTU-7

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #3**
Unit Address/DCPS Location	**3rd floor out window**
Unit Manufacturer	**VALENT**
Unit Model Number	**VPRE-310-30A-401C-1AA**
Unit Serial Number	**123407869**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report.
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **VPRE-310-30A-401C-1AA, 123407869**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
YES	**Temperature Differential -** Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} entering $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **VPRE-310-30A-401C-1AA, 123407869**		
	MERV Filter Manufacturer:		
	Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.		
Pre-Filters **20X24X4** Pre-Filters 24X24X2 Size:16X25X2	Depth:	Quantity: (1) 9 (2) 15 (3) 4	MERV: 8
Final Filters **20X24X4** Final Filters 24X24X2 Size:16X25X2	Depth:	Quantity: (1)9 (2) 15 (3) 4	MERV: 13
	Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*		YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer = BALDOR	Model = EM3311T	Phase = 3
HP = 7.5	Frame =215T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps =20.4-19.4/9.7
Volts =208-230/460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =			
Motor Sheave	Model:	Shaft Size: 1.125 IN	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

DGS DEPARTMENT OF GENERAL SERVICES BUILD MAINTAIN SUSTAIN

SETTY

SAMPLE

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **VDRE-310-30A-40LC-1AA, 123407869**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zone's actual use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #2**
Unit Address/DCPS Location	**3rd floor out window (East Bldg)**
Unit Manufacturer	**Lennox**
Unit Model Number	**LGH240H4BS2G**
Unit Serial Number	**5611D02700**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report.
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS2G, 5011D2700**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
YES	**Temperature Differential -** Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} entering $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **LGH240HUBS2G, 5611D02700**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters Pre-Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 8
Final Filters Final Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer =	Model = 102972-02	Phase = 3
HP = 10	Frame =215T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps =12.5
Volts =460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =			
Motor Sheave	Model:	Shaft Size: 3.38	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	52,000	

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Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **LGH240HYBS2G, 5011DO02700**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zone's actual use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #5**
Unit Address/DCPS Location	**3rd floor (MAIN ROOF)**
Unit Manufacturer	**VALENT**
Unit Model Number	**VPRE-310-40A-C1AA**
Unit Serial Number	**12407871**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report.
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **VPRE-310-40A-C1AA, 12407871**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
YES	**Temperature Differential -** Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} entering $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **VPRE-310-40A-C1AA, 12407871**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **20X24X4(1)** **Pre-Filters** 20X24X2(2) Size:16X25X2(3)	Depth:	Quantity: (1) 9 (2) 15 (3) 4	MERV: 8
Final Filters **20X24X4** **20X24X2** Final Filters 16X25X2 Size:	Depth:	Quantity: (1) 9 (2) 15 (3) 4	MERV: 13

	Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor		
Manufacturer = BALDOR	Model = EM3311T	Phase = 3
HP = 7.5	Frame =213T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps = 20.4 - 19.4/ 9.7
Volts =208-230/460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =		1.125IN	
Motor Sheave	Model:	Shaft Size:	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	
Variable Frequency Drive (VFD)		No	

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **VPRE-310-40A-C1AA, 12407871**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zone's actual use and Occupancy matches the design's expected Use and Occupancy.	

Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:

The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.

	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #4**
Unit Address/DCPS Location	**3rd floor out window**
Unit Manufacturer	**VALENT**
Unit Model Number	**VPRE-210-20D-201-C1AA**
Unit Serial Number	**12307870**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report.
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **VPRE-210-20D-201-C1AA, 12407870**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
YES	**Temperature Differential -** Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} $T_{entering}$ $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **VPRE-210-20D-201-C1AA, 12407870**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **16X25X4** **Pre-Filters** 16X25X2 Size:	Depth:	Quantity: (1) 6 (2) 15	MERV: 8
Final Filters **16X25X4** Final Filters 16X25X2 Size:	Depth:	Quantity: (1)6 (2) 15	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer = BALDOR	Model = EM3218T	Phase = 3
HP = 5	Frame =183T	RPM = 1750
HZ =60	Service Factor = 1.15	Amps =14-13.2/6.6
Volts =208-230/460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =		1.125IN	
Motor Sheave	Model:	Shaft Size:	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	40,000	

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Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **VPRE-210-20D-201-C1AA, 12407870**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zone's actual use and Occupancy matches the design's expected Use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #6**
Unit Address/DCPS Location	**3rd floor out window (MAIN ROOF)**
Unit Manufacturer	**LENNOX**
Unit Model Number	**LGH240H4B5S29**
Unit Serial Number	**5011D02699**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report.
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
	Temperature Differential - Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} entering $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **LGH240H4BS29, 5611DO2699**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **Pre-Filters** 24X24X2(2) Size:	Depth:	Quantity: 6	MERV: 8
Final Filters Final Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer = LENNOX	Model = 102972 - 02	Phase = 3
HP = 10	Frame =215T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps = 12.5
Volts =460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =		1.125IN	
Motor Sheave	Model:	Shaft Size:	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

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Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **VPRE-310-40A-C1AA, 12407871**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zone's actual use and Occupancy matches the design's expected Use and Occupancy.	

Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:

The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.

	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #6**
Unit Address/DCPS Location	**3rd floor out window (MAIN ROOF)**
Unit Manufacturer	**Lennox**
Unit Model Number	**LGH240H4BS29**
Unit Serial Number	**5611DO2699**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report.
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
	Temperature Differential - Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} entering $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **LGH240H4BS29, 5611DO2699**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **Pre-Filters** 24X24X2 Size:	Depth:	Quantity: 6	MERV: 8
Final Filters Final Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer =LENNOX	Model =102972 - 02	Phase = 3
HP = 10	Frame =213T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps = 12.5
Volts =460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =			
Motor Sheave	Model:	Shaft Size: 3.38	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

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Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zone's actual use and occupancy matches the design's expected use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #6**
Unit Address/DCPS Location	**3rd floor out window (MAIN ROOF)**
Unit Manufacturer	**Lennox**
Unit Model Number	**LGH240H4BS29**
Unit Serial Number	**5611DO2699**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report.
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
	Temperature Differential - Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} entering $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
	HVAC UNIT NUMBER **Unit Model and Serial Number:** **LGH240H4BS29, 5611DO2699**		
	MERV Filter Manufacturer:		
Document rating of existing pre & final filters: size/depth/quantity. Filters: size/depth/quantity.			
Pre-Filters **Pre-Filters** 24X24X2 Size:	Depth:	Quantity: 6	MERV: 8
Final Filters Final Filters 24X24X2 Size:	Depth:	Quantity: 6	MERV: 13
Is the filter installed correctly? *If not document the deficiency and take any measurements required to make the repair.*			YES

	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer =LENNOX	Model =102972 - 02	Phase = 3
HP = 10	Frame =213T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps = 12.5
Volts =460	ECM = Y/N	
Drive Assembly	Belt Driven	Direct Drive YES
Belt(s) Number=	Belt Type=	Belt Length:

Center to Center =			
Motor Sheave	Model:	Shaft Size: 3.38	Position (if Variable):
Fan Sheave	Model:	Shaft Size:	

Variable Frequency Drive (VFD) No

Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

	With unit operating at full cooling, or high fan speed, what is the filter pressure drop?	In. W.C.
	80,000	

DGS DEPARTMENT OF GENERAL SERVICES BUILD MAINTAIN SUSTAIN

SETTY

SAMPLE

Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

Ventilation Verification		
Unit Model and Serial Number: **LGH240H4BS29, 5611DO2699**		
	Determine Minimum Required Outside Air (OSA)	
	If available, obtain the design documents and obtain the minimum required OSA for the air handling unit.	
	Determine if the zone's actual use and occupancy matches the design's expected use and Occupancy.	
Original Occupancy (Design)	Occupancy Category (Use):	Occupancy:
The intent of this section is to verify the capability of the Air Handling Unit to provide the minimum code required OSA to the supply air system and to increase the OSA percentage to the maximum levels while maintaining unit control. See Sequence of Operations for Outside Air.		
	Update software to provide the Sequence of Operation to increase and monitor OSA, and CO2 levels.	
	Initially, over-ride the outside air CO2 level to determine the maximum capable OSA quantity while still maintaining other control conditions.	
	If AHU is a VAV unit, over-ride the VAV boxes to provide full airflow to all areas served by this system.	

See below table to record results of implementing the Sequence of Operations routine.

Increased Outside Air Record

Does the Unit have an Economizer Mode? Y / N

Maximum Total Supply Air from unit CFM

Maximum Outside Air while unit under stable condition CFM

Provide documentation, including relevant photographic documentation, in the assessment report so a licensed professional can determine if the minimum outside air can should be increased and can be without compromising the system's ability to maintain space conditions and pressurization.

Section 1 - Overview - Unit Condition Verification and pre-Assessment

Provide one assessment for each piece of HVAC air side equipment. For terminal units – one assessment is adequate representing a typical classroom.

Unit Condition Verification and Pre-Assessment	
Unit	**Janney Elementary RTU #7**
Unit Address/DCPS Location	**3rd floor out window MAIN ROOF (ALRIUM)**
Unit Manufacturer	**Lennox**
Unit Model Number	**LGH240H4BS26**
Unit Serial Number	**5611DO2698**
Unit Number (eg. AHU#1, AHU#2)	
Floor Installed	**ROOF (3RD)**
Room Installed	
Installation Date	
SEER Rating Seasonal Energy Efficiency Ratio	

General	Is the unit operating properly? YES
DONE	**Filtration -** Review system capacity and airflow to determine the highest Minimum Efficiency Reporting Value (MERV) filtration for eliminating contagions, replace or upgrade filters where needed, and verify that such filters are installed correctly.
DONE	**Ventilation Rate** - Documentation of the existing outside air rates at each piece of HVAC airside equipment. Outside Air Exhaust Air
DONE	**General Maintenance.** Verify coil condition, condensate drainage, cooling coil air temperature differential (entering and leaving dry bulb), supply heating and cooling medium temperatures, and fan drive assembly. Recommendations for additional maintenance, replacement or upgrades shall be recorded in the HVAC Assessment Report.
DONE	**Operational Controls -** Review of existing HVAC control sequences to verify systems will maintain intended ventilation, temperature and humidity conditions during operation. If shortcomings found, make recommendations for programming changes.

Section 2 – General Maintenance

Equipment Verification

Verify General Maintenance	
Unit Model and Serial Number: **LGH240H4BS2G, 5611DO2698**	
Check Box	**Check Box if completed**
YES	**Verify coil condition**
YES	**Verify condensate drainage**
	Temperature Differential - Measure and Document cooling coil air temperature differential (entering and leaving dry bulb) T_{DB} entering $T_{leaving}$ (leaving) If applicable, measure GPM:
	Verify heating heat exchanger operation – Measure and document air temperature differential (entering and leaving dry bulb) $T_{entering}$ $T_{leaving}$ If applicable, measure GPM:
YES	**Verify condition of drive assembly**. (if applicable) Identify (direct)
	Deficiencies - Document deficiencies, general condition of unit, and make recommendations for additional maintenance, replacement or upgrades.
	Repairs and Adjustment. Document Required Repairs and Adjustments Include relevant photographic documentation

Section 3 - Filtration

Filter Verification

Filtration			
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	Are the frames and filter bank free of any openings around the filters that would allow for untreated air to bypass the filters? *If not document the deficiency and take any measurements required to make the repair.*	YES
	Determine type of motor and control (ECM, VFD, Belt, Direct). ○ Document nameplate and installed components as applicable.	DIRECT

Motor

Manufacturer =LENNOX (BALDOR)	Model =102972 - 02	Phase = 3
HP = 10	Frame =215T	RPM = 1770
HZ =60	Service Factor = 1.15	Amps = 12.5
Volts =460	ECM = Y/N	

Drive Assembly		Belt Driven	Direct Drive YES
Belt(s) Number=		Belt Type=	Belt Length:
Center to Center =			
Motor Sheave	Model:	Shaft Size: 3.38	Position (if Variable):
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Manufacturer =	Model =	Operating Hz: Full cooling or High Fan Speed

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Section 4 – Ventilation Rate

Ventilation Verification and Adjustments

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