Wilmington Public Schools
Shawsheen School
Wilmington, MA

2020

HVAC System Evaluation

Prepared For:

Town of Wilmington
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September 4, 2020

GENERAL

Wilmington Public Schools engaged BLW Engineers to evaluate the Shawsheen School HVAC system relative to its current operating conditions, re-opening to the building to the public and potential considerations relative to COVID-19. BLW performed an initial site visit on August 14, 2020 as well as reviewed the original construction documents and supporting building documentation provided by the Town of Wilmington.

While at the site, BLW Engineers met with the facilities operator who reported the HVAC systems receives regular preventative maintenance which includes filter replacement, grease motors and bearings, replace fan belts and verify damper and valve operation.

The Shawsheen School is located at 298 Shawsheen Avenue, Wilmington, MA and was originally constructed circa 1968; the building comprises approximately 51,800 square feet of educational space.

HVAC SYSTEM EVALUATION

Existing Conditions

General

The space heat throughout the building is provided by the central boiler plant within the basement level Mechanical room. The boiler plant and associated system pumps and appurtenances were replaced in circa 2014. The boiler plant consists of (2) Lochinvar, 97% Eff. Condensing Hot Water Boilers each with a gross output of 1,900 MBH. Boiler system includes water specialties, insulated hot water distribution piping system, boiler breeching system and local electronic controls with a dedicated outdoor air temp sensor to modulate HWS distribution temperature. Insulated hot water distribution system from the boilers provides heating hot water into the insulated hot water distribution piping system throughout the building. The heating system circulator pumps were replaced in 2014; there are two (2) circulator pumps serving space heating systems throughout the building. The main circulator pumps operate in lead/lag configuration and have a capacity of 460 GPM at 60 Ft HD.

Classrooms

Typical Classrooms are provided with unit ventilators to provide classroom heating and ventilating. Typical classroom unit ventilators were designed to each have a total airflow capacity of 1,000 CFM and 500 CFM of outdoor air (OA). Classroom ventilation exceeds current code required ventilation (Classroom Ventilation = 10 CFM x Occupant + 0.12 CFM x SF or for a typical 1,000 classroom with 25 occupants that would be 370 CFM). Units are provided with a hot water heating coils interconnected to the hot water distribution piping system, UV-A is equipped with a 53 MBH heating coil and UV-B is equipped with an 39 MBH coil capacity. Each UV heating coil is controlled by a wall mounted thermostat connected to the coil control valve. Each classroom is provided with a low sidewall exhaust grille with a transfer duct to allow relief air into the common return plenum located above the corridor ceiling. Roof mounted Exhaust Fans (EF's) are located at common central points of the classroom corridor to provide pressure relief and exhaust interior spaces. Roof Mounted Exhaust Fans; CX-1, CX-2, CX-3 & CX-4 exhaust a combined total air flow of 13,720 CFM from the First and Second Floor Classroom and Common Spaces. Various classroom areas have been provided with Window AC units.

Gymnasium

The Gymnasium is heating and ventilated via two (2) Heating & Ventilating Units (AS-1 & AS-2) located at the interior of space and supported from the roof structure above. AS-1 & AS-2 each have a design airflow capacity of 2,800 CFM with 1,400 CFM outdoor air to provide hydronic heating and ventilation of the Gym. AS-1 and AS-2 are each equipped with a 42"X 18" return air register recirculating 1,400 CFM from the space. The two units are served by a common intake air plenum located at the adjacent roof plane. There are (2) 42" X 30" fresh air intake louver designed to provide 2,800 CFM to the units. The units were designed to operate as a single zone constant volume system with a dedicated local space temperature sensor. Each unit includes a 166.0 MBH hot water heat coil with 1-1/4" HWS/HWR piping connections. Both units are heat only. Supply air is distributed via exposed ductwork with high velocity sidewall diffusers. The unit dates to the original system installation circa 1961 and appears to have had belt and blower periodic service performed as needed. AS-1 & AS-2 have identical system capacities and ductwork layouts, each located at the East and West portions of the Gym. There are (2) exhaust fans that allow pressure relief and exhaust contaminated air from within the space; GX-1 & GX-2 each with a capacity of 1,400 CFM. There are (2) 24"X24" return grilles, each ducted to a dedicated inline fan (GX-1 & GX-2) located on the adjacent roof assembly. Gym units are controlled by pneumatic actuators. Each unit blower motor is rated at 1 HP and was designed with an ESP of 0.5" w.c. The Gym exterior wall assembly also has Two-Tier Finned Tube Radiation, which is assumed to act as Stage-1 heat source when the Gym is unoccupied.

Girls & Boys Locker Rooms

V-1 air handling unit serves the Boys and Girls Locker room and is designed to provide heating and ventilation air. V-1 has an airflow capacity of 2,000 CFM and is designed to provide 100% outdoor air at a rate of 2,000 CFM via a sidewall intake louver at the lower level exterior wall. V-1 includes a 195.0 MBH hot water heat coil with 1-1/2" HWS/HWR piping connections. Both the Boys and Girls locker rooms are exhausted by an inline fan (TX-3) that is located at the Second Floor Roof Assembly and has design capacity of 3,220 CFM. The unit blower motor is rated at 1 HP and was designed with an ESP of 0.5" w.c.

Kitchen

KV-1 & KV-2 both serve the Kitchen area and are designed to provide heating and ventilation air. KV-1 & KV-2 each have an airflow capacity of 3,850 CFM and were designed to provide 80% outdoor air at a rate of 6,200 CFM via (2) roof gooseneck intakes at the lower roof. KV-1 & KV-2 each includes a 291.0 MBH hot water heat coil with 1-1/2" HWS/HWR piping connections at 15.0 GPM. The unit blower motor is rated at 1.5 HP and was designed with an ESP of 0.625" w.c. Air is distributed to the kitchen areas via supply distribution ductwork located within a soffit and sidewall supply grilles. The Kitchen hood exhaust fan (KH-1) is designed with an exhaust airflow rate of 5,200 CFM and is a dedicated Type-1 Hood and Fan assembly to serve the Kitchen hood. The dishwasher is a Type-2 hood assembly with a dedicated roof mounted fan rated for 1,250 CFM @ 0.375, 1/3 HP.

Cafeteria

HS-1 serves the Cafeteria and is designed to provide heating and ventilation air. HS-1 has an airflow capacity of 3,600 CFM and is designed to provide 50% outdoor air at a rate of 1,800 CFM via a 55"X27" sidewall intake louver. HS-1 includes a 214.0 MBH hot water heat coil with 2" HWS/HWR piping connections. The unit has ductwork for supply air distribution located above the stage and discharges into the space via ceiling diffusers at the perimeter. There is a single 24"X24" sidewall return grille located adjacent to the stage platform. Contaminated air from the Gym is exhausted by a dedicated

roof mounted exhaust fan (HX-1) that exhausts 1,800 CFM to the outdoors. The HS-1 blower motor is rated at 2 HP and was designed with an ESP of 1.00" w.c. The Cafeteria wall assemblies also have Two-Tier Finned Tube Radiation, which is assumed to act as Stage-1 heat source during unoccupied periods.

Library

Library room has been provided with a single unit ventilator to provide classroom heating and ventilating. The Library unit ventilator was designed to each have a total airflow capacity of 1,000 CFM and 500 CFM of outdoor air (OA). Classroom ventilation exceeds current code required ventilation. Units are provided with a hot water heating coils interconnected to the hot water distribution piping system and is equipped with a 53 MBH heating coil. The UV heating coil is controlled by a wall mounted thermostat connected to the coil control valve. The Library is exhausted by a roof mounted exhaust fan that exhausts 480 CFM from the space. The Library bathroom is exhausted by a single exhaust grille that was designed to exhaust 60 CFM during occupied hours.

Administration Office Areas

Offices located at exterior assemblies are provided with operable window assemblies for ventilation air and are heated with baseboard finned-tube radiation. Each section has been provided with a local space sensor, though locations and zoning varies. Some of the Administrative spaces are provided with dedicated Unit Ventilators that provide ventilation and heating to the space.

Miscellaneous

Bathrooms, Janitor's Closets, Storage, etc. are provided by exhaust registers, exhaust duct distribution system and roof exhaust fans. Bathrooms are provided with hot water heating terminal equipment in the form of finned tube radiation within baseboard enclosures. Miscellaneous spaces have been provided with hot water terminal equipment interconnected with the hot water distribution piping system. The building HVAC systems are controlled by stand-alone pneumatic and electrical controls dedicated to the respective systems that they serve.

BOILER SCHEDULE

TAG No.	MANUFACTURER (AS STANDARD)	MODEL No. (AS STANDARD)	TYPE	BOILER DATA	
				NET OUTPUT (MBH)	INPUT GAS CFH
B-1	LOCHINVAR	FBN2000	HIGH EFFICIENCY – CONDENSING	1600	2000
B-2	LOCHINVAR	FBN2000	HIGH EFFICIENCY – CONDENSING	1600	2000

PUMP SCHEDULE

TAG No.	LOCATION(S) SERVED	MANUFACTURER (AS STANDARD)	MODEL No. (AS STANDARD)	TYPE	FLOW RATE GPM
P-1	BUILDING HEAT	TACO	FI-3009	BASE MOUNTED	460
P-2	BUILDING HEAT	TACO	FI-3009	BASE MOUNTED	460
P-3	HOT WATER HEAT	TACO	KV-3006	BASE MOUNTED	100
P-4	HOT WATER HEAT	TACO	KV-3006	BASE MOUNTED	100

EXHAUST FAN SCHEDULE

CX-1
DAVIDSON ROOF FAN PC-31
2880 CFM 3/8" S.P. 1/2 HP

CX-2
DAVIDSON ROOF FAN PC-37
4320 CFM 3/8" S.P. 3/4 HP

CX-3
DAVIDSON ROOF FAN PC-31
2400 CFM 3/8" S.P. 1/2 HP

CX-4
DAVIDSON ROOF FAN PC-37
4120 CFM 1/2" S.P. 1 HP

TX-1
DAVIDSON ROOF FAN PC-25
1770 CFM 3/8" S.P. 1/3 HP

TX-2
DAVIDSON ROOF FAN PC-16
720 CFM 3/8" S.P. 1/6 HP

HX-1
DAVIDSON ROOF FAN PC-25
1800 CFM 3/8" S.P. 1/3 HP

KX-1
DAVIDSON ROOF FAN PC-25
1250 CFM 3/8" S.P. 1/4" HP

UNIT VENTILATOR (UV) SCHEDULE

TYPE	CFM	TOTAL MBH	HEATING MBH	GPM	PRESSURE DROP	REMARKS
(A)	1000	97.1	53.7	10	2.3'	UNIT VENT. 1/6 HP
(B)	750	72.2	39.7	7.4	1.2'	UNIT VENT. 1/6 HP

BASED ON TRANE 50% O.A. 30° ENT. AIR
200° EWT H_2O TWD = 20°

GENERAL PUBLICATION RECOMMENDATIONS
Publications referenced include ASHRAE and State of Massachusetts Re-opening Guidelines for schools.

Operating school buildings under epidemic conditions requires a holistic framework during the crisis and the restoration to potentially a new "normal" after the public health emergency has ended. Considerations include:

- Review of current operational practices
- Holistic view for owner/operator

Review of current operational practices

- Modes of operation of HVAC systems
    - sequences of operations
    - set points
    - schedules
- Verification that equipment and systems are properly functioning and have the enhanced capabilities to address public health considerations, with a focus building air circulating systems.
- Understanding that infected people who are asymptomatic may enter buildings, increasing the likelihood of the spread of virus through air systems to other occupants.

Holistic view for owner/operator

Owners and operators should take a holistic view of their buildings and:

1. Develop a pandemic preparedness plan
2. Review indoor and outdoor environment
3. Review the space types
4. Operate and maintain HVAC
    - Air-Conditioning and Ventilation systems
    - Exhaust systems
5. Check Elevator Control
6. Check BAS and Access Control Systems

Develop a Pandemic Preparedness Plan

Consider these possible goals:

- Reduce the spread of infection among building occupants,
- Maintain HVAC and Building Service Systems in safe and healthy conditions,
- Minimize impact on building occupants and visitors,
- Communicate risks and precautions being taken with occupants transparently
- Implement measures that help make occupants feel secure:
    - Require occupants, visitors and maintenance personnel to wear appropriate PPE per CDC,
    - Screen, monitor and control the circulation of occupants and guests to help avoid transmission of disease,

- Increase frequency for surface disinfection on frequently touched surfaces, such as door handles, handrails, door bells and elevator buttons.

Ensure continuity of supply chains and have backup plans.

- Identify your critical suppliers, e.g. filters, cleaners, disinfectants, parts, PPE, etc.,
- Identify vendors who could negatively affect your operation if they fail to deliver,
- Review current service provider agreements to see if alternate suppliers can be engaged in the event of a supply disruption, for example, equipment service providers, and understand contract limitations and restrictions on using alternative providers,
- Ask critical suppliers to share their pandemic plans:
  - What does their plan include?
  - Have they tested their plan? When was it updated?
  - Set boundaries with suppliers – ask that they do not send staff who may be showing signs of illness to your property.

Review contract agreements:

- Review contract agreements: Review contracts with service providers, utilities, and suppliers to determine what rights and remedies they have because of disruptions due to unforeseeable circumstances that prevent fulfillment of a contract.

Establish a communication protocol and continuity of operations plan:

- Identify key contacts and publish normal and emergency contact information,
- Document the chain of command and communication requirements, and provide instructions and outline expectations for how all responses are to be documented and what records shall be maintained and distributed.

Provide staff with:

- PPE per CDC and OSHA requirements,
- Training on the proper use and disposal of PPE and waste,
- Training on infection prevention and control measures,
- Cross training to ensure critical building functions are maintained in an emergency, and
- Instruction to staff to stay at home if they are feeling sick.

Check with insurance providers to determine whether there are special measures that can be taken to preserve coverage or lower premiums.

Next Steps:

1. Notify staff, tenants and visitors about the plan
2. Follow all local, state and federal executive orders, statutes, regulations, guidelines, restrictions and limitations on use, occupancy and separation
3. Follow OSHA Guidelines, especially the portion in the guide regarding filter and outside air.

4. Ensure that custodial staff and service providers job descriptions includes performing proper cleaning procedures based EPA and CDC guidance using approved products and methods:
    - Disinfect high touch areas of HVAC and other Building Service systems such as on/off switches, and thermostats;
    - Consider UV light disinfection devices of high touch counters in public spaces.
    - Disinfect interiors of refrigerated devices, such as refrigerators, coolers and vending machines where the virus can survive for potentially long periods of time.
5. Consider installing a thermal camera at building entrances to help screen visitors for elevated body temperatures. Note that that infected individuals may show no signs of being ill, including having no fever, and can be responsible for much of the transmission. In such cases, thermal imaging may not be effective.
6. Provide MERV13 or higher filters for air handling equipment that recirculate air when equipment has the capacity; however, most existing air handling equipment will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.
7. The HVAC systems that are physical or capacity limited for better filtration and UV decontamination systems in the return airstream, consider installing portable filtration and air cleaning devices such as UVGI (Ultraviolet Germicidal Irradiation), especially if seniors or anyone with other health issues or compromised immune systems may be located, or, in mission critical areas where required.
8. Provide automatic hand sanitizer dispensers in the high touch areas and other common areas, including spaces where equipment where frequent maintenance is required, and ensure dispensers are serviced often and remain operational.
9. Post signage in prominent locations that contain information and instructions to educate and remind staff about proper procedures to maintain personal protection while cleaning, replacing filters and moving or using other equipment that maybe contaminated
10. Consider providing antimicrobial door mats at high traffic entrances to the building.
11. Institute additional cleaning procedures to ensure proper disinfection of bathrooms, kitchens and common areas. Educate cleaning and maintenance staff on proper personal protection and PPE use including following OSHA worker exposure guidelines.

Review Indoor and Outdoor Environment

- Maintain dry bulb temperatures within the comfort ranges indicated in ANSI/ASHRAE Standard 55-2017
- Maintain relative humidity between 40% and 60% through the use of the air conditioning systems.

In Cold Climates
i. HVAC systems with no humidification may not achieve the minimum humidity indicated, ii. Observe building assemblies and finishes frequently for condensation when indoor dew points rise above the surface temperatures of the assemblies and finishes,

In Cold Climates
iii. Excessive humidity may lead to condensation, indoor mold growth, and degradation of indoor air quality.

Review the space types

Conference Rooms	Keep doors to be opened to promote good ventilation where possible. If doors must be closed, consider local air filtration and cleaning devices and appliances such as portable air filters, or provide local exhaust fans discharging directly to the outside to improve ventilation.
Pantries/Storage Rooms	Provide local exhaust, or portable air filtration and cleaning appliances, especially if refrigerators, or similar appliances, are presented.
Public/Large Assembly Spaces	Where there can be a large assembly of people, consider air treatment, e.g. upper-room UVGI lamps.

Operate and maintain the HVAC system

Building owners and service professionals should follow the requirements of ASHRAE Standard 180-2018, Standard Practice for the Inspection and Maintenance of Commercial HVAC Systems which has tables to show the typical maintenance required for equipment that has been in operation. Consider PPE when maintaining ventilation materials including filters, condensate. Consult additional guidance before duct cleaning. Check specifically:

- Dampers, filter, and economizers seals and frames are intact and clean, are functional and are responding to control signals. MERV13 or higher filters are required for capture of airborne viruses; however, most existing equipment will not be able to support the associated pressure drop of these filters and equipment should be provided with only the highest MERV rating that does not affect the heating and cooling capacity of the units.
- Zone and air temperature are calibrated and accurately reporting environmental conditions to the BAS or local controllers.
- Exhaust fans are functional and venting to the outdoors.
- Check outside air intake regularly for any potential risk such as exhaust nearby and provide proper clearance if assessible by pedestrians, etc.

Operate and maintain the HVAC system – Air conditioning and ventilation systems

- Continued operation of all systems is recommended.
- For offices with fan coil units, open windows 2 hours before and after occupied periods.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: General information

- For central or floor-by-floor VAV systems that have the capacity to operate with 100% outside air, such as an economizer cycle, close return air dampers and open outdoor air dampers to 100% or to the maximum setting that the HVAC system can accommodate and still maintain acceptable indoor conditions.
- If there are heating and cooling coils to temper the air, it can provide comfort and eliminate recirculation (in the mild weather seasons this will have smaller impacts to energy consumption, thermal comfort, or humidity control, however, using 100% outside can be more difficult in extreme weather conditions).
- Considerations also should be given in areas with dry outside air that may lower the relative humidity to below 40%.
- Prioritize increasing outside air over humidity (see concerns about operating at indoor humidity outside the range of 40%-60%).

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Floor-by-floor

- In floor-by-floor VAV systems that have only minimum outside air damper positions or openings, open outside air damper to its maximum position (the same cautions and concerns stated above apply).
- If outside air is supplied centrally from outside air handling units (typically at mechanical levels) to all floors, and there are unoccupied tenant floors, divert the outside air to the occupied floors.
- Consider changing the floor level VAV air handling units' discharge air temperature setpoint the maximum (typically no higher than 60º F).
- This will cause VAV terminal units (boxes) to open to try and satisfy space cooling loads which will increase the number of air changes in the space being served.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Cooling coils

- Cooling coils, heating coils and condensate drain pans inside air handling equipment can become contaminated.
- Therefore, consider adding UVGI for coil surface and drain pan disinfection are encouraged as it will reduce the needs and frequency for in-person coil surface disinfection.
- These devices and systems should be monitored often and regular and emergency maintenances should continue.
- Provide PPE protection for building operators, maintenance technicians and anyone else who must inspect or come in contact with the device or equipment.

Centralized and floor-by-floor Variable Air Volume (VAV) systems: Operable windows

- In buildings with operable windows, when outside air thermal and humidity conditions and outdoor air quality are acceptable, open windows where appropriate during occupied hours.

- Disabling the interlock between opening windows and air conditioning system lockout or shut down if this feature is provided for in the Building Automation System.
- Monitor indoor spaces for possible contaminants entering through the windows such as toilets exhaust located nearby or for windows accessible to public and high traffic on adjacent streets and walkways.
- Exposure to seasonal and other outdoor allergens (pollen and mold spores) may occur with windows opened.
- Special ductwork cleaning, or, changing filters more often than normal is not necessary.

Domestic Heating Water systems:

- Keep heating water systems circulating and maintain temperatures above 140°F to avoid microbial incursion. Do not let water temperature to drop below 120°F.

Operate and maintain the HVAC system - Exhaust systems

- Exhaust system for toilets should run 24/7. Do not open operable windows in toilets.
- Other exhaust systems should continue to run as normal. Run exhaust systems 2 hours before and after occupied periods.
- If there are exhaust outlets located in pedestrian areas outside, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.

Elevator Control

1. Turn on elevator cab (lift) ventilation fans, where possible
2. Encourage occupants to take stairs, where possible, especially when elevator lobbies are crowded.
3. Allow elevators to run at high speed to minimize time in elevator.
4. Close elevator lobby vestibule doors, if available.
5. Consider local air treatment devices in frequently used lifts.

Building Automation System and Access Control System Programming

Building Automation Systems:

- Automate the control sequences in this document as an "Epidemic Mode" operation that can be turned on, shut down or override, if needed, by manual selection of the operator.
- Provide remote access to staff and trusted service providers who are responsible for operating and maintain Building Automation Systems, security, access control, information technology, fire alarm and life safety systems. Have written procedures and test remote access and secure access levels and permissions for all individuals prior to an emergency, if possible.

Access Control Systems:

- Post signage and communicate to tenants, and post visitors' procedures for entering and leaving the building that will minimize the time spent in public spaces.
- Use touchless assess control system if available and where possible.
- Require and enforce social distancing within public and shared spaces using signage.
- Ensure that workspaces are situated to accommodate social distancing recommendations

SJHAWSHEEN SCHOOL PLANNED REOPENING

The Wilmington Public Schools plans on the following school re-opening:

- School is to be occupied by 50% of students on Monday/Tuesday, Wednesday will be a disinfection/cleaning day and then occupied by 50% of students on Thursday/Friday
- Classrooms seating will be reorganized to provide recommended social distancing.
- Cafeteria will not be used in normal fashion; cafeteria will be provided with PPE and be occupied be smaller groups that are socially distanced.
- Gym will not be used in normal fashion.
- Library and Auditorium will not be used in normal fashion.

RECOMMENDATIONS

Based on applicable guidelines (ASHRAE, State of Massachusetts Re-opening Guidelines, etc.), the Shawsheen School is safe to occupy and should consider the following best practice operation of the current HVAC system in an effort to provide an environment to best protect the occupants and visitors to the building during the pandemic:

Tier 1 Recommendations: Tier 1 recommendations are immediate revisions to system operation prior to start of classroom and until the start of the heating season.

1. Create an "Epidemic Mode" Building Management System sequence of operation that can be turned on, shut down or override, if needed, by manual selection of the operator.
2. Replace the unit filters with the best filters available that will not impact the heating capacity of the units and develop a filter replacement plan; the existing air handling equipment will not be able to accommodate MERV13 filters without significantly impacting system operation, outdoor air delivery to the space and equipment component failures.
3. Filter upgrades will require more frequent changes due to pressure drop of filter and particulates that “dirty” the filters.
4. Continued operation of heating and cooling systems is recommended.
5. Operate toilet exhaust fans 24 hours a day, 7 days a week.; other fans shall operate two hours prior and two hours post occupied hours.
6. Monitor Carbon Dioxide (CO_2) levels in occupied areas of the building.
7. Should building exhaust exit building through sidewall louvers subject to pedestrian traffic, provide warning signs and consider diverting or rearranging the exhaust air discharge locations so that they would pose no opportunity to cause harm.
8. Operate the building in occupied mode with mechanical ventilation prior and two hours post occupied hours; where mechanical ventilation and exhaust are not currently provided, utilize operable windows.
9. Operate the building in the occupied mode during disinfection and cleaning operations.

10. Operate Classroom unit ventilators with maximum ventilation as originally designed. Based on reduced classroom sizes, the classroom current system can provide more than 30 CFM/occupant which exceeds current code requirements (10 CFM per occupant plus 0.12 CFM/SF) and can be supplemented by operable windows.
11. Operate Gymnasium air handling unit at maximum design air flow; the unit has the capability of providing 20/CFM per occupant for 140 occupants.
12. Operate Cafeteria air handling unit at maximum design air flow; the unit has the capability of providing 20/CFM per occupant for 75 occupants.
13. Utilize operable windows for Administration Offices and supplement with electric heat as required.
14. Operate Locker Room air handling unit and associated exhaust fan continuously.
15. At the commencement of school and until the heating season and when outdoor air temperature conditions allow, the air handling equipment with recirculated air can be run in the "economizer mode" with 100% outdoor air and no recirculation.
16. Operate unit ventilators and air handling units with highest percentage of outdoor air possible without adversely affecting the occupied environment; outdoor air percentage will be dependent on outdoor air temperature and allowable indoor air temperatures above/below normal operation.
17. Reset discharge air setpoint as high as possible to encourage variable air volume dampers to maximized outdoor air into the building.
18. Disable any CO2 demand control ventilation sequences of operation; operate units at maximum outdoor air capacity.
19. Eliminate outdoor air to zones that are not occupied to better use in occupied areas.
20. Relocate occupants from areas that do not have mechanical ventilation or operable windows.
21. Use operable windows when outdoor air conditions allow.
22. Keep conference room doors open as much as possible or open windows when feasible.
23. Increase regular maintenance of all mechanical heating, ventilating and air conditioning equipment.
24. Monitor the heating, ventilating and air conditioning operation of the building on a continual basis.
25. Follow recommendations of holistic view of building recommendations in General Recommendations.

Tier 2 Recommendations: Tier 2 recommendations are supplemental revisions/additions to the existing systems that may be required for the heating season when systems will need to utilize recirculated air to maintain space temperature setpoints.

1. Provide additional filtration with portable HEPA filter units or UV filtration units for classrooms with unit ventilators, Library and administration area.
2. Install portable humidifiers or retrofit existing heating/ventilating equipment with humidifiers for local humidity control.
3. Add plug-in type supplemental electric heat as required for increased ventilation requirements.
4. Apply and use outdoor air quality sensors or reliable web-based data for outdoor pollution information as part of the new ventilation operation.
5. Consider adding UV decontamination in return airstream for heating/ventilating units.
6. Consider UV decontamination lights on highly touched surfaces.

Notes:

1. While there is ventilation air and return air associated with each classroom unit ventilator and Library unit ventilator, the units only recirculate air within each classroom and do not recirculate air between classrooms. The ventilation and exhaust systems for the typical classroom is continuous and separate.
2. While there is ventilation air and return air associated with heating/ventilating units for the Gymnasium and Cafeteria the units only recirculate air within each space and do not recirculate air between other spaces.
3. These recommendations are based on guidance provided by applicable agencies and publications for best practices for protection of occupants and visitors to the building but do not provide absolute protection from the pandemic.
4. These recommendations will have a significant impact on the operating and maintenance related costs of the HVAC systems.