20057

FAIRFIELD PUBLIC SCHOOLS

501 KINGS HIGHWAY EAST, FAIRFIELD, CT 06825

AUGUST 08/26/2020

COVID VENTILATION EVALUATION FOR ELEMENTARY SCHOOLS

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Covid Ventilation Evaluation 20057

Fairfield Public Schools

Elementary Schools

GENERAL

CBK Engineering was hired to review the existing HVAC systems at 10 of the elementary schools in the Fairfield School District. The Ventilation systems were reviewed versus the State of Connecticut Department of Public Health Guidelines dated June 22, 2020.

General requirements include operation of all units in occupied mode for 1 week prior to occupancy, keep the ventilation systems running continuosly while the building is occupied, exhaust fans should operate 24 hours a day/7 days a week and any window fans or free standing fans blowing into a space should not be used.

All filter frames should be checked and sealed to limit the bypass of air around the filters. Any filter changes should be done with proper PPE protection.

Recommended temperature and humidity ranges are 72 degrees with 40-50% humidity in the winter and 75 degrees and 50-60% humidity in the summer (from ASHRAE epidemic task force document dated 7/17/20). UVC lights and humidifiers in the central units should be considered.

An isolation room should be identified in each building that will either exhaust to the outside (in a non pedestrian area) or contain a unit with a HEPA filter. These rooms must not recirculate to a central air handling unit.

Air balancing and commissioning are recommended to make sure the systems are operating as designed and producing the design flow to each space.

Note that the intent of this evaluation is not to prevent the spread of SARS-COV-2 (CoVid 19 disease) but to limit the spread by optimizing the use of existing systems and recommending options for improvements.

HVAC SYSTEM REVIEW

Per page 3, Item 1 of the Connecticut State Guidelines the HVAC systems in each of the 10 elementary schools were reviewed.

The types of systems and the areas they serve are identified under the existing conditions section of each of the schools.

The capabilities of each system to handle modifications are identified in the recommendations section of each of the schools.

The vast majority of the systems are working to their full capabilities. Any units not working to their capabilities is identified in the existing conditions and recommendations section for each school.
The capability of each system to handle the recommendations in the State guidelines is identified in the recommendations section for each school.

The demand based systems can't be converted to constant volume without compromising the required temperature and humidity recommendations in ASHRAE's epidemic task force document dated 7/17/20. Recommended adjustments to the control sequences to increase supply air to the spaces for the two schools affected are identified in the recommendations section for those schools.

Recirculation can't be totally suspended for all outdoor air conditions as it will compromise the required temperature and humidity recommendations in ASHRAE's epidemic task force document dated 7/17/20. Increased quantities are recommended by revisions to the control sequences to the greatest extent possible. These revisions are explained in the recommendations under each school.

Performance recommendations for most systems are identified in the recommendations section of each school.

A. Timothy Dwight

EXISTING CONDITIONS

1. Classrooms

   The existing classrooms have exhaust fans providing ventilation for the classrooms. An individual outlet in each classroom is tied into a central exhaust fan for each wing. The wing for the classrooms for kindergarten and first grade have only a small 10x10 exhaust outlet in the bathroom. The remainder of the classrooms have an approximately 24x24 inch outlet. Heating is done with fintube radiators on the exterior of each classroom. There are approximately 7 classrooms with mini split units and washable filters.

2. Gym

   The gym is provided with heat and ventilation from a rooftop heating and ventilating unit that is ducted into the gym space. This unit has 2" deep filters.

3. All Purpose Room

   The all purpose room is provided with heat and ventilation from a heating and ventilating unit located in a mechanical room located behind the stage that is ducted into the space. This unit has 2" deep filters.

4. Gym office, Administration wing, Media Room 1

   The gym office and administration wing each have their own HVAC unit located on the roof. Media room 1 has two rooftop units located on the roof. These units are ducted into each of the spaces. The unit for the administration wing has 2" deep filters and the unit for the gym office and the units for media room 1 have 1" deep filters.

5. Media Room 2

   The media room 2 area is provided with HVAC from a unit located in the hung ceiling that is ducted into the space. This unit filter depth is unknown. There is no outside air into this unit based on the balancing report.

6. Toilet Exhaust Fans

   There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

7. Controls

There is a central Automated Logic head end in this building that controls the occupied/unoccupied status of the units. The controls themselves are a combination of DDC with pneumatics. Damper position on some of units can be controlled from the front end.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units in the gym, all purpose room, gym office, administration wing and media room should be provided with MERV 13 filters. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures.

3. The exhaust fans in the classroom wings should run with the windows open to keep a negative pressure in the space. If possible the kindergarten wing should have additional exhaust added to increase airflow to those rooms. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof. Note that as temperature drops the radiators will not be able to keep up and the exhaust fans will need to be shut off. In order to keep these exhaust fans operational through the winter a makeup air system will need to be installed on the roof with ducts into each classroom. The unit will need to have a steam, hot water or gas coil to heat the air to room temperature.

4. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

5. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

6. Note that all of the above will result in higher energy costs.

B. Mill Hill

EXISTING CONDITIONS

1. Classrooms

   The existing classrooms have exhaust fans providing ventilation for the spaces. An individual outlet in each classroom is tied into a central exhaust fan for each wing. The classrooms have an approximately 24x24 inch or 20x8 inch outlets for each room. Heating is done with fintube radiators on the exterior of each classroom. There are approximately 4 classrooms with mini split units and washable filters.

2. Gym

   The gym is provided with heat and ventilation from a rooftop heating and ventilating unit that is ducted into the gym space. This unit has 2" deep filters.

3. All Purpose Room

   The all purpose room is provided with heat and ventilation from a heating and ventilating unit located on the stage that is ducted into the space. This unit has 2" deep filters.

4. Administration wing, Media Center

   The gym office and media center each have their own HVAC unit located on the roof. These units are ducted into each of the spaces. The unit for the administration wing and media center each have 2" deep filters.

5. Portable Classrooms

   The portable classroom area is provided with HVAC from units located on the roof that is ducted into the space. This unit filter depth is unknown.

6. Teacher's Lounge

   The teachers lounge is provided with HVAC from a unit ventilator that appeared to be inoperable. This unit filter depth is unknown.

7. Toilet Exhaust Fans

   There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

8. Controls

There is a Johnson Controls central head end in this building that controls the occupied/unoccupied status of the units. This is a Johnson FX system which is web based. The controls themselves are a combination of DDC with pneumatics. Damper position on some of units can be controlled from the front end.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units in the gym, all purpose room, administration wing, media center and portable classrooms should be provided with MERV 13 filters. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. . Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures.

3. The exhaust fans in the classroom wings should run with the windows open to keep a negative pressure in the space. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof. Note that as temperature drops the radiators will not be able to keep up and the exhaust fans will need to be shut off. In order to keep these exhaust fans operational through the winter a makeup air system will need to be installed on the roof with ducts into each classroom. The unit will need to have a steam, hot water or gas coil to heat the air to room temperature.

4. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

5. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

6. Note that all of the above will result in higher energy costs.

C. Burr

EXISTING CONDITIONS

1. Classrooms

   The classrooms have two central HVAC units located in a recess on the roof that are ducted to the two sides of the building. The ducts have VAV boxes in each classroom to control the temperature. There is an ERU section on each of the central HVAC units. These units have 2" and 4" deep filters.

2. Gym

   The gym has a central HVAC unit located in a recess on the roof that is ducted into the room. There is an ERU section on the central HVAC unit. This unit has 2" and 4" deep filters.

3. Cafeteria

   The cafeteria has a central HVAC unit located in a recess on the roof that is ducted into the room. There is an ERU section on the central HVAC unit. This unit has 2" deep filters.

4. Library

   The library has a central HVAC unit located in a recess on the roof that is ducted into the room. There are VAV boxes on the ductwork in the library to control temperatures in different areas of the library. There is an ERU section on the central HVAC unit. This unit has 2" deep filters.

5. Music Rooms

   The music rooms have a central HVAC unit located in a recess on the roof that is ducted into each of the rooms. There are VAV boxes on the ductwork to the rooms to control temperatures in the two rooms. There is an ERU section on the central HVAC unit. This unit has 2" deep filters.

6. Lobby

   The lobby has a central HVAC unit located in a recess on the roof that is ducted into the lobby on the upper level. There is an ERU section on the central HVAC unit. This unit has 4" and 2" deep filters.

7. MDF Room, Elevator machine room

   These two rooms have split system units with the fan/coil section located in the room and the condensing unit on the roof. This unit filter depth is unknown.

8. Toilet Exhaust Fans

   There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

9. Controls

   There is a Johnson Controls central head end in this building that controls the occupied/unoccupied status of the units. The controls also control damper position and provide full automation of the controls in the building.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units for the classrooms, gym, cafeteria, library, music rooms, and lobby should be provided with MERV 13 filters. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. This quantity should be maintained even as the supply cfm is reducedon the units with VAV boxes. The ERU heat wheel section should be disabled to prevent cross contamination. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof from the central unit relief.

3. The temperature from the central units should be lowered so that the VAV boxes will open closer to 100% until outside air reaches a temperature that the lower discharge air temperature can't maintain the proper temperature in the space. This can be done on a sliding scale of discharge air temperature versus outdoor air temperature. It is recommended that this programming be done separately so that when the CoVid issues are resolved the base programming can be reinstituted.

4. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

5. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

6. Note that all of the above will result in higher energy costs.

D. Osborn Hill

EXISTING CONDITIONS

1. Classrooms

   The existing classrooms have exhaust fans providing ventilation for the classrooms. An individual outlet in each classroom is tied into a central exhaust fan for each wing. Heating is done with fintube radiators on the exterior of each classroom. There are approximately 7 classrooms with mini split units and washable filters.

2. Gym

   The gym is provided with heat and ventilation from a rooftop heating and ventilating unit that is ducted into the gym space. This unit has 1" deep filters.

3. All Purpose Room, Kitchen

   The all purpose room is provided with heat and ventilation from a heating and ventilating units located on the roof. Ducts are extended from the units into the spaces. This unit has 1" deep filters.

4. Administration wing, Teachers Lounge, Media Center

   The teachers lounge, media center and administration wing each have their own HVAC unit located on the roof. These units are ducted into each of the spaces. The unit for the administration wing has 2" deep filters and the unit for the teachers lounge and the units for the media center have 1" deep filters.

5. Music Room

   The music room is provided with HVAC from a unit ventilator located on the exterior wall to the space. This unit filter depth is unknown but appears to be limited.

6. Portable Classrooms

   The portable classrooms are provided with HVAC from units located on the roof of the building. This unit filter depth is 1".

7. Toilet Exhaust Fans

   There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

8. Controls

   There is a central head end in this building that controls the occupied/unoccupied status of the units. The controls themselves are Allerton ABS DDC with pneumatics for the radiators. Damper position on some of units can be controlled from the front end.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units in the gym, all purpose room, teachers lounge, administration wing, portable classrooms and media center should be provided with MERV 13 filters. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures.

3. The unit ventilator for the music room can't be fitted with a MERV13 filter and has no capability to increase outside air. This room would require a new system to provide a higher level of filtration and additional outside air.

4. The exhaust fans in the classroom wings should run with the windows open to keep a negative pressure in the space. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof. Note that as temperature drops the radiators will not be able to keep up and the exhaust fans will need to be shut off. In order to keep these exhaust fans operational through the winter a makeup air system will need to be installed on the roof with ducts into each classroom. The unit will need to have a steam, hot water or gas coil to heat the air to room temperature.

5. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

6. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

7. Note that all of the above will result in higher energy costs.

E. North Stratfield

EXISTING CONDITIONS

1. Classrooms

   The existing classrooms have exhaust fans providing ventilation for the classrooms. An individual outlet in each classroom is tied into a central exhaust fan for each wing. Heating is done with fintube radiators on the exterior of each classroom. There are approximately 7 classrooms with mini split units and washable filters.

2. Gym

   The gym is provided with heat and ventilation from two rooftop heating and ventilating units that are ducted into the gym space. These units have 1" deep filters.

3. All Purpose Room

   The all purpose room is provided with heat and ventilation from a heating and ventilating unit located on the roof. Ducts are extended from the units into the space. This unit has 1" deep filters.

4. Nurse's area, Teachers Workroom, Media Center

   The nurse's area, media center and teacher's workroom each have their own HVAC unit located on the roof. These units are ducted into each of the spaces. The units for the teachers workroom, nurse's area and the unit for the media center have 1" deep filters.

5. Administration Wing

   The administration wing is provided with HVAC from a fancoil units located on the exterior walls of each of the spaces. This unit filter depth is 1".

6. Computer Lab

   The computer lab is provided with HVAC from a unit mounted on the roof. This unit filter depth is 1".

7. Toilet Exhaust Fans

There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

8. Controls

There is a Johnson FX central head end in this building that controls the occupied/unoccupied status of the units. The Johnson FX control system is a web based system. The controls themselves are DDC with pneumatics for the radiators. Damper position can't be controlled on any of the units from the front end.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units in the gym, all purpose room, teachers lounge, administration wing, portable classrooms and media center should be provided with MERV 13 filters. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures.

3. The fan coil units in the administration area be fitted with a MERV13 filter and they have no capability to increase outside air. These rooms should be monitored closely for potential coil freezeups as the MERV13 filters will provide a large static pressure for these small units. A central rooftop unit with ductwork is recommended for this area.

4. The exhaust fans in the classroom wings should run with the windows open to keep a negative pressure in the space. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof. Note that as temperature drops the radiators will not be able to keep up and the exhaust fans will need to be shut off. In order to keep these exhaust fans operational through the winter a makeup air system will need to be installed on the roof with ducts into each classroom. The unit will need to have a steam, hot water or gas coil to heat the air to room temperature.

5. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

6. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

7. Note that all of the above will result in higher energy costs.

F. Jennings

EXISTING CONDITIONS

1. Classrooms

   The existing classrooms have exhaust fans providing ventilation for the classrooms. An individual outlet in each classroom is tied into a central exhaust fan for each wing. Heating is done with fintube radiators on the exterior of each classroom. There are approximately 9 classrooms with mini split units and washable filters.

2. Gym

   The gym is provided with heat and ventilation from a rooftop heating and ventilating unit that is ducted into the gym space. This unit has 1" deep filters.

3. Cafeteria

   The cafeteria is provided with heat and ventilation from a heating and ventilating unit located on the roof. Ducts are extended from the units into the spaces. This unit has 1" deep filters.

4. Administration wing, Library

   The library and administration wing each have their own HVAC unit located on the roof. These units are ducted into each of the spaces. The units have 2" deep filters.

5. Toilet Exhaust Fans

   There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

6. Controls

   There is no central head end in this building. The control system in other buildings controls the occupied/unoccupied status of the units. The controls themselves are Johnson FX DDC with some pneumatic control. Damper position on some of units can be controlled from the Johnson system.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units in the gym, cafeteria, administration wing and library should be provided with MERV 13 filters. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures.

3. The exhaust fans in the classroom wings should run with the windows open to keep a negative pressure in the space. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof. Note that as temperature drops the radiators will not be able to keep up and the exhaust fans will need to be shut off. In order to keep these exhaust fans operational through the winter a makeup air system will need to be installed on the roof with ducts into each classroom. The unit will need to have a steam, hot water or gas coil to heat the air to room temperature.

4. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

5. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

6. Note that all of the above will result in higher energy costs.

G. Holland Hill

EXISTING CONDITIONS

1. Classrooms

   The existing classrooms have DOAS units located on the roof providing ventilation for the classrooms. These units contain a heat recovery wheel to recover heat from the exhaust to the supply airstreams. An individual fan coil unit located in each classroom is tied provides heating and cooling for each classroom. These fan coil units are VRV type units. The DOAS units have 2" deep filters and the fan coil units have 1" deep filters.

2. Gym

   The gym is provided with HVAC from a rooftop unit that is ducted into the gym space. This unit contains a heat recovery wheel. This unit has 2" deep filters.

3. All Purpose Room

   The all purpose room is provided with HVAC from a rooftop unit that is ducted into the space. This unit contains a heat recovery wheel. This unit has 2" deep filters.

4. Media Center

   The media center is provided with HVAC from a rooftop unit that is ducted into the space. This unit contains a heat recovery wheel. This unit has 2" deep filters.

5. IT Rooms

   The IT rooms located in rooms off the gym and media center contain small split system units with washable filters.

6. Kiln Room

   The kiln room contains a small split heat pump unit with the condensing unit on the roof. This unit has a washable filter.

7. Toilet Exhaust Fans

   There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

8. Controls

   There is a central head end in this building that controls the occupied/unoccupied status of the units. The controls themselves are Allerton ABS DDC. Damper position on some of units can be controlled from the front end.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units for the gym, all purpose room and media center should be provided with MERV 13 filters. The heat recovery wheel must not be used. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures.

3. The central DOAS units for the classrooms don't need to be provided with MERV 13 filters as they provide outside air only. The heat recovery wheel must not be used. Outside air to each of these units is fixed. The DOAS units should be evaluated to see if additional outside air can be provided and not provide temperature control issues. Based on the balancing report the fan coil units in the ceilings are already low compared to design so they should not be provided with MERV13 filters. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures. The additional static on the fan coil units must be checked so coils do not freeze at low airflow.

4. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

5. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

6. Note that all of the above will result in higher energy costs.

H. Stratfield

EXISTING CONDITIONS

1. Classrooms

   The existing classrooms have ERV units located on the roof providing ventilation for the classrooms. These units contain a heat recovery wheel to recover heat from the exhaust to the supply airstreams. An individual fan coil unit located in each classroom is tied provides heating and cooling for each classroom. These fan coil units are VRV type units. The ERV units have 2" deep filters and the fan coil units have 1" deep filters.

2. Gym

The gym is provided with HVAC from 4 rooftop units that are ducted into the gym space. These units contains heat recovery wheels. These units have 2" deep filters.

3. Cafeteria

The Cafeteria is provided with HVAC from a rooftop unit that is ducted into the space. This unit contains a heat recovery wheel. This unit has 2" deep filters.

4. Media Center, Special education area, Principal's office, conference room

The media center, special education area, principal's office and conference room are provided with HVAC from rooftop unit for each of the spaces that are ducted into the space. These units do not contain heat recovery wheels. These units have 2" deep filters.

5. Server Room, Teacher's Lounge

The server room and teacher's lounge are provided with HVAC from small split system units with washable filters. There is no outside air to these units.

7. Toilet Exhaust Fans

There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

8. Controls

There is a Siemens central head end in this building that controls the occupied/unoccupied status of the units. The controls themselves are DDC. Damper position on some of units can be controlled from the front end.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units for the gym, all purpose room and media center should be provided with MERV 13 filters. The heat recovery wheel must not be used. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. Some of these units dampers are not able to be adjusted at the computer front end, they need to be adjusted manually at each of the units. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures.

3. The central DOAS units for the classrooms don't need to be provided with MERV 13 filters as they provide 100% outside air. The heat recovery wheel must not be used. Outside air to each of these units is fixed. The DOAS units should be evaluated to see if additional outside air can be provided and not provide temperature control issues. The fan coil units in the ceilings can be provided with MERV13 filters. However the static pressure available on these units is limited to 1" so filter changes would have to frequent. Recommended filter drop on a MERV13 filter is 1" so changeout would have to be at a lower static pressure drop. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures. The additional static on the fan coil units must be checked so coils do not freeze at low airflow.

4. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

5. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

6. Note that all of the above will result in higher energy costs.

I. Riverfield

EXISTING CONDITIONS

1. Classrooms

   The majority of the classrooms have DOAS units located on the roof providing ventilation for the classrooms. These units contain a heat recovery wheel to recover heat from the exhaust to the supply airstreams. An individual fan coil unit located in each classroom is tied provides heating and cooling for each classroom. These fan coil units are VRV type units. The DOAS units have 2" deep filters and the fan coil units have 1" deep filters.

2. Gym, All purpose room

   The gym and all purpose room are provided with HVAC from a single rooftop unit that is ducted into the gym space and all purpose room. This unit does not contain a heat recovery wheel. This unit has 2" deep filters.

3. POD area

   The POD area iss provided with HVAC from a rooftop unit that is ducted into the space. This unit contains is a multizone unit with approximately 7 zones. This unit has 4" deep filters.

4. Media Center

   The media center is provided with HVAC from a rooftop unit for that is ducted into the space. This unit does not contain a heat recovery wheel. This unit have 2" deep filters.

5. IT, MDF, IDF

   The IT, MDF and IDF rooms are provided with HVAC from small split system units with washable filters.

7. Toilet Exhaust Fans

   There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

8. Controls

   There is a central head end in this building that controls the occupied/unoccupied status of the units. The controls themselves are Allerton ABS DDC. Damper position on some of units can be controlled from the front end.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units for the gym and all purpose room. POD area and media center should be provided with MERV 13 filters. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. Some of these units dampers are not able to be adjusted at the computer front end, they need to be adjusted manually at each of the units. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures.

3. The central DOAS units for the classrooms should not be provided with MERV 13 filters as they provide 100% outside air only. The heat recovery wheel must not be used. Outside air to each of these units is fixed. The DOAS units should be evaluated to see if additional outside air can be provided and not provide temperature control issues. The fan coil units in the ceilings should also not be provided with MERV13 filters as their pressure drop is limited to .4". Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures. The additional static on the fan coil units must be checked so coils do not freeze at low airflow.

4. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

5. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

6. Note that all of the above will result in higher energy costs.

J. McKinley

EXISTING CONDITIONS

1. Classrooms

   The classrooms have central HVAC units and return fans located in mechanical rooms throughout the building. These units are ducted to the different areas of the building. The ducts have VAV boxes in each classroom to control the temperature. These units have 2" deep filters.

2. Cafeteria, Gym

   The gym and cafeteria each have their own central HVAC unit and return fan located in mechanical rooms in the building. These units are ducted into each of the rooms. These units have 2" deep filters.

3. Library, Administration area

   The library has a central HVAC unit and return fan located in a mechanical room in the building. The central HVAC unit and return fan for the administration area is located above the ceiling. These units are ducted into each of the rooms. There are VAV boxes in each area to control temperature in each of the spaces. These units have 2" deep filters.

4. Computer closet, Tech room 144 and IT room adjacent to the library

   These three rooms have split system units with the fan/coil section located in the room and the condensing unit on the roof. This units have washable filters.

5. Toilet Exhaust Fans

   There are multiple exhaust fans that serve toilet rooms located in different areas of the building.

6. Controls

   There is a Johnson Metasys central head end in this building that controls the occupied/unoccupied status of the units. The controls also control damper position and provide full automation of the controls in the building.

RECOMMENDATIONS

1. Prepurge and postpurge can be done on all systems. The units should run in occupied mode for 2 hours before and 2 hours after occupancy.

2. The central units for the classrooms, gym, cafeteria, library, and administration area should be provided with MERV 13 filters. Outside air to each of these units can be increased based on an outdoor temperature reset schedule. Note that each of these units needs to be evaluated for capacity as temperatures drop. Both the filters and outside air quantities will not allow the units to provide proper heating at low temperatures. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof from the central unit relief.

3. The temperature from the central units that have VAV boxes should be lowered so that the VAV boxes will open closer to 100% until loutside air reaches a temperature that the lower discharge air temperature can't maintain the proper temperature in the space. This can be done on a sliding scale of discharge air temperature versus outdoor air temperature. It is recommended that this programming be done separately so that when the CoVid issues are resolved the base programming can be reinstituted.

4. Exhaust fans for the toilets should be run continuosly. Access to the roof will need to be limited and anyone going to the roof will have to wear a mask as any virus will be discharged to the roof.

5. Any filter alarm on a MERV13 filter should be changed to a higher filter pressure drop.

6. Note that all of the above will result in higher energy costs.

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

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Guidance for School Systems for the Operation of Central and non-Central Ventilation Systems during the COVID-19 Pandemic

Improving ventilation in school buildings is just one part of system of procedures that will safeguard the health and safety of students, teachers, and school staff during the COVID-19 pandemic. Other parts of this system of procedures include physical distancing, face coverings, and efficient identification and isolation of sick students and staff. While improving ventilation is not necessarily the most effective tool for reducing transmission of the virus that causes COVID-19 (maintaining social distancing and wearing face coverings are far more effective), some studies suggest that adjustments and attention to proper ventilation can reduce the viable virus load in indoor spaces. In addition, we know that providing good ventilation in schools is important even outside of the COVID-19 pandemic, because it has been shown to improve student and staff performance in educational settings.

This guidance provides actions schools should take to ensure that their ventilation systems are performing optimally. The goal is not for schools to invest in costly upgrades and add-ons to existing mechanical systems. Rather, schools should understand what their current mechanical systems are capable of and how they can adjust the function of those systems to optimize their capabilities.

Before School Opens:

1. Commission building mechanical systems for full occupancy (see details below for tips about how and why to commission mechanical systems for fall start-up).
2. Operate all ventilation systems at full capacity for one (1) week prior to the reopening of school buildings.
3. Discuss with the entire facilities team and school administrators the general principles about what changes are planned to the usual ventilation system operation for the coming year. It will be important to communicate with school staff the importance of not making any adjustments to the mechanical systems inside school buildings (thermostats, fan speeds, etc.) without input from the facilities team.

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After School Opens:

1. Flush the air inside the building for a minimum of two (2) hours prior to occupancy and one (1) hour after occupancy (after the night-shift custodians leave), with the dampers open as fully as possible (i.e. to maximize fresh air intake) during this flushing period.

2. Program and lock fan schedules to align with the building occupancy schedule (i.e. provide flushing ventilation starting two (2) hours before building occupancy and one (1) hour post occupancy).

3. Develop a system for building users to notify the facilities department if the building needs to be open longer than usual so that the fan schedule can be altered for that day.

4. Keep the ventilation system running during all hours that the building is occupied.

5. Do not allow teachers or other staff to make changes to ventilation system controls in their respective rooms. Explain to them the importance of keeping fans running all day. If temperature, noise, or other issues exist in certain areas, encourage staff to discuss the problem with the facilities department to try to identify a suitable fix that does not negatively impact ventilation.

6. Keep bathroom exhaust systems running all day, every day (24 hours a day/7 days a week).

7. For isolation rooms to be used for holding sick students prior to dismissal, consider adding supplemental filtration, such as a portable air cleaner. This is particularly important if the ventilation serving those rooms cannot be run at 100% exhaust at all times. If a portable air cleaner is used, it should:

    - Contain HEPA filters only <u>without</u> ionizers, ozone generators, UV light, or other add-ons.
    - Be correctly sized for the space, with an appropriate CADR (clean air delivery rate).
    - Be located for greatest efficiency within the space.
    - Be turned on at all times that the space is occupied.

8. Develop a specific plan for performing routine inspections and maintenance of mechanical systems, as specified in the commissioning process.

9. For buildings without central ventilation systems or with certain areas not served by the central ventilation system, there are other important design considerations facility managers should be aware of, and in control of, in order to maximize available dilution ventilation and minimize the spread of virus particles inside their facilities.

- At a minimum, where temperature allows and no other means of ventilation is available, windows should be opened to allow for some minimum level of fresh air exchange into occupied spaces.
- Window air conditioning units should be adjusted to maximize fresh air intake into the system. Air conditioner blower fans should be set on low speed and pointed away from room occupants to the extent possible.
- Ceiling fans should be adjusted so that fins are rotating in a direction that draws air up toward the ceiling rather than down onto occupants.
- Window fans should be turned to exhaust air out of the window in the direction of the outdoors. Ensure that fans are not blowing out of windows directly into walking paths or areas where individuals may congregate.
- Window fans that blow air into a room or free-standing fans that only serve to circulate existing air around a room should not be used.
- In addition, we do not recommend separate, free-standing air cleaner or HEPA filter units for individual classrooms. These units are highly variable in their effectiveness in larger open spaces such as classrooms and in general, any effect on indoor air quality is likely insignificant and greatly outweighed by the additional costs to school systems.

How to Commission Building Mechanical Systems for fall school reopening

1. If your school system does not already have one that it routinely works with, hire a mechanical engineering firm with a proven track record in evaluating, adjusting, and balancing ventilation systems, particularly ventilation systems in school buildings, to commission all of the buildings' mechanical systems for full occupancy. The school facilities manager should be part of the discussion team talking with the engineering firm and the commissioning agent.

   Consider asking your Commissioning Agent the following questions:

   - How many and what types of systems serve your buildings, and which area of the building does each separate system serve?
   - What are the capabilities of the systems present in your school buildings?
   - Are the systems currently working to their full capabilities?
   - Are the current systems' capabilities enough to satisfy full capacity for how the buildings need to operate now?
   - Can demand-based systems be converted to constant volume until cooling season is over (if systems provide central cooling)? During heating season? Longer-term?

- Can recirculation of air be suspended (economizers disabled)?
- Can they provide a summary of performance expectations for mechanical systems in the building?

2. Include the following items in the commissioning process:

   - A complete set of measurements to understand total air distribution throughout the building.
   - Inspection and evaluation of all building ventilation systems, both automated and manual.
   - Air balancing and appropriate retesting to ensure parameters that satisfy the conditions of full occupancy of the buildings.
   - Inspections:
     - Filter frames - Decide what kind of filter thickness and type you will be using if you decide to upgrade to a higher-rated filter. Discuss this with your ventilation engineering firm. Either way, all filter frames will need to be inspected. Replace or fix all bent, broken, misshapen frames to prevent air from by-passing the filter.
     - Dampers and all associated controllers and actuators need to be visually inspected. Do not rely only on looking at a computer screen if you have an automated building system.
     - Inspect, verify, and modify automated set points, if needed. Discuss both temperature and CO_2 set points in newer buildings that utilize these variables for automated decision-making.
     - Locations of supply and return diffusers. Look at ventilation effectiveness and whether short-circuiting is occurring. This happens frequently when supply and return diffusers are too close to each other. Discuss the possibility of moving them farther apart if this is occurring. If supplies and returns are ducted using flex duct and the room has a suspended ceiling, relocating can be performed more easily.

   - Air balancing, inspections, and other work should be performed in accordance with one of these certification bodies: NEBB (https://www.nebb.org/); TABB (https://www.tabbcertified.org/); AABC (https://www.aabc.com/)

3. Strive toward the following ventilation goals.

   - Increase outdoor air ventilation as much as possible by disabling demand-controlled ventilation systems and opening outdoor air dampers to 100%, as indoor and outdoor conditions permit. Disabling demand-based systems will allow fans to run continuously.
   - Tune ventilation systems to enable them to perform to the maximum capacity consistent with full occupancy conditions for the building.

- Bypass energy recovery ventilation systems that leak or recirculate potentially contaminated exhaust air back into the outdoor air supply.
- Once fans are running continuously, provide increased particle capture by increasing air filtering capacity through repair/upgrades to current system, where needed. This includes filter frames, filter configuration, and filter rating (ASHRAE recommends striving for filters with a MERV-13 rating where possible).

Why it is Important to Commission Building Mechanical Systems

1. Commissioning verifies that existing equipment is working properly. Adjustments can then be made to allow current systems to operate to the best of their ability.
2. Adjusting mechanical systems to satisfy full building occupancy, even if buildings will have reduced occupancy in the fall, will result in increased ventilation per person without over-taxing the equipment and potentially causing premature equipment failure.
3. Commissioning reduces the likelihood of unintended consequences of making changes to how systems operate.
4. If one or more of the systems are deemed to be inadequate, commissioning will provide the basis for making informed and intelligent decisions about next steps to improve those systems.
5. The cost for commissioning is money well spent because it will prevent building operators from spending money on things that add little value and instead, help them focus attention on things that will make a real difference.

Additional resources:

- AICARR- Decision Tree: Protocol for risk reduction of SARS-CoV2-19 Diffusion With the Aid of Existing Air Conditioning and Ventilation Systems
- Air filtration and COVID-19: Indoor air quality expert explains how to keep you and your building safe: Interview with Professor Jeffrey Seigel, University of Toronto
- The Path to COVID-19 Recovery: How To Improve Indoor Air Quality When Re- Opening K-12 Schools. Univ Calif Davis.

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