

Maine Indoor Air Quality Council: HVAC Basics for COVID-19 Readiness

MODULE ONE: HVAC SYSTEMS

Welcome!



**Maine Indoor Air
Quality Council**



**Maine Community
College System**

The Maine Indoor Air Quality Council has partnered with the Maine Community College System, in conjunction with Maine Quality Centers, to create a training in HVAC Basics for COVID-19 Best Practices.

We appreciate your willingness to participate in this training that focuses on keeping each other safe and healthy.

At the end of each module, there will be a brief knowledge check, where you will demonstrate your knowledge of the topics at hand.

And, following the successful completion of the training—with a passing rate of 80 % or higher, you will be awarded a Maine Indoor Air Quality Council: HVAC Basics for COVID-19 Readiness digital badge.

Learning Objectives of this Badge Program

- An understanding of mechanical systems within a building that have significant impact on indoor air quality and our health.
- An understanding of the role of ventilation air in minimizing risk of transmission.
- An understanding of the role of filtration in minimizing risk of virus transmission.
- Recommended practices for operating and improving HVAC systems to minimize risk of virus transmission.

Module One

In module one of this COVID-19 training, you will be provided with a basic knowledge of mechanical systems you may see at your facility.

There are many variations of mechanical systems in place and we will explain what we believe to be common systems in place at many schools.

This module is based on School Facilities and intended to inform facility users and operators of these facilities. Many of the recommendations and practices are applicable to other facility types.

What is COVID-19?

COVID-19 is a novel (new) coronavirus which was first detected in December 2019 in Wuhan City, Hubei Province, China and has since been detected in other countries, including the United States.

- ▶ A separate badge training with additional information regarding COVID-19 and how to manage indoor spaces to reduce exposure is located at Maineindoorair.org.

How does COVID-19 Spread?

The virus appears to spread in similar ways to influenza (flu) and the common cold. This may include spreading through:

- ▶ The air by coughing and sneezing as well as talking and general breathing. Transmission increases with level of speaking and breathing based on activities.
- ▶ Close personal contact, such as touching or shaking hands
- ▶ Touching an object or surface with the virus on it, then touching your mouth, nose, or eyes.



COVID-19: A Viral Hitchhiker

COVID-19 virus particles are very, very small, but they can't exist by themselves. The virus particles imbed themselves in larger particles made of mucus and saliva. Virus laden mucus/saliva particles are small enough to float/travel in the air like tiny balloons before they settle out of suspension onto available surfaces. How far the virus will travel depends on particle size and air flow.

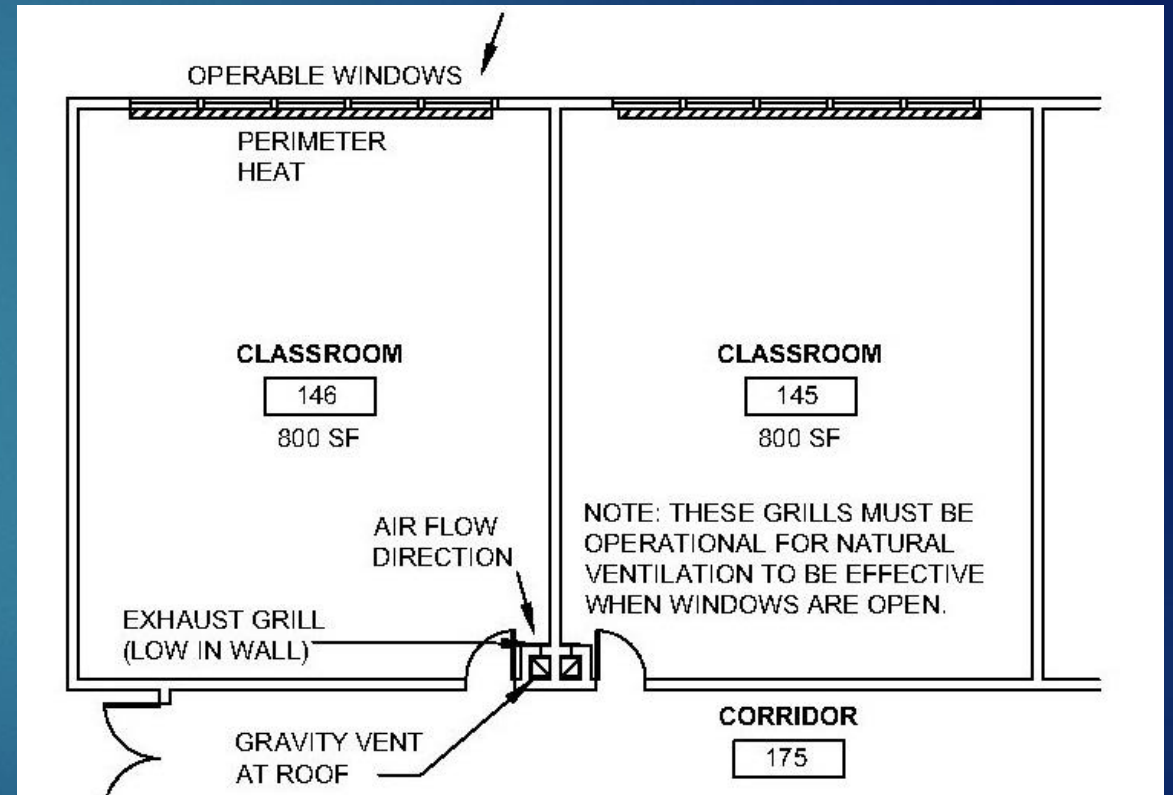
HVAC Basics for COVID-19

Readiness:

- ▶ It is important to have a basic knowledge of mechanical systems within a facility.
- ▶ Ventilation and Filtration within the mechanical systems help to reduce transmission of the virus.
- ▶ HVAC stands for Heating, Ventilation and Air Conditioning.
- ▶ There are approximately 30% of Maine schools that are provided with heating only systems. These systems rely on natural ventilation or infiltration for fresh air.
- ▶ Indoor spaces without mechanical ventilation have greater risk of virus transmission.

Heating with Natural Ventilation

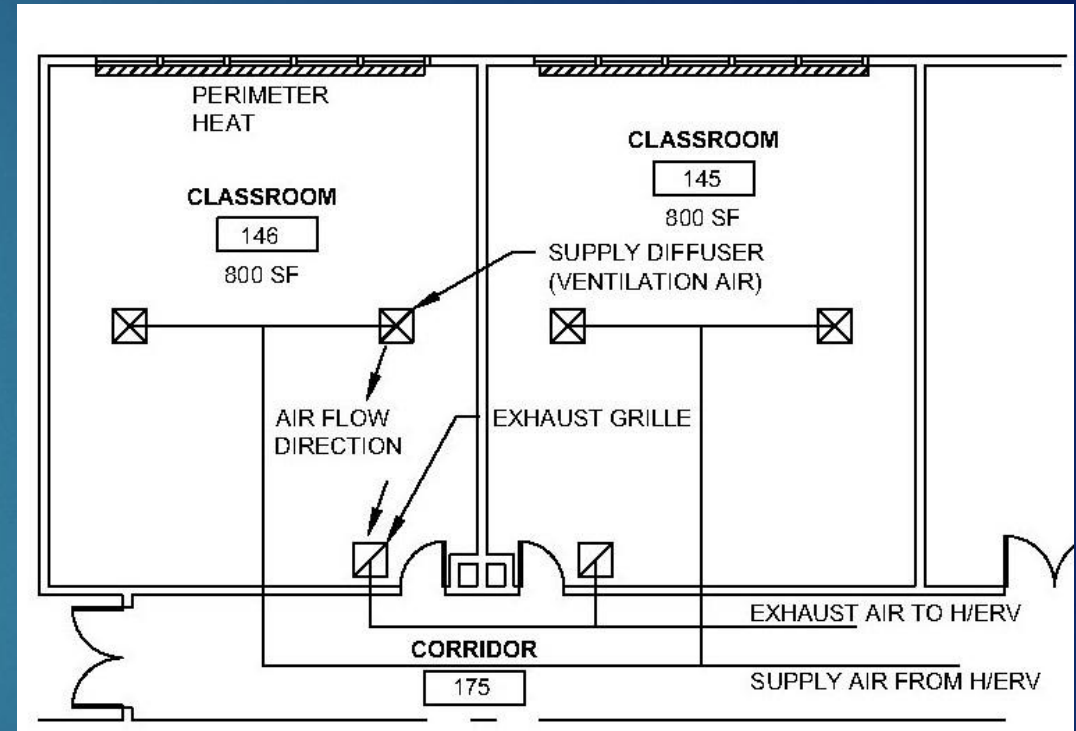
- ▶ Many older schools were provided with heating only systems. Ventilation in these rooms relied on infiltration and opening/closing windows. Exhaust grilles located low in rooms and tied to gravity ventilators on roof to draw air in from windows when opened and move throughout spaces.
- ▶ Many of these systems have been modified with the exhaust grilles being closed or removed as well as window being replaced or reduced to conserve energy. The combination of these energy conservation measures have reduced the indoor air quality and place students and staff at greater risk of illness.



HEATING W/ NATURAL VENTILATION

Heating with Natural Ventilation

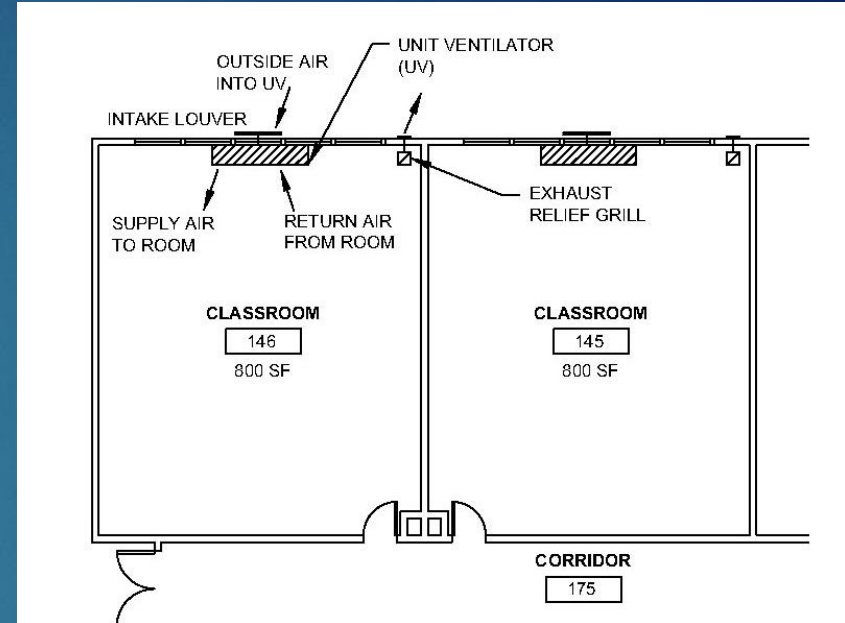
- ▶ Facilities that rely on natural ventilation should be making provisions to introduce ventilation air into occupied spaces to extent practical. In following modules we will address options for consideration.
- ▶ A large number of schools have addressed the lack of adequate ventilation air with the addition of Heat/Energy Recovery Ventilators (H/ERV) that provide the required ventilation air to occupied spaces. H/ERVs are an air handling unit with a heat recovery module.
- ▶ The unit also provides exhaust air from these spaces and recovers the heat/energy in airstream before exhausting. The recovered heat/energy tempers the outside air to minimize operating costs. H/ERVs match amount of outside air and exhaust air for a balanced system.



HEATING & VENTILATION With H/ERV SYSTEM

Unit Ventilators

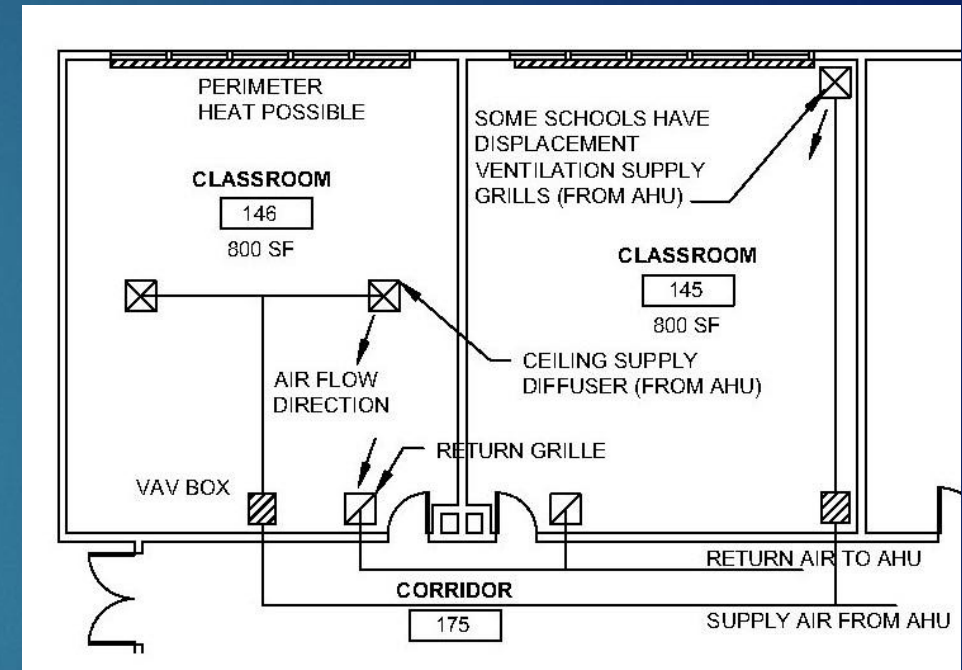
- ▶ A common heating and ventilation system in schools are Classroom Unit Ventilators (UV) located along exterior wall below windows.
- ▶ Ventilation air from exterior intake louvers is connected the UV at the bottom rear of units and mixed with return air from the classroom.
- ▶ An exhaust or relief grille is provided to allow for ventilation air to be drawn into unit. The relief grille discharges room air to exterior.
- ▶ Unit Ventilators will provide outside air during occupied periods as programmed and heating only during unoccupied periods.



Unit Ventilators

Air Handling Units

- ▶ Another common heating and ventilation system in schools utilize Air handling units (AHU). An air handling unit in simple terms is a fan in a box with filters and heating coil for most schools. These are located on roofs or within mechanical rooms. Ventilation air from exterior intake louvers is connected to the air handling units and mixed with return air from the various classrooms and spaces.
- ▶ These units typically serve a series of classroom and spaces through main supply and return ducts.
- ▶ A Variable Air Volume (VAV) box or similar device is provided at each classroom to provide proper airflow and temperature to the space.



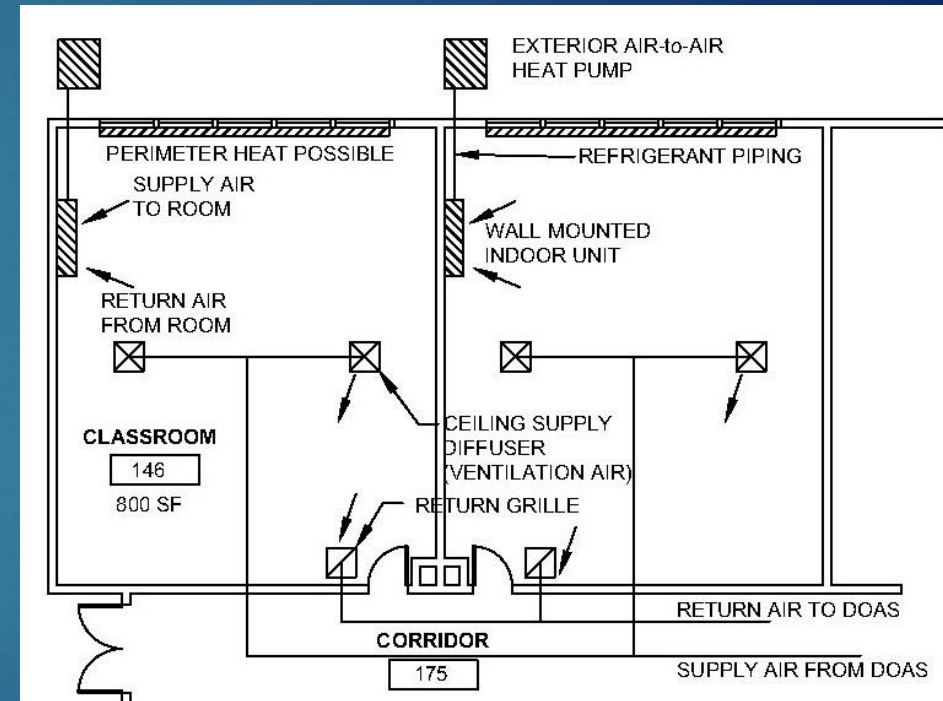
H & V W/ AIR HANDLING UNITS

Heating Ventilating and Air Conditioning Systems

- ▶ Some schools are provided with heating, ventilation and air conditioning (HVAC) systems. These facilities provide the greatest level of occupant comfort as they can heat and cool spaces in addition to ventilation.
- ▶ These systems look very much like the H & V systems previously mentioned as it has similar duct system and distribution to classrooms.
- ▶ Air conditioning is provided with exterior chillers, condensing units or geothermal fields. Geothermal wells provide heating and cooling.

Heating Ventilating and Air Conditioning Systems

- ▶ Newer and renovated facilities may be incorporating Air-to-Air Heat Pumps for heating and cooling needs. They consist of an indoor unit and an exterior heat pump.
- ▶ Wall mounted indoor units recirculate room air and do not filter room air adequately.
- ▶ A Dedicated Outside Air System (DOAS) provides the ventilation requirements to occupied spaces thru supply and exhaust duct systems. DOAS units typically provide heating/cooling and dehumidification of air prior to delivery to occupied spaces.



Heat Pumps with DOAS

HVAC Basics for COVID-19 Readiness

- ▶ In the following three HVAC modules, we will address the following portions of the HVAC system that are key in the prevention of COVID-19 transmission:
- ▶ Module 2 - Ventilation
- ▶ Module 3 - Filtration
- ▶ Module 4 - Operation

HVAC Basics for COVID-19

Readiness: Knowledge Check

1. _____ and _____ play important roles in an HVAC System to minimize risk of transmission.
2. For effective _____ by cracking windows, an exhaust grille or similar method is required to allow fresh air to move throughout space.
3. Approximately _____ percent of Maine Schools do not have mechanical ventilation.
4. Air-to-Air heat pump systems utilize wall mounted indoor units that provide _____ filtering of recirculated air.
5. _____ are systems that provide dehumidification of air prior to delivery to spaces.

HVAC Basics for COVID-19 Readiness: Knowledge Check - Answers

1. **Ventilation** and **Filtration** play important roles in an HVAC System to minimize risk of transmission.
2. For effective **Natural Ventilation** by cracking windows, an exhaust grille or similar method is required to allow fresh air to move throughout space. T/F "T".
3. Approximately **30 %** percent of Maine Schools do not have mechanical ventilation.
4. Air-to-Air heat pump systems utilize wall mounted indoor units that provide **inadequate** filtering of recirculated air.
5. **DOAS** are systems that provide dehumidification of air prior to delivery to spaces.

To learn more...

- ▶ Visit the COVID-19 Resources Page on the website of the Maine Indoor Air Quality Council. Click here: [COVID-19 Resources Page - Maine Indoor Air Quality Council](#)

- ▶ Contact:

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Congratulations!

You made it to the end of this session for
Maine Indoor Air Quality Council:
HVAC Systems

Your next step is to
start learning about
ventilation