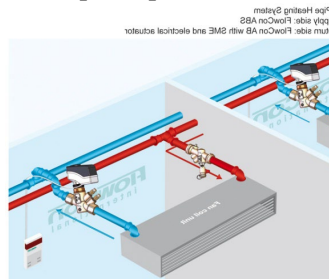


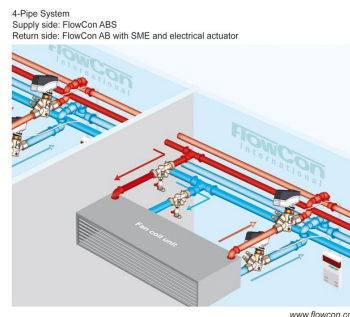
Ventilation Fact Sheet

Student success in the classroom has been shown to be related to and influenced by temperature, ventilation adequacy, relative humidity, carbon dioxide levels, presence of noise, and concentrations of indoor pollutants and contaminants (US EPA 402-K-03-006). Higher rates of respiratory irritation, illness and absenteeism, and asthma have been identified in schools with inadequate ventilation and higher rates of absenteeism

- Well-ventilation schools should contain:
 - Local Exhaust Ventilation: removes moisture, odors, and other pollutants at the source
 - HVAC systems: introduce fresh air into the facility by reducing contaminants by using filtration and dilution
 - Control of airflow through the facility, so that dirty, uncontrolled air can't carry contaminants around and into the occupied spaces of the school



- 2 Pipe System with heating/cooling coil
 - Cheaper to install
 - Simultaneous heating and cooling is not possible
 - Slower response
 - Requires manual switch



- 4 Pipe System with two heating/cooling coils
 - More expensive
 - Simultaneous heating and cooling
 - More energy efficient
 - System can immediately respond to occupant demands

- Chillers

- A device that removes heat from liquid using vapor compression
- Commercial chillers utilize four main components: a compressor, an evaporator, a condenser and a metering device
- Operate with a closed-loop system, which means that the coolant remains in the chiller and is recycled across many uses



- Boilers

- Commonly used to produce water/steam for various industrial processes. They are used as part of a heating system or to individually heat up water
- Condensing boilers are also more preferred today over the conventional ones because of their larger and more efficient heat exchangers



- Unit Ventilators

- Unit ventilators are sometimes referred to as packaged units
- Variety of configurations
- Disadvantages include:
 - Poor control (specifically for humidity)
 - Lower efficiency

- MERV Filter Rating System

MERV Std 52.2	Intended Dust Spot Efficiency Std 52.1 (1)	Average Arrestance	Particle Size Ranges	Typical Applications	Typical Filter Type
1 - 4	<20%	60 to 80%	> 10.0 μm	Residential/Minimum Light Commercial/ Minimum Equipment Protection	Permanent / Self Charging (passive) Washable / Metal, Foam / Synthetics Disposable Panels Fiberglass / Synthetics
5 - 8	<20 to 60%	80 to 95%	3.0-10.0 μm	Industrial Workplaces Commercial Better / Residential Paint Booth / Finishing	Pleated Filters Extended Surface Filters Media Panel Filters
9 - 12	40 to 85%	>90 to 98%	1.0-3.0 μm	Superior/Residential Better/Industrial Workplaces Better/Commercial Buildings	Non-Supported / Pocket Filter / Rigid Box Rigid Cell / Cartridge V-Cells
13 - 16	70 - 98%	>95 to 99%	0.30-1.0 μm	Smoke Removal General Surgery Hospitals & Health Care Superior/ Commercial Buildings	Rigid Cell / Cartridge Rigid Box / Non-Supported / Pocket Filter V-Cells

Table from National Air Filtration Association



- Areas or Items that requires exhaust ventilation in schools



- Bathrooms
- Locker rooms and shower areas
- Workrooms (over laminators and copiers)
- Boilers, furnaces, hot water heaters
- Clothes dryers
- Kitchen ranges
- Things to consider:
 - Are bathroom, workroom, and kitchen exhaust present, operational and in use?
 - Do staff bring in portable fans and heaters?
 - Can systems monitor for CO₂, temperature and relative humidity?
 - Are all combustion appliances vented/exhausted properly?
 - Are there rooms without windows?
 - Are there any rooms without vents?
 - Is condensation observed on surfaces?
 - Do windows routinely fog up?
 - Are there complaints of lingering odors?

