

Multifamily Facility Management Services

VENTILATION

Description:

Ventilation provides the fresh air necessary for the health, safety and comfort of a building's occupants. It reduces air contaminants (such as carbon dioxide, carbon monoxide, tobacco smoke, formaldehyde, radon), and helps control indoor air humidity. The ventilation system in a building performs these necessary tasks by continually rejecting a certain amount of stale inside air while simultaneously introducing fresh outside air, which is mixed with the remaining inside air. This process is referred to as air exchange. The ventilation system may also filter, condition and circulate the outside air as it is introduced into the building.

Building ventilation systems may be inactive, active or some combination. Inactive ventilation relies on natural forces for air exchange. Warm, stale air rises in the building and leaks out (or exfiltrates) through doors, windows, cracks and openings on the upper levels while fresh, outside air flows in (or infiltrates) through doors, windows, cracks and openings at the lower levels to replace it. By contrast, active ventilation relies on mechanical means to ensure adequate air exchange. This may include simple exhaust fans; self-contained systems which incorporate air intake and exhaust dampers and blowers in a single packaged unit; or completely integrated systems in which adjustable ventilation dampers, ducts and blowers are just one component of an entire heating, ventilating and air-conditioning (HVAC) system.

A lot of older steam or hot water heated buildings depend solely on natural ventilation to provide adequate fresh air in the building. Some older buildings rely on infiltration to provide replacement fresh air, but also have a few exhaust fans (such as those found in bathrooms or kitchens) to actively get rid of warm stale air. Self-contained units are often used as hallway ventilation, particularly in multifamily buildings. Fully integrated systems are more common in newer commercial buildings.

To reduce energy costs due to ventilation, two approaches should be taken:

1. maintain and operate the ventilation system properly, and
2. minimize ventilation rates in the system.

Maintenance and Operation

A building needs to be thoroughly examined to determine the way(s) that ventilation air is being supplied. All system components including fans, ductwork, dampers, filters and controls should be identified. Any controls or damper devices which might be used to reduce and shut off the supply of outdoor air when it is not required should also be noted. Once system components are identified, they should be carefully checked to make sure the system is properly sized, balanced and controlled, and that it is operating as it was designed.

For example, many ventilation systems have poor quality outdoor air dampers which allow outside air to leak into the building even when the dampers are fully closed. These should be adjusted, weather-stripped or replaced in order to ensure complete closure. Sometimes outside air dampers have been permanently closed, often in a misguided attempt to save energy. In other buildings these dampers may have been fixed open at the widest setting. In either case, the situation needs to be rectified. Ducts that have been blocked off or left open during remodeling projects should also be checked for. In addition, all fans and controls in the system need to be properly tested to ensure that they are working correctly. Finally, some ventilation systems have activated carbon filters which remove odors from recirculated air. These are useful since they improve the quality of existing air and reduce the amount of outdoor air required. However, these filters can become saturated and should be replaced or regenerated at regular intervals. In systems that do not have such filters, they can often be installed.

Minimize Ventilation Rates

A certain ventilation level is required in a building to provide good air quality. However, many buildings are ventilated at a rate that far exceeds what is necessary to maintain comfort, dilute odors, eliminate pollutants, or meet code requirements. Since all of the outside air brought into a building for ventilation requires conditioning, excess ventilation results in excess energy use. As a result, in order to reduce energy consumption and save money, air exchange should be reduced to the minimum that provides adequate air quality. During periods when the building is occupied, air exchange can often be reduced substantially from current levels. In addition, when the building is unoccupied, it is usually possible to totally shut down the ventilation system.

The first step to reducing ventilation rates is to be familiar with the code requirements for ventilation in a building. Local codes as well as those available from sources such as the Building Officials and Code Administration (BOCA) and the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE Standard 62) should be consulted. These codes commonly state minimum ventilation requirements in terms of the types of activities in the building, though the number of occupants is also important. Once the code requirements for a building are known, the next step is to ascertain current ventilation rates in the building by measuring the volume of air at the outdoor air intakes. This actual rate can then be compared with code requirements to determine the potential for reductions.

When taking steps to minimize ventilation rates, keeping the system balanced should be the guiding criterion. Outside supply air and exhaust air are linked, and the amount of air exhausted

(or that exfiltrates) from a building controls the amount of air that must come in to replace it. As a result, the amount of air exhausted from the building needs to be controlled as well as the outside supply air to the building reduced.

Common options for minimizing ventilation rates are listed below:

- seal unwanted sources of infiltration and exfiltration in building envelope;
- weather-strip outside air dampers, or replace with new low-leakage types;
- set outside air dampers to the minimum opening when building is occupied;
- close outside air dampers completely when the building is unoccupied;
- install timers on outdoor air fans to turn them off when building is unoccupied;
- install air recirculating units to filter air instead of replacing all of it;
- wire toilet exhaust fans in bathrooms to light switches;
- install timers on continuously operating exhaust fans to turn them off when the building is unoccupied, and at other times when they are not needed;
- supply ventilation to parking garages according to a CO monitoring system;
- install a baffle in frequently used range hoods over commercial cooking appliances to reduce the volume of exhausted air;
- when separate ventilation systems are installed, group occupants by type of activity when possible to reduce total ventilation rate.

How to Implement:

The building operator can perform most of the procedures required to turn off ventilation equipment at night or on weekends. However, the advice of a professional may be required to determine and implement the best strategies for reducing ventilation rates on an active system when the building is occupied. Such an expert will have specialized equipment capable of accurately measuring the volume of air at the outdoor air intakes and will be familiar with local and national ventilation codes. In addition, this professional will ensure that the supply and exhaust rates are balanced in the building.

The simple sealing required to reduce infiltration and exfiltration in buildings can be performed by maintenance staff. Such staff can also perform common maintenance on most ventilation systems, including weather-stripping dampers, clearing blocked ducts, replacing filters or checking control operation. Well-trained personnel may also be capable of replacing outside air dampers and fans, or installing timers, switches or exhaust hood baffles. If no experienced staff is available, a qualified contractor may be hired to perform these tasks instead.