There are numerous options to consider when determining ventilation systems for commercial and industrial buildings.

The endless number of variables make designing, installing and maintaining commercial/industrial ventilation systems a significant challenge.
When it comes to considering the ventilation needs of different commercial buildings, any HVAC technician, contractor or facility manager will agree there is one common factor: They all have at least four walls and a roof. But the similarities often end there, and what happens inside those four walls can have a significant impact on the amount of ventilation required by code to provide proper indoor air quality (IAQ).

ASHRAE Standard 62.1 is the recognized standard for ventilation system designs within commercial and industrial buildings. First published in 1973, this standard specifies minimum ventilation rates and other measures for providing IAQ that is comfortable and minimizes adverse health effects for people working inside new and existing buildings. For building occupants, IAQ is about more than providing fresh air.

While the removal of contaminants is an essential part of effective ventilation, temperature is equally important, and can have an impact on how employees inside the building approach their daily jobs. Different buildings have different needs, and the ventilation strategies that work for a warehouse or distribution center may vary dramatically from those used in an industrial setting.

Ventilating warehouses and distribution centers

High-bay buildings are some of the easiest types of structures to work with. For a high-bay warehouse or distribution center to meet the ASHRAE 62.1 standard and local building codes, the natural infiltration rate of the building is often enough to satisfy the fresh-air requirements during occupied hours. As building envelopes become tighter and more efficient, these buildings may need mechanical ventilation to meet local codes.

But the ventilation considerations do not end there. Regardless of whether a building relies on natural infiltration or mechanical ventilation, both methods require HVAC...
professionals to address the temperature of the outdoor air entering the building. While simple ventilation fans can help provide fresh, comfortable IAQ in buildings in more temperate climates, using unconditioned outdoor air to ventilate a building located in a region with cold winters or hot summers can create uncomfortable temperatures for the workforce.

Industrial facility considerations
Ventilation factors move to an entirely different level when considering industrial facilities. From pharmaceutical manufacturing plants to auto assembly plants, to even wastewater and sewage treatment facilities, industrial environments have different processes happening within their four walls that dictate the type and amount of mechanical ventilation needed to meet IAQ standards.

Even though these structures experience infiltration of outside air just like a warehouse, the amount of incoming air will not match the amount of mechanical exhaust that an industrial plant has in place to ventilate their facility. Industrial facilities require an in-depth study on the amount of exhaust cubic feet per minute (cfm) and the location of the exhaust fans to understand the make-up air options for replenishing the air, while maintaining a neutral pressurization, IAQ and comfortable working temperatures.

A note about retrofits
Whether it is a high-bay building or an industrial facility, retrofitting an environment for improved IAQ poses unique considerations, particularly if the original building has grown into a facility with multiple additions.

Each new addition brings added exhaust and ventilation equipment that can complicate the project. Newer ventilation units, for example, may be installed according to what the new square footage requires, with little thought given to how all the units together react across the entire structure. This can result in imbalanced airflow and temperature variations if the building ventilation strategy is not examined and designed holistically.

Whether it is a high-bay building or an industrial facility, retrofitting an environment for improved IAQ poses unique considerations, particularly if the original building has grown into a facility with multiple additions.

When embarking on a retrofit, an experienced engineer should walk the building to determine exhaust cfm levels, types of ventilation equipment and their locations so that the new equipment is working in conjunction with one another and not against each other.
One size does not fit all: Make-up air options

Make-up air units (MUA) can play an important role in maximizing ventilation for comfort and efficiency—and they are often required by codes.

MUAs use 100% outside air to provide ventilation or exhaust replenishment for a building. MUA equipment can condition the outside air through various means. These units come in a variety of designs, including:

- Straight MUAs, which bring outside air into the building;
- 80/20 units, which recirculate certain amounts of inside
- High-temperature heating and ventilation units (HTHV), which are often used in colder climates to heat the outside air as well as provide ventilation.

MUAs heat the outside air through either direct-fired or indirect-fired technology. Most direct-fired MUAs have a thermal efficiency of 92%. Because the products of combustion go into the space, they must meet the ANSI z83.4-2017 standard for non-recirculating, direct gas-fired heating and forced ventilation appliances in commercial and industrial applications.

Indirect-fired MUAs are less efficient due to the use of a heat exchanger, with the products of combustion being exhausted out of the building through a flue. While direct-fired units are more energy efficient than indirect-fired MUAs, this technology may not be suitable for all applications. Direct-fired units place all the products of combustion
In warm climates where the air needs to be cooled, an MUA unit can add on a hydronic, direct expansion or evaporative technology to cool the air before entering the building. In colder climates, HTHV MUA units can heat a facility using 100% outside-air, direct-fired make-up air. Unlike other types of MUA units, HTHVs have a discharge temperature of 160°F, as opposed to maximum discharge temperatures between 110°F—120°F of other MUAs. HTHVs also put dramatically less cfm of air into the space than normal MUAs, making it an efficient solution for heating.

Balancing act
When it comes to determining the fresh-air needs of a building, it is best to work with an engineer who understands the ASHRAE 62.1 standard, local building codes and what processes are taking place inside the facility. While warehouse and distribution facilities seem somewhat straightforward, industrial facilities can become quite complicated. An engineer’s expertise will be invaluable in helping balance ventilation, temperature needs, and ultimately, improve IAQ.

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