

Powered AirE-News For Engineers**Tech Talk - Air Doors & Conservation of Mass- Negative Building Pressure**

“In physics, a conservation law states that a particular measurable property of an isolated physical system does not change as the system evolves. The law of conservation of mass/matter (The Lomonosov-Lavoisier law) states that the mass of a system of substances is constant, regardless of the processes acting inside the system. An equivalent statement is that matter changes form, but cannot be created or destroyed. This implies that for any chemical process in a closed system, the mass of the reactants must equal the mass of the products.” (<http://en.wikipedia.org>)

Mass is neither created or destroyed. Many times this fundamental engineering principle is forgotten in building HVAC design. In a case where a building is functioning in a negative pressure mode there needs to be a path for air to enter a building. This will sometimes occur through building component joints that are not properly sealed, through an open window, through open doors or other openings in the building envelop.

An air door is a product design to prevent outside air from blowing into a building; however, if a building is operating in a negative pressure mode the air door effectiveness will be affected. The force vector of an air will “bend” inward if there is a negative pressure in the building and outside air will migrate into the building.

In order for an air curtain to be effective the building air balance must be calibrated so that there is a proper balance to provide a positive pressure in a building. This positive pressure won’t be sufficient to offset a localized gust of wind through a door but it will help ensure that outside air migration through the air curtain stream of air across the opening is not negatively impacted by the building negative pressure.

Application Consideration

Building air balance is a crucial part of the performance of the whole building, not just the HVAC system. A building under negative pressure can have unconditioned air entering through doors, windows and even the building walls. Air that enters a building through unintended paths can cause problems as obvious as discomfort from drafts to as complicated as causing condensation inside of a structure that can lead to serious mold problems.

Building air balance also directly impacts the effectiveness of an air curtain. An “air curtain” is a force of air developed by the air curtain unit that is intended to offset another force of air from nature blowing at the opening. Since mass is neither created or destroyed (conservation of mass physics principle) it must be understood that if a building is under a negative pressure the air curtain won’t prevent air from migrating through the “air curtain”. In this case the air curtain mixes with the outside air to provide a tempering effect but it won’t totally stop it from entering the building.

**Powered Aire Concealed Mounting Air Door**