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Energy Code Update: Air Curtains an Approved Alternative to Vestibules

The Air Movement and Control Association International, Inc. (AMCA International) recently announced that air curtains are an approved alternative to vestibules. Following tests with air curtains in accordance with ANSI/AMCA standards and manufacturers' instructions, the 2015 version of the International Energy Conservation Code (IECC) will contain this new provision.

Specifying air curtains as an energy-saving, low-cost alternative to vestibules in new construction has already become a growing trend among engineers and architects. Air curtains work by creating an invisible sheet of air that bends and resists thermal exchange over an opening using the building's internal pressure. Vestibules, on the other hand, often detract from the building's aesthetics, consume valuable floor space and may impede egress in an emergency situation. Unlike vestibules, air curtains have less of a propensity to be negated by common situations, such as high traffic and propped doors, and still minimize the infiltration of airborne contaminants. For this reason, air curtains are approved by the National Sanitation Foundation for use in the food service industry as a means of insect control for customer entry doors, and service entry doors and windows.

Air curtains are now accepted by both the International Green Construction Code (IGCC) and IECC as an alternative to vestibules. The benefit of air curtains over vestibules was so apparent to P.A. Troyer, an architectural firm in Ft. Wayne, IN, that the company campaigned to amend the energy code to add air curtains as an alternative to vestibules at the state level.

In the past, Indiana energy codes required a vestibule, which takes up approximately 50 square feet, in every new building constructed. This posed a challenge to smaller retailers because it meant the loss of valuable floor space. Many store owners wanted alternate solutions to the code requirements without surrendering precious floor space. P.A. Troyer turned to air curtains as the solution.

"After stepping back and considering the loss of space, the cost of the vestibule, and the inconvenience of going through two doors to enter the store, an air curtain seemed to be a logical choice," said Phil Troyer, architect at P.A. Troyer Inc. "I was already familiar with air curtains used in grocery stores and drive-up windows to separate environments. After speaking with a local distributor in the area, we decided that an air curtain was the solution to solving the space problem."

Troyer presented the argument to the State of Indiana Planning Committee for six different sites. He was approved by the state for all six locations. Today, the requirement for a vestibule has been resolved so that an air curtain is acceptable in a space that is less than 3,000 square feet, almost mirroring the IGCC and IECC requirements.

A recent study published by AMCA International evaluated the effectiveness of air curtains and confirmed that when compared to a vestibule, air curtains consistently meet or outperform vestibules in energy savings. The most recent study, *Investigation of the Impact of Building Entrance Air Curtain on Whole Building Energy Use*¹, was conducted by Liangzhu Wang, PhD, assistant professor at the Department of Building, Civil and Environmental Engineering of Concordia University, Montreal, Canada. Dr. Wang compared the cost effectiveness of an air curtain mounted over a single-entry door versus a vestibule using an approach that integrated three types of modeling software: ANSYS Fluent for the CFD

simulation, TRNSYS for the energy modeling, and CONTAM for modeling building air pressure and infiltration.

The study illustrated that whole building annual energy consumption, modeled with the air curtain door, is less in all climate zones when compared to the modeled vestibule door. The modeled air curtain door can reduce energy consumption by 0.3% to 2.2% in colder climate Zones 3-8, but marginal for Zones 1 and 2, as no changes were made to the operating characteristics of the air curtain. The study also established that the building entrance orientation, frequency of use and the balance of the building HVAC system (pressure) affect air infiltration/exfiltration, and the overall energy performance of the air curtain.

The IECC is published by the International Code Council (www.iccsafe.org), “a member-focused association dedicated to developing model codes and standards used in the design, build and compliance process to construct safe, sustainable, affordable and resilient structures.”

By: Frank Cuaderno, vice president of engineering of Mars Air Systems, the international leader in high quality air curtains that help make buildings comfortable, sanitary and energy efficient. With more than 50 years in the business, and utilizing the industry-leading tools and services, Mars provides architects, engineers, food service consultants and other specifiers with the most comprehensive air curtain solutions, while giving building owners the peace of mind of a reliable product and dedicated support. For more information, visit www.marsair.com.

¹ Wang2013: Wang, Liangzhu 2013: Investigation of the Impact of Building Entrance Air Curtain on Whole Building Energy Use. <http://www.amca.org/feg/research-and-whitepapers.aspx>