DASMA TECHNICAL DATA SHEET

Door & Access Systems Manufacturers Association International

#405

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High Speed Doors and Energy Conservation Through a Building Envelope

Introduction

High speed doors may be specified where environmental control and/or building security are a priority. Where energy losses through a building envelope are considered, high speed doors can provide significant energy savings. This Technical Data Sheet provides an explanation on when high speed doors can be used to provide such savings, outlines key code and standards provisions, and gives guidance toward how to apply the provisions..

High Speed Door Definition and Description

High speed doors are defined in codes and standards as "a nonswinging door used primarily to facilitate vehicular access or material transportation and having an automatic closing device, with an opening rate of at least 32 inches per second and a closing rate of at least 24 inches per second." The doors are typically intended to allow vehicular equipment to enter or access building spaces or to enter spaces within buildings. Common widespread applications include manufacturing facilities, distribution centers and pharmaceutical laboratories. High speed doors are often associated with the need for high cycle (needing to open and close a large number of times per day) operation.

High speed doors may be constructed of several materials, some of which include fabric, vinyl, rubber or composites. They can be opaque, translucent or a combination thereof. The assemblies are constructed of flexible materials at the perimeter to provide sealing against air leakage but yet to allow variations in contact between door panels/curtains and jamb construction to maximize the effectiveness of continual high speed operation. To facilitate high speed door movement, panels or curtains are usually made of a thin single or double layer of material. Thus, high speed doors cannot comply with all prescriptive U-factor requirements in ASHRAE 90.1 Tables. However, high speed doors can comply with code and standards provisions outlined later in this Technical Data Sheet.

High Speed Doors and Air Exchange

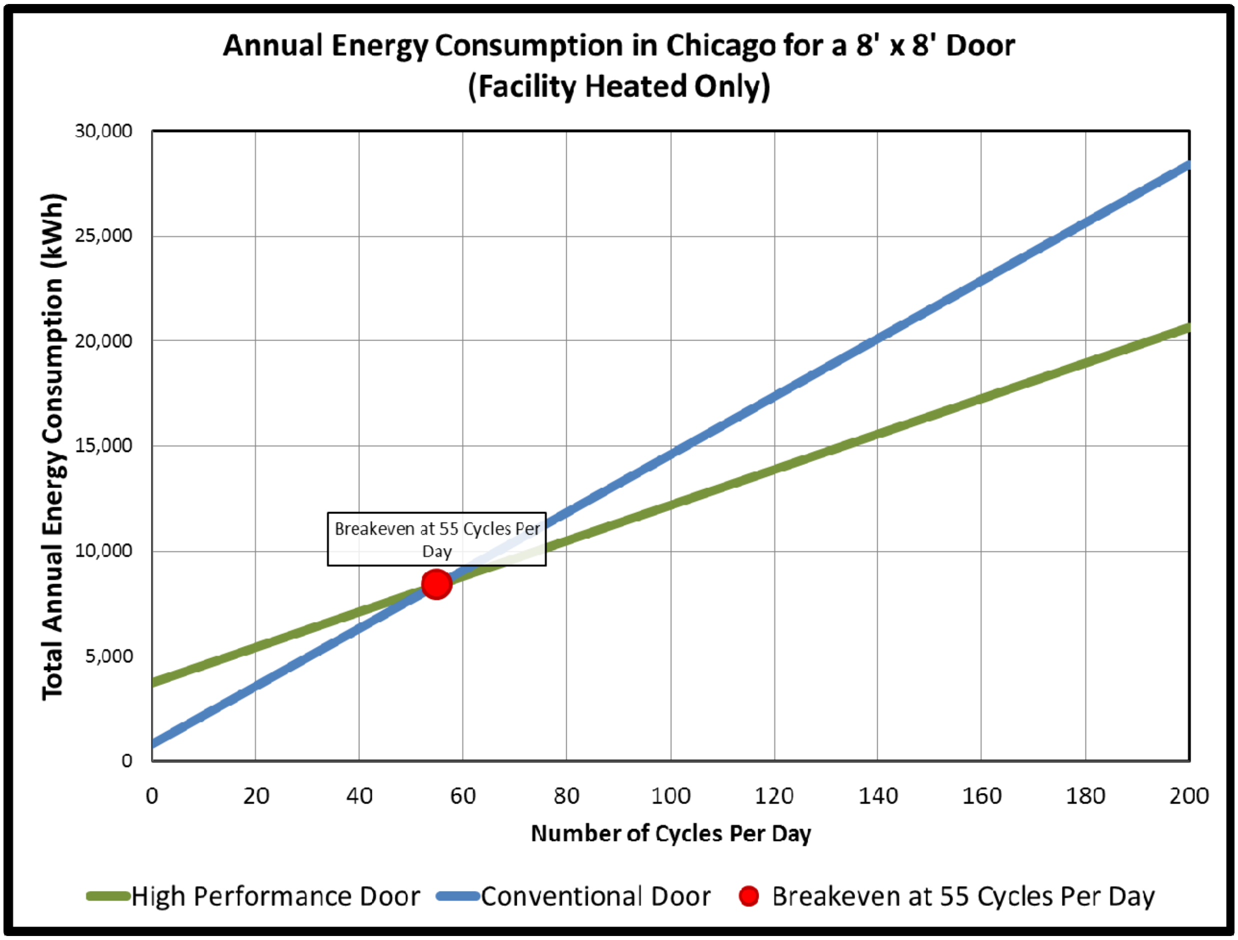
The high speed nature of these doors provides for minimizing of "air exchange", a valuable and predominant characteristic of minimizing overall energy losses through a door opening. An open door opening typically experiences air movement through the opening at a rate of approximately 3 feet per second. Further, an automatic closing device typically included with such doors saves energy by controlling the amount of time the door stays open.

Energy Analysis Involving High Speed Doors

Where a high speed door is needed for building need related purposes, a comparison to a conventionally operating insulated door will reveal the energy savings that can be provided. Studies have taken into consideration U-factor, air infiltration, air exchange and power usage, which is a better indicator of total door related energy losses from a performance standpoint than prescriptive U-factor requirements. Variables associated with door operation considered common to high speed doors include a minimum 32 inches per second door opening speed, a minimum 24 inches per second door closing speed, and 10 second door fully open time.

Studies also consider a U-factor value of 1.2 and an air leakage value of 1.3 cfm/sf for a high speed door, and a U-factor value of 0.25 and an air leakage value of 0.4 cfm/sf for a conventionally operating insulated sectional door.

Conservative parameters have been used to find the lowest cycles per year as the "crossover" point. The "crossover" point, at which annualized energy usage is equal for the high speed door and the conventionally operating insulated door is 20,000 cycles per year or any average of 55 cycles per day. At 75 cycles per day, a 10% energy savings is realized.



The International Energy Conservation Code (IECC) and Air Leakage

Beginning with the 2015 edition, IECC includes a maximum allowable air infiltration rate of 1.3 cubic feet per minute per square foot of door area (cfm/sf.) for high speed doors. This requirement is consistent with the 2013 version of ASHRAE 90.1. In the 2015 IECC, ANSI/DASMA 105 is listed as the acceptable test method to obtain air infiltration values for high speed doors.

Although the IECC requires a restrictive R-value (minimum 4.75) for the door component, a design professional is permitted to employ the U-factor trade-off method across the entire building envelope to compensate in the form of increased wall and/or roof R-values.

ASHRAE 90.1 and Air Leakage

Beginning with the 2013 edition, ASHRAE 90.1 includes a maximum allowable air infiltration rate of 1.3 cubic feet per minute per square foot of door area (cfm/sf.) for high speed doors. This rate was established through DASMA research testing on common high speed door product offerings. Compared to swinging doors having a maximum of 1.0 cfm/sf, the design for rapid door movement must allow for increased space at the perimeter. In addition, high speed doors typically do not involve habitable living space where air infiltration needs to be more tightly controlled.

Although ASHRAE 90.1 requires a restrictive U-factor (.50) that a typical high speed door (U factor 1.10-1.20) cannot comply with, a design professional is permitted to employ the U-factor trade-off method across the entire building envelope to compensate in the form of other exterior building element thermal performance values.

ASHRAE 189.1 and U-factor

Beginning with the 2013 edition, ASHRAE 189.1 includes a maximum allowable U-factor of 1.2 BTU/hr-degF-sf for high speed doors operating at a minimum average of 75 cycles per day. Manufacturers are expected to give design professionals the cycles per day information along with the opening and closing speeds. The U-factor requirement was needed in this "high performance building" standard because it cannot be "traded-off" by increasing exterior building element thermal performance values.

Air leakage is not addressed in ASHRAE 189.1 for high speed doors. Therefore, the air leakage provisions from ASHRAE 90.1 would apply to high performance buildings as well.

Conclusion

Codes and standards give recognition to how high speed doors limit air exchange through door openings when doors are in other than the fully closed position. Thus, although the U-factor and air infiltration limitations established in codes and standards are very practical, all three means of energy analysis - along with door power usage - must be analyzed to show the energy savings over a conventionally operating door where a high speed door is required.

High speed door manufacturers should be able to demonstrate the energy efficiency of their products. DASMA members also have access to DASMA Technical Research Document #4001, which is a spreadsheet where the exact parameters can be entered to exhibit energy savings.