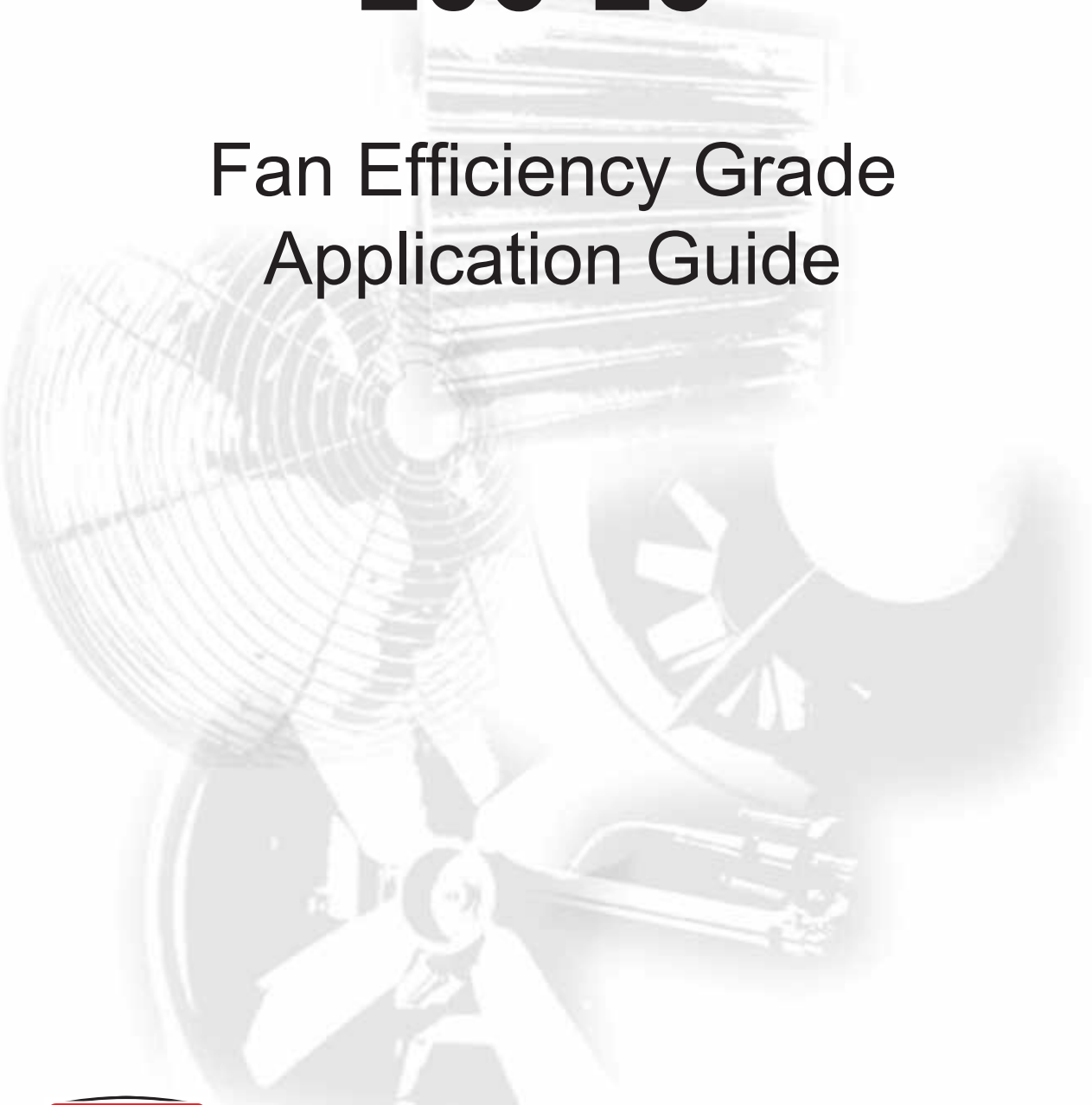
AMCA Publication 206-15

Fan Efficiency Grade Application Guide



AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL INC.

The International Authority on Air System Components

AMCA Publication 206-15

Fan Efficiency Grade Application Guide

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Related AMCA Documents

Related Standards	ANSI/AMCA Standard 205	Energy Efficiency Classification for Fans

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Fan Efficiency Grade Application Guide

1. Purpose

The fan efficiency grade (FEG) is an energy metric that describes the quality of energy transformation of a fan. The FEG metric is designed for establishing minimum fan energy efficiency requirements by regulatory bodies, code agencies and advocacy groups. The metric offers a simple means to identify the level of energy transformation in ducted air systems.

This document provides an overview of issues associated with fan energy consumption and offers guidance for using the FEG in codes, standards and regulations as a means to increase the use of energy efficient fans.

2. Scope

This document pertains to the FEG metric as defined in ANSI/AMCA Standard 205 [1] and ISO Standard 12759 [2].

3. Introduction

Worldwide awareness and need for energy conservation has lead government regulatory agencies and code bodies to impose energy efficiency requirements on a broad range of residential, commercial and industrial fans.

Worldwide source energy usage in 2010 was estimated to be 524 quadrillion BTU (quads) (553 EJ) and is expected to increase to 630 quads (665 EJ) by 2020, if no further energy conservation restrictions are put in place [3]. One quad is the equivalent of 180 million gallons of oil, 980 billion cubic feet of natural gas or 28 million tons of coal. In the U.S., energy consumption has been around 100 quad (106 EJ) for the last decade, and this trend is expected to hold steady for the next decade.

Commercial buildings in the U.S. consume about 20% of the annual energy budget. Of this, air distribution systems that provide heating, cooling, and ventilation are estimated to consume about 5.2 quads (5.5 EJ). Nearly one-third of this energy is consumed by fans that provide air transport through these systems [4]. Globally, fans are estimated to consume 8.5% of the worldwide electricity generation as shown in Figure 1 [5].

Although the oil crisis of the 1970s led to worldwide energy conservation awareness and regulation of many energy consuming products, regulatory agencies and code bodies have only recently turned attention to fan energy consumption. In 2007, the International Standards Organization (ISO) and AMCA International began to create separate but harmonized fan efficiency rating standards. These standards were published in 2010 as ISO 12759 and ANSI/AMCA Standard 205.

The ISO and AMCA standards both define FEG, a metric that can be used by regulatory bodies, code agencies and environmental advocacy groups to encourage responsible application of fans in ducted air distribution systems.

In Europe, the European Commission Regulation (EU) No. 327/2011 sets minimum efficiency targets that must be met by electric motor driven fans with input powers from 125W to 500kW. Compliance with Tier 1 targets became mandatory from January 1, 2013, and more stringent Tier 2 targets will apply beginning in January 1, 2015. Note that these European regulations are based on the fan motor efficiency grade (FMEG), the fan energy metric that includes the motor and drives (including electrical and mechanical components).

In the U.S., ANSI/AMCA Standard 205 is now being adopted into various model codes and standards for energy efficiency, including those published by the International Code Council (ICC) and the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). While Europe has established Tier 1 and Tier 2 levels with mandatory compliance, the U.S. approach uses separate national model codes and standards baseline requirements and “stretch” or “green” requirements. See Annex A for more information about baseline and stretch codes and standards.

4. Technical Background

A fan is a machine designed to produce continuous motion of an airstream through the aerodynamic action of a rotary impeller. (Note: while “air” is the term referenced throughout this document, other gasses apply in general.) Rotary power is generally supplied by an electric motor that is directly or indirectly connected to the fan. Fans are often classified as either axial or centrifugal, depending on the aerodynamic configuration of their impeller, although the hybrid impellers used in mixed flow fans have a combined axial and centrifugal action.

The conversion of rotary power to air power is the fundamental purpose of a fan, from an energy perspective. The air power represents the total energy rate the fan adds to the airstream to maintain continuous motion and to overcome the resistance in the air distribution system. The energy