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ANSI/ASHRAE Standard 2016-2020
Methods of Test for Determining Application Data of Overhead Circulator Fans

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NOTE

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FOREWORD

ASHRAE Standard 216 provides standardized performance data for the application of overhead circulation fans in indoor spaces. The room air speed distribution test results can be used to calculate occupant thermal comfort and to demonstrate compliance with the thermal comfort requirements of ASHRAE Standard 55. This standard includes requirements for test instrumentation, test room features, and measurement procedures. It also includes calculation procedures for a number of performance metrics relevant to thermal comfort application of overhead circulator fans, such as uniformity, room average cooling effect, heating draft risk, and comfort cooling efficacy.

This standard includes a cooling fan efficiency metric based on the ratio of the cooling effect to the input power of the fan. In the United States, the Department of Energy (DOE) regulates ceiling fan efficiency based on fan airflow and power consumption in units cubic feet per minute and watts (see 10 CFR part 430, subpart B, Appendix U). Information included in DOE certification reports and any representations on the FTC label must be determined in accordance with the DOE test procedure and DOE metric. This includes representations for ceiling fan efficiency in addition to ceiling fan airflow and energy use.

1. PURPOSE

The purpose of this standard is to specify the instrumentation, facilities, test installation methods, and procedures to determine circulator fan application data for occupant thermal comfort in a space.

2. SCOPE

2.1 This standard applies to overhead circulator ceiling fans.

3. DEFINITIONS

air density (ρ_a): the mass per unit volume of the air.

air density, standard (ρ_0): the density of air at standard conditions, 0.0750 lbm/ft^3 (1.20 kg/m^3), which approximates dry air at a temperature of 70.0°F (21.1°C) and a barometric pressure of 29.92 in. Hg (101.3 kPa).

air speed (V): the rate of air movement at a point, without regard to direction.

air speed, average ($V_{a,m}$): the average air speed at a test position or test point. The average is with respect to location and time. The height of the test points above the floor are 4, 24, and 43 in. (0.1, 0.6, and 1.1 m) for determining the average air speed for seated occupants, and 4, 43, and 67 in. (0.1, 1.1, and 1.7 m) for determining the average air speed for standing occupants. The air speed is averaged over a minimum interval of three (3) minutes.

barometric pressure, ambient (B_a): the pressure of the atmosphere relative to zero absolute pressure (a perfect vacuum).

blade height: the vertical distance from the lowest point on the fan blades to the floor.

comfort, thermal: the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation.

current, input (I): measured movement or flow of charge in an electrical circuit.

fan size (D): total diameter of a circle measured at the impeller blade tips.

fan speed (N): the rotational speed of the impeller.

humidity, relative (ϕ): ratio of the partial pressure or density of water vapor to the saturation pressure or density, respectively, at the same dry-bulb temperature and ambient barometric pressure.