BSR/ASHRAE Standard 216P

Public Review Draft

Methods of Test for Determining Application Data of Overhead Circulator Fans

Third Public Review (January 2020)
(Draft Shows Proposed Independent Substantive Changes to Previous Public Review Draft)

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FOREWORD

This proposed standard was created to provide standardized design data for the application of overhead circulation fans in indoor spaces. The test data can be used for occupant thermal comfort calculations and to demonstrate compliance with the thermal comfort requirements of ASHRAE Standard 55.

[Note to Reviewers: This public review draft makes proposed independent substantive changes to the previous public review draft. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the previous draft are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed substantive changes.]

Revise Section 3 Definitions as shown below. The remainder of Section 3 is unchanged.

3. DEFINITIONS

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

~~***voltage (VE):*** electric potential or potential difference.~~

~~***Revise Table 4.1 as shown below. The remainder of Table 4.1 is unchanged.***~~

~~**Table 4.1 Symbols and Units**~~

~~Symbol~~	~~Description~~	~~IP Unit~~	~~SI Unit~~
~~*VE*~~	~~Voltage~~	~~V~~	~~V~~

Revise Section 6.1.1 as shown below.

6.1.1 Steady State *Air Speed* Conditions. ~~M~~All measurements shall be done under steady state conditions. For the purpose of this standard, steady-state conditions are achieved at each test point when the absolute difference between the mean of the first half of the test sampling duration and the mean of the second half of the *test sampling duration* is less than either 10% or 10 fpm (0.05m/s) for each test sample. If steady state conditions are not met at the minimum *test sampling duration*, the *test sampling duration* shall increase in 180 second increments until steady state conditions are achieved, up to a maximum of 720 seconds, at which steady state conditions are assumed to have been met.

Revise Section 7.1.2 and Table 7.1 as shown below.

7.1.2 Fan location. The fan shall be tested in the chamber specified in Table 7.1. The fan shall be centered on the horizontal axes within the test chamber (±0.25 ft, ±0.076 m), and the vertical centerline through the fan setup shall be within ± 1° of vertical. The fan shall be assembled in accordance with the manufacturer's published installation manual. The required fan *blade height* shall be determined using Table 7.1 and shall be measured when the fan is stationary.

Table 7.1 – Test Chamber and Fan Mounting Dimensions

Fan size, ft (m)	**Test chamber size Width x Length x Height, ft (m)**	**Blade height*, ft (m)**
D ≤ 7.0 (2.1)	20x20x11 ±0.75 (6.1x6.1x3.4 ±0.23)	8.0 ±0.083 (2.4 ±0.025)
7.0 (2.1) < D ≤ 16.0 (4.87~~4.9~~)	50x50x22 ±1.5 (15.2x15.2x6.7 ±0.46)	15 ±0.167 (4.6 ±0.051)
D > 16.0 (4.87~~4.9~~)	80x80x32 ±2.0 (24.4x24.4x9.8 ±0.61)	21 ±0.25 (6.4 ±0.076)

*Additional testing performed at mounting heights not specified in Table 3 shall be clearly labeled as non-compliant with the mounting height requirements of this standard.

Revise Section 8.8 as shown below.

8.8 Room mean air speed ~~*average air speed*~~. The mean of the *average air speeds* measured at each *test position* specified in Section 8.3. Room mean air speed ~~*average air speed*~~ shall be calculated for both seated and standing occupants.

$$V_{a,m,seated,room} = \sum_{n=0}^{max} WF_n \times V_{a,m,seated,n} \quad \text{(Eq 8.10)}$$

$$V_{a,m,standing,room} = \sum_{n=0}^{max} WF_n \times V_{a,m,standing,n} \quad \text{(Eq 8.11)}$$

where

$V_{a,m,seated,n}$ = Seated *average air speed* at test position n, fpm (m/s)

$V_{a,m,standing,n}$ = Standing *average air speed* at *test position* n, fpm (m/s)

$V_{a,m,seated,room}$ = Seated room mean air speed ~~*average air speed*~~, fpm (m/s)CFE

$V_{a,m,standing,room}$ = Standing room mean air speed ~~*average air speed*~~, fpm (m/s)

Revise Table 8.1 as shown below.

Table 8.1 – Assumed Comfort Conditions for Average Cooling Effect Calculation

Comfort Conditions	**Baseline**	**Elevated Air Speed**
Air Dry-Bulb Temperature	80.0 F (26.7 C)	80.0 F (26.7 C)
Mean Radiant Temperature	80.0 F (26.7 C)	80.0 F (26.7 C)
Humidity Ratio	0.010	0.010
Metabolic Rate	1.1 met	1.1 met
Clothing Insulation	0.50 clo	0.50 clo
Air Speed	20 fpm (0.1m/s)	Room mean air speed ~~*average air speed*~~

Revise Section 9.1 as shown below. The remainder of Section 9.1 is unchanged.

9.1 Report. The report of a laboratory overhead circulator ceiling fan test shall at a minimum include the following data:

[…]
Test Data:
Air speeds for each test point
Ambient dry-bulb temperature
Ambient wet-bulb temperature
Ambient barometric pressure
Extraneous airflow - before test
Extraneous airflow - after test
Fan speed
System input current
System input frequency
System input power
System input voltage
Direction of operation (~~forward or reverse~~ downward or upward flow)

[…]
Calculated values:
Air density
Average system input power
Average air speed at each test point
Average air speed at each test position (seated)
Average air speed at each test position (standing)
Cooling Fan Efficiency (seated)
Cooling Fan Efficiency (standing)
Room mean air speed ~~*average air speed*~~ (seated)
Room mean air speed ~~*average air speed*~~ (standing)
Maximum air speed at a test position (seated)
Maximum air speed at a test position (standing)
Minimum air speed at a test position (seated)
Minimum air speed at a test position (standing)
Uniformity (seated)
Uniformity (standing)
Room average cooling effect (seated)
Room average cooling effect (standing)
2.5r cooling effect (seated)
2.5r cooling effect (standing)
Cooling coverage fraction (seated)
Cooling coverage fraction (standing)
Heating draft risk fraction (seated)
Heating draft risk faction (standing)