TABLE 2. VALUES OF C FOR VARIOUS AIR VELOCITIES

AVERAGE INDICATED VELOCITY, fpm	SUPPLY GRILLES	EXHAUST GRILLES
150	0.952	0.993
200	0.957	1.005
300	0.967	1.028
400	0.977	1.049
500	0.985	1.067
600	0.992	1.078
700	0.998	1.084
800	1.000	.....
Factors for average use	low velocity.....0.97 high velocity.....1.00	1.02

number of equal areas approximately 6 in. square. The anemometer should be held at the center of each section in contact with the grille (or as close as possible), for a period of time sufficient to insure an average reading. In the case of supply grilles, the instrument should always be held with the dial facing the operator. The average of the corrected readings should then be used in the following formula to obtain the flow in cubic feet per minute:

$$cfm = CV\,\frac{A + a}{2} \text{ or } \frac{CVA\,(1 + p)}{2} \qquad (5)$$

where

V = average of corrected anemometer readings in feet per minute.
A = gross area of grille, square feet.
a = net free area of grille, square feet.
p = percentage of free area of grille expressed as a decimal.
C = a coefficient that varies with the velocity from grille and may vary slightly with type of grille. (See Table 2).

As the velocity increases, C approaches a constant value, and the highest value shown can be used for all higher velocities with very slight error.

Exhaust Grilles. The surface of the grille should be marked off and readings taken in the same manner as with supply grilles, except that the instrument should be held with the dial facing the register. The average of the corrected readings, together with the proper constant for exhaust grilles (Table 2), when used in Formula (5), will give the flow in cubic feet per minute with a maximum error of 10 per cent, although in the majority of cases the error will be less than 3 per cent.

Chapter 32

FANS AND MOTIVE POWER

Types of Fans; Characteristic Curves; Selection of Fans; Fan Control, Designation of Fans; Arrangement of Drive; Motive Power; Electric Motors.

THE fans used for heating, ventilation and air conditioning are usually of the disc, propeller and centrifugal type. Electric motors are generally used for fan motive power.

TYPES OF FANS

Disc and propeller fans are especially desirable for the ventilation of small theaters, public buildings, restaurants, clubs and factories, and for removing steam, gases, foul air, etc., from dye houses, laundries, kitchens, laboratories and similar places where more or less large quantities of air are to be moved against a low resistance. This type of fan is most satisfactory when installed in such a manner as to have no duct work connected to it.

The centrifugal fans considered in this chapter are known as the multiblade type as distinguished from the positive pressure blower type which handle comparatively small quantities of air at high pressures. Centrifugal fans are used where more or less large quantities of air are required at pressures ranging from about ⅛ in. to 3 in. or more of water pressure. These fans usually are housed and are used for building and tunnel ventilation, heating, forced and induced draft, drying, dust collecting, conveying, etc.

There are many types of centrifugal fans but their principal difference is in the design of the wheel. These may be classified with respect to the direction of the blade at the periphery as follows:

1. Forward curve.
2. Radial tip.
3. Steel plate and partial backward curve.
4. Full backward curve.

CHARACTERISTIC CURVES

Characteristic curves of fans are determined by tests performed in accordance with the Standard Code for the testing of Centrifugal and Disc Fans,[1] as adopted by the AMERICAN SOCIETY OF HEATING AND

[1] A.S.H.V.E. TRANSACTIONS, Vol. 29, 1923, p. 407.