10 and 50 fpm, depending on the nature and texture of the sheets. The initial resistance, or the resistance when the filter media are clean, is likewise somewhat lower. The usual practice is to allow the dirt to accumulate on the filtering surface until the resistance has reached a pre-determined maximum. At this point the load of dirt is removed by some mechanical means and the filter thereby reconditioned. A constant resistance such as is obtained with the automatic viscous filters cannot usually be maintained with dry filters. However, an *average* operating resistance results, provided the filter is properly maintained and reconditioned. Dry-air filters usually are made up in units which are assembled in groups in a manner similar to viscous cell filters.

AIR WASHERS

Information on air washers will be found in Chapter 30, Air Conditioning Apparatus.

DUST REMOVAL EFFICIENCY

The efficiency in dust removal of air-cleaning devices can be determined by means of tests made with air at stated capacities and with dust of definite quantity and quality. There are a number of excellent commercial instruments available for this purpose. The percentage of dust removal for commercial air-cleaning devices should range between 80 and 98 per cent, and the minimum removal under such conditions should be specified and guaranteed by the manufacturer.

RECOMMENDATIONS FOR AIR FILTER INSTALLATIONS

1. An air filter should be of ample size for the amount of air it is called upon to handle. An overload of 10 per cent to 15 per cent is regarded as the maximum allowable. When air volume is subject to increase, a larger filter should be installed.
2. Duct connections to and from the filter should change size or shape gradually to insure even air distribution over the entire filter area.
3. Filters should be installed so that the face area is at right angles to the air flow to avoid eddy currents and dead air corners.
4. If space is limited and uniform air distribution difficult to obtain, baffles or diffusers should be provided to distribute air flow equally over the filter area.
5. Sufficient space should be provided in front as well as behind the filter to make it accessible for inspection and service. A distance of two feet may be regarded as the minimum.
6. Access doors of convenient size should be provided in the sheet metal connections leading to and from the filters.
7. All doors on the clean air side should be lined with felt to prevent infiltration of unclean air. All connections and seams of the sheet metal ducts on the clean air side should be as airtight as possible.
8. Electric lights should be installed in the chamber in front of and behind the air filter.
9. Air washers should, whenever possible, be installed between the tempering and heating coils to protect them from extreme cold in winter time.
10. Filters installed close to air inlet should be protected from the weather by suitable louvers, in front of which a large mesh wire screen should be provided.

Chapter 34

FANS AND MOTIVE POWER

Classification of Fans; Characteristic Curves; Selection of Fans; Control; Designation; Arrangement of Drive; Motive Power; Electric Motors.

THE term *fan* is usually applied to equipment used for the purpose of creating air flow by any means, except positive displacement. Compressors or rotary blowers are used where positive displacement is required. In general, fans of all types can be made to perform the same duty, although mechanical difficulties, noise or lack of efficiency may limit the use to one or the other type as outlined under the heading, Selection of Fans.

CLASSIFICATION OF FANS

Fans may be classified according to the direction of air flow as follows:

1. Axial flow (flow parallel with axis).
   a. Disc type.
   b. Propeller type.
2. Radial flow (flow parallel with radius of rotation).
   a. Centrifugal type.
   b. Kinetic type.

Radial-flow fans include steel plate fans, pressure blowers, etc., while the kinetic type includes all the so-called multiblade fans. All the foregoing types have variations which may be obtained by slight modification of the proportions or change in the angularity of the floats. The angularity of the floats determines the speed characteristic of a centrifugal type of fan, the forward curve corresponding to slow speed and the backward curve to high speed operating characteristics.

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 VENTILATING ENGINEERS and the *National Association of Fan Manufacturers*. The results of tests are plotted in different ways; the abscissae may be the ratio of delivery assuming full open discharge as 100 per cent and the ordinates may be static pressure, dynamic pressure, horsepower

[1] A.S.H.V.E. TRANSACTIONS, Vol. 29, 1923 and revised June, 1931.