motion since any probable error in recording the time of fall will only amount to a small fraction of the total period. To calculate the air movement, obtain the dry Kata cooling power (H) in millicalories per second by dividing the Kata factor (F) engraved on the stem by the average time of cooling in seconds. The dry Kata cooling power is then divided by the difference between 36.5 C and the dry-bulb air temperature (Θ) and the velocity in meters per second (V) determined from the following equations:

For velocities above one meter per second

$$\frac{H}{\Theta} = 0.13 + 0.47\sqrt{V} \qquad (9)$$

For velocities below one meter per second

$$\frac{H}{\Theta} = 0.20 + 0.40\sqrt{V} \qquad (10)$$

Chapter 33

AIR CLEANING DEVICES

Requirements of an Air Cleaner; Types of Air Cleaners; Air Washers; Viscous Cell Filters; Viscous Automatic Filters; Dry Air Filters; Dust Removal Efficiency; Recommendations for Air Filter Installations.

EFFICIENT air cleaning devices serve to eliminate air borne impurities which are detrimental to human comfort and well-being and cause extensive property damage. Impurities of the air may be classified as dusts, fumes and smoke.

Dusts are particles which are large and heavy enough to fall with increasing rapidity, due to gravity, in still air. For instance, particles of flying sand or grit, such as are blown on a windy day, the average diameter of which is approximately 0.01 cm (100 microns), may be called dust. The great bulk of harmful impurities in the atmosphere belongs to the class of dusts which include products of combustion such as flue dust, soot and carbon; minerals such as silica dust and cement dust; organic dusts such as decayed animal and vegetable matter, bacteria. Under organic dust might also be included pollens and tree dusts, which are today regarded as causitive agents in hay fever and similar allergic disorders. The size of some of the pollens which are a most frequent cause of these disorders are:

Ragweeds	18 to 24 microns diam.
Timothy Grass, Johnson Grass, etc	40 to 50 microns diam.
Tree dusts, such as Maple and Oak	36 to 52 microns diam.

Fumes are smaller particles which fall with constant, rather than with increasing, velocity, due to gravity, in still air. The solid particles from atmospheric fog, for instance, are called fumes and have an average diameter of about 0.0014 cm (14 microns).

Smokes are particles which do not settle at all in still air, which diffuse constantly, and which are actuated by the Brownian motion, rather than by gravity. An example of this type would be certain smokes, the average diameter of the particles of which is about 0.0000015 cm (0.015 micron).

REQUIREMENTS OF AN AIR CLEANER

The first attempt at air cleaning for general ventilation work probably was by the use of dry screens. Since ordinary Portland cement passes a screen having 100 mesh to the inch, it is apparent that much dust may pass the finest screen. When a fine screen is moistened, not only the dirt ceases to pass but also the air passages clog so that the filter becomes