DESIGN OF SYSTEMS

Various factors are to be considered in the design of a central system, some of which have been touched upon in the foregoing as a modification or economic factor, while others are a part of the normal design procedure. These, in the order of usual occurrence are discussed herewith. For practical purposes these factors cover *Year 'Round Air Conditioning Systems*. Those directly applicable to summer only or winter only systems are to be viewed accordingly.

Design Conditions

Physiological principles and design conditions are covered in Chapter 2. A detailed study of these is beyond the scope of this chapter other than certain recommendations with regard to their application.

Where extreme or unusual outdoor conditions prevail for long periods of time, such as in the tropics, at high altitudes, in regions of extremely

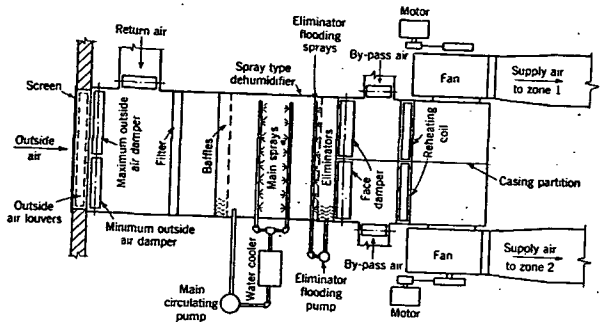


FIG. 6. CENTRAL SYSTEM USING MULTIPLE FANS WITH BY-PASSES AND REHEATING FOR ZONING

low humidities, etc., due allowance must be made for the fact that the people have become acclimatized, to a certain degree at least, to these conditions and the inside conditions should be selected accordingly.

A change in the inside conditions from a set standard sometimes is warranted from an economic standpoint. It is possible at times to make substantial savings in initial and operating costs by maintaining a lower temperature and higher humidity in the conditioned space while maintaining the same effective temperature.

In winter, the matter of condensation on windows, walls, etc., is of extreme importance. Humidities low enough to avoid this should be maintained, and when it is necessary to carry the higher humidities, double glass should be used or suitable means of handling the condensation should be provided.

During intermediate seasons the use of refrigeration as a source of cooling may be undesirable from an operating cost standpoint depending on the local energy rate structure and demand charges. As a result the

use of outdoor air, either directly or indirectly, as a source of cooling will be required and the system may have to operate on an unusual basis with regard to the temperatures and humidities that can be maintained. This situation should be carefully investigated. As a rule, provision should be made for introducing all outdoor air into the system during intermediate seasons as described later.

With regard to outside conditions it must be noted that where systems are to operate at certain hours of the day only, the outside conditions that occur during these times can be used provided the cumulative effect or heat gain lag is taken into consideration in the estimate.

Outdoor Air

Standards affecting the quantity of outdoor air have been established in Chapter 2. These standards relate the minimum amount of outside

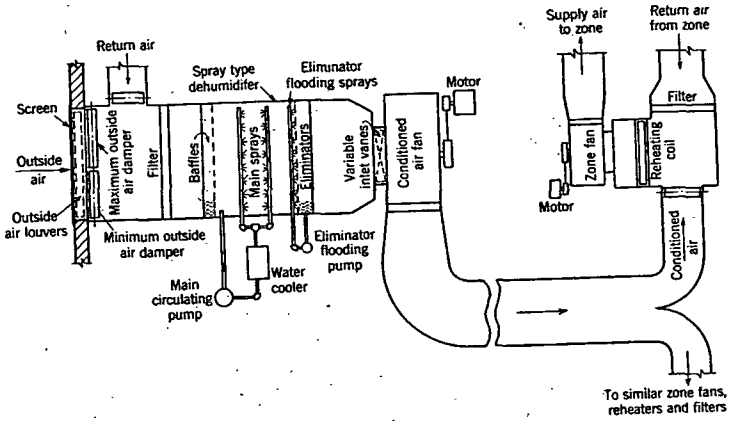


FIG. 7. CENTRAL SYSTEM WITH CENTRAL FAN AND CONDITIONER AND WITH INDIVIDUAL ZONE FANS

air to be introduced into the conditioned space for both the number of occupants and the type of occupancy, *i.e.*, people smoking, etc. This, of course, is the common-sense approach to the problem, but there are some cases, such as those spaces having a very low occupancy with regard to the cubical content where mustiness may develop unless a sufficient air change is provided. Where such a condition exists in a few spaces out of several which are being handled by a central system, the *averaging* ability of the central system may cope with the situation satisfactorily. This is due to the fact that the return air from the particular space is mixed thoroughly with the return air from all the other spaces, and all the outside air supplied to all the other spaces.

It should be noted that the minimum quantity of outdoor air is affected by infiltration and leakage. Infiltration will reduce the quantity to be introduced by the system while leakage may have to be offset by an increase in the quantity of outdoor air.