

portant since the loss of revenue is directly chargeable to the operating cost of the system. Consideration of the spaces available with respect to the type of system and method of distribution used and their effect on over-all cost is essential.

Initial cost is given first consideration all too frequently. While elaborately designed installations are seldom justifiable, proper consideration must be given to operating costs and maintenance, performance required, and the life of the system. The increase in cost incurred by suitable zoning can be offset partially by reduced quantities of dehumidified air, and partially by reduced refrigeration requirements. In the end it may prove less expensive than an unsatisfactory single zone system. A small increase in initial cost to provide better access to equipment, better airflow and distribution, and better zoning, usually will pay for itself.

Operating costs often receive too little attention. Proper relationship between equipment selected and the load to be carried must be obtained.

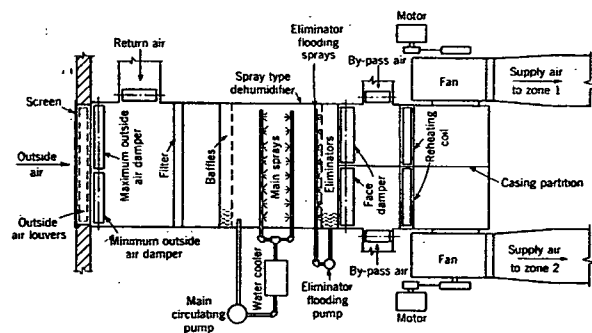


FIG. 6. CENTRAL SYSTEM USING MULTIPLE FANS WITH BY-PASSES AND REHEATING FOR ZONING

Cooling systems in general operate at maximum capacity less than 20 per cent of the time and heating systems operate under design conditions but a few days in the year. Good partial load performance is essential for low operation costs. Proper zoning, good arrangement and selection of equipment and type of system all tend to reduce operation costs. Central systems having the bulk of equipment in a central location properly arranged, and having only the equipment required for zoning distributed through the conditioned space or spaces, will have relatively low maintenance costs. Care must be used to provide ease of access to important equipment and those items requiring servicing.

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 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

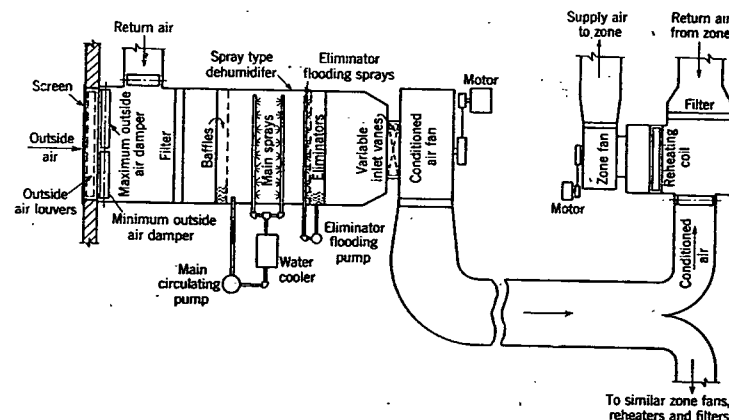


FIG. 7. CENTRAL SYSTEM WITH CENTRAL FAN AND CONDITIONER AND WITH INDIVIDUAL ZONE FANS

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 may 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.

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