

Cooling Load

The method of determining the cooling load for a conditioned space or spaces is outlined in Chapter 15. As pointed out therein, many of the items of heat gain are variable and do not reach their maximum values simultaneously. Proper consideration of these *peaks* and the avoidance of pyramiding these peaks in the cooling load calculations are stressed. Maximum solar heat gain on an east exposure is seldom coincident with the maximum outdoor wet-bulb.

A large difference in the incidence of the peaks between various spaces or parts of the same space indicates the necessity for zoning. In a building having an east and west exposure where solar heat gain forms a fair share of the cooling load, the times of their individual peaks are apt to be hours apart, and the peak load of one plus the off peak load of the other will be

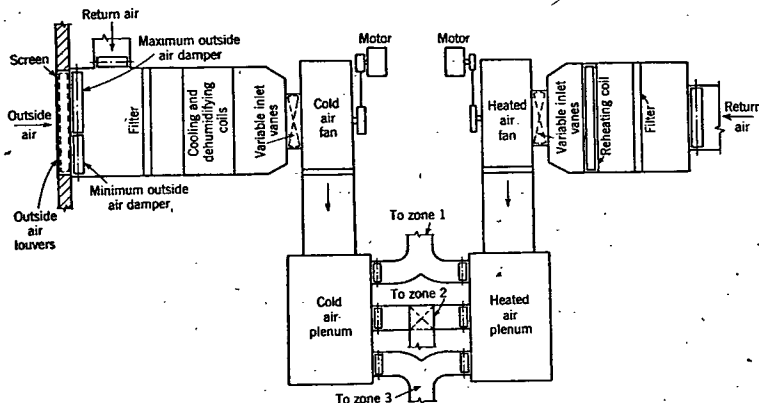


FIG. 9. CENTRAL SYSTEM USING DUAL DUCT METHOD OF ZONING

substantially less than their combined peak loads. Proper zoning will permit taking full advantage of this condition or similar conditions of non-simultaneous peaks and will result in a lower total load, reflecting itself in savings in equipment.

A factor, similar in effect and closely related to the non-simultaneous occurrence of peak loads, is *diversity*. Typical of this is the case of a large department store where the air handling equipment serving a certain space must be sufficient to handle the load created by the throngs of people attending sales in that space. Under such a condition the number of people in other spaces is usually normal or below. While this means that the air handling equipment for certain departments must be large enough to cope with the situation, the refrigeration equipment must be only large enough to handle the average maximum. If a system employing zone recirculating fans and a single central fan and dehumidifier were used, the saving would be reflected in the capacity of the central fan and dehumidifier. Another example of this diversity is found in an office building having restaurants and stores of certain types on the first floor and basement. At noon, when the restaurants and stores are crowded, the offices are below normal occupancy.

Heat lag should be carefully considered in the cooling load calculations.

In certain types of building construction the effect of solar radiation is still apparent hours after the sun has shifted from that exposure. In other types having a much lighter construction, the heat gain due to solar radiation decreases markedly with the passing of the sun. Some walls, having been warmed by the sun, may radiate heat long after the passing of the sun, thus requiring lower inside temperatures to offset the radiant energy.

Storage effect is usually present in some degree. Often it can be utilized to great advantage and it has more than once provided an unknown safety factor. If a space is kept below the design inside temperature for a period of time, the interior walls, floors, furniture and fixtures begin to assume the temperature of the space. Where the period of time is sufficient, the entire mass may reach the room temperature, rather than just the skin or surface of the item. Thus, when a space has been pre-cooled below the

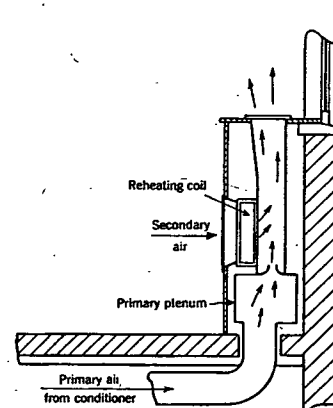


FIG. 10. INDUCTION UNIT (LOW PRESSURE TYPE)

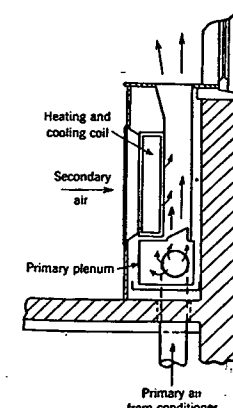


FIG. 11. INDUCTION UNIT (HIGH PRESSURE TYPE)

design maximum temperature for a period of time prior to the advent of the peak load, and the heat gain begins to increase to peak conditions, some of the increase is used in raising the temperature of the furniture, fixtures, etc., to the design conditions and the cooling load can be reduced accordingly. However, unless very accurate data with regard to the mass, surface, specific heat, etc., of the items within the space are available, due caution must be used in discounting the cooling load for this storage effect. In the absence of reliable data it is often a matter of experience rather than calculation.

Where air conditioning supply and return ducts pass through unconditioned spaces there will be a transfer of heat from these spaces to the air in the ducts, even though these ducts are well insulated. An allowance should be made for this heat gain and included in the heat estimate so that air can be supplied at a temperature low enough to offset the rise caused by this heat gain (see Chapter 41). There will also be some heat gain to the air in ducts passing through conditioned spaces, but since a cooling effect is produced in the space through which the duct passes,