

through the ducts, as well as in poor control. Too high a supply air temperature may result in excessive initial and operating costs. Suggested limits for the effectual temperature difference are from 12 to 20 deg, the actual selection being based on the requirements of the particular case. For winter air conditioning, too high supply air temperatures result in excessive heat losses from the ducts and stratification within the room unless thorough mixing is assured, while too low supply air temperatures may cause drafts, high operating costs, etc. Suggested limits are from 15 to 35 deg. There can be no set rule, and each case should be judged according to its particular requirements of the installation.

Reference may be made to Chapter 31 for further discussion of the most satisfactory design difference between the entering air temperature and volume in relation to the desired room condition.

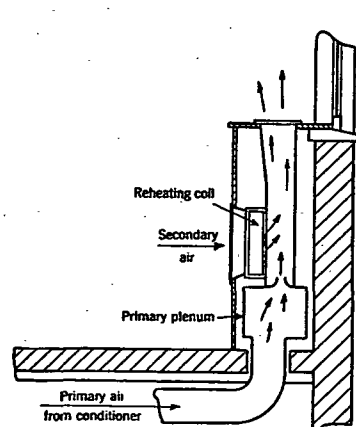


FIG. 4. INDUCTION UNIT
(LOW PRESSURE TYPE)

INDUCTION CONVECTORS—LOW PRESSURE TYPE

Induction convectors located in the room that is to be served, utilize a jet of primary conditioned air to mix with a stream of secondary room air as shown in Fig. 4. The mixture is discharged into the room through a grille at the top of the convector. Heating coils are located in the secondary air stream. The output is controlled either by manually or automatically throttling the air jet. Heat may be supplied to the coil in summer as well as in winter. These induction convectors present several advantages. Since the secondary air stream is thoroughly mixed with the high velocity low temperature air stream before leaving the discharge outlet of the device, the resultant temperature of the mixture is satisfactory even though the primary air is introduced at a temperature too low for ordinary methods of distribution. One of these devices usually is provided under each window in place of the customary direct radiator, and combines the air distribution system with the heating system. An air conditioning system without induction convectors may require installation of direct radiation for maintenance of minimum temperatures during air conditioning shut-down periods, but when induction convectors are used they may be selected with heating coils of sufficient capacity to

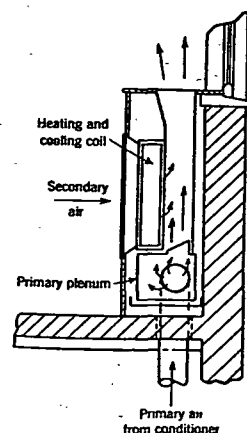


FIG. 5. INDUCTION UNIT
(HIGH PRESSURE TYPE)

maintain, by thermal circulation, a reasonable temperature when the primary air supply system is shut off. The use of low temperature, dehumidified air which has not been reheated or mixed with room air before delivery to the room, may permit a reduction in fan capacity and the use of smaller ducts. In some cases a by-pass may be desirable in order to maintain the primary air volume and to provide additional control. This system can provide a degree of zoning that is usually difficult with conventional design since the air delivered by each unit can be controlled individually. Selection of induction convectors should be made with due regard to noise level. The inductive capacity of the device increases with the jet velocity, but high jet velocities may result in objectionable noise.

INDUCTION CONVECTORS—HIGH PRESSURE TYPE

Another type of induction convector, Fig. 5, employs nozzles which produce a high velocity air jet without objectionable noise. The term, high pressure, is to some extent inaccurate, since the air pressure at the nozzles, while several times that used with a low pressure induction convector, is still less than the total resistance pressure of a conventional central system. The high velocity jet of primary air induces a flow of air from the room through coils located in the secondary air stream and supplied with chilled water in summer and with hot water in winter. The chilled water removes a large portion of the sensible heat in summer and the hot water supplies the sensible heat loss in winter. The primary air is delivered at a sufficiently low dew-point to compensate for the latent heat gain in summer. In winter the primary air is supplied at a sufficiently high dew-point to take care of latent heat losses. Control of temperature is obtained by throttling the water quantity supplied to the secondary coil. The required flow of primary air is greatly reduced due to the fact that a portion of the sensible heat load is carried by the secondary air stream. Since the primary quantity is small, very high velocities can be maintained in the supply ducts without requiring fan power in excess of that for a conventional system. Therefore, the supply ducts or pipes can be very small and can be run in chases, or furred in at columns along with the water pipes. The primary air is treated in the usual manner to reach the required dew-point and a surface or spray dehumidifier or a dehydrator may be used. The primary air quantity is sufficient for ventilation purposes and frequently consists entirely of outdoor air. The water piping for the coils can be so valved that hot water will be supplied to one zone that may require heating, while cold water may be supplied at the same time to a zone that requires cooling.

This system usually is limited in application to hotels, apartments, office buildings and other multi-room installations having a large perimeter with relation to the floor area. The units usually are installed beneath the windows, replacing direct radiation or thermally-circulating enclosed convectors. Where the spaces to be conditioned extend a considerable distance from the outer wall into the interior of the building, a separate system or zone for the conditioning of the interior portions may be required.

EVAPORATIVE COOLING

In climates where, on the hottest days, the outdoor wet-bulb depression is relatively great, it may be possible to replace mechanical refrigeration, or other cooling sources, and use the evaporative cooling effect. A well designed air washer using recirculating sprays will reduce the entering dry-bulb temperature to within a degree or two of the entering wet-bulb condi-