

### **SENSIBLE COOLING WITH UNWETTED COILS**

Under favorable atmospheric conditions where a large wet-bulb depression exists and the dew-point of the outdoor air is sufficiently low at all times, acceptable cooling may be obtained by removing only the sensible heat from the outdoor air delivered to the rooms. Under this condition of a great wet-bulb depression, a temperature-reducing coil may be located in the air stream and supplied with water from a cooling tower. When humidity control is desired, sprays to saturate or partially saturate the air may be used down-stream from the unwetted coil. Saturation or partial saturation after the coil will reduce further the dry-bulb temperature and the air quantity required. This system has very definite application in hot dry climates.

### **RUN-AROUND SYSTEM**

An interesting method of control is found in the use of combined reheating and precooling usually termed the run-around system. Typically three coils are placed in series in the air stream. The primary one receives liquid that has been cooled in the third coil. The center coil is maintained at a temperature colder than the dew-point of the air. The primary coil thus pre-cools the air and the third coil reheats the saturated air from the center coil. The third coil is heated by the relatively warm water coming to it from the primary coil. The run-around scheme has the advantage of permitting a higher supply air dew-point temperature than would be possible otherwise. This is due to the fact that continual reheating is available, which is not a large penalty on the refrigeration plant since it provides precooling at the same time. This reheating at peak load creates an artificial sensible heat gain which increases the ratio of sensible heat to total heat and for a given room temperature results in a higher apparatus dew-point. Thus, while the volume of supply air is increased, the low-side temperature level of the refrigeration plant is raised and this may effect savings in initial and operating costs. The run-around system has the disadvantage of providing a decreasing amount of heat for reheating as the demand for reheating increases.

### **SELECTION OF TYPE OF SYSTEM**

If the perimeter of the building is large with regard to the area, and if there are many rooms, induction convectors of either the low or high pressure type may be employed. Occasionally a dual system, one duct carrying air at a warmer temperature than the other, may be considered.

Low buildings with large floor areas may be divided into sections or zones with separate central air supply systems to facilitate temperature control. In the case of large department stores it may be possible to provide a single conditioner with a fan delivering the conditioned air to local mixing fans which supply the various departments or spaces. This application is limited by the practicability of running the large conditioned air ducts to the various recirculating fans. Each vertical section of the building also may be supplied by a separate fan delivering conditioned air to local mixing fans. In many cases the most economical and satisfactory scheme may be to employ a hot water or steam reheater in each branch duct to each room. Where vertical sectionalizing is not indicated, the building may be divided into horizontal groups, each handled by a central system and adequately zoned. In some large

buildings, apparatus rooms for the systems may be located in the basement and in the attic and on intermediate floors.

In high buildings the necessity for horizontal sectionalizing may be suggested by the size of air supply and return risers and by the extent to which they encroach upon usable space. Each story should be cut off by doors from other stories as otherwise the cool air tends to collect in the lower story and the warm air is forced to the upper story.

Balconies and large lobbies in theatres and similar high rooms frequently justify the use of separate zoning fans, to counteract the tendency of the heavier, cooler air to collect at the lower levels.

Fans operate at full capacity continuously in many systems and therefore should be selected for good efficiencies. In winter when higher temperature differentials are used, it is sometimes practicable to deliver smaller air quantities than when cooling.

In climates where winter temperatures fall below freezing, the tempering coils should be of the steam-distributing type; or if they are heated by a liquid, this liquid should contain some anti-freezing substance such as ethylene glycol. If hot water is employed in cold climates, the temperature control of the air should be obtained through use of face and by-pass dampers rather than by throttling the valves, to prevent damage due to freezing.

If zone reheaters placed in supply duct branches are employed, they should be of such type as to be heated over the entire surface so that no temperature-stratification can occur in the delivered air. Steam distributing-tube coils or mechanically circulated water coils are serviceable in such cases and throttling valves may be used.

Refrigeration equipment must be carefully selected to satisfy the particular requirements of each installation. For some small plants the evaporator may be placed in the air stream, when type of refrigerant and nature of occupancy permit. In many cases, chilled water coils are required by considerations of safety. Where low temperature and relative humidity are necessary, brine, often of calcium chloride, may be indicated.

Condensing requirements must have economic analysis. Wells, public water service, cooling towers and evaporative condensers present possibilities for consideration. Condenser water may have a secondary use for roof sprays in hot weather, and is usually suitable for lawn sprinkling. Most health department rules in cities prohibit any connection from refrigerant condensers that might permit the water to be used for drinking or lavatory purposes.

Practically without exception, air cleaners should be provided for both outside and recirculated air.

Control of temperature and of relative humidity by automatic means is vital, if comfort and economical operation of air conditioning equipment are to be attained.

The insulation of ductwork is not merely a matter of economics but sometimes is a necessity from the standpoint of limiting the temperature change of the air between the conditioning apparatus and the point of final delivery. Such temperature change of the air should be taken into account when apportioning the air and sizing the ducts. When computing heating or cooling loads, due allowance must be made for the effect of any hot or cold ducts or pipes contained in the space under consideration and insulation must be incorporated where necessary or justified. Con-