

Where a number of rooms are to be heated and ventilated through one central fan system it is customary to provide tempering heating units, automatically controlled to provide a minimum temperature for ventilation only and additional heating units to supply the heating requirements. These reheating units may be located in the various branch ducts to the different rooms, each under control of its individual room thermostat, or individual ducts may be run to the various rooms from the central unit. In this case reheater coils are provided to maintain a predetermined temperature in a warm air chamber. Each room duct is connected to this warm air chamber and to the tempered air supply, and through the action of a room thermostat on a gradual-acting double-mixing damper the proper proportions of warm and tempered air are secured to maintain desired conditions in the room.

In all types of central fan systems, the outdoor air damper is usually opened and closed by a damper motor controlled from a manual switch

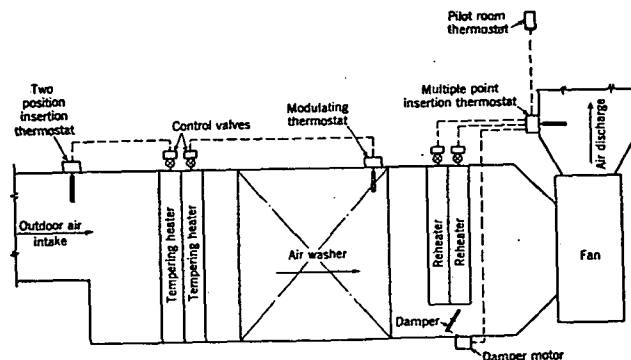


FIG. 3. CONTROL OF VENTILATING SYSTEM WITH AIR WASHER USING PILOT THERMOSTAT

or by a relay in the fan motor circuit, so arranged that when the fan motor is started, the relay causes the damper motor to open the outdoor air damper.

Recirculating and vent dampers may also be opened and closed by means of damper motors controlled from remote locations. Generally these damper motors are positive acting and are either completely open or closed. However, in some cases, where part outdoor air and part recirculated air is desired, it is advantageous to control the dampers so that definite proportions of damper opening area exist. In some installations the control of outdoor air and recirculating dampers is under the command of a thermostat at the intake to the conditioner, in which case the proportions of outdoor and recirculated air are fixed by the resultant temperature of their mixture. This arrangement tends to reduce the amount of outdoor air used as the outside temperature is lowered.

The operation of a central fan system during the heating cycle often results in unfavorably low relative humidity and the provision and control of humidity becomes an important factor of the system. If water spray humidification is used, control may be effected by a humidity con-

troller actuating a control valve in the water supply to the sprays. If steam humidification is used, either of the steam jet type or of the steam heated evaporating type, the flow of steam may be controlled from the humidity controller in the ventilated space. Where an air washer is used, approximate control of humidity may be obtained by maintaining the air temperature in the air washer at a predetermined desired dew-point temperature.

For example, the dew-point temperature at 70 F and 40 per cent relative humidity is 45 F. Therefore, if the air temperature is maintained at 45 F as it leaves an air washer (assuming it is fully saturated) and then is heated to 70 F, it will have a relative humidity of 40 per cent. If it is desired to maintain these conditions in a given space, the air temperature can be raised to any necessary point, say 120 F (at which the relative humidity will be only 9 per cent). When the heat in the air has been dissipated, the space temperature being maintained at 70 F, the relative humidity will be 40 per cent.

Whenever moisture is being added to the air during the heating cycle by the use of a spray or any other means, a considerable amount of care must be used in order to prevent frost from collecting on the windows due to the air being reduced below its dew-point at the inside surface of the windows.

Cooling Cycle

Central fan cooling systems are divided into two general groups based upon the methods employed to control the temperature and humidity of the treated space. Cooling normally involves the removal of moisture from the air, and to accomplish this end the temperature of the air must be lowered below the dew-point. The air at this low temperature must then be treated or introduced into the room in such manner as to avoid uncomfortable cold drafts.

In the first group the air is supplied from the conditioner after being cooled and dehumidified to a fixed temperature and humidity and then before entering the treated space is reheated. This is accomplished either by passing the air through coils heated with steam, hot water, or other heating medium, or the air from the conditioner is mixed with recirculated air before entering the conditioned space.

In the second group are those systems which use the treated space as a mixing chamber, the air being supplied to it at the temperature and humidity leaving the conditioner and depending upon diffusion in the conditioned space to give ultimately the correct conditions. In these systems the temperature and humidity of the treated space are measured and govern, through control of the cooling means, the temperature and the humidity of the air leaving the conditioner.

In Fig. 4 is represented one of the most simple central fan types of cooling system. Thermostat *T* measures the temperature within the treated space and operates to start and stop the refrigeration compressor or to control the supply of refrigerant to the cooling unit as required to maintain a fixed temperature in the space.

There are three general methods for the control of relative humidity in central fan cooling systems, which are: