

and an average body surface of 19.5 sq ft and 15.5 sq ft for convection and radiation respectively, an equivalent effect can be considered on two cylinders 5 ft 8 in. high by 13.15 in. diameter and 10.45 in. diameter respectively.

BRITISH EQUIVALENT TEMPERATURE

The British Equivalent Temperature (BET) is the temperature of an environment which is effective in controlling the rate of sensible heat loss from a sizable black body in still air when the body has a maintained surface temperature equal to that of the human body. The BET is, therefore, a function of both the air temperature and the mean radiant temperature. Its numerical value in a uniform environment (walls and air at the same temperature) is equal to the temperature of the walls and the air. In a non-uniform environment (walls and air at different temperatures) the BET for America is at present considered to be equivalent to that of a uniform environment in which an 83 F surface loses sensible heat at the same rate as it does in the non-uniform environment. As originally defined, the BET was based on a body surface temperature of 75 F, but 83 F has been accepted as giving results more nearly conforming with American practice⁴. Temperatures selected depend on the clothes worn by the individual, which explains why ladies in evening dress desire a higher body surface temperature than a man dressed in evening suit leaving only hands and head uncovered.

For accurate calculations it would be more logical to assume a body surface temperature applicable to the room being occupied, but for general purposes it is considered sufficient to take an average of 83 F for all rooms. The higher the BET the less the heat loss from the body, as the rate of loss in still air is approximately proportional to the difference between the BET and the mean body surface temperature.

If the BET were 83 F, there could be no sensible heat loss from a surface at that temperature; so the temperature of a normal body surface would have to rise to a point where the heat generated in the tissues could be dissipated.

APPLICATION METHODS

There are several methods of applying radiant heating, as follows:

1. *By warming the interior surfaces of the building.* Pipe coils are embedded in the concrete or plaster of the walls or ceilings, the heating medium being hot water circulating through the pipe coils. These coils are generally constructed of small pipe spaced about 6 in. apart (Fig. 1). This has the effect of warming the entire concrete or plaster surface in which the pipes are embedded. Since the temperature of the heating medium should not exceed about 130 F due to the possibility of cracking the plaster, the area of the panel must be sufficient to supply the requisite quantity of heat at this low temperature. When carefully designed, this method produces comfortable and economical results, but offers some slight obstacles when alterations or additions to the building are desirable. Normally the hot water circulation is maintained by means of a circulating pump and facilities have to be provided to eliminate all air at the top of the system. All of the pipes are welded together and tested after erection to a hydraulic pressure of 500 lb per square inch.

⁴A.S.H.V.E. RESEARCH REPORT No. 962—Application of the Eupatheoscope for Measuring the Performance of Direct Radiators and Convectors in Terms of Equivalent Temperatures, by A. C. Willard, A. P. Kratz, and M. K. Fahnestock (A.S.H.V.E. TRANSACTIONS, Vol. 39, 1933, p. 303).

2. *By placing hot water or steam pipes under the floor.* With this arrangement the whole floor surface of a room is raised to a temperature sufficient to give comfortable conditions. This method is used extensively for schools and hospitals where large quantities of outside air are desirable (Fig. 2). In some cases special floors are con-

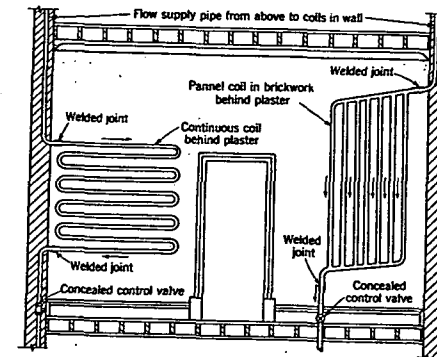


FIG. 1. PIPE COILS LOCATED IN INTERIOR WALL SURFACES

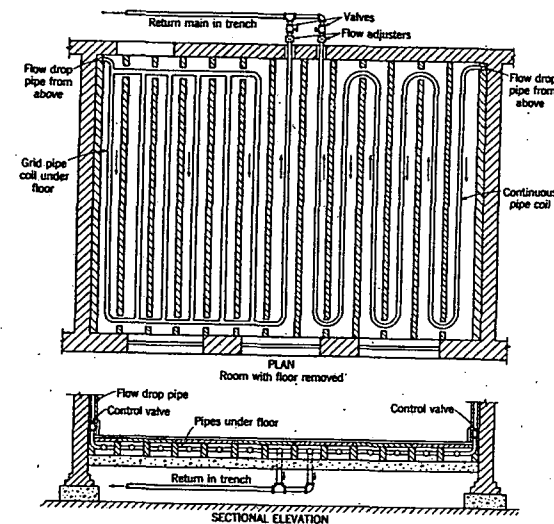


FIG. 2. ARRANGEMENT OF CONTINUOUS PIPE COIL IN FLOOR CONSTRUCTION

structed in sections so that a whole floor can be lifted to examine the pipes. The floor surface may be of concrete, wood blocks, marble or any other material unaffected by heat. Pipes under the floor may be larger than those embedded in the plaster walls and ceilings.

3. *By circulating warm air through shallow ducts under the floor.* In this design the entire floor surface of a room is heated as in method 2. This method while being more