BRITISH EQUIVALENT TEMPERATURE

The British Equivalent Temperature (BET) is the mean temperature of the entire environment which is effective in controlling the rate of sensible heat loss from a *black body* in still air when this body has a surface temperature equal to that of the human body, and a size comparable to the human body. The BET is, therefore, a function of both the air temperature and the mean radiant temperature of the surrounding objects. Its numercial value in a uniform environment (walls and air at the same temperature) is equal to the temperature of the walls and air. In a non-uniform environment (walls and air at different temperature), the BET for America is at present considered to be equivalent to that of a uniform environment in which a body with an 80 F surface temperature will lose sensible heat at the same rate as in the given non-uniform environment. As originally defined (in England) the BET was based on an average body surface temperature of 75 F, while 80 F seems to be more nearly conforming with American conditions. The most suitable temperature to assume will depend in part on the clothes worn by the individual. This explains why ladies in evening dress require a higher BET for comfort, than a man having only hands and head uncovered. The higher the BET, the less the heat loss from the body, as the rate of heat loss in still air is approximately proportional to the difference between the BET and the mean body surface temperature.

If the BET were 80 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. Broadly speaking, it may be stated that with a BET of about 65 F to 70 F, the sensible heat losses from the assumed average individual will approximate those stated on page 800.

APPLICATION METHODS

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

1. *By warming the interior surface 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 ½ or ¾ in. I.D. and spaced about 6 in. to 9 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 never exceed about 130 F (due to the possibility of cracking the plaster) the area of the warmed surface must be sufficient to supply the requisite quantity of heat at this low temperature. When carefully designed, this method produces very comfortable results and great operating economy, 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 coils and circulating pipes are welded together and tested after erection to a hydraulic pressure of 300 lb per square inch.

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 recommended for schools and hospitals where large quantities of outside air are desirable (Fig. 2). In some cases special floors are constructed in sections so that a whole floor can be lifted to examine the pipes installed under the floor. 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 floor or 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 Fig. 3. This method was used 2000 years ago in many parts of the Roman Empire. While this method is more expensive in construction, it is effective and quite suitable for cathedrals and large public buildings. To provide a uniform floor temperature, one should give special consideration to the design of the air ducts so that equal heat distribution is obtained.

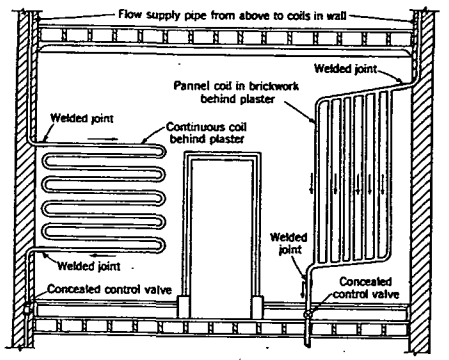

FIG. 1. PIPE COILS LOCATED IN INTERIOR WALL SURFACES

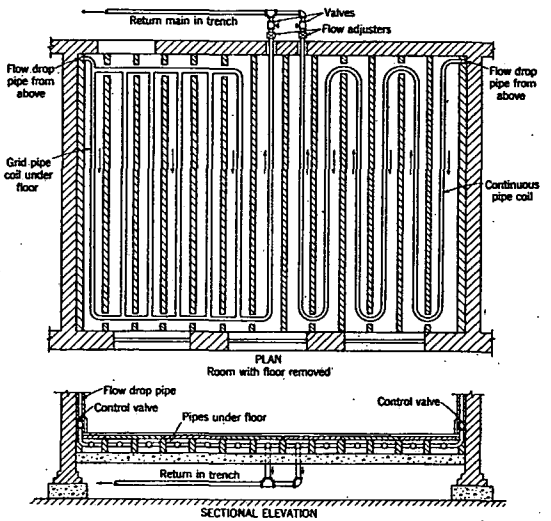

FIG. 2. ARRANGEMENT OF CONTINUOUS PIPE COIL IN FLOOR CONSTRUCTION

4. *By attaching separate heated metal plates or panels to the interior surfaces.* These plates or panels are placed either in an insulated recess so that the surface of the panel is flush with the surface of the walls or ceilings, or they may be secured to the face of the wall. They may be covered with wood veneers and decorated to harmonize with other parts of the room, or they may be cast into panels to imitate oak or other wood designs.