Assuming heat losses from the room in Table 3:

Area Square Foot		Btu per Hour
297 External Wall	(U = 0.25) 297 × 0.25 × 65 F =	4,820
279 Glass	(U = 1.13) 279 × 1.13 × 65 F =	20,476
480 Inner Wall	(next to heated room)	
480 Ceiling	(heated surface)	
480 Floor	(U = 0.10) 480 × 0.10 × 65 F =	2,490
5760 cu ft Infiltration	1½ Changes per hour 0 F to 65 F =	10,200
Total		37,986 Btu per hour

Therefore the total number of Btu per hour to be supplied to the room will be 37,986 of which 10,200 will be for ventilation.

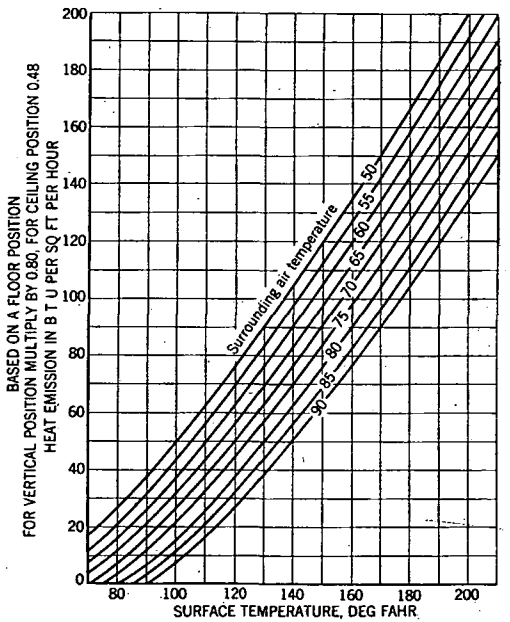

Fig. 8. Heat Emission by Convection from Radiant Heat Panels with Still Air at Various Temperatures

The ceiling with a surface temperature of 115 F and a surrounding MRT of the unheated surfaces of 54 F will emit 56 Btu per hour by radiation (see Fig. 7), and with an air temperature of 65 F will emit (50 × 0.48) = 24 Btu per hour by convection (see Fig. 8).

480 sq ft × 56 = Total by radiation = 26,880 Btu per hour
480 sq ft × 24 = Total by convection = 11,520 Btu per hour

Total = 38,400 Btu per hour

The difference between 38,400 and 37,986 Btu per hour gives a margin of 414 Btu per hour.

Should more heat have been required for ventilation, this could have been supplied by adding wall panels or by introducing direct ventilation with air introduced to the room at the correct temperature.

MEASUREMENT OF RADIANT HEATING

Convection heating, intended to maintain a given air temperature, is best measured by thermometric methods, which indicate the air temperature, and not the rate of heat loss from the human body. Radiant heating, on the other hand, aims to control this rate of heat loss and can be measured only by calorimetric methods.

The apparatus for this purpose consists essentially of a cylinder, maintained at the accepted mean surface temperature of the human body, together with an accurate (usually electrical) measuring of the varying rate of heat supply required to maintain this exact temperature. This instrument, the *eupatheoscope*, is readily adapted to function like a thermostat so as to turn heat on or off, when the desired temperature of 80 F, or any other predetermined surface temperature of the cylinder, decreases or increases as a result of changes in the BET.

For testing work, the *globe thermometer* is a useful instrument. It consists of an ordinary mercury thermometer, with its bulb placed in the center of a sphere from 6 to 9 in. in diameter, usually made of thin copper and painted black and sometimes covered with cloth. The temperature recorded by therometer with its bulb in the center of the sphere is termed the *radiation-convection temperature.*

CONTROL OF RADIANT HEATING

The effectiveness of any control depends on the time lag of the system. With warm air passing through floor ducts the time lag is usually too long for a room thermostat, and with massive brickwork and masonry it is too long for any control except a time control operated by outside conditions. Hot water pipes embedded in the plaster of ceiling and walls or in the concrete of a floor may be effectively controlled by a suitable instrument which will control the temperature of the water circulating in the system by the outside conditions. Metal panels installed on the ceiling or side walls may be controlled by the outside weather conditions or by a room thermostat.

One type of room instrument consists of a blackened copper sphere of 6 or 8 in. in diameter, in which a cylindrical sump contains a volatile liquid. A small electric heating coil creates in the sphere a vapor pressure which remains constant as long as the total heat loss from the sphere is at the desired rate. If the BET becomes too high for comfort, a greater vapor pressure results from the smaller heat loss from the sphere. This acts on a diaphragm and turns down the supply of heat to the room. With too low a BET the reverse action occurs. A similar instrument which has an electric heating element for warming the air inside the sphere and thermostat operated switch is also used for controlling room conditions.

FUEL CONSUMPTION

Because of the lower air temperature necessary with radiant heating, there is a possible saving in fuel consumption. This saving depends very largely on the method employed to heat the surfaces and the provision made to prevent heat passing from the coils to the earth or outside air.