SSHC, INC.
ENERJOY RADIANT PEOPLEHEATER®

CHARACTERISTICS OF RADIANT HEAT

MAXIMUM COMFORT AND CONTROL IN HEATING

SYSTEM CONCEPTS

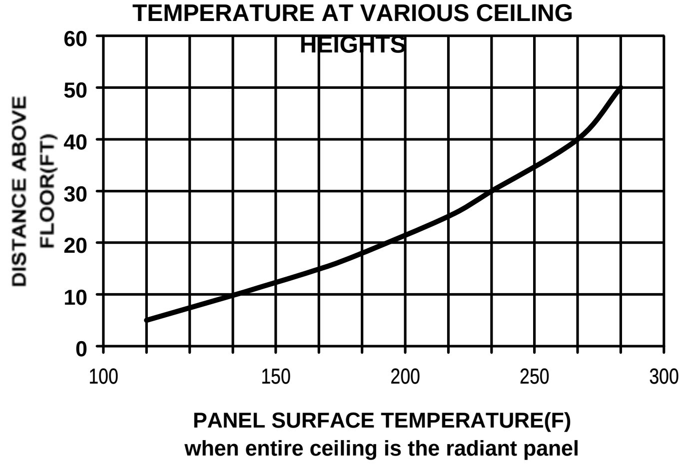
All bodies with a temperature above that of absolute zero emit rays, and the wavelength depends on the temperature of the body surface. Every facet of the surface emits rays in straight lines at right angles to the facet. The surface of concrete or rough plaster, when examined under a microscope, is covered with numerous facets, all giving off radiant energy. On the other hand, the examination of polished steel or similar polished surfaces shows no such facets. Thus, a rough surface is more efficient for emitting heat rays than a polished surface.

The invigorating effect of radiant heat is experienced when the body is exposed to the sun's rays on a cool but sunny day in spring. Some of these rays which impinge on the body come directly from the sun and include the whole range of ether waves, while other rays coming from the sun impinge on surrounding objects where they are increased in wavelength and reflected to the body as low temperature radiation, thereby producing a comfortable feeling of warmth. Should a cloud pass over the sun, there is instantly a sensation of cold; although in such a short interval, the air temperature does not vary a fraction of a degree.

In searching for the correct conditions which are compatible with the physiological demands on the human body, no system can be rated as completely satisfactory which does not satisfy the three main factors controlling the heat loss from the human body: namely, radiation, convection, and evaporation. It is sometimes thought that radiant heat system is desirable for only certain buildings and in some climates, but is not desirable otherwise. However, wherever people live, these three factors of heat loss must be considered. It is equally important to provide the correct conditions in a very cold climate as in one of moderate temperature. The problem of maintaining the correct comfort conditions by low temperature radiation is not insurmountable for even the most severe weather conditions.

Panel heating and cooling systems function on the basis of providing a comfortable environment by controlling surface temperatures and minimizing excessive air motion within the space. Comfort, as defined by ASHRAE Standard 55-74, is "that condition of mind, which expresses satisfaction with the thermal environment." The person is not aware that his environment is being heated or cooled. Recent study has given us better insight on the human body and its response to the surrounding environment. The mean radiant temperature (MRT) strongly influences the feeling of comfort. When the surface temperature of the outside walls, particularly those with large amounts of glass, begins to deviate excessively from the ambient air temperature of the space, it becomes increasingly difficult for convection systems to counteract the discomfort resulting from cold or hot walls. Heating and cooling panels neutralize these deficiencies and minimize excessive radiation losses from the body.

Figure 1
SUGGESTED DESIGN CEILING SURFACE TEMPERATURE AT VARIOUS CEILING HEIGHTS

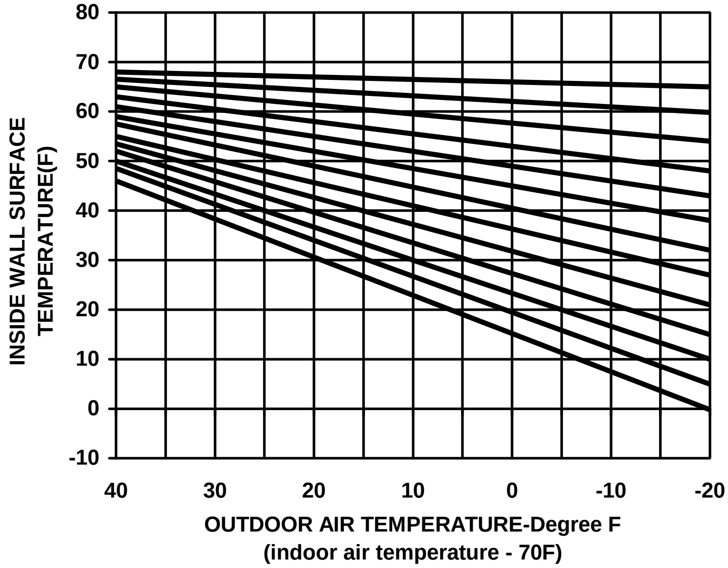


Panel Heating and Cooling Systems

Unlike most heat transfer equipment where performance can be measured in specific terms, the performance of the radiant panel is related directly to the structure in which it is located, and an evaluation and an evaluation of this relationship is desirable. Research and testing of panel performance have been conducted by various independent researchers and manufacturers. Heat transfer between the radiant panel and the other room surfaces is well established in a boxlike room where the primary heat gains and losses are from the wall, floor, or ceiling surfaces. The performance ratings presented in this chapter for radiation and convection can be applied directly to the calculated room heating and cooling loads. Various investigators and manufacturers report increased cooling performance due to solar effects and ceiling-mounted lighting fixtures. Use this empirical information, which has been developed as a result of field testing, only in consultation with manufacturers experienced in this field.

Fortunately, most building surfaces have high emissivity factors, and therefore absorb and reradiate energy from the active panels. This is significant because all surfaces within the room tend to assume an equilibrium temperature resulting in an even thermal comfort condition within the space. In much the same way that light energy from a lighting fixture illuminates the room so that all surfaces can be seen, a warm radiant panel emits energy that is absorbed and reradiated, and all surfaces become warm. Warm ceiling panels are effective for winter heating because they warm the floor surfaces and glass surfaces by direct transfer of radiant energy. The surface temperature of well-constructed and properly insulated floors will be 2 to 3°F (1 to 2°C) above the ambient air temperature, and the inside surface temperature of glass is increased significantly. [Inside single-glass surface temperatures 10 to 15°F (5 to 8°C) above those indicated in figure 2 are commonly observed]. As a result, downdrafts are minimized to the point where no discomfort is felt. Installation with ceiling heights of 50 feet (15 m) and single glass from floor to ceiling provide satisfactory results. See Figure 2 for suggested design surface temperatures at various ceiling heights.

Figure 2
Relation of Inside Surface Temperature to Overall Cofficient of Heat Transfer



DEFINITION OF TERMS

R -- THERMAL RESISTANCE The resistance to heat flow through one square foot of a given material, one inch thick, in a period of one hour with a temperature difference between surfaces of one degree Fahrenheit. The reciprocal of transmission, conductance or conductivity.

R_T -- TOTAL THERMAL RESISTANCE The sum of the individual material resistances adjusted to their installed thickness and including the resistance of air films and air spaces where applicable.

U -- COEFFICIENT OF TRANSMISSION The number of BTU's transmitted in one hour through one square foot of completed structural element (such as wall, ceiling or floor) with a one degree Fahrenheit difference in *air* temperatures on either side of the element.

$$R_T = \frac{1}{U}$$

$$U = \frac{1}{R_T}$$

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