ment of comfort with relative humidities as high as 80 per cent, provided the effective temperature is between 70 and 75 deg.

The second school favors a higher dry-bulb temperature, according to the prevailing outdoor dry-bulb, with a comparatively low humidity (well below 50 per cent), the main purpose being to reduce temperature contrasts upon entering and leaving the cooled space and to keep the clothing and skin dry. This second scheme requires more refrigeration with the present conventional type of apparatus.

In connection with summer cooling mention should be made of the danger of over-doing it. Possible impairment to health may have resulted from the sharp contrast between air conditioned trains and the outside atmosphere in the early days of this practice. Current practice in theaters, restaurants, etc., follows a schedule similar to that shown in Table 5. This schedule should be used with considerable judgment, depending on the occupancy and local climatic conditions. There are some indications that a definite indoor effective temperature may be applicable throughout the cooling season, but other observations seem to show that changing indoor conditions are desirable with violently changing outdoor weather conditions. It is questionable whether entirely satisfactory air conditions could be adduced for practical use to meet the changing requirements of patrons from the time they enter to the time they leave a cooled space. Too many uncontrollable variables enter into the problem. Work now going on at the A.S.H.V.E. Research Laboratory and other institutions may throw considerable light on this complex problem.

TABLE 5. DESIRABLE INSIDE CONDITIONS IN SUMMER CORRESPONDING TO OUTSIDE TEMPERATURES[a]

Occupancy Over 40 Min

Outside Dry-Bulb Deg F	Inside Air Conditions				
	Effective Temperature	Dry-Bulb Deg F	Wet-Bulb Deg F	Dew-Point Deg F	Relative Humidity Per Cent
100	75	83	66	56	40
	75	82	67	59	45
	75	81	68	61	51
	75	80	70	65	60
95	74	82	64	53	36
	74	81	66	57	44
	74	80	67	60	51
	74	79	68	62	57
	74	78	70	66	68
90	73	81	63	52	36
	73	80	64	54	41
	73	79	66	59	50
	73	78	67	61	56
85	72	80	61	48	32
	72	79	63	53	41
	72	78	64	56	46
	72	77	66	60	56
80	71	78	61	49	36
	71	77	63	54	45
	71	76	64	57	52
	71	75	66	61	61

[a]Applicable to individuals engaged in sedentary or light muscular activity.

For cooled banks and stores where the customers come and go, spending but a few minutes in the cooled space, observations indicate a schedule about 1 deg of effective temperature higher than that shown in Table 5. Laboratory experiments with exposures of 2 to 10 min indicate temperatures 2 to 10 F higher than those in Table 5, but with much lower relative humidities.

It should be kept in mind that southern people, with their more sluggish heat production and lack of adaptability, will demand a comfort zone several degrees higher than that for the more active people of northern climates. Instead of the summer comfort lines standing at 71 deg ET as here given, it was found to be much higher for foreigners in Shanghai where climatic conditions are similar to those of our gulf states. This difference in adaptability of people forms a very real problem for air conditioning engineers. Cooling of theaters, restaurants, and other public buildings in southern climates cannot be based on northern standards without considerable modification.

RELATION OF AIR AND WALL TEMPERATURES

In the previous discussion, it has generally been assumed that air and wall temperatures are alike and, of course, this is roughly the case. In a room heated by pure convection, the walls are generally heated by the warm air and in a room heated by pure radiation, the air is gradually warmed by convection from surfaces which have themselves been warmed by absorption of radiant heat. In ordinary indoor spaces, whatever the heating method, the mean of floor, ceiling and all four walls, is not likely to differ more than 3 F from the air temperature; but individual walls which have a dominant effect on certain areas of the room may be 20 F below air temperature[46] (see Fig. 9).

With an open fire, or a high temperature radiant heater the influence of radiant heat may be considerable; and with large window areas the converse cooling effect may be important. Outdoors in the sun, the influence of radiation is, of course, enormous. Where substantial differences between air and surrounding surfaces (or special radiant heat sources) do exist, this factor must be taken into account.

An interesting point indicated by the studies at the *John B. Pierce Laboratory*, is that when a given operative temperature (that is, the temperature which should physically exert a certain heat-demand upon a body of fixed surface temperature) is produced by (1) air and walls at approximately the same temperature, and (2) colder air and warmer walls (in the zone of body cooling), the skin temperature falls to a lower point for the cold air warm wall situation, thus decreasing the actual rate of heat loss. The reason for this effect is somewhat obscure but it is believed to be related to local stimulation by the colder air exerted on the membranes of the nose and throat and to the greater chilling of the exposed skin surfaces when those parts of the body are moved.

[46]Wall Surface Temperatures, by A. C. Willard and A. P. Kratz (A.S.H.V.E. TRANSACTIONS, Vol. 36, 1930, p. 447).