average wind velocity from December through February is 15 mph or higher in only 7 of the cities listed and Column 9 shows that a wind velocity of 15 mph did not occur in any city listed for temperatures equal to or lower than those shown in Column 8 for the years 1935–1939. Consequently, it will often be desirable to modify the U values in Tables 5 to 15, 18, and 19 of Chapter 9 to correspond to lower wind velocities. Correction factors for wind velocities can be found in Table 20 of Chapter 9.

Column 6 in Table 1 lists the average annual minimum temperature which is the average of readings of the one lowest temperature occurring for each year the weather station has been in existence. A comparison of the temperatures listed in Columns 6, 8, and 10 of Table 1 offers some guidance in selecting a suitable outdoor design temperature for particular cities. For the 63 cities in the United States having temperatures listed in all three columns the average annual minimums in Column 6 average 2.3 deg warmer than the design temperature in common use listed in Column 10 whereas the design temperatures in Column 8 average 11.0 deg warmer than those in Column 10. There are variations of 6 deg or more in either direction from these average differences, however, for a few cities in this group.

Designers are cautioned against attempting to compensate for internal vagrant heat sources in a structure, the heat generated by electrical equipment, the approximations that may exist in heat transmission factors and infiltration rates, and the safety factors used in selecting heating plant capacity by adjusting the design temperature difference between indoors and outdoors. These factors should be accounted for by more careful analysis of their existence and magnitude in computing the heating load that must be carried by the heating plant itself.

INSIDE TEMPERATURES

The inside air temperature which must be maintained within a building is understood to be the dry-bulb temperature at the breathing line, 5 ft above the floor, or at the seating level, 30 in. above the floor, and not less than 3 ft from the outside walls. Inside air temperatures usually specified, vary in accordance with the intended use of the building. Table 2 presents values which conform to good practice.

The proper dry-bulb temperature to be maintained depends upon the relative humidity and air motion, as explained in Chapter 6. In other words, a person may feel warm or cool at the same dry-bulb temperature, depending on the relative humidity and air motion. The optimum winter *effective temperature* for sedentary persons, as determined at the A.S.H.A.E. Research Laboratory, is 67–68 ET.

As explained in Chapter 6 for so-called still air conditions, a relative humidity of approximately 50 percent is required to produce an effective temperature of 68 ET when the dry-bulb temperature is 72.5 F. However, even where provision is made for artificial humidification, the relative humidity is seldom maintained higher than 40 percent during the extremely cold weather, and where no provision is made for humidification, the relative humidity may be 20 percent or less. Consequently, in using the figures listed in Table 2, consideration should be given to the actual relative humidity to be maintained, if provision is to be made for humidification. If no humidification is to be provided, the higher temperatures

may not even produce comfort on cold days; if humidity is to be maintained at 50 percent, the lower temperatures will apply.

In rooms having large glass areas, when sun is not shining, or in rooms with walls having a high transmission coefficient, the lowered surface temperature will cause a feeling of coolness even though the air temperature in the room is at or above the temperatures indicated in the table. In rooms of this character, it is desirable to design for even higher temperatures than those listed, unless a compensating higher temperature surface is installed to offset the low temperature surfaces.

TABLE 2. WINTER INSIDE DRY-BULB TEMPERATURES USUALLY SPECIFIED[a]

Type of Building	Deg F	Type of Building	Deg F
Schools—		Theaters—	
Class rooms	70–72	Seating space	68–72
Assembly rooms	68–72	Lounge rooms	68–72
Gymnasiums	55–65	Toilets	68
Toilets and baths	70		
Wardrobe and locker rooms	65–68	Hotels—	
Kitchens	66	Bedrooms and baths	70
Dining and lunch rooms	65–70	Dining rooms	70
Playrooms	60–65	Kitchens and laundries	66
Natatoriums	75	Ballrooms	65–68
		Toilets and service rooms	68
Hospitals—			
Private rooms	70–72	Homes	70–72
Private rooms (surgical)	70–80	Stores	65–68
Operating rooms	70–95	Public buildings	68–72
Wards	68	Warm air baths	120
Kitchens and laundries	66	Steam baths	110
Toilets	68	Factories and machine shops	60–65
Bathrooms	70–80	Foundries and boiler shops	50–60
		Paint Shops	80

[a] The most comfortable dry-bulb temperature to be maintained depends on the relative humidity and air motion. These three factors considered together constitute what is termed the *effective temperature*. (See Chapter 6.) When relative humidity is not controlled separately, optimum dry-bulb temperature for comfort will be slightly higher than shown in Table 2.

The inside temperatures specified in Table 2 may be used for panel heated spaces as well as for spaces heated by warm air, radiators or convectors. It is true that warm panel surfaces tend to produce a comfortable environment at a lower room air temperature than when warm panels are not present, but field experience in the United States has indicated that actual reductions in air temperature are slight in operation.

Temperature at Proper Level. In making the actual heat loss computations, however, for the various rooms in a building it is often necessary to modify the temperatures given in Table 2 so that the air temperature at the proper level will be used. By *air temperature at the proper level* is meant, in the case of walls, the air temperature at the mean height between floor and ceiling; in the case of glass, the air temperature at the mean height of the glass; in the case of roof or ceiling, the air temperature at the mean height of the roof or ceiling above the floor of the heated room; and in the case of floors, the air temperature at the floor level.

Temperature at Ceiling. The air temperature at the ceiling is generally higher than at the breathing level due to stratification of air resulting from the tendency of the warmer or less dense air to rise. An allowance for this fact should be made in calculating ceiling heat losses, particularly in the case of high ceilings. However, the exact allowance to be made may be somewhat difficult to determine as it depends on many factors, including (1) the type of heating system, (2) ceiling height, and (3) the inside-outside temperature differential. The type of heating system is par-