The outside temperature to be assumed in the design of any heating system must not be more than 15 deg above the lowest recorded temperature as reported by the Weather Bureau (Table 3) during the preceding 10 years for the locality in which the heating system is to be installed. In the case of massive and well-insulated buildings in localities where the minimum does not prevail for more than a few hours, it is possible that more than 15 deg above the minimum may be allowed, due primarily to the *fly-wheel* effect of the heat capacity of the structure. The outside temperature assumed and used in the design should always be stated in the heating specifications.

If Weather Bureau reports are not available for the locality in question, then the reports for the station nearest to this locality are to be used, unless some other temperature is specifically stated in the specifications.

In computing the average heat transmission losses for the heating season in the United States the average outside temperature from October 1 to May 1, shall be used. This is to be that reported by the U. S. Weather Bureau during the preceding 10 years, for the locality in question.

Summer

The maximum cooling load in summer may be calculated for an outside dry-bulb temperature not to exceed 95 F and a wet-bulb temperature not to exceed 77 F. While higher outside dry-bulb temperatures are frequently observed they are either of short duration or accompanied by low relative humidities. Weather Bureau reports are frequently misleading in this respect as they report the maximum temperature for the day with the relative humidity, which occurs during a different period and which usually is much higher than the relative humidity occurring at the maximum temperature. Any statement of weather condition which gives a wet-bulb temperature higher than 80 F in the United States is questionable.

WIND MOVEMENT

The effect of wind on the heating requirements of any building should be given consideration under two heads:

1. Wind movement increases the heat transmission of walls, glass, and roof, affecting poor walls to a much greater extent than good walls.

2. Wind movement materially increases the infiltration (inleakage) of cold air through the cracks around doors and windows, and even through the building materials themselves, if such materials are at all porous.

It is entirely possible that a building may require more heat on a windy day with a moderately low outside temperature than on a quiet day with a much lower outside temperature. It will, therefore, be evident that the wind movement in any locality must be given careful consideration in computing the probable heating requirements of a building, and for the purposes of calculation, not less than the average wind movement in any locality during December, January and February should always be provided for in computing (1) the heat transmission of a building, and (2) the heat required to take care of the infiltration of outside air.

The first condition is readily taken care of, as explained in Chapter 3, by using a surface coefficient f_o for the outside wall surface, which is based on the proper wind velocity. In case specific data are lacking for any given locality, it is sufficiently accurate to use an average wind velocity of approximately 15 mph which is the velocity upon which the heat transmission coefficient tables in Chapter 3, are based.

In a similar manner, the heat allowance for infiltration through cracks and walls (Tables 1 and 2, Chapter 4) must be based on the proper wind velocity for a given locality, as explained in Chapter 4. In the case of *tall buildings*, special attention must be given to infiltration factors, as also explained in Chapter 4.

Wind movement involves both *direction* and *velocity*, and hence after transmission and infiltration losses have been computed, using coefficients which allow for the proper velocity, a further allowance must be made for the direction of the prevailing wind in any given locality. This shall be done by adding 15 per cent to the wall and glass transmission losses and the infiltration losses on the sides of the building exposed to the prevailing winds. Those walls which lie in the two adjacent sides of the building most nearly facing the prevailing wind are to be considered in making this correction. (See Fig. 8, Chapter 4). This is not necessarily the same as adding 15 per cent to the total heat loss of a room on the exposed sides of the building.

The correction for exposure to the prevailing wind may also be made by using the average *prevailing* wind velocity for sides exposed to the prevailing winds and the average *non-prevailing* wind velocity for other sides of the building. The most common practice, however, is to use the average wind velocity during the three coldest months of the year for estimating the infiltration losses for all sides of the building and to add 15 per cent to both the infiltration and transmission losses on the sides exposed to the prevailing wind.

HEAT SOURCES

Heat Available from Sources other than Heating Plant

The heat supplied by persons, lights, motors and machinery should always be ascertained in the case of theaters, assembly halls, and industrial plants, but allowances for such heat sources must be made only after careful consideration of all local conditions. In many cases, these heat sources should not be allowed to affect the size of the installation at all, although they may have a marked effect on the operation and control of the system later. In general, it is safe to say that where audiences are involved, the heating installation must have sufficient capacity to bring the building up to the stipulated inside temperature before the audience arrives. In industrial plants, quite a different condition exists, and heat sources, if they are always available during the period of human occupancy, may be substituted for a portion of the heating installation. In no case should the actual heating installation (exclusive of heat sources) be reduced below that required to maintain at least 40 F in the building.

Motors and the machinery which they drive, if both are located in the room, convert all of the electrical energy supplied into heat, which is