

the temperature difference between the inside and outside air, the result expresses the heat required to warm up the cold air leaking into the building per hour.

7. The sum of the heat losses by transmission (paragraph 5) through the outside wall and glass, as well as through any cold floors, ceilings or roof, and the heat equivalent (paragraph 6) of the cold air entering by infiltration is the total heat required for warming any building.

INSIDE TEMPERATURE

The inside air temperature which must be maintained within a building, and which should always be stated in the heating specifications, is understood to be the temperature at the breathing line 5 ft. above the floor and not less than 3 ft. from the outside walls. Inside air temperatures usually specified vary in accordance with the use to which the building is to be put, and Table 1 presents values which are in conformity with good practice.

TABLE 1. INSIDE TEMPERATURES USUALLY SPECIFIED

Type of Building	Deg. Temp.		Deg. Temp.
Warm Air Baths.....	120	Residences.....	70
Steam Baths.....	110	Schools.....	70
Hospital Operating Rooms.....	85	Factories.....	65
Bath Rooms.....	85	Stores.....	65
Paint Shops.....	80	Gymnasias.....	55 to 60
Hospitals.....	72 to 75	Machine Shops.....	60 to 65
Public Buildings.....	68 to 72	Foundries, Boiler Shops, etc.....	50 to 60

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 1 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. In the case of heated spaces adjacent to unheated (no heat of any kind) spaces, it will usually be sufficient to assume the temperature in such spaces as the mean between the temperature of the inside heated space and the outside air temperature.

The air temperature at the mean height between floor and ceiling is the "breathing line" temperature, Table 1, for rooms not over 10 ft. in height. For rooms above this height, add 2 per cent per foot of height to the breathing-line temperature for each foot or fraction of a foot difference between the mean height of the vertical wall, glass, roof or ceiling surface, and the height of the breathing line.

In determining mean air temperatures just above floors which are next to ground or unheated spaces, a temperature 5 deg. lower than breathing-line temperature may be used, provided breathing-line temperature is not less than 55 deg. fahr.

The outside air temperature used in computing the heat loss from a building is seldom taken as the lowest temperature ever recorded in a

given locality. Such temperatures are usually of short duration and are rarely repeated in successive years. It is therefore evident that a temperature somewhat higher than the lowest on record may be properly assumed in making the heat loss computations.

OUTSIDE TEMPERATURE

The outside temperature to be assumed in the design of any heating system must not be more than 15° deg. fahr. above the lowest recorded temperature as reported by the U. S. Weather Bureau (Table 2) during the preceding 10 years for the locality in which the heating system is to be installed. The outside temperature assumed and used in the design should always be stated in the heating specifications.

If U. S. Weather Bureau reports are not available for the locality in question, then the U. S. Weather Bureau 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 the average outside temperature from October 1 to May 1 shall be used. This average temperature is to be that reported by the U. S. Weather Bureau during the preceding 10 years, for the locality in question.

General Statement on Temperatures and Wind Velocity

In order that no misunderstanding may occur, the specifications for all heating systems or plants shall include a clause covering the following points:

1. The lowest recorded outside temperature in the locality, as reported by the U. S. Weather Bureau for the preceding 10 years;
2. The outside air and inside breathing-line temperatures which were assumed and actually used in making the heat loss computations;
3. The average wind velocity in miles per hour for December, January and February, and the direction of the prevailing wind during these same months for the locality in which the heating plant is located—both wind velocity and direction are to be taken from the U. S. Weather Bureau records for the preceding 10 years.

HEAT TRANSMISSION COEFFICIENTS

Definition

The amount of heat expressed in B.t.u. which is transmitted in 1 hr. per square foot of the material as used in the building, for a difference in temperature of 1 deg. fahr. between the air on the inside and outside of the building, is called the coefficient of heat transmission for the material. The heat transmission coefficient for any given building

¹There seems to be no agreement in this country at present as to the method of arriving at the proper outside temperature to be used in the calculations or design of a heating system. Some offices use the average of the lowest yearly temperatures for the preceding ten years.