employed in building construction, the radiation and convection-conduction components may vary independently of each other.

Table 1, Section B, gives the thermal conductances and resistances of air spaces of uniform thickness and moderately smooth surfaces, based on experimental measurements conducted at the *National Bureau of Standards*.[9] Although the conductances of air spaces vary to some extent with thickness in the range over ¾ in., average values are tabulated for the range from ¾ in. to 4 in., for all except horizontal spaces with heat flow downward. The error involved by averaging is less than 10 percent in

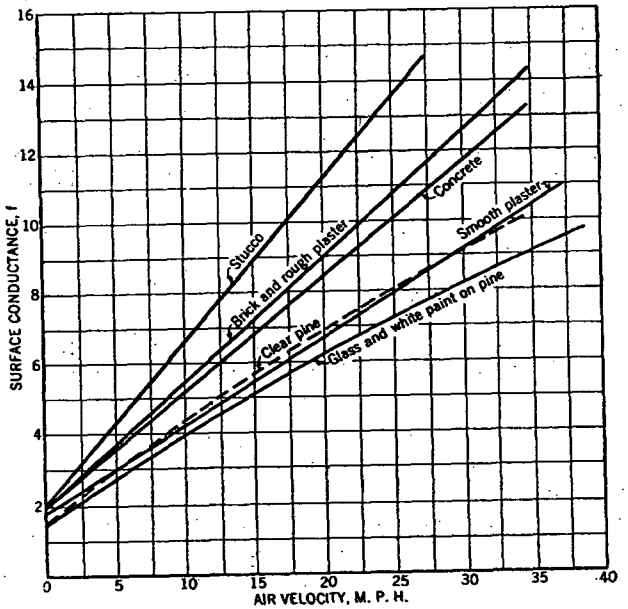

FIG. 4. CURVES SHOWING RELATION BETWEEN SURFACE CONDUCTANCES FOR DIFFERENT SURFACES AT 20 F MEAN TEMPERATURE

the extreme case and less than 5 percent in most. For more exact values Reference 9 may be consulted.

For narrow air spaces, which may be defined as those for which the product of the cube of the thickness of the space in inches times the temperature difference (Fahrenheit degrees) across the space is less than 3 for heat flow horizontally or downward, or less than 1 for heat flow upward, the conductance is the sum of the radiative heat transfer coefficient and that for conduction alone through air, since convection is practically suppressed. The radiation component can be computed by means of Equation 4 and Table 4 of Chapter 5; the conduction component can be computed using the conductivity of air at the appropriate mean temperature.

The effects of different mean temperatures, temperature differences, and effective emissivities are indicated in Table 1, Section B. As indicated, use may be made of interpolation and moderate extrapolation of conductance values in the table to obtain conductances for conditions moderately different from those given. Interpolation of resistance values is not recommended, especially in relation to emissivity values.

Table 1, Section C gives values for the surface reflectivities and emissivities of materials used as boundaries of air spaces in building construction, for total radiation at ordinary building temperatures. Effective emissivities for various combinations of these materials, for use in conjunction with Section B of Table 1, are given in the last two columns of Section C.

When considering heat transfer across air spaces in building construction, the emissivities of the boundary surfaces should be known. The possibility of change in emissivity of highly reflective surfaces due to exposure to conditions promoting chemical action, deposition of dust, or soiling of the surface, must be considered in selecting a material for use.[10]

PRACTICAL COEFFICIENTS AND THEIR USE

For practical purposes it is necessary to compute average coefficients that may be applied to various materials and types of construction. Table 2, as revised in this issue, gives representative values for dry materials at 70 F mean temperature, as selected by the ASHAE Technical Advisory Committee on Insulation. Since there may be some variation in the materials and in test conditions, these selected values may not be in exact agreement with published data of all manufacturers. The exact value for the conductivity or conductance of a certain manufacturer's material can only be secured from unbiased tests or guaranteed by the manufacturer.

Tables 5 and 7 through 19 have not been revised in this edition due to the extensive computations involved. These tables are now in the process of revision, and until new values are available, the values given in the tables may be used with the assurance that the U-values will not be in error by an amount greater than would be anticipated from normal variations in the materials to which they apply. Tables 7 through 19 illustrate typical examples of constructions frequently encountered. The U-values for constructions not given, or for conditions where more accurate values are desired, may be computed by the use of the conductivity and conductance values shown in Table 2 or obtained from the manufacturer.

Caution

The user should realize that the average conductivity and conductance values given in Tables 2 or 5 do not necessarily apply to all products of the same general description. In using these values, judgment should be exercised with regard to the extent to which the product (either as received or as applied) will comply with the tabulated values. Exact conductivities or conductances for specific materials should be obtained from the manufacturer.

Due to the inconsistency of actual building construction, because of the human element, many designers do not use overall coefficients of transmission lower than 0.10 for walls and particularly roofs, except where the construction is installed under continuous supervision. It should also be noted that these coefficients do not include any factor of safety and that when no supervision is used, some designers incorporate a 10 percent factor of safety.