of the air and the hygroscopic properties of the material as explained in Chapter 45.

Omissions in Drying Cycle

Many solids, such as lumber, are so dry at the beginning of the drying operation that the constant rate period of free surface evaporation does not occur. Frequently the surface of the material is dry enough so that no surface drying can take place, in which case only the final stage of sub-surface drying is involved. In other instances, the critical moisture content of a wet solid is sufficiently low that sub-surface drying starts almost immediately after the conclusion of the constant rate period. Thus the intermediate state of unsaturated surface drying does not occur and the drying is of the sub-surface type during practically the whole of the falling rate period. With other kinds of material, particularly thin sheets, such as newsprint paper, sub-surface drying may occur at such a low moisture content that it is not encountered in commercial work, the falling rate period being confined in practice to unsaturated surface drying.

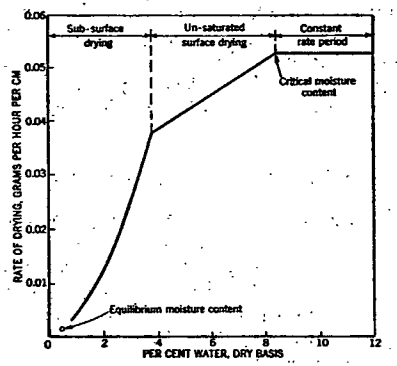

FIG. 1. RATE OF DRYING OF WHITING SLAB

FACTORS INFLUENCING DRYING RATES

Temperature

The driving force for evaporation is directly proportional to the difference between the absolute humidity of the air being used and the absolute humidity of saturated air at this temperature. It may be seen from the psychrometric chart, Fig. 2, that as the temperature increases the humidity of saturated air corresponding to that temperature increases immensely. For example, at 100 F one pound of dry air will carry about 0.04 pounds of water, while at 120 F this figure has become 0.08 pounds. Thus during the constant rate and uniform falling rate periods an increase in temperature will increase the drying rate. During the varying falling rate period, i.e., sub-surface drying where diffusion is the controlling factor, an increase in temperature will lower the viscosity permitting a more rapid drying. Temperature and thickness of the material are the only external variables which affect the drying rate during the variable falling rate period. The drying rate varies inversely with the square of the thickness of the material.

In general, then, it is preferable to use as high a temperature as possible for any drying operation because of the faster rate of drying and the greater capacity of the air to remove water. During the constant rate

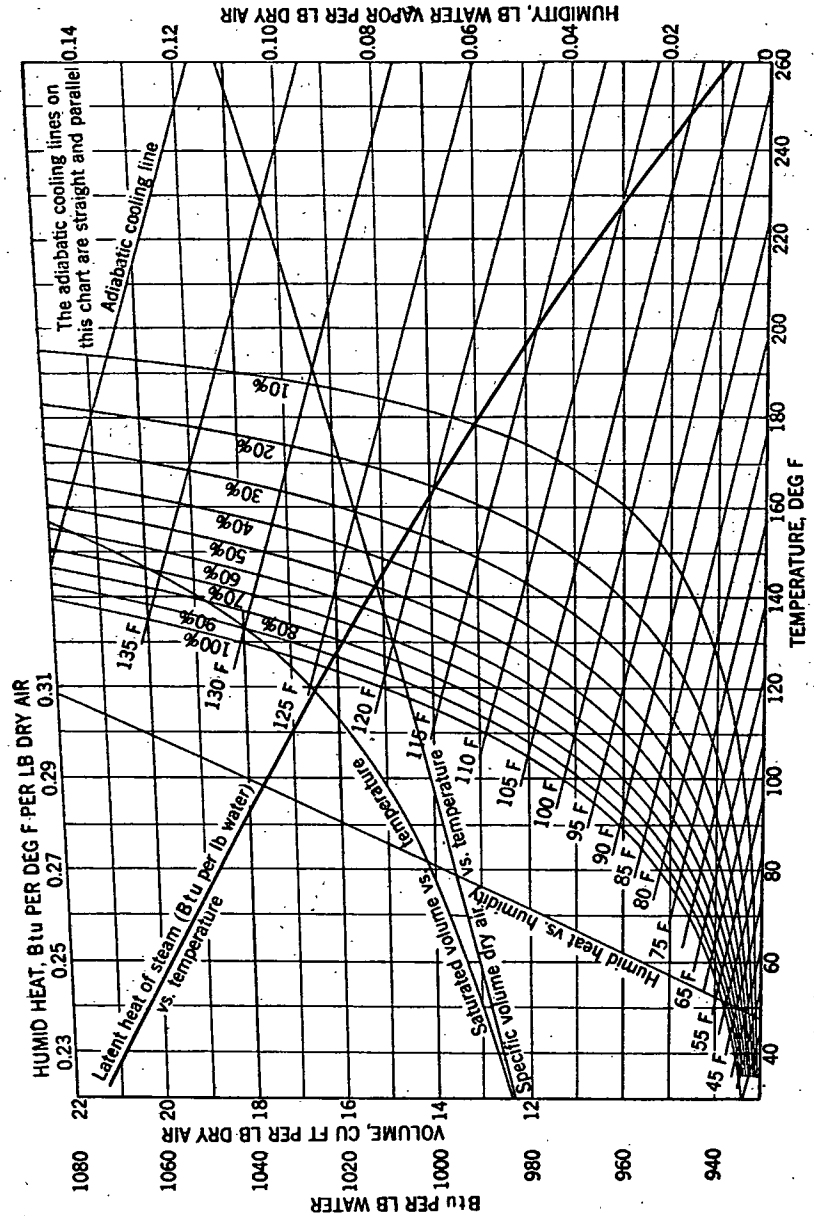

FIG. 2. PSYCHROMETRIC CHART