

VAPOR BARRIERS

The walls enclosing a dehumidified space are subjected to a vapor pressure differential. The pressure of the vapor outside the walls tends to force moisture through the walls into the dehumidified zone of relatively low vapor pressure. As this process can be an unnecessary load on the dehumidifying equipment, provisions should be made for keeping the vapor transfer to a minimum. Also, if the space is cooled below the ambient dew-point there is a possibility that condensation may occur within the walls unless vapor transfer is controlled. For these reasons

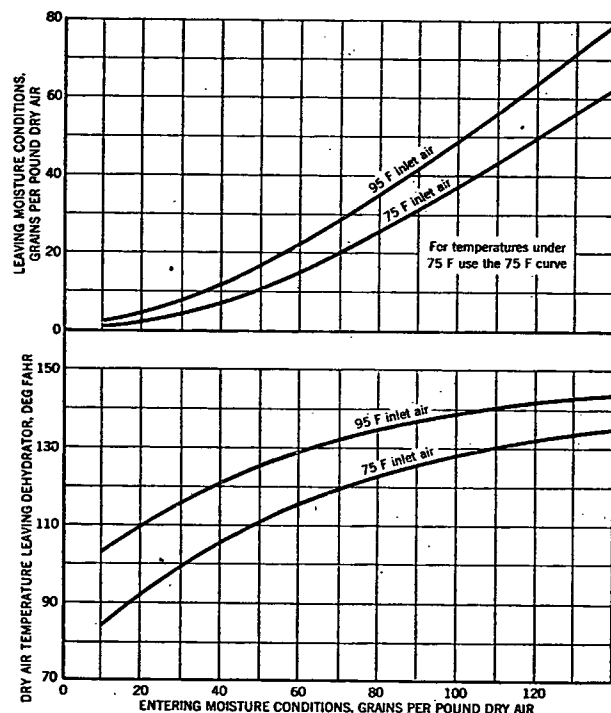


FIG. 6. PERFORMANCE DATA FOR TYPICAL COMMERCIAL SOLID ADSORBENT DEHUMIDIFIER

a vapor barrier should be located within the wall construction as near to the high vapor pressure side as feasible. To be effective a barrier must be continuous and should be so located within the structure that it will be protected from rupture.

Some types of insulation are supplied with the vapor barrier attached. Asphaltic paints, asphalt impregnated and surface coated papers, laminated papers, and combinations of metal foil and kraft papers are among the types of available barriers. Sheet metal linings have been used in rooms where moisture transmission must be eliminated. In existing construction, barriers may be added to the surface of the walls by application of proper paints or the addition of foil or laminated impregnated paper.

When vapor permeability is expressed as grains per (hour) (square foot) (inch of mercury pressure differential) a value not exceeding unity indicates a proper vapor barrier. Moisture vapor transmission rates for various materials are listed in Table 24, Chapter 15.

The formula for the amount of moisture vapor transmitted through a wall is:

$$W = \mu A (P_1 - P_2)$$

where

W = total moisture vapor flow, grains per hour through the wall.

μ = permeability, grains per (hour) (square foot) (unit vapor pressure differential).

A = area of the wall, square feet.

P_1 = vapor pressure on the humid side of the wall, and

P_2 = vapor pressure on the other side of the wall, both in units consistent with the pressure units of the transmission coefficient.

The over-all moisture transfer coefficient for a wall consisting of a combination of several materials in series may be calculated by combining the permeabilities (μ_1, μ_2, μ_3 , etc.) of the individual materials according to the formula:

$$\mu = \frac{1}{\frac{1}{\mu_1} + \frac{1}{\mu_2} + \frac{1}{\mu_3} + \dots + \frac{1}{\mu_n}}$$

Example 2. Find the moisture transfer through a wall of 1000 sq ft area if the permeability of the wall is 0.45 grains per (square foot) (hour) (inch Hg) and the air conditions are 85 F dry-bulb with 65 per cent relative humidity outside and 90 F dry-bulb with 20 per cent relative humidity inside.

Solution. The vapor pressures are therefore $0.65 \times 1.21 = 0.787$ in. Hg outside and $0.20 \times 1.42 = 0.284$ in. Hg inside.

The vapor transfer of the wall is therefore $1000 \times 0.45 (0.787 - 0.284) = 226$ grains per hour.

Allowance should be made in design load calculations for imperfections in application of vapor barriers and consequently some judgment is necessary in determining the quality of the workmanship.

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