PART FOUR
CALCULATING THE VARIOUS MOISTURE LOADS

The following methods have been used successfully to calculate vapor loads, replacing the extensive calculations and laboratory tests that might otherwise be required when a designer considers a new space humidity problem or application.

Actual data from moisture loads entering a space through walls, floors, and ceiling are available for various moisture loads and classes of construction. A survey sheet, such as the sample in Appendix 2, page 39 will help you gather data for the needed calculations.

For standard types of construction, Bry-Air has determined values for calculating the moisture load entering a space at controlled humidity levels. Usually these calculations are relatively easy. The following tables are aids for load calculations.

Outside humidity levels shown in the Table 1 are deliberately higher than data for design specifications. This compensates for days when the design wet-bulb temperatures are reached and the design dry-bulb temperatures are lower than expected (thus creating higher total humidity). Use the area design wet-bulb and the specific humidity figures shown here to accurately rate the moisture control situation. Further information on design can be found in Appendix 1 and in the ASHRAE Fundamentals Handbook, "Weather Data and Design Considerations".

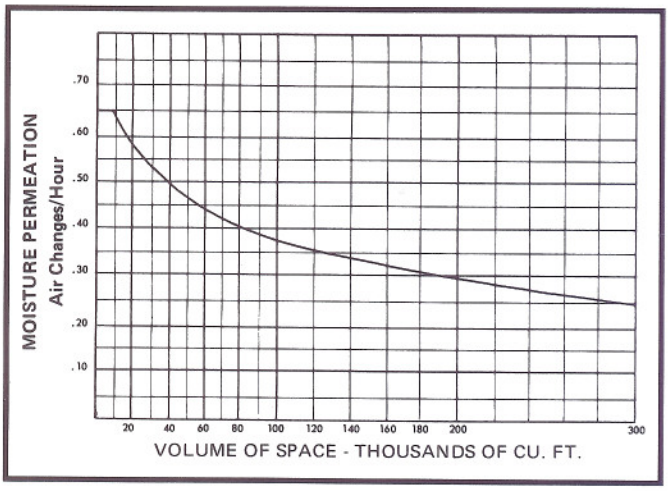
TABLE I
RECOMMENDED DESIGN OUTSIDE MOISTURE LEVEL

DESIGN		DESIGN	
Outside Wet Bulb	Specific Humidity	Outside Wet Bulb	Specific Humidity
°F	gr/lb	°F	gr/lb
81	149	75	121
80	143	74	117
79	139	73	113
78	134	72	109
77	130	71	106
76	125	70	102

TABLE II
F_1 FACTOR for GRAIN DIFFERENCE

Gr/lb Difference	F_1 Factor
35	1.0
40	1.12
50	1.35
60	1.59
70	1.82
80	2.06
90	2.29
100	2.53
110	2.76
120	3.00

TABLE III
F_2 FACTOR FOR SPACE PERMEATION



Space moisture load is a combination of permeation and infiltration and both will be encountered in determining the load. Permeation is a straight line function of the difference in interior and exterior vapor pressures (determined by gr/lb). As shown in Table III, infiltration, represented in air changes per hour is not straight line because of the two factors involved:

1. Each pound of air entering the space will impose a moisture load determined by the difference in interior and exterior moisture content.
2. Since the vapor pressure differs as the moisture content, the vapor will move at a higher velocity than the air.

The combination of the two factors, results in the space moisture load increasing at an ever increasing rate as the difference between the interior and exterior moisture contents increase.

In view of the above, the F-1 factor is used to adjust for the increased vapor velocity. Therefore, the combination of the F-1 and F-2 factors represent the space moisture load anticipated from both permeation and infiltration.

TABLE IV

F_3 FACTORS FOR CONSTRUCTION		F_4 FACTORS FOR VAPOR BARRIERS	
Masonry or Frame Construction	1.0	Laminated, mylar - metallic or polyethylene film.	0.5
Sheet metal, steel welded	0.3	Two layers edge sealed moisture paper	0.67
Module panel, caulked and sealed.	0.5	Two coats vapor proof paint	0.75

If the product of $F_3 \times F_4$ is less than 0.5, use 0.5. If the room is completely vapor proofed, with continuous vapor barrier under the floor (or of all-metal, welded material) the factor may be reduced to 0.3.