AIR CONDITIONING EQUIPMENT TO HANDLE MOISTURE LOADS FROM INFILTRATION

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Introduction

The predominant form of air infiltration into a building is through the windows and doors. Every window and door differs, so it is important to refer to the manufacturer's specifications. However, according to Florida Building Code 2001, Mechanical, Chapter 13, Florida Energy Efficiency for Building Construction, Table 6-2, the maximum allowable infiltration rates are as follows:

Windows and doors (including sliding doors) $= 0.3\left[\frac{CFM}{SQ.FT.of\ window\ area}\right]$

Swinging doors $= 0.5\left[\frac{CFM}{SQ.FT.of\ door\ area}\right]$

Caution

It is important to note that for effective moisture removal to occur, the air conditioning unit must be sized properly. Air conditioners only remove moisture when they are operating. If they are oversized, they do not run that often, and are not effective in moisture removal.

Calculation of Moisture

STEP 1: Determine infiltration rate by either ways as follows:

a. Use a heat load calculation program
b. Calculate the rate based on specific manufacturer's cut sheets.

$$\mathbf{I}_{max} = \boxed{}\ [CFM]$$

STEP 2: Convert infiltration, $\mathbf{I}_{max}$, into pints per day, $\mathbf{M}_{max}\left[\frac{pints}{day}\right]$. Refer to Technical Bulletin #13.

$$\mathbf{M}_{max}\left[\frac{pints}{day}\right] = \mathbf{I}_{max}[CFM] * 0.0123\left[\frac{gallons}{hour*CFM}\right] * 24\left[\frac{hour}{day}\right] * 8\left[\frac{pints}{gallon}\right]$$

$$\mathbf{M}_{max}\left[\frac{pints}{day}\right] = \mathbf{I}_{max}[CFM] * 2.36\left[\frac{pints}{day}\right]$$

$$\mathbf{M}_{max}\left[\frac{pints}{day}\right] = \boxed{}\left[\frac{pints}{day}\right]$$

STEP 3: Estimate the average infiltration rate $\mathbf{M}_{avg}\left[\frac{pints}{day}\right]$

Assumption: Minimum is about 25% of maximum and the average between minimum and maximum is 75% of maximum.

$$\mathbf{M}_{avg}\left[\frac{pints}{day}\right] = 0.75*\mathbf{M}_{max}\left[\frac{pints}{day}\right]$$

$$\mathbf{M}_{avg}\left[\frac{pints}{day}\right] = \boxed{}\left[\frac{pints}{day}\right]$$

STEP 4: Estimate the amount of moisture $\mathbf{R}_{day}\left[\frac{pints}{day}\right]$ the air conditioners can remove. Air conditioners only remove moisture while they are running.

Assumptions:

1. Air conditioner run time
   a. 8 AM – 5 PM 80%
   b. 5 PM – 8 AM 40%
2. Weighted average = 55%

$$\mathbf{R}_{day}\left[\frac{pints}{day}\right] = \frac{1}{3}\left[\frac{gallons}{ton*hour}\right]*24\left[\frac{hour}{day}\right]*8\left[\frac{pints}{day}\right]$$

$$\mathbf{R}_{day}\left[\frac{pints}{day}\right] = 64\left[\frac{pints}{day*ton}\right]$$

$$\mathbf{R}_{day}\left[\frac{pints}{day}\right] = 64*\mathbf{T}[tons]$$

$$\mathbf{R}_{day}\left[\frac{pints}{day}\right] = \boxed{}\left[\frac{pints}{day}\right]$$

STEP 5: If there is any moisture that the air conditioner cannot remove, then a dehumidifier should be used. $\mathbf{M}_{avg} - \mathbf{R}_{day} > 0$, then use a dehumidifier

Size of dehumidifier:

$$\mathbf{DH} = \left(\mathbf{M}_{\mathbf{avg}} - \mathbf{R}_{day}\right)\left[\frac{pints}{day}\right]$$

$$\mathbf{DH} = \boxed{}\left[\frac{pints}{day}\right]$$