

# TECH TIP # 6



One of a series of dealer contractor technical advisories prepared by HARDI wholesalers as a customer service.

## SIZING HUMIDIFIERS BY THE “BOOK”

Sizing central humidifiers for residential and light commercial applications is generally based on an individual's own rule-of-thumb method or some engineer's or manufacturer's personalized selection chart. But humidifiers can be sized and selected using industry “standard” procedures, just as furnaces and air conditioning units have been for many years.

In 1968, the Air Conditioning and Refrigeration Institute published the first standard *RATING* procedure (Std 610) for central humidifiers just as they do for unitary air conditioning units. The *voluntary* standard details how manufacturers should uniformly test their humidifiers to determine their capacity (gal/day) and other performance factors. Such a standard assures that all humidifiers (subscribing to the standard) can be compared on a reasonably scientific basis. (Current version is Std 610-96)

In 1972, ARI published a second standard on the *selection* and *installation* of humidifiers (Std 630-72). In this new standard, a standard humidity load calculation procedure, based on avoiding condensation on windows was detailed. It was based on local design winter outdoor temperatures and an assumed 80 percent outdoor relative humidity. Design indoor relative humidity was a variable, based on selected design indoor room temperature (either 70 or 75), the use of single or double glass in construction, and local outdoor design temperature.

But in 1974, a revised standard (Std 630-74) was introduced that *fixed* design indoor conditions at 75° F and 35% relative humidity (RH) and established design outdoor conditions for calculating humidity requirements as a function of house construction. For tight construction, design outdoor conditions are 0° F and 80% RH; for average construction, 20° F and 80% RH; and for loose construction 31° F and 80% RH.

Building construction is defined as either “tight” (one-half infiltrating air change per hour), “average” (one air change per hour), or if built before 1930, as “loose” (two air changes per hour). Infiltration of cold dry air is of course a direct factor in demand --- the greater the in-leakage of outdoor air, the lower the indoor humidity.

(continued)

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Standard 630 is no longer published but based on the original ARI information the following simplified formula can be used to estimate the humidification load requirements in gallons per day for a residence or small commercial building ---

$$\text{Humidification Load} = (V \times K)/33,000$$

Where V is the volume of the space to be humidified and K is a combination moisture infiltration factor with a value of 17.5 for *tight* construction, 27 for *average* construction and 38 for *loose* construction.

For example: if the house volume was 12,000 cubic feet and construction was judged to be average, the humidification load would be ---

$$(12,000 \times 27)/33,000 \text{ or } 9.81 \text{ gal/day}$$

The humidifier *selected* should have a capacity to satisfy the load thus determined --- *AFTER* the (ARI) *rated* capacity of the humidifier has been corrected to actual operating conditions encountered in the system.

Example:

- Rated capacity is based on *continuous duty*. Thus, the rated capacity of the humidifier being selected should be adjusted (downward) to account for the actual amount of system operation time at design conditions. (One reasonable adjustment factor suggested was .75, but it depends on the actual amount of furnace oversizing in the design.)
- If actual system air flow rate over the humidifier is cooler (or hotter) than at *rated conditions* (140° F supply, 75° F return applications), then humidifier output must again be adjusted based on manufacturer performance data.
- If the plenum air velocity is other than 800 feet per minute (fpm), or the pressure differential for bypass units is other than 0.2 in WG, then the rated capacity of the humidifying unit must be further adjusted based on manufacturer's specifications.

One final note: while the generation of internal moisture by occupancy (cooking, bathing, laundry, etc.) is a recognized phenomenon, no adjustment for these "free" moisture releases is normally attempted in residential type applications. However, 2 gal/day is a suggested credit. That is --- loads determined by the formula can be *decreased* by 2 gal/day if desired.