

# Taking the Guesswork out of HVAC System Sizing

## Standard Practices

A good Heating, Ventilation and Air-Conditioning (HVAC) contractor will use one of the standard methods for determining heating and cooling loads on buildings, such as Air Conditioning Contractors of America's (ACCA) Manual J and Manual N. These methods take into account specific building characteristics including orientation, dimensions and thermal performance of exterior components (i.e. walls, ceilings, basements, windows and doors). Local averaged weather data as well as summer and winter peak design temperatures are also considered. Then, a building is placed into an air-leakage category based on construction tightness estimates and a generalized wind shielding description to guess at how the building will perform (or not perform) in breezy or windy conditions. This, in short, is the accepted standard method for heating and cooling load calculations in North America.

In the interest of customer satisfaction, to insure that desired interior design conditions can be met at all times, an HVAC contractor will often add considerable extra heating and cooling capacity when selecting equipment. This fairly common desire to oversize is largely due to the un-predictability of performance that is expected from typically constructed "leaky" buildings. Extra heating and cooling capacity add significant extra cost and additional HVAC system space requirements.

This is particularly true on the cooling side. Humid summer conditions coupled to oversized A/C units lead to conditions of short cycling that super-cool without de-humidifying adequately. This produces a cold clammy environment with high relative humidity (RH) which is a breeding ground for mold and mildew (see design note titled: Humidity and Mildew: Causes and Cures). Building occupants are faced with poorer Indoor Air Quality coupled with higher energy costs due to ineffective oversized systems.

## Removing the Unpredictability

Once again, "Building Tight and Ventilating Right" is the answer to minimizing guesswork involved in HVAC equipment selection. Tight construction drastically reduces the significance of air-leakage and its effect on HVAC system sizing. And, tight construction coupled with mechanical ventilation ensures proper air quality to occupants during all weather conditions. Unfortunately, constructing tight buildings that are increasing in complexity with conventional materials and methods has proven to be a difficult and costly challenge.

## Icynene®: A Multi-Function Product That Works

The Icynene Insulation System® handles the "tightness" challenge easily. Using a Blower Door diagnostic air leakage test, Icynene® insulated residential buildings regularly test at less than 1.5 ACH @50 Pa (1.5 Air Changes per Hour at -50 Pascals of internal pressure). This compares very favorably to conventionally constructed homes that often test at 5 to 7 ACH @50 Pa. In addition to air sealing, flexible Icynene® provides thermal insulation to R-3.6 per inch (RSI-0.62 per 25 mm) of thickness throughout any size cavity. Without convective airflow within the cellular material, Icynene's® R-value remains virtually the same in all conditions of temperature and air pressures.

## The Bottom Line Benefits

Now, sizing HVAC systems for buildings is far less of a challenge than ever before with The Icynene Insulation System®. Icynene® ties together all other building assembly materials creating a monolithic envelope that is extremely airtight and thermally efficient in all weather conditions. The HVAC contractor no longer needs to guess at air leakage levels or compensate for shortcomings in air barrier and insulation materials. The net result for the consumer is an average of 30 to 50% reduction in heating and cooling system size and a similar reduction in energy costs.



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www.icynene.com  
1 800 758 7325