Prescott Green Builders LLC

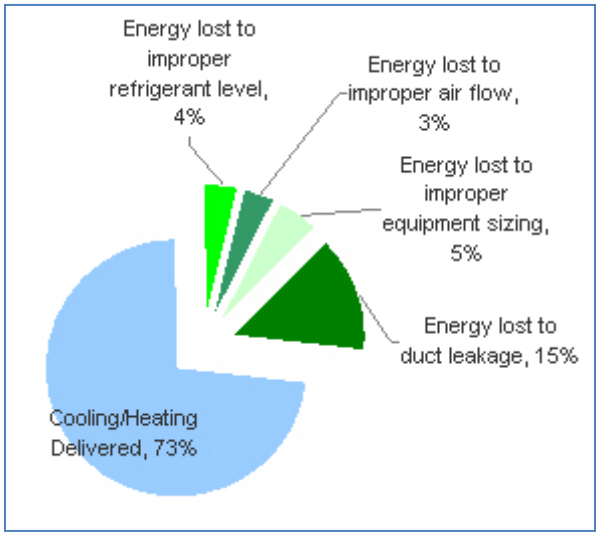
Energy Efficiency and Heating, Ventilation, and Air Conditioning (HVAC) Equipment

Space heating and cooling is the primary consumer of energy (about 56%) in a typical home. So the installation of efficient HVAC equipment is an important factor in constructing an energy-efficient, high-performance home.

HVAC Equipment Design

The first step to heating or cooling a residence is to calculate how much heating and cooling the house will require. The "heat load calculation" using the recommended "Manual J" method estimates home heat loss and heat gain, and includes factors such as climate zone (Prescott is Zone 4), insulation levels, window areas and orientations, how tight the house is (i.e., air infiltration), and the number of occupants. The calculation results in the BTUs of heating and cooling required and is the basis for properly sizing HVAC equipment. There are benefits associated with "right-sized" HVAC equipment rather than using oversized equipment:

- Lower equipment costs
  - Cost differential can be applied to enhance other energy-efficiency components in t he home
- Improved humidity control/moisture removal due to less "short cycling" than an oversized unit
  - Less potential for moisture related problems e.g., wood rot, mold, health issues
- Improved equipment energy efficiency due to less short cycling
  - Analogy is highway MPG vs. city MPG for your car… more frequent stop/start (i.e., short cycling) is less energy efficient



HVAC Equipment Installation

Improper HVAC equipment installation can reduce system efficiency by up to 30 percent (see pie chart illustrating the typical U.S. home energy losses) — costing you more on your utility bills and possibly shortening the equipment's life. Therefore, it is important that the HVAC contractor performs a quality installation that addresses the following elements:

- Proper Sizing of Equipment
- Sealing Ducts
- Optimizing Air Flow
- Proper Refrigerant Charge (Central Air Conditioners and Heat Pumps Only)

Heating and Cooling Equipment Options

There are many equipment and fuel options available to heat and cool a home. Look for Energy Star ratings which can be used as a guide for selecting the most energy-efficient HVAC equipment using any of these options.

- Heating Equipment and Fuel Options
- Cooling Options
- Heat Distribution Options

Additional HVAC Resources on the Internet

U.S. Department of Energy Energy Efficiency & Renewable Energy Program

U.S. Environmental Protection Agency Energy Star Program

Green Building Advisor.com

Best of Building Science Online Training HVAC and Ducts

Build it Tight, Ventilate it Right

In addition to heating and cooling equipment, a home constructed to high-performance specifications for air leakage does not fulfill the recommended fresh air requirements for occupants. There are several methods to supply fresh air to the interior of a tight home. Of these, the balanced ventilation system which mechanically supplies filtered fresh air, expels stale interior air, and assists in humidity control is clearly the optimum choice for a high-performance home.

Ducts

If a forced-air HVAC system is used, tight ducts are essential to efficiently distributing the conditioned air to all parts of the home. There are two key points relative to ducts in energy efficient homes:

1. Leaky ducts located in vented attics or crawlspaces become especially problematic relative to energy consumption, indoor air quality, occupant health, and structural durability. Therefore, whenever possible ducts should be located within the conditioned space.

2. Duct leakage can be measured and is considered to be excessive (by Energy Star standards) if leakage to the exterior is greater than 6cfm / 100 sq ft of floor area. Ducts (and air handlers) should be sealed using duct mastic at all seams in metal ductwork and around boots where flex duct joins sheet metal.

In addition, the Department of Energy recommends the following duct installation practices to optimize the ability of the HVAC equipment to deliver comfort and savings:

- Air distribution system should be designed using ACCA manual D or other acceptable method
- System design should include proper selection and sizing of grills, registers and diffusers
- Return air systems should be hard ducted and sealed. Building cavities should not be used as return ducts.
- Install proper air filtration
- Properly install air distribution system to maintain mechanical integrity
- Perform airflow testing and balancing (commissioning)
- Conduct a Combustion Safety Test after ducts are sealed to ensure there is no backdrafting of combustion gasses from gas or oil-burning appliances