

HOME HEATING AND COOLING

COMMONLY USED TERMS



This collection of terms is meant to provide general background information about home heating and cooling systems as well as energy efficiency. The definitions were adapted from various sources, including utility, government, and industry websites. This document is provided as general guidance and is not intended to be legal or technical advice.

Air Conditioner

An air conditioner (AC) is a device for cooling air in a home. A central air conditioning system can be installed to cool a whole house. Such a system includes a central unit to cool a house, a system of ducts and fans to move air through the ducts, and a thermostat to control the system. A window air conditioner can be installed in a window or wall to cool one room only. A mini-split (see definition) is another type of air conditioning unit.

Air Infiltration

Air infiltration refers to air leaks in a building envelope. Air escapes from or enters buildings through cracks, gaps, or poor sealing around windows, doors, and other penetrations.

Air Infiltration Measurement

Air infiltration measurements are taken as part of a building energy audit or assessment to determine and/or locate air leaks in a building shell or envelope or in the duct system. Specifically, blower door or other types of tests are used to determine air infiltration rates based on air pressure.

Blower Door Test

A blower door test is diagnostic tool that utilizes a powerful fan temporarily mounted into the frame of an exterior door of your house. The fan pulls air out of the house, lowering the air pressure inside. Calibrated blower door tests allow auditors to locate air leaks as well as quantify the amount of leakage indicated by differential air pressure. A “post-installation” blower test is often used after completing energy efficiency retrofits, such as window sealing and insulation replacement, to calculate the overall improvement of the home’s air tightness. HERS Raters must be certified in California to conduct blower door tests, as well as home energy audits.

BTU (or British Thermal Unit)

A BTU is a measurement of heat energy. One BTU is the amount of heat required to raise one pound of water by 1 degree Fahrenheit. The higher the BTU rating, the larger the load or greater the capacity of the system. For example, air conditioners are sized (or rated) based upon BTUs per hour for different size spaces.

Building Code

Building code refers to the rules and regulations adopted by the State of California and a city or county (such as the City of Davis) that specify minimum standards for construction, electrical, plumbing, and other building activities. Meeting these standards is required to receive a building permit (see definition).

Building Envelope

Building envelope refers to the exterior walls, windows, roof, and other parts that enclose your home. The envelope separates heated or cooled air from outside air. A properly sealed and insulated building envelope reduces leakage and heat transfer between inside and outside, thus improving a home's energy efficiency and comfort level.

Building Permit

A building permit is required by a city (or county) in which the activity is conducted. A permit is usually required before work begins, and depending on the nature of the work, plans may need to be submitted for review. The work will likely require one or more inspections by the local building department to ensure that it has been carried out properly and meets local and state building codes before the permit is "finalized" and the work is approved as complete.

Certified Installer

A certified installer is someone who meets specified standards for installing certain equipment or systems. For example, California certifies solar photovoltaic installers. (See also Licensed Contractor)

Dual Pane Windows

Dual pane windows are those with two or more pieces of glass, separated by air space or a buffer. Some newer dual pane windows have specialized air or gas, such as argon, in the space between the glass panes to make the windows more energy efficient. Efficiency of windows is measured by the 'U-factor' (see definition). Dual pane windows help make buildings more comfortable by minimizing heat transfer, which serves to keep rooms warm in the winter and cool in the summer, and insulates against noise and drafts.

Ducts or Ductwork System

Ducts or ductwork system refers to the metal or synthetic tubes (or ducts) used to move air from heating, ventilation, and air-conditioning (HVAC) equipment throughout a home. Ducts usually run through attics and walls but can run through the crawlspace of a home with a raised floor.

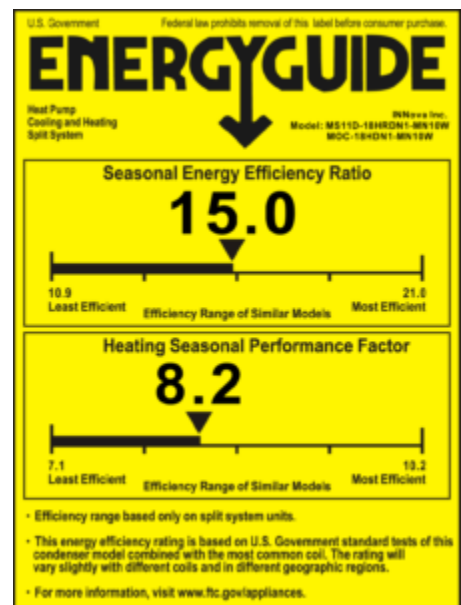
Duct Leakage Testing

Duct leakage testing measures air leakage in the ducts used to move hot or cold air to rooms in a house. Duct leakage is measured using a diagnostic tool called a duct blaster. The duct blaster includes a fan that is connected to the return grille of a ducted HVAC system. Once supply vents are sealed off with tape, the ductwork becomes pressurized and the resulting airflow through the fan is measured to calculate system leakage by percent.

Energy Efficiency Ratings for HVAC Appliances

An Energy Efficiency Rating is a term used to describe the energy efficiency of air cooling equipment. It is determined by the amount of thermal energy produced divided by the energy required to produce the thermal energy. For example, if a 10,000-BTU air conditioner consumes 1,200 watts, its EER rating is 8.3 (10,000 BTU/1,200 watts). Higher ratings indicate a more efficient air conditioning unit. The federal government requires new air conditioners meet minimum energy efficiency standards, based on these ratings:

- **SEER** (or Seasonal Energy Efficiency Ratio). SEER is an energy efficiency rating for air conditioners and the cooling operation of heat pumps (see definition). It is the ratio of the amount of cooling energy produced (BTU) divided by the amount of electricity consumed (in watts), measured in units of BTUs per watt hour. Higher SEERs designate more efficient units that use less energy. Minimum SEER is set by the US Department of Energy and periodically updated. As of 2016, new air conditioners sold in the US are required to be 14 SEER or higher. Air conditioners with higher SEER numbers are available and can increase your home's energy efficiency.
- **HSPF** (or Heating Seasonal Performance Factor). HSPF is an energy efficiency rating for the heating function of heat pumps (see definition). It is a ratio of BTU heat output during heating operation compared to the amount of electricity consumed (in watts), measured in units of BTUs per watt hour. Higher HSPFs designate more efficient units. Currently heat pumps sold in the US must meet an HSPF rating of 8 HSPF or higher.
- **AFUE** (Annual Fuel Utilization Efficiency). AFUE is a measure of the energy efficiency of a furnace. It is the percentage of the energy in the fuel that becomes heat that is supplied to the home and is not wasted in the flue exhaust system or lost from standby losses from the tank. Federal AFUE standards do not allow furnaces with an AFUE less than 80%.



Most units must be labelled and come with manuals and paperwork that include these ratings, which are based on US Department of Energy test procedures as reported to the Federal Trade Commission. Bright yellow EnergyGuide labels show consumers how much it might cost to run an appliance each year based on how much energy it uses and are designed to make it easier for shoppers to compare to similar models.

Energy Star®

ENERGY STAR® is a program of the U.S. Environmental Protection Agency (EPA) and a rating of the relative energy efficiency of appliances, including HVAC equipment. Energy Star® ratings help consumers identify which appliances are more energy efficient than others. Only appliances that meet minimum energy efficiency ratings qualify to receive an Energy Star®. For example, only air conditioners that are in the top 25 percent of energy efficiency ratings may carry the Energy Star® label.

Evaporative Cooler (or “swamp” cooler)

An evaporative cooler is a type of cooling unit that cools air through the evaporation of water. Evaporative coolers are also known as “swamp coolers” because the resulting cooled air has more moisture than air from typical air conditioning units.

Filter

Filters for residential HVAC systems help remove dust and other particles from the air that moves through an HVAC system. Generally, filters should be replaced or cleaned every 2 to 6 months (depending on the type and manufacturer recommendations). A High Efficiency Particulate Air (HEPA) filter with a 17 to 20 Minimum Efficiency Reporting Value (MERV) rating might be better for people with asthma or other chronic respiratory diseases because it is designed to filter particles as small as .3 microns at 99% efficiency.

Furnace

A furnace heats air as part of a central heating system. Heated air from the furnace is distributed throughout the home through ducts. The efficiency of a furnace is measured by its AFUE rating (see definition). Sometimes the term “heater” is used interchangeably with furnace, although furnace is the generally accepted term for combustion-type (natural gas) equipment. Wall furnace units typically do not have a duct system.

Heat Pump

A heat pump is a “packaged” heating and cooling unit that uses electricity to transfer heat from a cool space to a warm space through the use of refrigerants. During the winter, a heat pump moves heat from the cool outdoors to the indoors to warm your home. In the summer, it reverses the process and removes heat from the house and releases it outdoors. Heat pumps run on electricity and not natural gas. (More on [how a heat pump works.](#))

HERS (Home Energy Rating System)

In California, the California Energy Commission has adopted regulations for the California Home Energy Rating System (HERS) Program that governs home energy rating services in California, including home energy audits. These regulations require that home energy audits be performed only by a HERS professional who has been approved by an authorized State agency. Installation of a new HVAC system may require a HERS test in order to receive a building permit. A home energy audit performed within a specified timeframe is actually required in order to qualify for certain rebates on system improvements or replacements. Full service HVAC contractors

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perform these audits in-house or may contract with a Home Energy Rating System (HERS) professional to do the work. California Home Energy Rating System (HERS) Program: <http://www.energy.ca.gov/HERS/>

Home Energy Audit or Assessment

A home energy audit or assessment is an evaluation of your home's efficiency and opportunities for improvement (also referred to as energy efficiency retrofits). Audits generally follow HERS procedures (see above), and usually identify opportunities to improve energy efficiency. Some audits may include what's called a "blower door test" or duct leakage testing (see above)

HVAC

HVAC is commonly used shorthand for Heating, Ventilation and Air Conditioning system. HVAC systems generally include a furnace (also sometimes called a heater) or a heat pump to heat the air, a blower or ventilation equipment to move the heated or cooled air, and an air conditioner to cool the air. Homes can include a separate heater or air conditioner, or, a combined (packaged) system. A "central" HVAC system includes a ducted system that distributes the heated or cooled air throughout the home. Ducts usually run through attics and walls.

Insulation

Insulation is material added to the attic, basement, and/or inside exterior walls to slow the transfer of heat between inside and outside and help keep a building warm in the winter and cool in the summer. The capacity of insulation to resist heat flow is reflected by its R-rating (see definition).

Kilowatt or Kilowatt Hour (kWh)

Kilowatt is a unit of electrical power and kilowatt hour is a unit of electricity use. For example, Energy Star® ratings identify the amount of kilowatt hours an appliance uses per year.

Licensed Contractor

A licensed contractor meets specified experience and performance standards and requirements established by the State of California and has passed the applicable licensing exam, such as that for an HVAC contractor.

Mini-Split

A mini-split is a small, combined heating and air conditioning unit that provides heated or cooled air in indoor spaces. Mini-splits typically do not use ducting to move air throughout a home but instead have a small indoor fan and coil (frequently mounted high on a wall) connected to an outdoor condensing unit. The indoor units are designed to heat and cool a single room or space. Several indoor units can be connected to a single outdoor unit to serve more than one room or space. Mini-splits are sized according to the size of the space being heated and cooled. Ducted mini-split systems are available but require very short duct runs typically located in dropped ceilings to serve multiple rooms.

PACE (Property Assessed Clean Energy program)

PACE program financing allows qualified homeowners to finance the HVAC, renewable energy, water and/or energy efficiency upgrades over time through an addition to their property tax bill. If the property is sold, the next homeowner continues to pay for the improvements through the property tax addition. City and county governing bodies must adopt an ordinance in order for PACE programs to be offered within their jurisdictions. Eligible PACE financing in Davis as of 2018 are: CaliforniaFIRST, HERO and YGreene programs.

Packaged Unit

Heating and cooling systems contained in one unit.

Rebate

Rebates are financial incentives offered by utilities, a city or county, a special district, or the State for certain energy efficiency improvements. Rebates offered by PG&E are regulated by the California Public Utilities Commission. Before undertaking a project, it is important to determine whether a project is eligible for a rebate and what, if any, conditions apply to that eligibility. Rebates can significantly reduce the upfront cost of an energy efficiency or HVAC project.

Return on Investment (ROI or Payback Period)

Return on investment is the amount of time it takes to recover the initial project cost, such as HVAC installation and/or energy efficiency upgrade. ROI is usually calculated in terms of months or years. For example, if a new HVAC replacement or energy efficiency retrofit project costs \$6000 and annual energy savings are about \$960 per year, the return on investment (or payback period) is about 6.25 years.

R-value

R-value is a measure of the ability of a material, such as insulation, to resist heat flow. The higher the R-value, the better the insulation value and the more resistant the material or assembly is to heat flow, resulting in a more energy efficient home. R-value is the reciprocal of U-factor (see definition).

Set points

Set points are temperatures indicated using a thermostat to communicate to Heating, Ventilation, and Air Conditioning (HVAC) systems a desired target temperature for a space. Some thermostats control both heating and cooling systems with one set point, while others require both heating and cooling set points. For a heating set point, a furnace or heat pump will heat the room to the setpoint temperature and try to maintain that temperature. For a cooling set point, an air conditioner will cool the room to the setpoint temperature and try to maintain that temperature. If a cooling set point is set at 74°F but the actual temperature is 78°F, the cooling equipment will run to cool the space until the room temperature reaches 76°F.

Source: UC Davis Energy Conservation Office <https://eco.ucdavis.edu/blog/word-month-setpoint>

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SEER (Seasonal Energy Efficiency Rating System)

See definition above for Energy Efficiency Rating.

Therm

Therm is a measurement of heat, equivalent to 100,000 BTUs. For example, the energy used by a natural gas powered heater or water heater is indicated by the number of therms per year.

Thermostat, Programmable Thermostat, and Smart Thermostat

A thermostat allows one to set the heating or cooling temperature in a room or home. A programmable thermostat is a thermostat with the ability to adjust home heating and cooling equipment according to a pre-set schedule and adjustment for seasonality. For example, a programmable thermostat could be set to maintain a home temperature of 72 degrees throughout the day and 65 degrees from 11:00 p.m. to 7:00 a.m. every night. A programmable thermostat can also be adjusted to reflect comfort needs during different seasons (such as winter or summer). A “smart” thermostat is a wifi-enabled device that can automatically adjust heating and cooling temperature settings in your home for optimal performance. Various types of smart thermostats can also regulate different conditions and further save energy, such as times when the homeowner is away for the day or for vacation.

Title 24

Title 24 commonly refers to the section of the California Building Standards Code (Part 6) that regulates energy performance and energy efficiency for residential and nonresidential buildings.

Ton(s) or Tonnage

A ton is used as a measurement of the nominal cooling energy provided by an air conditioner and is used for “sizing” air conditioning units. A ton is defined as the amount of energy required to melt one ton of ice and is equivalent to 12,000 BTUs of energy. Residential air conditioning units come in full and half sizes ranging from $\frac{3}{4}$ tons to as much as 5 tons. Typical system sizes range from 1.5 tons for the average residence. A correctly sized or “right-sized” air conditioning system can have a big impact on energy consumption and costs. Proper system sizing is dependent upon multiple factors such as heat loss and gain, insulation, air leakage, ductwork, and sunlight exposure. Rule-of-thumb sizing is discouraged by the Air Conditioning Contractors of America (ACCA), which notes that the official industry standard is to perform a detailed load calculation using the Manual J Residential Load Calculation Procedure. An extremely general range, however, is 1 ton per 600sf to 1,200sf of home area.

U-factor

U-factor is commonly used to measure the rate of heat loss of a window assembly. It can also be used to evaluate the rate of heat loss of any building assembly. A lower U-factor means a window is better at resisting heat loss and thus is more energy efficient. U-factors for windows generally range from 0.2 (very little heat loss) to 1.2 (high heat loss). U-factor is the reciprocal of R-value (see definition).

Whole House Fan

A whole house fan is a large stationary fan usually installed in a central ceiling location that uses cool night air from outside and pulls it through living spaces into the attic where it is then exhausted to the outside. Whole house fans should be operated when the outside temperature is cooler than the inside temperature, generally late in the evening or early in the morning, and windows must be opened before operation. Our local Delta Breeze often results in cooler nighttime temperatures during the summer, making whole house fans a powerful cooling tool for Davis residents. Whole house fans are very effective in removing warm air from a home and pre-cooling the home to coast through hot summer days. Refer to the [two-part video series](#) by Cool Davis on home pre-cooling for more information.

Cool Solutions Home Heating and Cooling Planning Guides

- Make a Home Heating and Cooling Plan ... Now
- Home Comfort and Health
- Understanding My Home Energy Worksheet
- All-Electric Home Planning Guide
- Working with Contractors Cheat Sheet
- Contractor Bid Comparison Table
- Ways to Pay for Home Energy Improvements
- Home Heating and Cooling Commonly Used Terms

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Who is Cool Davis?

Cool Davis is a local non-profit organization dedicated to helping Davis residents and businesses adopt more sustainable practices and reduce their greenhouse emissions. Cool Davis has partnered with the city since 2010 to offer resources, host events, and provide outreach and educational experiences for Davis residents. To learn more about other Cool Davis projects related to energy, transportation, and consumption of goods and services, visit us at www.cooldavis.org.