Heating, Ventilation, and Air Conditioning (HVAC): A Quick Guide for Homeowners

A ***home performance upgrade*** makes your home more comfortable while helping reduce your energy bills. An upgrade prevents air and energy leaks and ensures that heating and cooling equipment is efficient, that ducts are free of leaks, and that your water heater and other home appliances are working efficiently. Installing the correct HVAC equipment and ensuring ducts are sealed and insulated helps achieve energy savings and comfort.

This quick guide explains the basics of HVAC systems ducts in your home. Some of the information in this guide is adapted from ***HVAC: A Guide for Contractors to Share with Homeowners***, published by the U.S. Department of Energy.

HVAC SYSTEMS

A Heating, Ventilation, and Air Conditioning (HVAC) system usually consists of the following components: a heating system, a cooling system, a distribution system (ducts), and a thermostat.

Most heating systems in the Sacramento area are fueled with natural gas. SMUD provides rebates only for measures that reduce electricity use. Contact your natural gas provider for rebates for gas savings.

How is the efficiency of a cooling system measured?

Cooling system efficiency is measured in Seasonal Energy Efficiency Ratio (SEER) and Energy Efficiency Ratio (EER). SEER measures the equipment efficiency during the cooling season, while EER measures the equipment's instantaneous efficiency. For both SEER and EER, higher numbers indicate greater efficiency.

Common cooling system types

Central air conditioning. Central cooling systems distribute cool air throughout your home, usually using the same duct network as the heating system. Central systems work by moving cool air into the home.

Central cooling systems can be split or packaged. ***Split systems*** have an outdoor component (condenser) and an indoor component (evaporator coil). In a ***packaged system***, the condenser and evaporator coil are both located outdoors. Split systems are typically more efficient than packaged systems.

Heap pump. Instead of moving cool air into the home, heat pump cooling systems work by removing hot air from the home. Heat pumps are also available as split or packaged systems, and heat pumps can both cool and heat a home.

Heat pumps are an energy-efficient way to heat and cool your home. (source: energy.gov)

COOLING SYSTEM TONNAGE

Most residential HVAC systems are oversized (measured in system "tonnage"). Oversized HVAC systems operate inefficiently and can break down earlier than properly sized equipment. Oversized HVAC equipment is plagued by "short cycling," wherein the system alternates between working very hard (and using a lot of electricity) for a short time and turning off completely for a short time. Short cycling puts undue stress on your equipment, and is an inefficient way to cool your home. (Imagine walking to the store by alternating sprinting and stopping, instead of maintaining a smooth pace.)

Installing a properly sized cooling system saves energy and money and increases comfort. Your SMUD Home Performance Program contractor can perform the calculations necessary to choose the right size of equipment based on your home size, air infiltration, ductwork condition, and insulation level. The better shape your ducts and building envelope (insulation, windows, infiltration) are in, the smaller your system needs to be.

DISTRIBUTION SYSTEMS (DUCTS)

In most homes, heated and cooled air is distributed throughout the home via ducts. Ducts are usually located in "unconditioned space" like attics and crawlspaces, which means the outside air temperature is counteracting the heating and cooling effects of the air inside the ducts.

Duct sealing reduces the amount of conditioned air that leaks directly from the ducts into unconditioned space. Just as leaky pipes waste water, leaky ducts waste the energy it takes to heat and cool air. Your contractor will use a duct blaster test to measure how leaky your ducts are. Ducts in typical older California homes leak up to 30% or more, while new ducts need to be sealed to 6% or less. Old ducts need to be sealed to 8% or less in order to qualify for a SMUD rebate.

Duct insulation reduces the heat transfer between air inside and outside of the ducts. Even if a duct has 0% leakage, heat from a hot attic will warm the cool air in a duct if the duct is not insulated. New ducts must be insulated to at least R-8. (The higher the R-value, the less heat is transferred.)

Your contractor will perform a duct blaster test to measure the leakiness of your ducts. (source: Home Energy Pros, Lawrence Berkeley National Laboratory, 2013)

Reconfiguring ducts to reduce duct length and joints minimizes energy loss through leaks and heat exchange. New ducts should be as short and straight as possible.

Deep buried ducts are shortened, straightened, sealed, and insulated, then buried under at least 3.5 inches of insulation material. Ducts are typically deep buried in conjunction with an attic insulation upgrade.

THE SMUD HOME PERFORMANCE PROGRAM

How do I choose a qualified contractor?

SMUD provides a list of Home Performance Program contractors at ***hpp.smud.org***. All contractors on this list are qualified to earn energy upgrade rebates for your home.

What rebates available for HVAC systems?

Replace HVAC. $400-$2,000, based on the upgraded system's type and efficiency. Additional rebates available for multiple system replacements.

HVAC tonnage reduction bonus. $100-$300, based on the reduction in cooling system tonnage ($100 per ½ ton reduction).

Duct replacement. $500 for one system, $700 for two systems. New ducts must be insulated to at least R-8 and final leakage to outside must be less than or equal to 6%.

Duct sealing. $250. Final leakage to outside must be less than or equal to 8%.

Reconfigure and deep bury ducts. $200. Ducts in the attic must be straightened and shortened and deep buried under attic insulation. Contractor must provide photos of the reconfigured ducts before they are buried and of the ducts after they are buried.

FOR MORE INFORMATION

For more information about energy efficiency incentives available through SMUD, visit:

http://hpp.smud.org/
james.mills@smud.org

For more information about insulation ventilation:

http://www.eere.energy.gov/
http://www.energystar.gov/

Contractors:
Staple your business card here