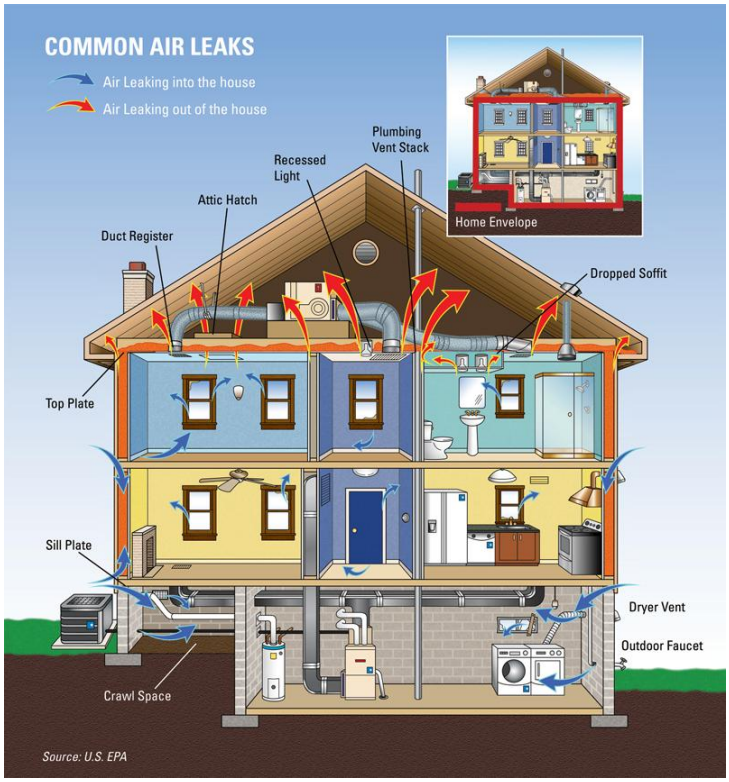
Prescott Green Builders LLC

Energy Efficiency and Tight Construction/Sealed Ducts

Tighter house construction means reduced air infiltration and control of the air flowing into or out of the building envelope. In the construction process, there can be hundreds of opportunities for air leakage through a typical home's air-barrier shell (exterior walls, ceilings, floors) or through thermal bypasses (i.e., locations where insulation is not in contact with the air barrier). These leakage points include the following and those shown on this cutaway graphic of air leakage points:

- Framing gaps
- Wiring penetrations through framing
- Recessed light fixtures in the ceiling
- Window penetrations in exterior walls
- Plumbing penetrations through framing
- Duct leaks



Why Build A Tight House?

A high-performance house, especially one which is certified, is required to have reduced air infiltration to attain the following advantages:

- improved energy efficiency and lower costs
  - the escape of conditioned air is reduced
  - energy costs required to re-condition the interior air are lower
  - air leakage accounts for 25–40% of the energy used for heating and cooling in a typical home
- improved air quality and occupant health
  - dust, pollen, car exhaust, and insects (which can accompany infiltrating air) are kept out of the home
- improved comfort
  - air-infiltration factors which negatively affect comfort (hot or cold rooms, humidity, noise) are mitigated

How is a High-performance House Constructed to Reduce Air Leakage?

The following methods can be used to achieve – and verify – that a house has been tightly constructed:

- Follow checklists (e.g., thermal bypass, air-sealing) to make sure nothing is forgotten
- Typical framing-stage details used to limit air leakage and thermal bypasses include the following:
  - A sill sealer is used between the bottom plate and the concrete to limit air loss (for slab-on-grade homes)
  - Bottom plates are glued and nailed to the subfloor (for crawlspace homes)
  - Exterior sheathing is glued and nailed to the wall studs
  - Weep screed laps over the stemwall/bottomplate seam
  - Housewrap is properly lapped, taped, nailed, and caulked (top and bottom) to the exterior sheathing
  - Thermal bypasses are capped so that insulation is in contact with the air barrier (e.g., soffits, chases, archways, behind tubs and shower units on exterior walls, behind fireplaces on exterior walls
  - Framing penetrations for plumbing or electrical are sealed with expanding foam
  - Plumbing penetrations through the exterior wall are flashed
  - Window and door penetrations are properly flashed
- Wall cavity insulation is installed so that it is in contact on all six sides with air barrier materials (e.g., wood, plywood, drywall)

Air Sealing Resources on the Internet

Energy Star New Homes
U.S. Department of Energy Efficiency & Renewable Energy Program

Department of Energy Best Practices Series: Air Sealing, A Guide for Contractors to Share with Homeowners

Zero-Energy Homes Start With Air-sealing, Insulation, and Weatherproofing
Fine Homebuilding 5/11/2010

Air Leakage Control: The Devil's in the Details
Home Energy Jan/Feb 2005

Toolbase Services: Air Sealing Technology Fact Sheet

- Attic (ceiling) insulation is installed to proper thickness, including over exterior walls; for even higher levels of performance, attics and/or crawlspaces are constructed as unvented, semi-conditioned spaces
- Drywall is glued and fastened to the stud framework
- Drywall penetrations are sealed including:
  - Electrical junction boxes in walls and ceilings sealed with mastic, drywall cutouts sealed with caulk
  - Cutouts for HVAC registers in ceilings or floors are sealed with caulk
  - Drywall is mudded to the floor
- Exhaust fans (e.g., kitchen, bathroom) are dampered to prevent air exchange
- Ducts and air handlers are sealed with mastic; ducts are pressure tested to verify leakage amount
- On completion, the home is pressure tested to verify the air leakage rate (i.e., blower door test)

View a Slideshow
Typical air sealing measures
in high-performance homes in Prescott