

## Chapter 9

### 9.1 BUILDING SCIENCE FACTS

### 9.2 AIR SEALING

### 9.3 INSTALLING INSULATION IN WALL CAVITIES

#### Tools needed by volunteer:

Nail apron  
Tape measure  
Utility knife

#### Materials needed:

[24" R-19 insulation](#)  
3" tape  
Caulk  
[Poly vapor barrier sheathing](#)  
Staples  
Spray foam  
1" foamboard insulation

#### Tools and equipment needed:

Generator  
Extension cords  
Lighting  
Hammer tacker stapler  
Caulk gun  
Framing square

#### [Personal Protection Equipment:](#)

[Dust mask \(recommended\)](#)  
[Gloves \(recommended\)](#)  
[Hearing protection \(recommended\)](#)  
[Safety glasses \(required\)](#)

## **9.1. BUILDING SCIENCE FACTS**

1. All of our homes are Focus on Energy New Homes Program and [Energy V3](#) certified. [The average air leakage of homes we built in 2011 was 53% better than certification requirements.](#) We achieved this because of your great attention to detail. We address energy conservation at every step of the building process, from framing to installing appliances. Doing this gives us a great end product that ultimately benefits the families with a very tight and energy efficient home, making it very affordable for them. Keep up the great work!
2. We need to be intentional about sealing every penetration and hole in the house, both interior and exterior.
3. We want to stop air flow from exterior to interior, interior to exterior and from one level of the house to the other.
4. 40% of heat loss is a result of warm air (air leakage) escaping out of the house.
5. The better job we do at air sealing, the greater the R-value we can achieve from our batt insulation and that will equate to a much more energy efficient home.
6. Fiberglass batt insulation performs the best when it enclosed and air sealed in a six-sided box.
  - Top plate
  - Bottom plate
  - Studs on either side
  - Foamboard or OSB on exterior
  - Vapor Barrier/Drywall on interior
7. Anytime we have airflow through batt insulation we can reduce the R-value by 50% or more.

## **9.2. AIR SEALING**

1. Caulk all holes in all of the wall and ceiling electrical boxes.
2. Caulk or spray foam all holes in all [\(and only\)](#) exterior wall studs.
3. Fill all holes in the top and bottom plates on interior and exterior walls. Look for any unused holes and fill them.
4. Caulk or spray foam all holes (being used or not) or gaps in the foam board or OSB that are visible from inside the house.

5. Fill the gaps that are between window/door jambs, king and jack studs and other gaps in the framing. For a hole that is 1/4" or smaller use caulk; if it's larger than a 1/4" use spray foam.

**NOTE:** When using spray foam, only spray a small amount in the cavity at a time. Have only one experienced person doing this. Have that person go around and check all doors and windows for gaps in the spray foam. Let the spray foam expand completely and then go back and fill the small gaps that need it. A 1/2" depth of spray foam air seals just as well as spray foam expanding out past the window/door jambs.

6. Caulk or spray foam all sillbox penetrations such as dryer vent, plumbing pipe, etc.
7. [From the basement, spray foam all heating duct boots that penetrate through the sheathing to the house's main floor.](#)
8. [If the plumber has run drain pipes for the tub, cover the hole in the floor for the bathtub plumbing with OSB or lumber and seal tight with caulk or spray foam.](#)

**[REQUIREMENT:](#)** [This is a Building Code and a Focus on Energy New Homes program requirement.](#)

### **9.3.INSTALLING INSULATION IN WALL CAVITIES**

#### **9.3.1.[Safety](#)**

1. [Handling insulation releases small airborne particles that can be inhaled. Therefore, it is recommended that a dusk mask be worn when installing insulation.](#)

#### **9.3.2.[General Instructions](#)**

1. Batt type insulation, like most things, performs the best when installed properly. Failure to seal all air leaks, thereby allowing airflow across the insulation, can cause the insulation to lose up to half of its insulation R-value.
2. Failure to fluff the insulation in the wall cavity, or compressing it as little as an inch can cause the insulation value to go from an R-19 to an R-10.
3. Insulate all outside walls with (R-19) batt insulation. Install loosely, never pack it in. Slit the batt to fit over wires and pipes to avoid any air pockets.
4. For those areas where the batt needs to be "cut to size", cut the batt 3/4" larger than the size of the area.

**EXAMPLE:** If there is an area that measures 18" x 30", the batt should be cut to 18<sup>3</sup>/<sub>4</sub>" x 30<sup>3</sup>/<sub>4</sub>".

5. Use foamboard to fill any wall cavity less than 3" wide. It is very hard to fill such a small space effectively with the batt insulation.
6. [Split the batt in half to fit it around electrical wires and plumbing pipes. See Figure 9-1.](#)



**[Figure 9-1.](#)**

7. Cut out around electrical boxes. Cut out as tightly to the box as possible. [See Figure 9-2.](#)

**EXAMPLE:** If the box measures 4" for the height, 3" for the width and 3" for the depth, cut out the insulation only to that size. Be sure to install insulation behind the box.



**Figure 9-2.**

8. Do not insulate any ceiling areas.
9. Take time to ensure insulation is fluffed/pulled out so it is flush to interior wall studs. Make sure insulation fills the entire space from top plate to bottom plate and from stud to stud. [The sharp end of a pencil inserted into the edges of the insulation works well to fluff the batts.](#)
10. Install a poly vapor barrier on the ceiling trusses taking care that the poly extends down the wall 12". Staple to the trusses, overlap seams a minimum of 2' and tape. Make certain the poly fits tight into ceiling corners so as not to interfere with the installation of ceiling sheet rock.
11. Install a poly vapor barrier on all exterior walls. Staple at every stud, plate and window/door rough opening. Use care in wrapping in and around corners so poly does not bunch up and affect sheetrock installation. Overlap seams a minimum of 2' and tape.
12. Tape all seams (PER CODE) to air seal the house. DO NOT TAPE THE SEAM AT CEILING CORNERS.
13. After the poly has been installed, cut X openings at windows, doors, scuttle hole, etc. Wrap poly around rough openings and staple.

14. At each electrical or air opening, cut an X slightly smaller than the box on the inside of the box and push the poly out and around the outside of the box for a snug fit.  
TAPE ONLY IF THE FIT IS NOT TIGHT.
15. Cut the poly over the bath fan slightly smaller than the fan's outer edge. Attach the poly to the fan's flange using Weathermate tape.