

Insulation is one of those boring subjects to consider as a homeowner. Nobody ever sees it and none of your family and friends will 'oooh' and 'aaah' about your wall insulation like they would about new kitchen countertops. However, insulation determines how comfortable your house is to live in and how much energy (and money) it takes to heat or cool your home.

There is no getting around it, re-insulating our Levittown homes is not typically on the top of our list of fun things to do. It is messy and disruptive, and yet it is important to do. As homeowners, before you take on that task and run off to the building supply store, there are a few things to consider.

What Levitt Built

Our houses were framed with 2x4 stud walls using lumber harvested from the west coast and shipped here for this project. (It is actually good quality lumber that is hard to find now.) Walls have a 3 ½ inch deep cavity into which Levitt called for 3 inches of rock wool (or fiberglass) batting to be installed. This equates to an approximate R11 insulation value. The kraft-faced insulation batts were stapled in place.

Insulation in the ceilings varied. Blown or loose-fill insulation was used in some instances (particularly in Levittowners) and batting was used in others. About 3 ½ inches of insulation was originally used there. See Figure 1 below.

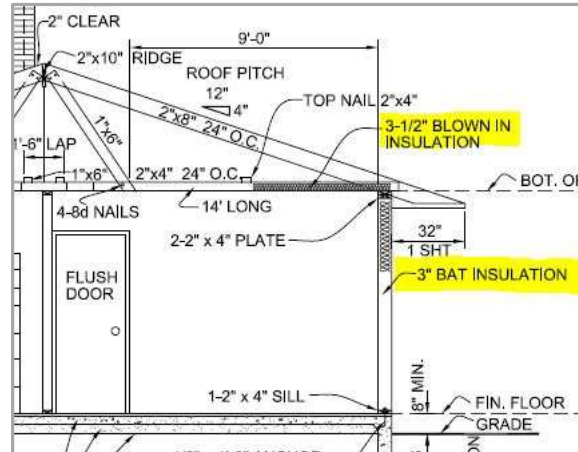


Figure 1: Excerpt from "Levittowner" Drawing (Levittown Archive)

For houses that have a Cape Cod style (Country Clubber, Jubilee, Pennsylvanian, and Rancher), the slope of the roof created an interior knee wall. Levitt chose to insulate the slope of the roof line with kraft-faced batting that was stapled in place. Inside the second floor, insulation was covered by drywall along the slope. Behind the knee wall, the batting was uncovered and unsupported as it followed the roof line. Figure 2 illustrates the installation.

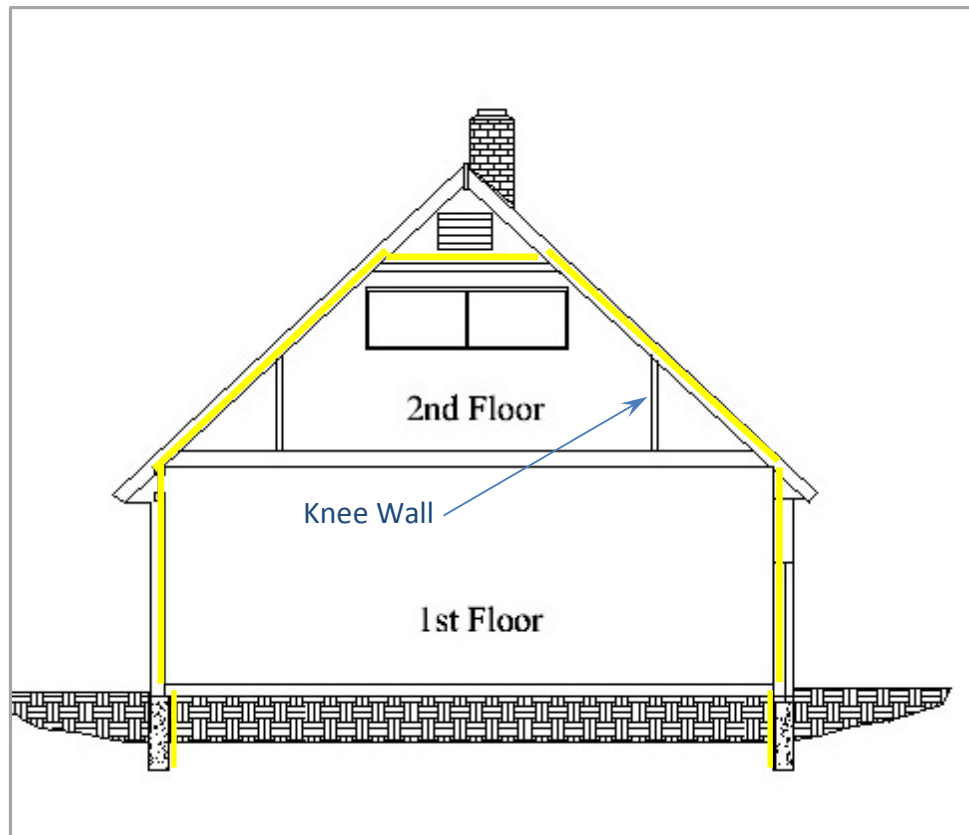


Figure 2: Insulation Envelope Used by Levitt for Cape Cod Style Models

Issues

- 1) The kraft paper on the face of the insulation batts dries and becomes brittle over time. This can result in it detaching from the staples that hold it in place and allow the batt to sag in the wall cavity. In some cases, it may crumple completely to the bottom of the wall.
- 2) In the sloped areas on the 2nd floor, the insulation in the rafter cavity behind the knee wall is unsupported. When it detaches from the staples, the batt breaks apart and falls into the space behind the knee wall. In some cases, it causes the batt in the entire cavity to slip down behind the knee wall. Observations all around Levittown indicate that this is common. See Figure 3.
- 3) As shown in Figure 1, 3 inches of insulation is expected to be in the walls. In some instances, only 2 inches were found, which would reduce the rating of the wall to around R7.5.
- 4) The ceiling insulation amount of 3 ½ inches (estimated to be R13) is well below current recommendations for this region (R49), but was consistent with 1950s standards.

DIY Things To Do

First things first – come up with a plan. Unless the house is unoccupied and/or you want to stay married for as long as possible, consider working on one room at a time. You will have to remove all of the sheetrock from the inside of the exterior walls and you will create a mess. Hint – you may want to start with adding ceiling insulation first – that is fast and doesn't disrupt the household. (There is an alternative to the removal of the sheetrock, but it is not considered DIY. See below for alternatives.)

Ceilings

- 1) Make a decision about the existing insulation that is laying in the joist bays now. If it is in good shape, leave it there and add more on top of it. It doesn't matter if you want to use loose fill or batts, but you will need about 12 inches of insulation to reach the minimum recommended R49 value. Note that your ceiling joists will be covered, so watch your step.

Walls

- 1) Wear a dust mask and carefully remove the old insulation from the wall cavity after the drywall is taken off. Look over the insulation as you remove it – black discoloration is a sign of air or water leaks into the bay. Carefully inspect the interior of the wall cavity and pay particular attention to the bottom plate. Make repairs to any wood members as necessary before re-insulating.
- 2) Before installing new insulation, caulk all around the inside of the stud bay to seal it from air leaks. Although 3 ½ inch R13 fiberglass batting is sold at all of the home centers, consider using 3 ½ inch high density R15 insulation instead. This is about a 15% improvement in insulation value that you will benefit from well into the future. If all goes well, you will never see the inside of this wall again and now is the time to get as much benefit as you can for your hard work.
- 3) Staple the new insulation batts in place carefully. The facing of the new insulation (kraft or foil) is important; it acts as a barrier and limits the movement of air and moisture through the insulation. Repair tears and rips in the facing as necessary.
- 4) Install new drywall. You may notice that the R15 insulation batt bulges a little until the drywall draws tight and compresses the batt snugly into the wall cavity. After installation, you should have a tightly insulated wall cavity. Take a break, clean up the mess, and move on to the next room.



Figure 3: Suspected Insulation Slippage - Levittown PA

Slopes

- 1) The sloped wall/roof areas on the 2nd floor of Clubbers, Jubilees, Pennsylvanians, and Ranchers are problem areas. Levitt chose to insulate the slope of the roof behind the knee wall, but insulation was unsupported and frequently pulled away from the rafter bay allowing cold air to sweep into the space and follow the ceiling cavity into the house. Because the area behind the knee wall is heated (conditioned) space, when this strategy is used, heat is also lost when insulation falls and it rises up through the rafter bay and out. This all happens behind the knee wall out of sight. So, decision time – how do you want to insulate this area? There are basically two options illustrated below in Figure 4.

Option(a): Re-insulate by following the roof line per the original construction as shown in Figure 4(a). In the roof area behind the knee wall, add supports across the face of the insulation. Furring strips would work well here. Because you are adding insulation to the rafter bay, a 6-inch batt can be used (compared with a 3 ½ inch batt used in the walls) due to the larger size of the rafter. Leave a gap or add Styrofoam baffles to allow air to pass under the roof plywood.¹

Note that this approach results in the shaded area (see Figure 4a) behind the knee wall being heated or cooled (conditioned). This is not living space; it is essentially a heated attic area.

¹ A gap is typically left to allow air to flow along the underside of the roof plywood to remove moisture and prevent condensation. However, Levitt did not vent the soffits and there is no source for this airflow.

Option(b): Re-insulate by following the envelop around the living space as shown in Figure 4b. The area behind the knee wall will become essentially attic space similar to the upper one above the 2nd floor ceiling. Take care to seal off the area right under the knee wall in the joist bay to prevent unconditioned air from migrating into the living space areas.

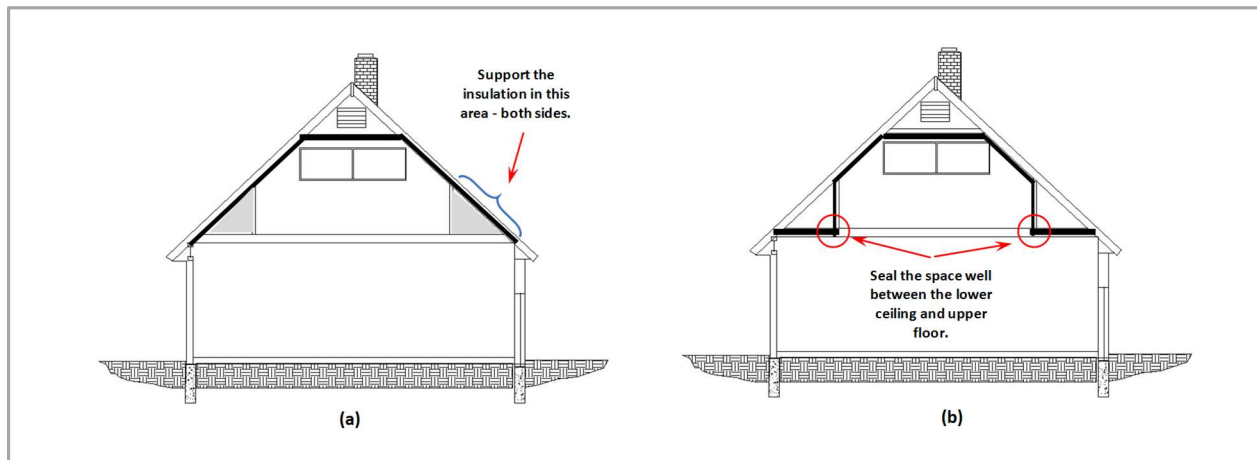


Figure 4: Insulation Options; Roof Slope and Knee Wall

Air Sealing

Insulation will not be effective by itself if cold air blows in through gaps around window frames, electrical boxes, door jams, etc. While you are insulating, you should also be sealing all of the gaps you find. If you are removing drywall, you have also removed trim moldings and it is a perfect time to check out all of these areas underneath for gaps that can be caulked.

Not So DIY Alternatives

This kind of work is not for everybody and if you use a contractor to do the project, he/she will generally want to do it all at once (or at least in big pieces) to be efficient. You will also have more options, some of which may avoid taking all of the drywall off your interior walls. Dense-packed insulation techniques can blow insulation into your walls directly through holes cut into each stud bay. These are later replaced and if performed from the outside, will exist out of sight under the siding. Spray foam can also be used in exposed areas such as behind the knee wall or in the attic. It can also be used for the walls if the drywall is removed. Both of these techniques require special equipment and expertise.

There are many new construction alternatives for your dormer expansion, garage conversion, etc. A good source of information is available at the link below from DOE. Tool around their site. There is a lot of information out there. Good luck with the project. <https://www.energy.gov/energysaver/insulation>