

# Foundation Subfloor

*Air Seal Floor Systems in Basements and Crawlspaces*



## SKILL SET

Be sure you have the experience needed for this job. If you are in doubt, hire a contractor.

## SAFETY

These tasks require working in tight clearances and under task lighting. Use a dust mask/respirator, gloves, safety glasses and kneepads.

## TOOLS

Utility knife, table or circular saw, caulk gun, measuring tape, lights, straight edge and markers

## MATERIALS

Foam/caulk/construction adhesive/duct mastic  
 Insulation – cavity batts or rigid foam board insulation  
 Sheathing – OSB/plywood or code-approved foam board  
 Fasteners – screws with washers or button-capped nails

## COST BENEFIT

Air sealing, combined with insulation in basements and crawlspaces reduces heating and cooling costs and improves comfort and indoor air quality.

### PRIORITY LEVEL

LOW MED **HIGH**

### SKILL LEVEL

**DIY** PRO

## Air Seal Before Insulating

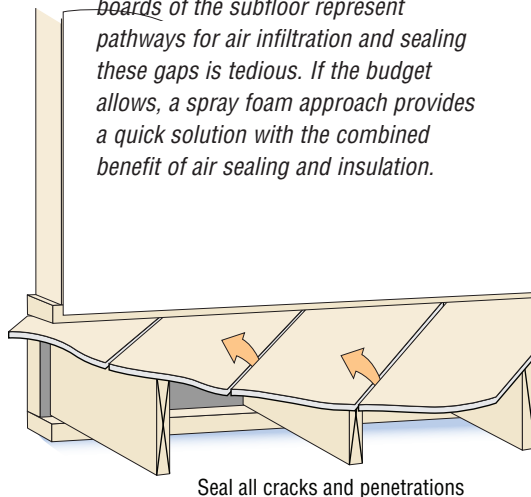
Air sealing and then insulating framed floor assemblies over basements and crawlspaces represent one of two options on how to determine the thermal envelope at the foundation. The other approach is to condition or indirectly condition the basement or crawlspace and thus air seal and insulate the foundation walls.

There are many advantages to air sealing and insulating the foundation walls and then conditioning or indirectly conditioning the basement/crawlspace, however, sometimes this approach is not viable. In this case, you should airseal the subfloor prior to insulating. The advantages of air sealing and insulating the subfloor include:

- No need to alter the combustion air scenario if the foundation space contains vents and standard efficiency combustion appliances
- Risk reduction for radon entry
- Separation of crawlspace/basement air from main living space
- Appropriate in flood prone areas
- Okay to store items like lawn equipment in this location since it is isolated from the house.

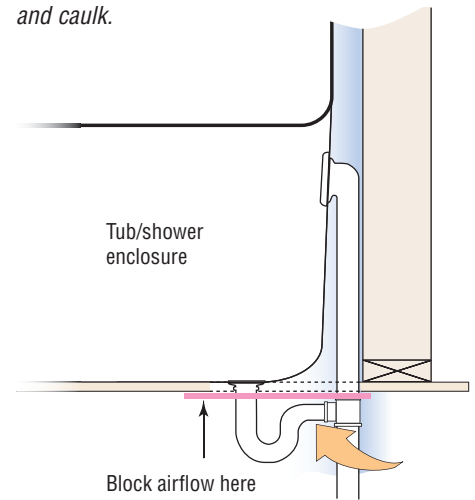
## Subfloor Challenge

*Older homes may have a subfloor with lumber laid on a bias. The gaps between boards of the subfloor represent pathways for air infiltration and sealing these gaps is tedious. If the budget allows, a spray foam approach provides a quick solution with the combined benefit of air sealing and insulation.*



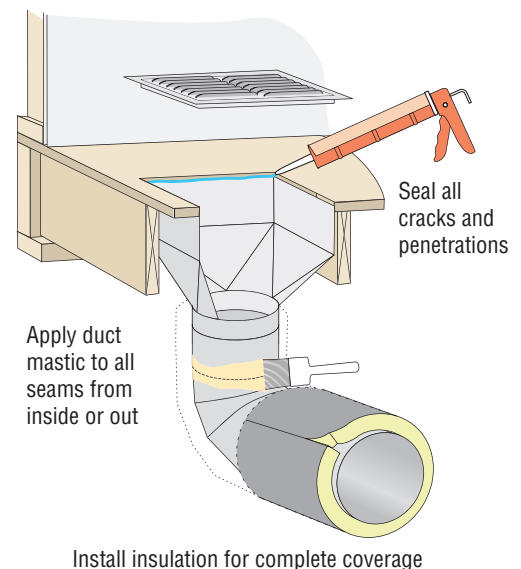
## Large Penetrations - Plumbing

*Use sheathing materials to block large holes and seal edges with spray foam and caulk.*



## Large Penetrations - HVAC

*Airsealing from the living space can be an option for items such as duct boots. Remove the register to seal gaps and seams from the inside.*



## Subfloor Air Sealing Details

All crawlspace floors need 100% ground cover using a plastic vapor barrier that is sealed to the foundation walls – basements usually have a concrete floor poured over the plastic. Visually inspect for obvious signs of pest (termites, rodents, snakes, etc.) or moisture damage and consult a professional if necessary.

Older homes will typically have floor framing joists that support a diagonal “one-by” subflooring with the finished flooring material (e.g., carpet, tile, hardwood, etc.) installed on top. Occasionally a finished wood flooring (e.g., tongue and groove hardwood) is installed directly onto the floor joists. Newer homes usually have plywood or OSB sheets as their subfloor material and are inherently more air tight because of this – however air leakage can still occur at the seams, particularly at weepholes in the tongue and groove joints.

If there is existing insulation beneath the subfloor, it will need to be removed in order to air seal. One approach is to remove the existing insulation, air seal and begin with new insulation. Another strategy is to carefully remove any existing insulation from an area, perform necessary air sealing and neatly replace the old insulation. The condition of the existing insulation will need to be assessed to determine potential for reuse. See the *Foundation Subfloor Insulation* recipe card for guidance on insulation levels.

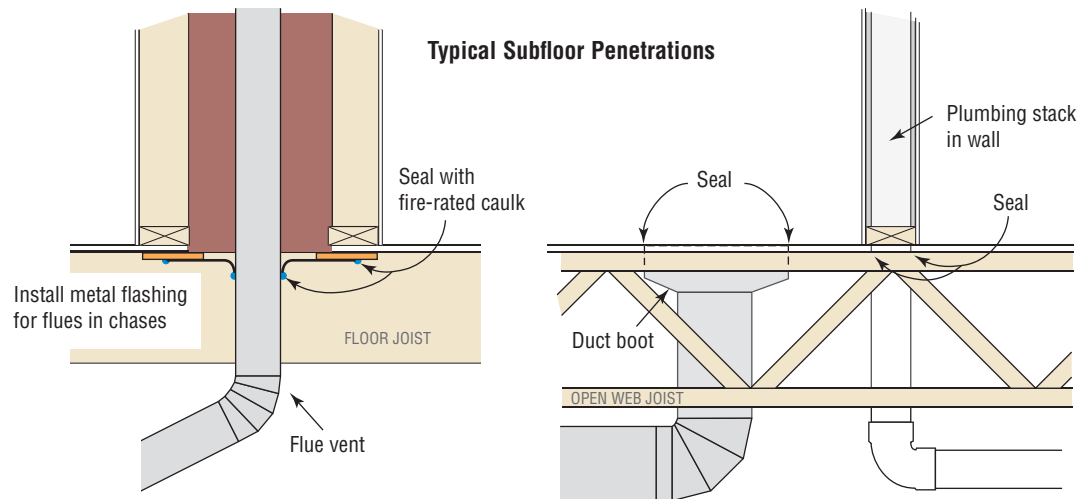
Penetrations and seams are the primary targets for air sealing the subfloor. A two-part foam “froth pack” or a reusable one-part foam gun with replaceable canisters are ideal tools for air sealing cracks, seams and small penetrations from beneath the subfloor. A caulk gun may work in some applications as well as sealing paste material such as duct mastic.

When air sealing, the rule is to go after the big holes first then medium sized holes and finally smaller cracks and seams. On existing homes, it may be easier to simply complete a section before moving on to the next part. However, there are certain places to investigate first as discussed below.

## Target Areas for Air Sealing the Subfloor

**Plumbing** installation creates the most holes and penetrations in the subfloor. Fortunately, these holes are predictable and generally easy to find given the known location of the plumbing fixtures. Examples of plumbing penetrations include shower/tub drains, hot and cold water supply lines and plumbing drain and vent stacks. If the gaps are small, (~ ¼” or less) then caulk or mastic is an ideal sealant. Larger cracks (> ¼” up to 1-2 inches) can be sealed using a foam gun. For openings too large for the canned spray foam to seal, a sheet material such as OSB/plywood or rigid foam board can be cut to fit and then sealed with caulk, adhesive or mastic and mechanically fastened with screws or nails to plug large holes.

**Wiring** penetrations are also common. Trace electrical wiring to determine where it passes through the floors above. Generally, caulk or foam is



*Different floor assemblies provide unique challenges but the end result is the same - seal all cracks and penetrations*

sufficient to seal these penetrations. Also look for other types of wiring such as a security system, phone, cable, thermostat and other conduits.

**Mechanical** penetrations are likely if there is HVAC and water heating equipment present in the basement/crawlspace. Anytime a duct or boot penetrates the subfloor, there is likely to be a gap that can be sealed with caulk, foam or mastic. Sometimes it is easier to seal the gap between the boot and subfloor from the house side by simply removing the register grill and sealing the gap with caulk or mastic. Duct boots can also be sealed from the inside with mastic.

Combustion appliances such as standard efficiency boilers, furnaces and water heaters will have a metal flue pipe that often penetrates the subfloor through a chase. Since the metal flue can get hot during operation, it is important to use rolled sheet metal and high temperature rated (intumescent) caulk for the first 3” outwards from the flue pipe. Beyond that, another sheet material, such as plywood/OSB may be used. High efficiency “condensing” mechanical equipment is usually vented with PVC pipes and regular caulk or foam may be used for air sealing these penetrations.

When mechanical or laundry equipment is located on a floor above the basement/crawlspace, there will often be plumbing, gas, condensate and dryer vent lines connecting from below. Seal these penetrations with caulk or foam as discussed above.

**Masonry chimneys** sometimes rest on the ground in the basement/crawlspace and run vertically up through the subfloor. Because the bricks could get hot, sealing the gap between the chimney to wood framing should be similar to hot flue pipes – employing sheet metal and high temperature rated caulk.

**Access** to a basement is commonly from the house living space via stairs. Regardless of whether the basement door is located at the top or the bottom of the stairs there are going to be walls that must be air sealed (and insulated) as well as the rough opening for the doorway. Finally, install proper weatherstripping and an adjustable threshold to carefully seal the door. Occasionally there will be a crawlspace hatch inside the home. The hatch should be weatherstripped and insulated.