Home owners may consider converting a vented attic to an unvented attic to add rooms in the attic, to provide temperate storage or a temperate space for heating and cooling equipment, or because a roof replacement may offer the opportunity to reinsulate the attic. If heating and cooling equipment must be located in the attic, then sealing the attic vents and insulating the attic space along the roof line makes sense from an energy-efficiency standpoint. Heat transfer through the walls of the ducts is reduced, the equipment does not have to work as hard to overcome the greater temperature difference of the attic space, heat loss through duct leaks to the outside is minimized, condensation on the ducts is less likely, and the potential to draw unconditioned unfiltered attic air into the air supply system is eliminated. A full set of guides is available on air sealing and insulating attics[1] in the Existing Homes Tool.

When renovation work will involve the attic, the attic should first be assessed as described in the first section below, Potential Stop-Work Conditions. This inspection must be based on federal, state, and local regulations and should be carried out by a licensed or certified contractor. The following sections provide greater detail on these conditions. This assessment is adapted from the Measure Guideline report, “Guide to Attic Air Sealing [2]” prepared by Building Science Corporation for the U.S. Department of Energy’s Building America program.

Potential Stop-Work Conditions

Figure 1 summarizes potential stop-work conditions and the remediation actions needed for each of these conditions. If any of these conditions are found during the site assessment, they must be dealt with before proceeding with improvements to the attic or roof. Additional information on these conditions and others follows the figure.
An exterior and interior inspection should be conducted, as well as an inspection of the attic space itself as described in the sections below. Some elements of the attic inspection vary depending on whether a vented or non-vented, conditioned attic is planned. Find Solution Center guides on both attic types in the Existing Home Checklist [3].

### Exterior Walk-Around

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the attic floor has floorboards or other sheathing that prevent inspection</td>
<td>Then professional advice should be obtained to determine if the floorboards serve a structural function prior to their removal. If yes, this function must be replaced prior to disturbing the floorboards.</td>
</tr>
<tr>
<td>If the house attic has active knob and tube wiring</td>
<td>Then the house must be rewired before work in the attic may begin.</td>
</tr>
<tr>
<td>If the house has vermiculite insulation</td>
<td>Then professional advice should be obtained. Vermiculite insulation may contain asbestos and must be tested prior to attic work beginning. Contact the state health department. See the EPA Protocols (see link in the text below).</td>
</tr>
<tr>
<td>If bathroom fans are vented into the attic</td>
<td>Then the bathroom fans must be vented to the outside prior to attic work. Check for mold near duct outlets.</td>
</tr>
<tr>
<td>If the house has roof leaks</td>
<td>Then the roof must be repaired prior to beginning attic work. Check for mold in areas showing water damage or spots.</td>
</tr>
<tr>
<td>If any mold is observed</td>
<td>Then a mold remediation professional should conduct an in-depth inspection and follow up with the proper remediation of the affected areas. No work can proceed until the space has been certified clean by the mold professional. See the EPA Protocols.</td>
</tr>
<tr>
<td>If the house has an unvented kerosene heater or fireplace</td>
<td>Then the kerosene heater or fireplace must be vented or removed prior to attic work. See the EPA Protocols and the Pre-Retrofit Assessment of Combustion Appliances.</td>
</tr>
<tr>
<td>If signs of pest-related activity or damage are observed</td>
<td>Then inspection and treatment by a certified pest control contractor will be necessary before work can proceed.</td>
</tr>
<tr>
<td>If the structural integrity of framing is not adequate and/or shows signs of rot or decay</td>
<td>Then the framing must be made structurally sound, rot must be remediated, and sources of moisture corrected before work can proceed.</td>
</tr>
</tbody>
</table>
Note specifics such as the quantity, size, and location of the following items:

- Soffit vents, gable end vents, mushroom cap vents, and ridge vents: Note the quantity and size of each and use this information to calculate the amount of upper and lower ventilation present in a vented attic. This calculation is described in the assessment guide “Calculating Attic Ventilation.”

- Plumbing stacks and flue or chimney shafts: Note the quantity and locations of these stacks. Ensure there are no water leaks around these openings or from the plumbing itself and that they are properly flashed. See the Solution Center guide “Air Sealing Duct and Flue Shafts [4]”

**Interior of Home Walk-Through**

Note the locations of the following:

- exhaust fans
- air supply vents through the ceiling
- lighting fixtures in the ceiling, both recessed cans and standard lights
- masonry and metal chimney pipe chases.

Look for signs of a leaking roof. If the roof is leaking, it must be repaired before proceeding with the retrofit.

**Attic Inspection**

Check each of the items listed in Figure 1 “Potential Stop-Work Conditions” and respond as indicated.

**Attic Flooring**

Attic flooring or floor sheathing may prevent access to areas that need to be inspected and areas that need to be air sealed. Therefore, it will need to be removed before work can proceed. However, the attic flooring or floor sheathing may also be providing an important structural function. Consult a qualified professional before removing floorboards or sheathing attached to ceiling/attic floor joists that are not parallel to roof rafters. Replicate the structural function of the attic flooring, if needed, before removing it.

**Hazardous Materials**

If hazardous materials and conditions such as knob and tube wiring, vermiculite insulation, mold, or pest infestation are found, they must be repaired or mitigated before proceeding with the retrofit. For more information, see the assessment guides Pre-Retrofit Assessment of Hazardous Materials [5] and the U.S. Environmental Protection Agency’s Healthy Indoor Environment Protocols for Home Energy Upgrades. For more on vermiculite and asbestos, see the EPA’s Asbestos website [6].

**Exhaust Fans**

Refer to the list of exhaust fans identified during the walk-through. Ensure that none of these exhaust fans vent into the attic but instead that all of them vent to the exterior of the house. For more information see the guide on assessing ventilation equipment. If any exhaust fans currently vent into the attic, look for signs of mold, which will need to be remediated before renovation work can proceed.

**Roof Leaks**

Inspect for water staining, damp wood, and other signs of roof leaks. Especially inspect around .

**Plumbing Stacks and Flue or Chimney Shafts**

As part of the attic inspection, note specifics such as the presence, size, and location of these items. Compare to your notes from the interior and exterior evaluations for the locations of the plumbing stacks and flue and chimney shafts. Ensure that there are no leaks around the penetrations through the roof or from the plumbing itself. In vented attics, insulate any supply pipes to stop condensation and to avoid heat loss. Ensure that nonflammable materials will be available for air sealing. See the Solution Center guide, Air Sealing Duct and Flue Shaft [4].

**Combustion Appliances and Carbon Monoxide**

If fuel-fired combustion appliances, such as a furnace or water heater, are located in a vented attic that will be sealed and insulated, determine their venting and combustion air sources before conducting renovations such as air sealing the attic. If they are natural- draft or open-combustion (Category 1) appliances that draw their combustion air from the surrounding space, the best approach is to replace a natural draft-vented furnace or water heater with a sealed-combustion, direct-vent appliance or an electric heat pump or heat pump water heater. Direct-vent gas furnaces draw combustion air directly from outside through piping.
to the unit. All combustion by-products are vented through sealed piping to the outdoors, minimizing the possibility of any carbon monoxide spillage into the home.

If the Category 1 appliances will remain, all gas lines and gas appliances should be tested for gas leaks and the vents, burners, crossovers and heat exchangers should be visually inspected proper size and pitch and to confirm there are no blockages, cracks, leakage, or corrosion. A worst-case depressurization test and worst-case spillage test of the combustion appliances should done, and carbon monoxide levels around the appliances should be checked with a CO detector before and after renovations are completed. See the assessment guide “Pre-Retrofit Assessment of Combustion Appliances [7]” for more information.

Condensate Drains

If there are mechanical systems in the attic such as an air conditioner or heat pump that have a condensate drain, the drain line should be adequately supported and routed directly to a drain or a sanitary sewer. In addition to the primary drain, and as a safety precaution in case the primary drain fails, an auxiliary drain pan with a separate drain should be located beneath any evaporator coil to prevent condensate from flooding the attic and spaces below.

Ductwork

If the attic will remain vented and ductwork and/or air handling equipment will remain in the attic, ensure that the air handler cabinet is air sealed [8] and inspect and test the ducts to ensure that they are air sealed and insulated. To further reduce heat loss, the ducts can be buried under deep insulation or encapsulated with spray foam and buried in blown insulation. The Existing Homes Tool links to several guides describing how to seal and insulate ducts [1].

Code Considerations

Check with local code authorities prior to the installation of any insulation to ensure that all local code requirements are met, such as R-value levels for insulation and fire and combustion safety requirements.

Safety

During any air sealing process, follow safe work practices to minimize any effects from sealants or adhesive fumes on workers’ health. Temporary ventilation could be necessary during the installations. See the U.S. Department of Energy’s Standard Work Specifications [9] for more information about worker safety in attics.
More Info.

Access to some references may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

References and Resources*

1. Asbestos
   Author(s): U.S. Environmental Protection Agency
   Organization(s): EPA
   Publication Date: July, 2017
   EPA’s website about asbestos.

2. Healthy Indoor Environment Protocols for Home Energy Upgrades
   Author(s): U.S. Environmental Protection Agency
   Organization(s): EPA
   Publication Date: December, 2014
   This publication provides a set of best practices for improving indoor air quality in conjunction with energy upgrade work in homes.

3. Measure Guideline: Guide to Attic Air Sealing
   Author(s): Lstiburek
   Organization(s): Building Science Corporation
   Publication Date: September, 2014
   Report that provides information and specifications to anyone that is attempting to air seal existing attics.

4. Measure Guideline: Guide to Attic Air Sealing
   Author(s): Lstiburek
   Organization(s): Building Science Corporation
   Publication Date: September, 2014
   Report that provides information and specifications to anyone that is attempting to air seal existing attics.

*Publication dates are shown for formal documents. Dates are not shown for non-dated media. Access dates for referenced, non-dated media, such as web sites, are shown in the measure guide text.

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