By now, most conscientious builders and designers know that ducts, furnaces, and air handlers belong inside a house’s conditioned space. Researchers have shown that ductwork in unconditioned attics or vented crawlspaces wastes about 20% of the output of a furnace or air conditioner. If the duct system is unusually leaky and poorly insulated—or as occasionally happens, if some of the ducts are crushed, ripped, or completely disconnected—the energy waste will be far higher.

The furnace or air handler’s location determines where ducts should be installed. The best locations for ducts are in insulated basements, sealed crawlspaces, or unvented conditioned attics. If these places won’t work, ducts can be installed in open-web floor trusses or in some type of soffit, dropped ceiling, or chase.

**Ducts in open-web floor trusses**

If you are building a two-story house with a centrally located mechanical room, it often makes sense to put ducts in open-web floor trusses. Follow these steps:

- Any duct leaks will pressurize the joist bays, so be sure to air-seal the rim joist carefully to keep conditioned air indoors.
- Order joists at least 16 in. deep to make room for insulation and ductwork. Account for this when designing stairs.
- If you are building a tight, well-insulated house with high-performance windows, locate supply registers near the center of the house instead of at the perimeter. This will keep duct runs short.
- Communicate and coordinate with the HVAC contractor, the plumber, and the electrician. These subcontractors will all be competing for the same joist space.

**Ducts in soffits or dropped ceilings**

In a single-story home, it often makes sense to install ducts in soffits or in a dropped ceiling. Make sure that duct chases don’t have any leaks or air pathways that communicate with the outdoors. Before any ducts are installed, the chases need to be lined with an airtight barrier—for example, drywall, plywood, or OSB with sealed seams.

**More details online**

Some of these details are new to Green Building Advisor’s collection of air-sealing details. GBA Pro members get full access to the detail library, which contains almost 2500 details on building better, tighter, more-energy-efficient houses. Go to GreenBuildingAdvisor.com/detail-drawings to browse through the collections.
Is all this work really worth the hassle?

Placing your ducts indoors has several benefits:
- It may be possible to downsize the air conditioner and furnace, which saves money.
- Room-to-room temperature differences will probably be reduced, which improves occupant comfort.
- Energy bills should be significantly lower.

In spite of these obvious benefits, bringing the ducts inside the conditioned envelope is usually a headache for the builder, and the necessary details raise costs. Open-web trusses will probably cost more than I-joists, and deep joists may require a longer stairway. For a successful job, the general contractor will need to budget time for facilitating coordination between all of the trades, including the framers, the HVAC contractor, the plumber, the electrician, and the drywallers.

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