No Ducts or Air Handlers Located in Garage

Last Updated: 03/24/2017

Scope

- Do not locate HVAC ducts or air handlers in the garage.

  - Design the HVAC system to be located within the conditioned space of the home, either in a utility closet or in an air-sealed conditioned attic, basement, or crawl space.

  - Install all ducts and air handling equipment inside the conditioned space of the home (or in an insulated attic, basement, or crawlspace) and within the home's air barrier to isolate the ducts from the garage environment.

  - If the air handling equipment must be located in the garage, construct an insulated, air-sealed closet to enclose the equipment.

See the Compliance Tab for related codes and standards, and criteria to meet national programs such as ENERGY STAR, DOE's Zero Energy Ready Home program, and EPA’s Indoor airPLUS.
Historically, in many parts of the country, air handling equipment and ductwork was installed inside the attached garage to preserve livable space within the home. However, this common practice can cause indoor air quality issues within the home by actively drawing contaminants from the garage environment, through the air distribution system, and into the home. Garage air contaminants such as gasoline fumes, auto exhaust fumes, paint, and other chemicals pose a health and safety risk to occupants. These contaminants must be prevented from entering the living space by ensuring a tight air barrier between the house and attached garage.

HVAC equipment and ductwork should not be located in the garage where it can act as a conduit for air movement between the garage and the house. In addition, any walls, ceiling cavities, and floor cavities separating the garage from livable space should be extensively air sealed.

Consider placement of the HVAC system in the initial design stage of the home. There are many ways to include the HVAC system within the conditioned space of the home. They can be installed in a utility closet or utility room in the home, in an unvented attic, or in an insulated and air-sealed basement or crawlspace.

If a system must be located in the garage, an insulated and air-sealed closet should be constructed to completely isolate the HVAC equipment from the garage. This closet should be equipped with a sealed and weather-stripped door with self-closing hinges that is wide enough to allow for future equipment replacement.

How to Separate Ducts and Equipment from the Garage

1. During the design stage, plan for the duct system and equipment to be located inside the conditioned space of the house and not in the garage.
   a. Locate all ductwork and equipment within the air barrier of the home and completely isolate it from the attached garage by extensive air sealing. Do not locate equipment or ductwork in the garage, in the house-to-garage common walls, ceiling, or in the exterior walls of the garage.
   b. Follow and utilize all Air Conditioning Contractors of America (ACCA) Manuals J, S, D, and T protocols when designing the HVAC system. See Figure 1 for which ACCA manuals to use at which stage in the design process.
   c. During the design stage, locate all duct runs to provide the most efficient access for installation within the home. This can be achieved in several ways: with properly sized chases, bulkheads, furred interior walls, or interior partition walls. Or, ducts can be installed in a sealed and insulated attic or crawlspace or basement.
2. If equipment must be located in garages, construct a well-sealed equipment closet around the equipment. Insulate the walls, then tape and mud the drywall to create a conditioned, air-sealed room for the equipment and any attached ductwork. Work with trades to sequence the HVAC and drywalling work; some drywall may need to be installed before the HVAC equipment and some after (see Figure 2). Seal all framing bottom plates to the garage slab using a closed-cell foam “sill seal.” Weather strip the closet door to ensure no air transfer occurs between the closet and the garage. Install spring-loaded hinges that automatically close the door if it is left open. Seal all joints in the air handling equipment per manufacturer requirements. Seal all ductwork with fiberglass mesh tape and mastic paste. See Figure 3. Additional information can be found in the guides Air Seal HVAC Cabinet Seams, Air Sealing Attached Garages, Garage Rim/Band Joist Adjoining Conditioned Space, and Air Sealing Doors Adjacent to Unconditioned Space. Also see the Building America Measure Guideline report: Air Sealing Mechanical Closets in Slab-On-Grade Homes.
3. If any natural draft or power-vented equipment (HVAC and/or water heating equipment) is located in the closet, provide sufficient combustion makeup air through a ducted outdoor air intake to prevent back-drafting of the flue gasses. Back-drafting can draw combustion by-products into the air handling equipment, which can then be distributed into the occupied space of the house, causing a health and safety hazard for the occupants.

4. If ductwork must be located in the garage framing, seal all joints and seams in the ductwork with mastic paste to the appropriate thickness. (See Figure 4.) Then encapsulate the ductwork and framing cavity in closed-cell spray foam to ensure the ductwork is air sealed and to provide the highest possible R-value for the ductwork. Once the spray foam is cured, drywall can be installed to finish the garage. No supply or return registers should be installed in the garage. For more information on foaming ducts, see the Building America Solution Center guide, Encapsulated Ducts. For more on sealing and insulating ducts, see the guides Sealed and Insulated Flex Ducts, Sealed and Insulated Metal Ducts, and Sealed and Insulated Fiber Board Ducts.
Figure 4. All seams in the HVAC equipment and ductwork are sealed with mastic; because the HVAC equipment is in the garage, it is an air-sealed closet. (Image courtesy of IBACOS).

5. Install all equipment and ductwork in compliance with ACCA Standard 9, HVAC Quality Installation Verification Protocols to ensure a high-quality system installation.
Ensuring Success

Design the home’s floor plan to accommodate the full HVAC system inside the conditioned space of the house, attic, basement, or crawlspace. If you are the architect, work closely with the builder and HVAC installer to design adequate floor space for this purpose. If you are the HVAC installer, look for available floor space inside the house to locate the ductwork and equipment, and make your builder aware of your concerns if no conditioned floor space is available for this purpose. If you are the builder, specify to your architect and installer to locate equipment in conditioned space and not inside the garage. If you are the homeowner, ask the builder or HVAC installer to locate your system inside the conditioned space of the home.

If ductwork must be run in garage framing, inspect to ensure that a robust air barrier is installed to isolate the ducts from the garage space. If air handling equipment must be installed in the garage space, make sure an insulated and well-sealed equipment closet has been constructed to locate the equipment, that seams in the air handling cabinet have been properly sealed, and that all interior and exterior air barriers between the garage and house are continuous and well-sealed.

Test the ducts for air tightness with a duct blower test. The air handler closet can be tested for air tightness with respect to the garage.
Climate

No climate-specific information is applicable to this guide. This information applies specifically to indoor air quality and relates to all climate zones where air handling equipment or ducts may be installed in a garage.
Training

Right and Wrong Images

Display Image: HVAC218_NoDuctsinGarage-W1_IBACOS_1-24-17.jpg
CAD
None Available
Compliance

The Compliance tab contains both program and code information. Code language is excerpted and summarized below. For exact code language, refer to the applicable code, which 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.

**ENERGY STAR Certified Homes, Version 3/3.1 (Rev. 09)**

National Rater Field Checklist

7.7 Air inlet location (Complete if ventilation air inlet location was specified (2.12, 2.13); otherwise check “N/A”): 46, 47
7.7.1 Inlet pulls ventilation air directly from outdoors and not from attic, crawlspace, garage, or adjacent dwelling unit.

Please see the [ENERGY STAR Certified Homes Implementation Timeline](#) for the program version and revision currently applicable in your state.

**DOE Zero Energy Ready Home (Revision 07)**

Exhibit 1 Mandatory Requirements.

Exhibit 1, Item 1) Certified under the ENERGY STAR Qualified Homes Program or the ENERGY STAR Multifamily New Construction Program.

Exhibit 1, Item 6) Certified under EPA Indoor airPLUS.

**EPA Indoor airPLUS (Revision 04)**

4.3 Location of Air-Handling Equipment and Ductwork. Do not locate air-handling equipment or ductwork in garages.

Note: Ducts and equipment may be located in framing spaces or building cavities adjacent to garage walls or ceilings if they are separated from the garage space with a continuous air barrier.

**Air Conditioning Contractors of America (ACCA)**

When designing an HVAC system for a home, the designer should follow the established ACCA protocols that are included in Manuals J, S, D, and T. When installing an HVAC system, the installer should follow ACCA Standard 9, HVAC Quality Installation Verification Protocols to ensure a high-quality system installation.
Case Studies

1. **New Whole-House Solutions Case Study: New Traditions Homes, Landover Commons, Vancouver, WA**
   - Author(s): PNNL
   - Organization(s): PNNL
   - Publication Date: April, 2012
   - Case study about energy efficient new home construction that also incorporated moisture management techniques for durability in the damp Northwest climate.

References and Resources*

1. **Air Barriers - Airtight Drywall Approach**
   - Author(s): Lstiburek
   - Organization(s): Building Science Corporation
   - Publication Date: May, 2009
   - Brochure about creating an air barrier by sealing drywall assemblies.

2. **DOE Zero Energy Ready Home National Program Requirements (Rev. 07)**
   - Author(s): U.S. Department of Energy
   - Organization(s): DOE
   - Publication Date: May, 2019
   - Standard requirements for DOE's Zero Energy Ready Home national program certification.

   - Author(s): Schoen, Brennan, Musser, Rudd
   - Organization(s): ASHRAE
   - Publication Date: December, 2018
   - Report providing guidance on indoor air quality in single-family and multifamily housing for designers, builders, property managers, homeowners, buyers, and renters.

4. **Sealing Air Barrier Penetrations**
   - Author(s): Lstiburek
   - Organization(s): Building Science Corporation
   - Publication Date: May, 2009
   - Information sheet about air sealing.

*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.

Contributors to this Guide

The following authors and organizations contributed to the content in this Guide.

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