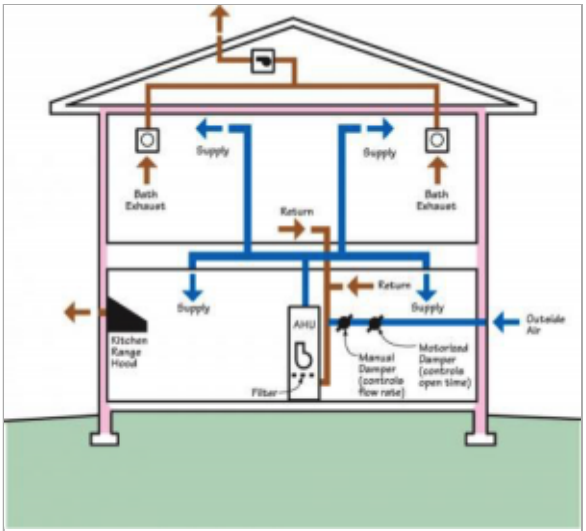
Outdoor Air Intake Damper Controlled

Last Updated: 07/19/2017

Scope



A fresh air inlet is ducted to the return side of the home's central air handler; a motorized damper and electronic controls help balance the flow of fresh incoming air with controlled exhaust to meet ventilation requirements

When an outdoor air inlet is ducted to the return side of the HVAC system's central air handler

- Install a motorized damper that can close the air intake.
- Install controls to provide intermittent fresh air based on a timer.
- Set the timer to meet desired or code-mandated ventilation requirements.

See the **Compliance Tab** for related codes and standards requirements, and criteria to meet national programs such as DOE's Zero Energy Ready Home program, ENERGY STAR Certified Homes, and Indoor airPLUS.

Description

In a home that has a balanced ventilation system that uses central-fan-integrated supply ventilation, a heat recovery ventilator (HRV), or an energy recovery ventilator (ERV), fresh air is brought into the home from a ventilation air inlet located on the exterior of the home (often in a roof soffit or porch roof, see the guide **Ventilation Air Inlet Locations**). If the outside air inlet is ducted to the return side of the central air handler, the duct should not be allowed to remain open at all times. Over-ventilation can unnecessarily increase energy use and can increase indoor humidity in humid climates. The volume and duration of fresh air intake periods should be controlled by a motorized damper that is controlled electronically to automatically provide intermittent fresh air. The damper can be controlled with a timer that is set by the HVAC installer to meet desired or code-mandated ventilation requirements (for example, the ventilation minimum determined using **ASHRAE Standard 62.2-2010/2013, Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings**). See manufacturers' instructions for installing and setting the timer, damper, and controls. Some ERV and HRV models come with an integral motorized damper to prevent airflow when the HRV or ERV fan motor is not operating.

The timer can be used to coordinate periods of fresh air intake with operation of an exhaust fan operating within the home to provide balanced ventilation, so that the home does not become overpressurized. For more information, see the guide **Whole-Building Delivered Ventilation**.

The electronic controls can also be set to coordinate operation with the central air handler fan by cutting back on fan-only run time during hours when the desired amount of ventilation run time has already been met by the HVAC fan while it is operating to meet heating or cooling demand. See guide [Rater F 7.5] ECM/ICM Air Handler Fans.

See Figure 1 for one example of a whole-house ventilation system that incorporates a central fan integrated ventilation system with a fresh air intake that is ducted directly to the return side of the air handler. Electronic controls operate the motorized damper to balance the amount of air brought into the home through the fresh air intake with exhaust fans to provide adequate ventilation air to meet the requirements of ASHRAE 62.2.

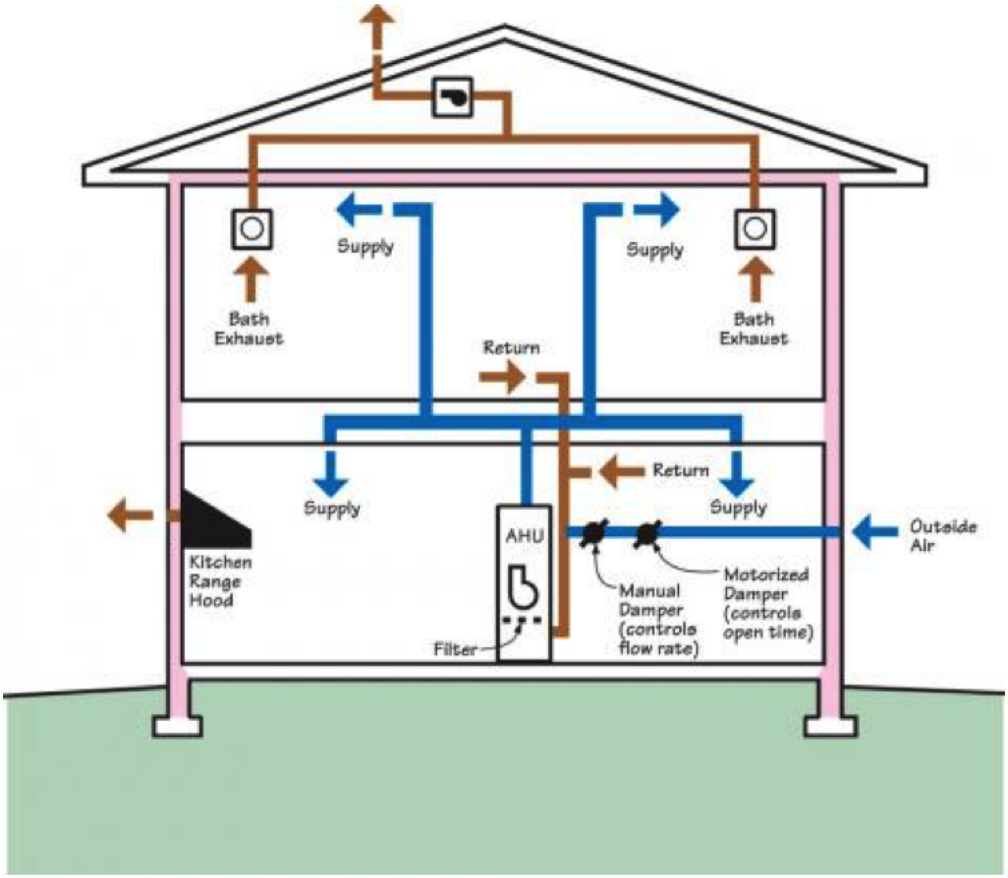


Figure 1 – A fresh air inlet is ducted to the return side of the home's central air handler; a motorized damper and electronic controls help balance the flow of fresh incoming air with controlled exhaust to meet ventilation requirements (Source: **Local Exhaust and Whole House Ventilation Strategies**)

Ensuring Success

The home energy rater should verify that any fresh air intake connected to the return side of the HVAC system has a damper that is electronically controlled to provide timered ventilation and to close when not in use.

Climate

Mechanically controlled dampers limit ventilation to prevent over-ventilation in humid or extreme temperature conditions.

Training

Right and Wrong Images

None Available

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.

ASHRAE 62.2-10/13
The standard "Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings" by the American Society of Heating, Air-Conditioning and Refrigeration Engineers (ASHRAE), defines methods for determining the minimum levels of ventilation needed to provide acceptable indoor air quality in low-rise residential buildings.

2009 IECC
Section 403.5 Mechanical ventilation (Mandatory). Automatic or gravity dampers are installed on all outdoor air intakes and exhausts.

2012 IECC

Section R403.5 Mechanical ventilation (Mandatory). The building must have ventilation that complies with the International Residential Code or International Mechanical Code. Outdoor air intakes and exhausts must have automatic or gravity dampers that close when the ventilation system is not operating.

Section R403.5.1 Whole-House mechanical ventilation system fan efficacy. Mechanical ventilation system fans should meet the fan efficacy requirements shown in IECC Table R403.5.1. However, when the HVAC air handler or furnace blower fan is used for ventilation, it should be powered by an electronically commutated motor.

2015 IECC

Section R403.6 Mechanical ventilation (Mandatory). The building must have ventilation that complies with the International Residential Code or International Mechanical Code. Outdoor air intakes and exhausts must have automatic or gravity dampers that close when the ventilation system is not operating.

Section R403.6.1 Whole-House mechanical ventilation system fan efficacy. Mechanical ventilation system fans should meet the fan efficacy requirements shown in IECC Table R403.6.1. However, when the HVAC air handler or furnace blower fan is used for ventilation, it should be powered by an electronically commutated motor.

(Same as 2012.)

2009 IRC

Section M1507.3 Ventilation rate. Ventilation systems shall be designed to have the capacity to exhaust the minimum air flow rate determined in accordance with TAble M1507.3:
Kitchen fans should have an exhaust rate of 100 cfm intermittent or 25 cfm continuous.
Bathroom fans should have a mechanical capacity of 50 cfm intermittent or 20 cfm continuous.

2012 IRC

M1507 The whole-house mechanical ventilation system shall consist of one or more supply or exhaust fans, or a combination of such and associated ducts and controls. Local exhaust or supply fans are permitted to serve as such a system. Outdoor air ducts connected to the return side of an air handler shall be considered as providing supply ventilation. The whole-house mechanical ventilation system shall be provided with controls that enable manual override.

The whole house mechanical ventilation system shall provide outdoor air at a rate equivalent to the minimum rates shown in Table M1507.3.3(1) for continuous air flow and Table M1507.3.3(2) for intermittent mechanical ventilation; these requirements are based on the home's floor area and number of bedrooms.

Local exhaust rates (per Table M1507.4) Kitchen fans should have an exhaust rate of 100 cfm if operated intermittently or 25 cfm if operated continuously.

2015 IRC

Same as 2012. Duct length and diameters are specified in Table M1506.2 and are based on the fan flow rate, which should be in accordance with ANSIE/AMCA 210-ANSIE/ASHRAE 51.

ENERGY STAR Certified Homes

ENERGY STAR Certified Homes (Version 3.0, Revision 08), Rater Field Checklist, 7. Whole-House Mechanical Ventilation System, 7.3. No outdoor air intakes connected to return side of the HVAC system, unless controls are installed to operate intermittently and automatically based on a timer and to restrict intake when not in use (e.g., motorized damper).

DOE Zero Energy Ready Home

The U.S. Department of Energy (DOE) **Zero Energy Ready Home National Program Requirements** requires (in Exhibit 1 and 6) that all homes meet ENERGY STAR Certified Homes Version 3 or 3.1 and the U.S. Environmental Protection Agency Indoor airPLUS Construction Specifications

EPA Indoor airPLUS

The U.S. Environmental Protection Agency (**EPA) Indoor airPLUS Construction Specifications** requires homes to meet the ENERGY STAR Certified Homes requirements. Additional advisories include the following.

4.5 Mechanical Whole-House Ventilation
Advisory: Outdoor air ducts connected to the return side of an air handler should be used as supply ventilation only if the manufacturers' requirements for return air temperature are met (e.g., most manufacturers recommend a minimum of 60 degrees Fahrenheit air flow across furnace heat exchangers).

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.

Case Studies

None Available

References and Resources*

1. **ASHRAE Standard 62.2 (2016), Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings**
   Author(s): ASHRAE
   Organization(s): ASHRAE
   Publication Date: January, 2013
   Standard defining the roles of and minimum requirements for mechanical and natural ventilation systems and the building envelope intended to provide acceptable indoor air quality in low-rise residential buildings.

2. **DOE Zero Energy Ready Home National Program Requirements**
   Author(s): Department of Energy
   Organization(s): DOE
   Publication Date: April, 2017
   Standard requirements for DOE's Zero Energy Ready Home national program certification.

3. **ENERGY STAR Certified Homes, Version 3 (Rev. 08) National Program Requirements**
   Author(s): U.S. Environmental Protection Agency
   Organization(s): EPA
   Publication Date: December, 2015
   Webpage with links to Document outlining the program requirements for ENERGY STAR Certified Homes, Version 3 and 3.1 (Rev. 08).

4. **Local Exhaust and Whole House Ventilation Strategies**
   (2MB)
   Author(s): Rudd
   Organization(s): Building Science Corporation
   Publication Date: February, 2011
   Report on whole-house and spot ventilation strategies for improved indoor air quality.

5. **The Ventilation Omission That Can Make You Sweat**
   Author(s): Bailes
   Organization(s): Green Building Advisor
   Publication Date: October, 2013
   Article about installing balanced ventilation systems.

*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.

Pacific Northwest National Laboratory