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  - EQ115 | Thermal comfort
  - EQ115 | Thermal comfort
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  - EQ115 | Thermal comfort
  - EQ116 | Thermal comfort
  - EQ116 | Thermal comfort
  - EQ116 | Thermal comfort
  - EQ116 | Thermal comfort
  - EQ116 | Thermal comfort
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# Ventilation

## Required

**1** result in**All** .

- Glossary

### Intent

To reduce moisture problems and occupants' exposure to indoor pollutants from kitchens, bathrooms and other sources by exhausting pollutants to outside and ventilating with outdoor air.

### Requirements

**Case 1. Single Family**

Meet all of the following requirements for local exhaust and outdoor air ventilation including the requirements of ASHRAE 62.2 – 2010, sections 4, 5 and 7 and Section 1504.4 of the 2009 International Residential Code (IRC), including:

1. **Local Exhaust.** Meet all the following requirements:
   Design and install local exhaust systems in all bathrooms (including half-baths) and the kitchen to meet the requirements of ASHRAE Standard 62.2–2010, Sections 5 and 7 or local equivalent, whichever is more stringent. Sample requirements that relate to minimum intermittent local exhaust flow rates are shown in Table 1.

   Exhaust air to the outdoors. Do not route exhaust ducts to terminate in attics or interstitial spaces. Recirculating range hoods or recirculating over-the-range microwaves do not satisfy the kitchen exhaust requirements.

   Use ENERGY STAR–labeled bathroom exhaust fans in all bathrooms (including half-baths) or performance equivalent for projects outside the U.S. A HRV or ERV can be used to exhaust single or multiple bathrooms if it has an efficacy level meeting the ENERGY STAR Technical Specifications for Residential Heat-Recovery Ventilators and Energy-Recovery Ventilators (H/ERVs) Version 2.0 as certified by HVI.

   For exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (188 liters per second), provide makeup air at a rate approximately equal to the exhaust air rate. Makeup air systems must have a means of closure and be automatically controlled to start and operate simultaneously with the exhaust system.

   **Table 1. Minimum air-flow requirements for intermittent local exhaust**

| | Minimum air flow |
|---|---|
| Kitchen | 100 cfm (47 liters per second); vented range hood required if continuous exhaust fan flow rate is less than 5 kitchen air changes per hour |
| Bathroom, half-bath | 50 cfm (23 liters per second) |

   AND

2. **Whole House Mechanical Ventilation.** Design and install a whole-house mechanical ventilation system that complies with ASHRAE Standard 62.2–2010, Sections 4 and 7 or local equivalent, whichever is more stringent. Whole house ventilation fans must be rated for sound at a maximum of 1.0 sone per ASHRAE 62.2–2010, Section 7.2.1. Remote mounted fans need not meet these sound requirements.

   The ASHRAE options can be summarized as follows:

   - Continuous ventilation. Meet the ventilation requirements. Simplified minimum air-flow requirements are shown in Table 2.
   - Intermittent ventilation. Use ASHRAE Standard 62.2–2010, Equation 4.2, to demonstrate adequate ventilation air flow.
   - Any passive ventilation system must be approved and verified by a licensed HVAC engineer as providing ventilation equivalent to that achieved by continuous ventilation systems.

**Table 2a. Simplified minimum air-flow requirements (cfm) for continuous ventilation systems**

| Conditioned floor area (ft2) | Bedrooms 0, 1 | 2, 3 | 4, 5 | 6, 7 | > 7 |
|---|---|---|---|---|---|
| ≤ 1,500 | 30 | 45 | 60 | 75 | 90 |
| 1,501–3,000 | 45 | 60 | 75 | 90 | 105 |
| 3,001–4,500 | 60 | 75 | 90 | 105 | 120 |
| 4,501–6,000 | 75 | 90 | 105 | 120 | 135 |
| 6,001–7,500 | 90 | 105 | 120 | 135 | 150 |
| > 7,500 | 105 | 120 | 135 | 150 | 165 |

**Table 2b. Simplified minimum air-flow requirements (liters per second) for continuous ventilation systems**

| Conditioned floor area ($m^2$) | Bedrooms 0, 1 | 2, 3 | 4, 5 | 6, 7 | > 7 |
|---|---|---|---|---|---|
| ≤ 139 | 14 | 21 | 28 | 35 | 42 |
| 140 – 279 | 21 | 28 | 35 | 42 | 49 |

| | | | | | |
|---|---|---|---|---|---|
| 280 – 418 | 28 | 35 | 42 | 49 | 56 |
| 419 – 557 | 35 | 42 | 49 | 56 | 63 |
| 558 – 697 | 42 | 49 | 56 | 63 | 70 |
| > 698 | 49 | 56 | 63 | 70 | 77 |

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of this prerequisite.

**Case 2. Multifamily**

Design and install a whole-unit ventilation system for each individual dwelling unit that complies with the requirements of ASHRAE Standard 62.2–2010 (with errata) or local equivalent, whichever is more stringent, and all local exhaust requirements for Single Family section, above. Major components of the standard are summarized below.

- Provide outdoor air to each unit directly from the outdoors. Project teams using exhaust ventilation systems must specify how outside air is delivered at the flow rate required by ASHRAE 62.2–2010. Do not use systems that rely on transfer air from pressurized hallways or corridors, adjacent dwelling units, attics, etc.
- For continuous ventilation systems, meet the requirements of ASHRAE 62.2–2010 shown in Table 2, Continuous in-unit ventilation fans must be rated for sound at a maximum of 1.0 sone, per ASHRAE 62.2–2010, Section 7.2.1. Remote mounted fans need not meet these sound requirements.
- For intermittent ventilation systems, install fans to meet ASHRAE Standard 62.2–2010. The fan flow rate must be equal to the outdoor air flow requirements multiplied by the fan flow rate multiplier. The system must be designed such that it can operate automatically based on a timer. Fans must be rated for sound at a maximum of 1.0 sone. Remote mounted fans need not meet these sound requirements.
- As applicable, follow the restrictions on system types for hot, humid climates and very cold climates. In hot, humid climates, whole-house mechanical net exhaust flow must not exceed 7.5 cfm per 100 square feet (38 liters per second per 100 square meters) of conditioned floor area. In very cold climates, mechanical supply-only systems must not exceed 7.5 cfm per 100 square feet (38 liters per second per 100 square meters). See ASHRAE 62.2–2010, Sections 4.5 and 8, for more details and climate categories.
- Locate air inlets that are part of the ventilation design at least 10 feet (3 meters) from known sources of contamination, such as a stack, vent, exhaust hood, or vehicle exhaust. Place the intake such that entering air is not obstructed by snow, plantings, or other material. Forced air inlets must be covered by screens to exclude rodents and insects (mesh not larger than ½ inch or 13 millimeters). See ASHRAE 62.2–2010, Section 6.8, for more details and a list of exceptions.

For all non-unit spaces, meet the minimum requirements of ASHRAE Standard 62.1–2010 or local equivalent, whichever is more stringent, Sections 4–7, Ventilation for Acceptable Indoor Air Quality (with errata).

Mechanically ventilated spaces must be designed using the ventilation rate procedure or the applicable local code, whichever is more stringent. Ventilation fans that penetrate rated assemblies may require radiation and fire dampers to meet local building and fire codes.

Naturally ventilated spaces must comply with ASHRAE Standard 62.1–2010, Section 6.4.