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# ENERGY STAR INDOOR AIR PACKAGE Specifications, version 3



February 27, 2008

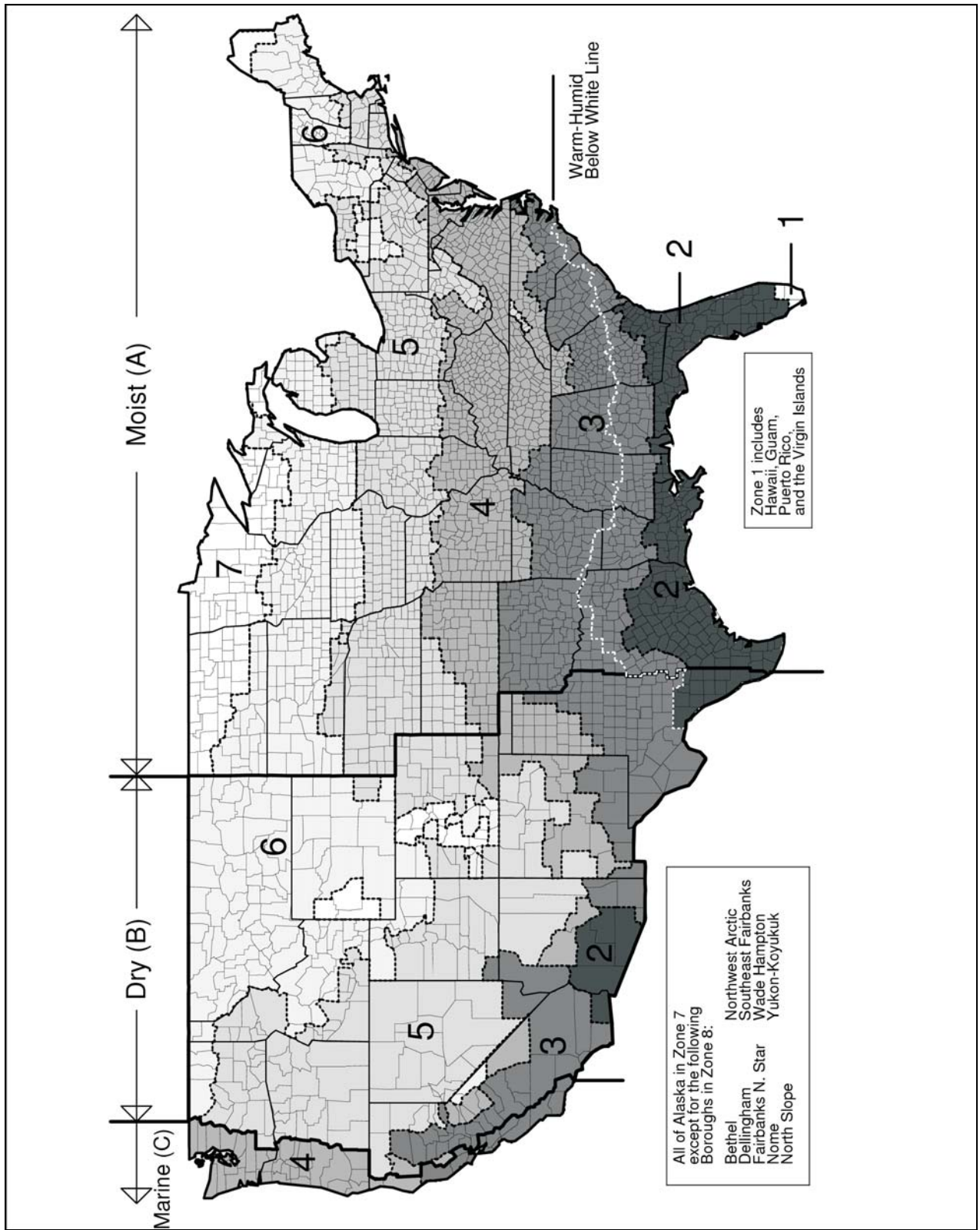
The following specifications have been developed by the U.S. Environmental Protection Agency (EPA) to recognize homes equipped with a comprehensive set of Indoor Air Quality (IAQ) features. Homes that comply with these specifications and are *verified with a completed Indoor Air Package Verification Checklist* (separate document) can use the "*Indoor Air Package*" as a complementary label to ENERGY STAR for homes. *Only ENERGY STAR qualified homes are eligible for this label.*

These specifications were developed with significant input from external sources, based on best available science and information about risks associated with IAQ problems, and balanced with practical issues of cost, builder production process compatibility, and enforceability. EPA may change these specifications as more information becomes available.

The construction practices and technical specifications that comprise the ENERGY STAR Indoor Air Package are designed to contribute to improved IAQ in new homes compared with code-built homes. However, these measures alone will not guarantee that homebuyers will not experience IAQ problems in their homes. Rather, the Indoor Air Package should be viewed as a way to reduce the likelihood of experiencing such problems. For example, homeowner behavior may negatively impact the home's IAQ and the performance of the measures specified in the Indoor Air Package.

More program information, including Verification Checklist and brochures, available at:

<http://www.energystar.gov/homes/iap>



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### 1. MOISTURE CONTROL

Note: **ENERGY STAR Thermal Bypass Checklist** (TBC) requirements are an integral part of the moisture control strategy described in the Indoor Air Package. TBC requirements improve control of air and thermal flows through building assemblies, both critical in effective control of water vapor migration and condensation. Since TBC compliance and verification are required for ENERGY STAR qualification, TBC requirements are not re-stated in these specifications.

#### Water Managed Foundations

- 1.1 Surface water management shall be provided as follows:
- Patio slabs, walks and driveway shall be sloped  $\frac{1}{4}$  inch per foot away from house; AND final grade shall be back-fill tamped to accommodate settling and be sloped away from the foundation  $\frac{1}{2}$  inch per foot within the first 10 feet. Where setbacks limit space to less than 10 feet, provide swales or drains designed to carry water from foundation. Back-fill tamping is not required if proper drainage can be achieved using non-settling compact soils, as determined by a certified hydrologist, soil scientist, or engineer.
  - Install protected drain tile at footings below basement and crawlspace walls, level or sloped to discharge to outside grade (daylight) or to accessible sump pump. Top of drain tile pipe must always be below bottom of concrete slab or crawl space floor. Pipe shall be surrounded with min. 6 inches of  $\frac{3}{4}$  inch washed or clean gravel that is fully wrapped with fabric cloth.
  - Exterior surface of below grade walls shall be finished as follows:
    - Poured concrete, concrete masonry and insulated concrete forms with damp proofing coating; AND
    - Wood framed walls with trowel-on mastic and polyethylene, or equivalent water proofing.
- 1.2 Capillary break shall be installed at all concrete slabs with either:
- 4 inch bed of  $\frac{1}{2}$  inch diameter or greater clean aggregate, covered with minimum 6 mil polyethylene sheeting in direct contact with the concrete slab, lapped 6 to 12 inches at joints; OR
  - A minimum 4 inch uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting lapped 6 to 12 inches at joints.
- Exceptions:**
- In areas with free-draining soils, identified as Group 1 in the IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required.
  - Polyethylene sheeting not required in Dry climates as defined by IECC, Figure 301.1, unless required for radon resistance (2.1).
- 1.3 Crawl spaces shall be unvented and conditioned, as follows:
- Crawl space floors shall be covered with a capillary break, using either:
    - Concrete slab over lapped polyethylene (i.e. a "rat slab"); OR.
    - 6 mil. polyethylene (10 mil. recommended) sheeting, lapped 6 to 12 inches and sealed or taped at seams. Sheeting shall be attached to walls and piers with adhesive and furring strips;
- AND
- Crawl spaces shall be sealed to prevent outside air infiltration and be provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area; AND
  - In areas designated by local jurisdiction as flood zones, a sump pit and pump shall be installed in the crawlspace, with discharge point at least 10 ft. outside foundation.
- Exceptions:**
- Raised pier foundation with no walls.
  - Dry climates as defined by IECC, Figure 301.1 and Table 301.1.
  - Marine climates as defined by IECC, Figure 301.1 and Table 301.1, if no air handler or return ducts are installed in the crawlspace.
- 1.4 Do *not* install a continuous vapor barrier on interior or living space side of basement or crawlspace walls (semi-vapor permeable rigid insulation is not considered a vapor barrier).

#### Water Managed Wall Assemblies

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- 1.5 Install continuous drainage plane behind exterior wall cladding AND flashing or equivalent drainage system at the bottom of exterior walls to direct water away from drainage plane and foundation. Drainage plane material shall lap over flashing and be fully sealed at all penetrations. Any of the following systems meet this requirement:
- Monolithic weather resistant barrier (i.e. house wrap) sealed or taped at all overlap joints, top, and bottom; OR
  - Weather resistant sheathings (e.g. faced rigid insulation), fully taped at all "butt" joints; OR
  - Lapped shingle-style building paper or felts.
- Include weep holes for masonry veneer and weep screed for stucco cladding systems, per manufacturer specifications.
- 1.6 Fully flash all window and door openings, including pan flashing at sills, side flashing that extends over pan flashing and top flashing that extends over side flashing.

### Water Managed Roof Assemblies

- 1.7 Direct roof water from house with guttering and downspouts that empty to lateral piping that deposit water on sloping finish grade a minimum of 5 ft. from foundation. When lot space limits or prevents required grading, direct roof water to underground catchment system (not connected to foundation drain system) that deposits water 10 ft. from foundation.
- Exception:**  
Dry climates as shown in IECC, Figure 301.1 and Table 301.1.
- 1.8 Install step flashing at all roof/wall intersections, with the exception of continuous flashing at metal and rubber membrane roofs. "Kick-out" flashing shall be installed at the low end of roof/wall intersections to direct water away from walls, windows, and doors below. In all cases, flashing shall extend at least 4 inches on the wall surface above the roof deck and shall be integrated with drainage plane above (shingle style) to direct water flow onto and not behind flashing. In addition, intersecting wall siding should terminate a minimum of 1 inch above roof, or higher per manufacturer's recommendations.
- 1.9 Install self-sealing bituminous membrane or equivalent at all valleys and roof decking penetrations for durability at failure points.
- Exception:**  
Dry climates as shown in IECC, Figure 301.1 and Table 301.1.
- 1.10 In colder climates (IECC Climate Zones 5 and higher), install self-sealing bituminous membrane or equivalent ("ice flashing") over the sheathing at eaves for ice-dam protection. Ice flashing shall extend 2 feet inside the vertical plane of the exterior wall.
- Exception:**  
Climate Zones 1-4, as shown in IECC, Figure 301.1 and Table 301.1.

### Interior Water Management

- 1.11 Appropriate materials shall be installed in areas expected to get wet or inherently vulnerable to plumbing leaks, including:
- Water-resistant hard-surface flooring (i.e. kitchens, entryways, laundry areas, and utility rooms). Wall-to-wall carpet shall not be installed adjacent to toilets and bathing fixtures (i.e. tubs and showers), AND
  - Moisture-resistant backing material behind tub and shower enclosures (i.e. cement board or equivalent, not paper-faced), AND
  - Install water heaters near floor drain and/or provide catch pan, piped to home exterior, AND
  - Insulate piping installed in exterior walls.
- 1.12 Permeability rating of finishes used on the interior side of a home's exterior walls in hot humid or humid mixed climates shall be greater than '1'.
- 1.13 Building materials with visible signs of water damage or mold shall not be installed. In addition, interior walls shall not be enclosed (e.g. with drywall) if either the framing members or insulation products have a high moisture content. For wet-applied insulation products, follow manufacturer's drying recommendations.
- Advisory:**

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Lumber should not exceed 18% moisture content.

### 2. RADON CONTROL

- 2.1 Homes built in U.S. EPA Zone 1 Radon areas shall be constructed with approved Radon-resistant features (i.e. passive radon control), according to any of the following codes or standards: NFPA 5000, Chapter 49; IRC, Appendix F; CABO, Appendix F; or ASTM E1465. The following requirements shall be visually verified:
- Capillary break installed according to 1.2; AND
  - Vertical vent pipe, clearly labeled "Radon Pipe" or "Radon System", 3"-4" in diameter, open at the bottom, extending from below the capillary break and terminating a minimum of 12" above the roof opening; for crawlspaces, perforated drain tile attached to the bottom of the radon vent pipe (beneath the sheeting) with a T-fitting and running horizontally, parallel to the long dimension of the house; AND
  - Electrical circuit installed in accessible location near the passive vent pipe, to facilitate fan installation if post-occupancy radon test reveals the need for an active system; AND
  - Foundation air sealing with polyurethane caulk or equivalent in all slab openings, penetrations, and control or expansion joints. Sump pump covers shall be air sealed (e.g. mechanically attached with full gasket seal or equivalent.)

**Exception:**

Not required in U.S. EPA Zone 2 and Zone 3 Radon areas.

**Advisory:**

Homes with elevated levels of radon have been found in all three zones on the U.S. EPA Radon Map. Consult with your state's radon coordinator for current information about radon in your area. See [www.epa.gov/iaq/whereyoulive.html](http://www.epa.gov/iaq/whereyoulive.html) and click on your state for contact information.

- 2.2 Provide owners of homes in U.S. EPA Zone 1 and Zone 2 radon areas two radon test kits designed for 48-hour exposures, including instructions for use and guidance for follow-up actions to testing results.

**Advisory:**

The U.S. Surgeon General and EPA recommend that all homes be tested for Radon (including homes built in Zone 3). Refer interested homebuyers to <http://www.epa.gov/radon/> for more information.

### 3. PEST BARRIERS

- 3.1 Minimize pathways for pest entry, by sealing with blocking, foam, and polyurethane caulk or equivalent, including penetrations and joints in and between foundation and exterior wall assemblies. In addition, sump pit covers shall be air-sealed (e.g. mechanically attached with full gasket seal or equivalent.)

**Advisories:**

1. Additional precautions in areas subject to "Heavy" termite infestation probability as identified by IRC Figure 301.2(6):

- Foundation walls shall be solid concrete or masonry with top course of solid block, bond beam, or concrete-filled block; AND
- Construct all interior concrete slabs with 6" x 6" welded wire fabric or equivalent, and concrete walls with reinforcing rods to reduce cracking; AND
- Sill plate shall be of preservative-treated wood.

2. Additional precautions in areas subject to "Very Heavy" termite infestation probability as identified by IRC Figure 301.2(6) (i.e., AL, FL, GA, LA, MS, SC, and parts of CA and TX):

**Below-grade:**

- Do not install foam plastic insulation on exterior face of below-grade foundation walls, or under slabs; AND

**Above-grade:**

- Foam plastic insulation installed on exterior of above-grade foundation walls shall be kept a minimum of 6 inches above the final grade and any landscaping bedding materials, and shall be covered with moisture resistant, pest-proof material (e.g., fiber cement board, galvanized insect screen at bottom-edge of openings); AND
- Foam plastic insulation applied to the interior side of conditioned crawl space walls shall be kept a minimum of 3 inches below the sill plate and a minimum of 2 inches above the floor of the crawl space.

- 3.2 Provide corrosion proof rodent/bird screens (e.g., copper or stainless steel mesh) for all building openings that cannot be fully sealed and caulked (e.g. ventilation system intake/exhaust outlets and attic vent openings), except clothes dryer vents.

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### 4. HVAC SYSTEMS

#### Heating and Cooling Equipment

- 4.1 Heating & cooling design loads shall be determined for each room according to ACCA Man J, ASHRAE Handbooks, or equivalent method (e.g. software). Heating & cooling equipment shall be properly sized and selected to meet the design loads, including accommodation for pressure drop from specified filter (4.8). This requirement shall be verified by:
- Documentation of design load calculations (i.e. load calculation worksheet or software report), AND
  - System design documentation (i.e. sizing calculations and equipment performance information), AND
  - Verification that outdoor and indoor coils match in accordance with ARI standards.
- 4.2 Duct system(s) shall be designed according to ACCA Man D, ASHRAE Handbooks, or equivalent software, AND installed to be substantially air tight and properly balanced. This requirement shall be met by the following prescriptive requirements OR the Performance Alternative below:
- Design verified by appropriate documentation (i.e. duct sizing worksheet or annotated layout), AND
  - Duct system verified to meet the following additional requirements:
    - Seams in the HVAC cabinet, plenum, and adjacent duct work shall be sealed with either or a combination of mastic systems or tape that meet the applicable requirements of UL 181A or UL 181B; and/or gasketing systems.
    - Building cavities shall not be used as part of the forced air supply or return system.
- Performance Alternative:**
- Room-by-room airflows balanced and verified within +/-20% of calculated room airflows to meet design loads (see 4.1), except for baths, closets, and pantries, AND
  - Duct system TOTAL leakage test  $\leq 6$  CFM per 100 s.f. floor area (or 9% design fan flow), measured at 25 Pascals, with duct boots and air handler in place, according to ASTM E1554, ASHRAE 152, or other RESNET approved method.
- 4.3 No air handling equipment or ductwork shall be located in garages.
- Note:**  
Ducts and equipment may be located in spaces or building cavities adjacent to garage walls or ceilings if they are separated from garage space with a continuous air barrier (see ENERGY STAR Thermal Bypass Checklist Guide).
- 4.4 Room pressure differentials shall be minimized by installing transfer grills or jump ducts for any closed room without a dedicated return, except for baths, kitchens, closets, pantries, and laundry rooms. Opening size shall be 1 square inch capacity (grille area) per CFM of supply (including free area undercut below door as part of the area).
- Performance Alternative:**  
Measured pressure differential no greater than 2.5 Pa (0.01" w.c.) between closed rooms and adjacent spaces with return.

#### Ventilation

- 4.5 Provide mechanical whole-house ventilation meeting all ASHRAE 62.2 requirements. The following requirements shall be visually verified:
- Whole house mechanical ventilation system & controls installed to deliver prescribed outdoor air ventilation rate (62.2 section 4), including ventilation restriction in 62.2 section 4.5 (i.e. max 7.5 cfm/100 sq.ft.) for "Warm-Humid" climates as defined by IECC Figure 301.1; AND
  - Transfer air (i.e. air from adjacent dwelling units or other spaces such as garages, crawlspaces, or attics) shall not be used to meet ventilation requirements (62.2 section 6.1); AND
  - Air inlets shall be located a minimum of 10 ft. from contaminant sources (62.2 section 6.8), AND
  - Airflow tested to meet rated fan airflow (at 0.25 in. w.c.), or duct(s) sized per requirements of 62.2 Table 7.1 and/or manufacturer's design criteria (62.2 section 7.3).
- Notes:**
- Outdoor air ducts connected to the return side of an air handler shall be permitted as supply ventilation only if manufacturers' requirements for return air temperature are met (e.g., "air shall be tempered to maintain minimum 60 degree F continuous air flow across furnace heat exchanger"),

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- The ventilation restriction for "Warm-Humid" climates is not applicable when Energy Recovery Ventilators (ERV's) or dehumidification systems are installed per manufacturer's instructions.

4.6 Known pollutant sources shall be vented outdoors, as follows:

- Provide local mechanical exhaust ventilation to outdoors in each bathroom and kitchen, meeting ASHRAE 62.2 section 5 requirements. In addition, all bathroom ventilation fans shall be ENERGY STAR qualified unless multiple bathrooms exhausted with a multi-port fan.
- Clothes dryers shall be vented to outdoors, except electric condensing dryers plumbed to a drain per manufacturer's instructions.
- If central vacuum system is installed, system shall be vented outdoors at least 10 ft. from ventilation system air inlets (see 4.15), or power/filtration unit installed in garage per manufacturer instructions.
- Combustion sources (see section 5).

### Air Filtration

4.7 Central forced-air HVAC systems shall include a filtration system meeting the following requirements:

- No equipment is permitted that intentionally produces ozone (rather than as an incidental by-product).
- HVAC filters shall be rated MERV 8 or higher at 295 feet per minute according to ASHRAE 52.2.
- There shall be no visible bypass between the filter, the filter rack, and the plenum/blower housing. In addition, the filter rack shall be designed to ensure the filter is in complete contact with the rack as follows:
  - The filter rack shall be fitted with flexible, air-tight (e.g. closed cell foam) gasketing on the surface that contacts the air-leaving (downstream) side of the filter, or equivalent method; AND
  - The filter shall be held firmly in place by friction fit, spring clips in the filter rack (installed on the upstream side of the filter), or equivalent method.

**Note:**

Manufacturer filter media boxes designed to accomplish these purposes meet these requirements.

### Dehumidification

4.8 In "Warm-Humid" climates as defined by IECC Figure 301.1 (i.e. climates with prolonged periods of sustained warm-humid weather), equipment shall be installed with sufficient latent capacity to maintain Relative Humidity (RH) at or below 60%. This requirement shall be met by either of the following:

- Additional dehumidification system(s), OR
- Central HVAC system equipped with additional controls to operate in dehumidification mode.

**Exception:**

Not required in Climate Zones 2B, 3B, 3C, 3A above the white line, and 4-8, as shown by IECC Figure 301.1.

**Advisory:**

Also recommended in Climate Zones 3A and 4A as shown by IECC Figure 301.1.

## 5. COMBUSTION SOURCES & GARAGE ISOLATION

### Combustion Sources

5.1 Combustion fueled space heating and water heating equipment *located in conditioned spaces*:

- Gas-fired furnaces/boilers shall be direct vented,
- Oil-fired furnaces/boilers shall be power vented or direct vented.
- Combustion fueled water heaters shall be power vented or direct vented.

**Exception:**

Climate Zones 1-3, as shown in IECC, Figure 301.1 and Table 301.1. This exception only applies to space heating appliances.

**Note:**

Unfinished basements and crawlspaces (except raised pier foundation with no walls), and attached garages that are air-sealed to the outside for intended use as work space or living space, are considered "conditioned spaces" for the purpose of this requirement.

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- 5.2 Fireplaces and Fuel Burning Appliances located in conditioned spaces shall meet the following efficiency or emissions standards and restrictions:
- **Masonry fireplaces** are not permitted, with the exception of "masonry heaters", as defined by ASTM E1602, and the IBC, 2112.1.
  - **Factory-built, wood-burning fireplaces** shall meet the certification requirements of UL 127, and meet the emission limits in EPA 40 CFR Part 60.
  - **Natural gas and propane fireplaces** shall be power vented or direct-vented, as defined by NFPA 54, 3.3.108, have a permanently fixed glass front or gasketed door, and comply with ANSI Z21.88/CSA 2.33.
  - **Wood stove and fireplace inserts** as defined in Section 3.8 of UL 1482, shall meet the certification requirements of that standard, and shall meet emission requirements of EPA 40 CFR Part 60 and WAC 173-433-100 (3).
  - **Pellet stoves** shall meet the requirements of the ASTM E1509.
  - **Decorative gas logs** as defined in K.1.11 of NFPA 54 (National Fuel Gas Code) are not permitted.
  - **Un-vented combustion appliances** are not permitted, with the exception of kitchen-type cooking devices with exhaust ventilation meeting ASHRAE 62.2 (5).

**Advisory:**

To minimize the potential for spillage or "back-drafting", fireplaces and fuel burning appliances located in conditioned spaces must be vented to the outdoors and supplied with adequate combustion and ventilation air, according to manufacturers' installation instructions, AND by complying with ASHRAE 62.2 (6.4) or conducting a Worst Case Depressurization Combustion Air Zone (CAZ) Test according to an established protocol.

- 5.3 All homes with combustion appliance(s) or attached garage shall have one carbon monoxide (CO) alarm installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. They shall be placed according to NFPA 720, and be hard-wired with a battery back-up function. The alarm devices shall be certified by either CSA 6.19-01 or UL 2034.
- 5.4 Reduce environmental tobacco smoke (ETS) exposure in multi-family buildings through the following:
- Prohibit smoking in indoor common areas in building rental/lease agreements or condo/coop association covenants and restrictions.
  - Locate exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows.
  - Minimize uncontrolled pathways for ETS transfer between individual residential units by sealing penetrations in walls, ceilings, and floors of dwelling units, sealing vertical chases adjacent to dwelling units, and weather stripping all doors in dwelling units leading to common hallways.

### Garage Isolation

- 5.5 Attached garages shall be isolated from conditioned spaces as follows:
- Common walls and ceilings between attached garages and living spaces shall be visually inspected to be air-sealed before insulation is installed.
  - All connecting doors between living spaces and attached garages shall include an automatic closer, and shall be gasketed or made substantially air-tight with weather stripping.

- 5.6 Attached garages shall include an exhaust fan, with installed capacity of 50 cfm or greater, rated for continuous operation, and installed to vent outdoors. If automatic fan controls are installed, they shall activate the fan whenever the garage is occupied, and for at least 1 hour after the garage is vacated.

**Advisory:**

ENERGY STAR qualified fans are highly recommended.

## 6. BUILDING MATERIALS

- 6.1 Pressed wood materials (i.e. plywood, OSB, and MDF) shall be certified for low-formaldehyde emissions, as follows:
- Structural plywood conforming to PS1 and PS2 and oriented strand board shall be made with exterior-type adhesives. Exterior-type adhesive is evidenced by the appearance of "Exposure 1" or "Exterior" in the panel trademark.
  - Particleboard and medium density fiberboard (MDF) shall be certified compliant with ANSI A208.1 and A208.2, respectively.

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- Hardwood plywood shall be compliant with ANSI/HPVA HP-1-2004 and U.S. HUD Title 24, Part 3280.
- 6.2 Interior paints & finishes shall be certified for low-formaldehyde emissions (approved labels only).
- 6.3 Carpets, carpet cushion (i.e. padding), and carpet adhesives shall be labeled with the Carpet & Rug Institute (CRI) Green Label or documented to meet the CRI Green Label testing program criteria. Products labeled with the CRI Green Label Plus also meet this requirement.

## 7. HOME COMMISSIONING

- 7.1 HVAC systems & ductwork shall be commissioned to be dry, clean, and installed according to design, as follows:
- Inspect ductwork before installing registers, grilles, and diffusers, to verify it is dry and substantially free of dust/debris, and that there are no disconnects or large air gaps between boots and framed openings. If duct openings were not covered during construction, vacuum each opening prior to installing registers, grilles, and diffusers.
  - Inspect air-handling equipment and verify heat exchangers/coils are free of dust created by construction activities (e.g., drywall, floor sanding) AND filter is new, clean, and matches specified MERV rating (4.8). After installation of registers, grilles, and diffusers, verify detectable airflow from each supply outlet.
  - Verify HVAC contractor has documented measured airflow or pressure drop across the cooling coil and/or heat exchanger within +/- 15% of system design airflow, or manufacturer specified operating range, tested according to ASTM E1554, ASHRAE 152, or equivalent method.
  - Verify HVAC contractor has documented installation and testing of proper refrigerant charge. This requirement may be met by any of the following:
    - Superheat method test measurement within 5% of manufacturer recommended charge, OR
    - Sub cooling method test measurement within 3% of manufacturer recommended charge, OR
    - Other equivalent method/tolerance approved by equipment manufacturer.
- Note:**  
If weather conditions do not meet required test conditions, verify builder or contractor has arranged for future test.
- 7.2 Verify home has been ventilated with outside air at the highest rate the ventilation system can produce, *if practical*, during and shortly after installing products that are known sources of contaminants (e.g. cabinets, carpet padding, and painting), and during the period between finishing and occupancy, meeting ventilation requirements for outdoor air flow and humidity control (4.15). If whole house ventilation is impractical prior to occupancy, advise home buyer to do so during the first few months of occupancy.
- 7.3 Provide home buyer with a checklist listing all required measures from this specification along with the signature of official representative of builder indicating full compliance with the checklist.

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### References

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- ACCA Man J:** ACCA Manual J: Residential Load Calculation. 2006. Air Conditioning Contractors of America.
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- ANSI A208.2:** ANSI A208.2: Standard for Medium Density Fiberboard (MDF). 2002. American National Standards Institute.
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- ANSI Z21.88/CSA 2.33:** ANSI Standard Z21.88-2005/CSA Standard 2.33-2005: Vented Gas Fireplace Heaters. 2005. American National Standards Institute / Canadian Standards Association.
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- ASHRAE 52.2:** ANSI/ASHRAE Standard 52.2-1999: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size. 1999. American Society of Heating, Refrigeration, and Air-Conditioning Engineers.
- ASHRAE 62.2:** ANSI/ASHRAE Standard 62.2-2004: Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings. 2004. American Society of Heating, Refrigeration, and Air-Conditioning Engineers.
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- ASTM E1509:** ASTM Standard E1509-04: Standard Specification for Room Heaters, Pellet Fuel-Burning Type. 2004. American Society for Testing and Measurement.
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- CSA 6.19-01:** CAN/CSA Standard 6.19-01: Residential Carbon Monoxide - Alarming Devices. 2001. Canadian Standards Association.
- ENERGY STAR Thermal Bypass Checklist:** U.S. Environmental Protection Agency. <http://www.energystar.gov/homes>
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- HUD Title 24:** U.S. HUD Title 24 Part 3280: Manufactured Home Construction and Safety Standards. 1993. U.S. Department of Housing and Urban Development.
- IBC:** International Building Code. 2003. International Code Council, Inc.
- IRC:** International Residential Code for One- and Two-Family Dwellings. 2006. International Code Council, Inc.
- IECC:** International Energy Conservation Code. 2006. International Code Council, Inc.

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- NFPA 720:** Standard for the Installation of Household Carbon Monoxide (CO) Warning Equipment. 2005. National Fire Protection Association.
- NFPA 5000:** Building and Construction Safety Code. 2006. National Fire Protection Association.
- PS1 & PS2:** Voluntary Product Standards for Exterior Grade Plywood. 1995. American Plywood Association.
- UL 127:** Standard for Factory-Built Fireplaces. 1996. Underwriters Laboratories, Inc.
- UL 181A:** Standard for Closure Systems for Use With Rigid Air Ducts. 2005. Underwriters Laboratories, Inc.
- UL 181B:** Standard for Closure Systems for Use With Flexible Air Ducts and Air Connectors. 2005. Underwriters Laboratories, Inc.
- UL 723:** Standard for Test for Surface Burning Characteristics of Building Materials. 2003. Underwriters Laboratories, Inc.
- UL 1482:** Standard for Solid-Fuel Type Room Heaters. 1996. Underwriters Laboratories, Inc.
- UL 2034:** Standard for Single and Multiple Station Carbon Monoxide Alarms. 1996. Underwriters Laboratories, Inc.
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