EPA DRAFT New Home IAQ Specifications

Topic	Required Specification	Best Practice Recommendation
1. Moisture Control		
Foundation: All	• Slope garage floor toward garage roll-up door. • Concrete floors (basements & slab-on-grade): 1) Capillary break of 4" clean or washed gravel (½" or greater) first placed over soil (see references in "Radon Control" Section for alternatives). 2) Cover all gravel with 6 mil. polyethylene sheeting moisture barrier, joints lapped 1 ft. or more. 3) For Zone 1 Radon areas nationwide, see foundation-related practices referenced in the Radon section of these guidelines. • Seal all plumbing, electrical etc. penetrations of walls and floors and joints between building materials with polyurethane caulk. • At foundation maintain grade slope (½" per foot) away from house, for 10 ft. Backfill tamped to accommodate settling. Patio slabs, walks and driveways slope ¼" per foot away from house. • Direct roof water to adequate guttering and downspouts (HUD/NAHB spec). Downspouts empty to lateral piping that deposits water on finish grade 10 ft. from foundation. In limited spaces, deposit to underground catchment system that carries water 10 ft. from foundation.	• Pick site with good natural drainage away from proposed home foundation at all points. • Insulate foundation walls and floors so that interior surface temperatures are above the dew point. Use materials that slow the rate of water vapor movement by diffusion and air transport through the insulation to the cool surfaces (for example, extruded or expanded styrene insulation on a below grade foundation wall).
Foundation: Basement	• Provide drain tile for all basement footings, level or sloped to discharge to outside grade (daylight) or to sump pump. Top of drain tile pipe must always be below level of where bottom of concrete slab will occur. Pipe surrounded with min. 6" of ¾" washed or clean gravel, and gravel fully wrapped with fabric cloth. • Finish wall exterior with damp proofing or use min. 5,000 PSI concrete. • Insulate walls to MEC specified R-value; where insulation placed on interior side, provide vapor barrier on interior side.	• Provide exterior insulation/ capillary break finish system that drains water to footing drain.

Foundation: Crawl Space	• Provide 6 mil polyethylene over exposed soil with minimum 12” lapped taped joints, affixed to walls with glue and furring strips. In Zone 1 Radon areas, consult “Radon” section of these specifications. • Interior surface must be level with or higher than exterior grade. • In vented crawl spaces, minimum net vent area of foundation wall openings shall be double IRC code requirement (see Appendix).	• Min. 2” slag concrete floor over 6 mil polyethylene, with all joints lapped 1 ft. or more. • Construct un-vented “conditioned” crawl spaces with insulation applied to walls rather than floor above.
Exterior Walls	• Install complete drainage plane (see Appendix). • Fully flash all window and door openings, including pan flashing at sills. Provide step flashing at all intersections of roof and walls.	• To produce a capillary break, provide min. 3/8” furred space between drainage plane and exterior cladding. • Provide counter flashing over step flashing. • Do not locate supply or drain plumbing in exterior walls. • Provide detailed drawings showing how drainage planes are accomplished, and flashing details for intersections between different roof planes, roofs and walls, and roof penetrations. These should be made part of owner’s manual
Ceiling/Attic	• Recessed lights in insulated ceilings must be airtight and IC rated.	• Use raised-heel trusses. • No recessed lighting in insulated ceilings.

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2. Radon-Control		
For EPA Zone 1 Areas	• Consult ***http://www.epa.gov/radon***, or contact your State Radon Coordinator through your state health office (http://www.epa.gov/iaq/whereyoulive.html) to identify if you are building in a Zone 1 Radon area. • If you are in a Zone 1 area, you must install radon-resistant features into the home. Consult the following references for guidance: 1) International Residential Code (IRC), Appendix F, "Radon Control Methods", 2000 Edition, 2) One and Two Family Dwelling Code, Appendix F, 1998 Edition, Council of American Building Officials, or 3) U.S. Environmental Protection Agency guidance document entitled "Building Radon Out", document #EPA/402-K-01-002, available through EPA's web site: (http://www.epa.gov/radon/pubs).	

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3. Pest Control		
Pest Control	• Provide rodent and corrosion proof screens (e.g., copper or stainless steel mesh) for all openings that cannot be full sealed and caulked. • In areas subject to termite infestation (see Appendix): Solid concrete foundation walls or masonry wall with top course of solid block, bond beam or concrete-filled block. To control cracking, construct slabs-on-grade with wire mesh reinforcing and conc. walls with reinforcing rod. Foundation walls capped with continuous (minimum .016 gauge) sheet metal termite shield (see Appendix) before installation of sill plate. Sill plate shall be of preservative-treated wood (see "Preservative-treated wood" in Appendix for CCA-wood limitations). • Protect exposed foundation insulation with moisture resistant, pest-proof cover (e.g., fiber cement board, galvanized insect screen).	• Have a pest control company develop and implement an integrated pest management system to control household pests. • All foundation areas protected with termite bait system, applied by a certified pest control operator.

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4. Heating, Ventilation and Air Conditioning (HVAC)		
Ductwork	• Ductwork shall not be installed in garage or unconditioned crawl spaces. • Any ductwork located in unconditioned attics can only have a maximum duct leakage of 3%. • Max. 5% duct leakage from all other ductwork, to be field measured. • All metal and flex duct to be sealed with UL 181 mastic. • Duct board to be sealed with UL 181 mastic or butyl tape. • Building framed cavities shall not be used as part of forced air distribution system. • Any room with a supply and no dedicated return, and that can be separated from the central return grill by a closed door shall have cross-over ducts or transfer grills with 0.5 sq. in. capacity (grille area) per CFM of supply (including free area undercut below door as part of the area). • Cover supply and return duct boots with "duct mask" or similar sheeting to keep ductwork clean during heavy dust-creating construction activities.	• Provide a return air duct in each bedroom. • Ductwork sized and laid out per ACCA Manual J and D. • With doors closed, field measure interzonal pressure differences to be less than 3 Pascals. • Exhaust ductwork, from kitchen, bath or ventilation fans, passing through unconditioned space shall be insulated (to avoid condensation problems) and sealed to less than 5% leakage. • Locate all duct work inside conditioned space • Do not locate ductwork in unconditioned attics.
Heating and Cooling Equipment	• Heating and cooling equipment shall be sized per ACCA Manual J and S. • Air handling equipment shall not be located in garages or unconditioned crawl spaces. • Drain pans should be sloped, corrosion resistant (e.g. stainless or plastic). • Drains should be located at the low point in the pans. • Filter must fit snugly within filter rack so that there is no bypass of air around the filter. • No equipment designed to intentionally produce ozone is permitted. • Do not operate ducted heating and cooling systems, or ventilation systems during construction activities that create excessive dust, such as dry wall and floor sanding.	• Install air handler with variable speed motor. • Install all air handling equipment within the conditioned space; do not locate air handlers and equipment in vented attics or vented crawl spaces.
Air Filtration	• Install a MERV 9 or higher (ASHRAE's Min. Efficiency Reporting Value) filter specified for low-pressure residential use compatible with air handler.	• Install MERV 13 or higher filter. • Install central vacuum vented to outdoors.

Ventilation	• Provide mechanical ventilation meeting ASHRAE 62.2. • Locate all outdoor air intakes at least 10 feet away from exhaust outlets and areas where vehicles may be idling. • Provide ENERGY STAR labeled fans, exhausting to outdoors, for spot ventilation in all bathrooms (see Appendix for sizing). • Provide range exhaust fans ducted to outdoors. (see Appendix for sizing): Updraft fans located directly over cook top/range can be used in all applications, but cannot be re-circulating-type. Downdraft ventilators are permitted only if other appliances are electric, or gas with closed combustion. Fireplaces must be airtight and have provisions for dedicated outdoor make-up air (see “Combustion Appliances” section). • All clothes dryers shall be vented to the outdoors. • Kitchen fans should be rated at no more than 5.0 sones.	• Provide a Heat Recovery Ventilator (HRV) or Energy Recovery Ventilator (ERV). • Use smooth, metal ducts between bath fan, (and also between attachment point in wall or ceiling for dryer’s flex hose) and termination point outside building envelope. • Bath fans shall have timers that operate fan a minimum of 20 minutes. • Provide ventilation fan in garage, either to run continuously, or to operate intermittently for minimum or 20 minutes when activated by the operation of the overhead or roll-up garage door (see Appendix). • Install exhaust fans in rooms where office equipment will be used and in laundry room areas, rated no more than 1.5 sones and ducted to outdoors (see Appendix for sizing).

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5. Combustion Safety		
Combustion Appliances	• Furnaces and water heating combustion equipment shall be sealed combustion or power vented outdoors. • Fireplaces: 1) Gas fireplaces shall be direct vented or power vented and meet Canada CSAP.4 Gas Fireplace Efficiency Standard. 2) Wood-burning fireplaces shall only be of an airtight insert type tested to meet EPA standard 40 CFR Part 60, subpart AAA, 60.530 – 539b, Standards of Performance for New Residential Wood Heaters.	
Garage Isolation	• Weather-strip the door between the house and the garage; use spring-loaded hinges on the door. • Air-seal the common wall between garage and living space (see Appendix). • Build garage exterior walls “loose” with respect to the air sealing of common wall (see Appendix).	• Garage is built as separate structure, not connected to house. (Fan noted in “Ventilation” (“Best Practices”) section would not apply.) • For attached garage, close passage door connecting to living space and operate forced air heating and cooling system and ventilation system, and all exhaust-air appliances while checking around baseboard, door framing and electrical switch and outlet plates in adjacent living spaces with smoke-stick to ensure airflow is not coming from garage.
CO Monitors	• See “Commissioning”, (Owner’s Checklist/Manual) Section.	

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6. Building Materials/Applications		
Preparation	• Protect building materials stored on site from exposure to rain and materials wetted during the construction process shall be allowed to dry before closing in building assembly.	
Installation	• Raise paper covered gypsum board ½" from concrete slabs on or below grade. • Ventilate home during and shortly after installing products that are known sources of contaminants (see "Ventilating Construction Areas" in the Appendix).	• Provide min. 5 ACH ventilation when applying paints, varnishes, adhesives, vinyl flooring and carpeting, and for a minimum of two days afterwards (see "Ventilating Construction Areas" in Appendix)
Materials	• Please comment on which of these two specification options should be used for formaldehyde-containing products. 1) Plywood used shall be of exterior–grade type (i.e. containing phenyl formaldehyde resins) and not urea formaldehyde found in other grades. **OR** 2) Only use formaldehyde-containing products that are certified to meet the following standards: particle board and medium density fiberboard compliant with ANSI A208.1 and A208.2 respectively; hardwood plywood compliant with Hardwood Plywood Man. Assn. HPMA FE86 and U.S. HUD Std. 24 Part 3280; and all engineered wood products containing urea formaldehyde compliant with ANSI standards. • Carpets and carpet adhesives shall carry the Carpet & Rug Institute (CRI) green and white low-emitting product label. • No wall-to-wall carpet shall be installed in bathrooms, kitchens, and utility rooms. • Do not use cabinetry products with conversion varnish finish. • Do not use vinyl wallpaper in hot humid or humid mixed climates.	• No wall-to-wall carpet installed in entryways. • In basements, concrete must be sufficiently cured and dry before carpet installed. • Use cementitious board or fiberglass covered gypsum board in wet areas (e.g., tub and shower surrounds).

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7. Commissioning		
Final Preparation	• Inspect each supply and return point in the system to ensure that air is flowing and that there are no disconnects. • Inspect air-handling equipment for debris and cleanliness before start-up. • Before installing registers/grilles/ diffusers, inspect ductwork to ensure that it is clean, dry, and free of debris. • For the period between finishing and occupancy, ventilate the building with outside air at the highest rate the ventilation system can produce (see "Flush Out Air Contaminants" in Appendix). • Verify with the HVAC contractor that refrigerant charge meets manufacturer's specifications.	• Measure the flow rate of air handling equipment and system to balance and make any necessary adjustments to meet specified rates.
Owner's Checklist/ Manual	• Provide a checklist of all IAQ-required specifications installed as per IAQ label specifications and signed by builder or an official representative of the builder. • Provide home owner's manual (See Appendix) documenting all special equipment, instructions for proper operation and maintenance, and HVAC load calculations. • Suggest to buyers of homes containing combustion equipment/appliances: "Consider purchasing and installing CO detectors for your home". On each floor of home containing a bedroom, place one Carbon Monoxide alarm in hallway adjacent to bedroom area. Alarm must meet any of these standards: Underwriters Laboratories 2034 (second edition 1998), International Approval Services 6-96 (second edition 1998), or Canadian Standards Assn. 6.19-01 (2001)." ***(Special Comment requested- please see CO Alarms below).***	• Provide comprehensive home owner's manual including information about all IAQ measures and their impact on air quality. • Provide "as built" drawings of the home showing details as they were actually constructed. • For HVAC and related ventilation equipment, provide load calculations, duct sizing specifications, duct layout drawings, and operating manuals and specifications for all HVAC and ventilation equipment, to include bath fans, and range hoods.

Special Comment Requested on CO Alarms:

The use of CO alarms is recommended by the Consumer Product Safety Commission, the Centers for Disease Control, the Dept. of Housing and Urban Development (HUD), and the National Fire Protection Association, among others. EPA advises the public that carbon monoxide alarms are widely available in stores and consumers may want to consider buying one as a back-up to, but not as a replacement for, proper use and maintenance of fuel-burning appliances. EPA also cautions that CO alarm technology is still developing, that they are not as reliable as smoke detectors, and that their performance varies.

A study published in June, 2002, conducted by Mosaic Industries, Inc. for the Gas Research Institute reported the following:

The study assessed the performance of commercially available CO alarms, several pre-production prototypes, and several removed from residences by first responders. Alarm performance was assessed in terms of Underwriters Laboratories UL 2034 design specification for sensitivity to CO, their immunity to interfering gasses, the accuracy of their digital displays, and their ability to detect CO in ambient air of various relative humidity.

Alarms of three of ten commercially available brands alarmed within the UL 2034 specification. They performed consistently, without false alarms, and always alarmed when presented with dangerous CO levels. Alarms of six of ten commercially available brands behaved inconsistently, with one-half of the devices failing to alarm in at least one test at dangerous CO levels and moderate humidity, and four out of five failing to alarm at low humidity. Three of seven commercially available brands with digital displays were accurate to within +/- 30%, with one brand being accurate to within +/- 10%. The other four brands were highly inaccurate with a significant portion of alarm units of two brands reading 0 ppm when exposed to CO concentrations as great as 100 ppm.

Given the reported failure rate, do you believe that the IAQ Specifications should contain a requirement for CO alarms? It has been placed in the "Owner's Information", that is, something that would be discussed as part of an "Owner's Manual". Builders would suggest (as in EPA's guidance to the public) that "they may want to consider buying a CO detector as a back-up, but not as a replacement for proper use and maintenance of fuel-burning appliances"?

HOW TO COMMENT ON THE PROPOSED INDOOR AIR QUALITY LABEL FOR NEW HOMES

E-mail your comments to:

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Please submit all comments no later than March 12, 2004