



## THREE PRINCIPLES FOR HEALTHY HOUSING

Through the work done by various research establishments, and the insight gained by building for the environmentally hypersensitive, three key principles for producing Healthy Housing have emerged:

1. Source Control
2. Separation
3. Ventilation

This paper will outline basic strategies that can be incorporated in your building practices to enable you to produce healthier homes.

### PRINCIPLE 1 - SOURCE CONTROL

By far the most important strategy, Source Control means eliminating pollutants at their source rather than trying to filter them out or dilute them with ventilation air. Selecting low odor building materials is an example of source control.

- **SELECT THE BUILDING SITE CAREFULLY** - Power lines, agricultural spraying, vehicle exhaust and industrial pollution are all potential sources of indoor air contamination.
- **USE CLEAN MATERIALS** - Materials that are VOC free, formaldehyde free and low odor are less likely to cause adverse health effects. The greatest care should be taken in choosing finishing materials for the floors, walls and ceilings as these represent the largest surface areas in contact with house air. Home furnishings and cleaning products are often a significant source of contamination and should be chosen carefully.

- **NATURAL IS NOT ALWAYS BETTER** - Some people mistakenly believe that natural products, such as aromatic woods (e.g. cedar or pine), are more "healthful" than synthetic materials. Anything that has a strong odor, such as natural linoleum, or linseed oil finishes should be avoided. On the other hand, plastic laminate - a synthetic material made with formaldehyde-based glue - is a good choice because the high temperature manufacturing process renders the material inert, resulting in a low-odor surface that is easy to keep clean.

- **CONTROL RELATIVE HUMIDITY (RH)** - Mold will grow at a RH of +70% or during short interval surface condensation. Dust mites will reproduce at +55%. Control of RH can be aided by mechanical ventilation and, in some climates, mechanical dehumidification such as air-conditioning (moisture condenses on the cooling coil and can be drained away). Minimize the amount of water that gets into the house from outside; for example water will migrate from the ground through concrete by capillary action, so draining water away from the house and dam proofing foundation walls is important. Vented crawl spaces can be sources of high humidity and mold growth because they remain cool enough to cause condensation during humid summer months, so sealed crawl space or slab-on-grade foundations should be used. Humidifiers used during dry winter months should be inspected and cleaned often to prevent mold growth.

- **USED SEALED COMBUSTION APPLIANCES** - Gas boilers, kerosene space heaters, oil-fired water heaters and other appliances that use fossil fuels and air from inside the house for combustion can spill pollutants, including carbon monoxide, back into the house. Sealed combustion appliances draw combustion air from outside and mechanically exhaust the smoke to the outside so the risk of spillage is eliminated.
  - **AVOID CARPET** - Carpet materials (fibres, backing, etc.), as well as the adhesives that are used to install them, can be significant sources of chemical contamination. Carpets can also harbor biological contaminants such as dust mites and animal dander if not carefully cleaned - and thorough cleaning is difficult to do. Cleaning products themselves can have an adverse effect on air quality.
  - **AVOID THE USE OF PESTICIDES OR FUNGICIDES** - Toxic chemicals used to control plants, insects and fungus are also normally toxic for humans. Mold growth within the house can be eliminated by sealing the building envelope and tempering the indoor air with the mechanical system to control humidity. Use of toxic chemicals outside the house will inevitably contaminate the indoor environment as well.
  - **PROVIDE CONTINUOUS SITE SUPERVISION** - Control of the building site during construction is critical to avoid the inadvertent use of harmful materials and reduce the risk of contamination. All trades-people and building material suppliers should be instructed regarding the “healthy housing” objectives of the project.
  - **PROVIDE AIR CONDITIONING (cooling)** - During pollen season people with allergies often prefer keeping windows closed and relying on filtered air from the ventilator. Air conditioning increases thermal comfort in two ways; by lowering the indoor air temperature, and by lowering the humidity level - condensing moisture out of the indoor air on the cooling coil. With less moisture in the house the potential for condensation on other cool surfaces - such as toilet tanks - is reduced, and thus the chances of mold growth are diminished.
  - **PROVIDE A LOW-TEMPERATURE HEAT SOURCE** - Forced-air heating systems that use a high temperature source (furnaces) and electric resistance heaters can burn dust causing air-quality problems. Hydronic (hot water) systems, either in-floor or with wall mounted radiators, are preferable.
- PRINCIPLE 2 - SEPARATION**
- Many common building materials represent a potential health risk but their effect on indoor air can be minimized by sealing them away from the occupants. Building an airtight building envelope to seal out harmful insulation fibres is an example of separation.
- **BUILD TIGHT** - Only by minimizing air leakage is it possible to control the quality of incoming ventilation air and to control the risk of contamination of materials



in the building assembly. For example an airtight polyethylene air/vapour barrier will reduce occupant exposure to fiberglass insulation and outdoor air pollution. A blower door (house depressurization) test should be done to verify the level of air tightness.

- **USE INERT SEALERS** - Many potentially noxious materials - such as urea formaldehyde particle board cabinetry - can be made acceptable by sealing them with a low VOC paint or clear finish. Plastic laminates, neutral-cure silicones, aluminum foil and polyethylene sheet are also valuable products for sealing harmful materials away from house occupants.

### PRINCIPLE 3 – VENTILATION

Continuous, balanced mechanical ventilation reduces the buildup of contaminants and, when combined with filtration, ensures an adequate supply of fresh outdoor air for the occupants.

- **USE BALANCED, FULLY DUCTED, MECHANICAL VENTILATION** - Ventilation air can be filtered to remove outdoor contaminants and this clean air will dilute the concentration of indoor contaminants. Air tightness should be confirmed with a blower door test and the minimum value should be below 1.5 air changes per hour at 50 Pascals of pressure. Clean air should be supplied to all habitable rooms and exhaust air should be taken from any room where moisture or odors are generated.

- **AIR FILTERS ARE A SECOND LINE OF DEFENSE ONLY** - It is far better to eliminate the source of contamination than to try to filter it out of indoor air. There are basically two types of air filters - particulate and adsorption filters. Removing particulates is relatively easy and low cost. Adsorption filters remove gasses with an activated medium (e.g. charcoal) but their effectiveness is short-lived and their replacement cost is high. Whole house filters are preferable to room specific filtering systems.
- **INSTALL A CENTRAL VACUUM SYSTEM** - A central vacuum that exhausts to the outdoors is an effective way to control dust mites, animal dander, pollen and other particles that are linked to health problems. The presence of a central vacuum is more likely to encourage frequent cleaning when compared with the more clumsy mobile type, and the outdoor exhaust ensures that small particles that pass through the filter do not re-enter the house.

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