# Building and Maintaining Healthier Housing

By Ellen Tohn

Dr. Sandel sees many children each week at her Boston Medical Center clinic. One young girl in particular visits the Emergency Room regularly, suffering from asthma despite daily medicine. The summer months offer Emily a respite from her frequent hospital visits; she lives with her grandmother in a home that has no moisture or pest problems. In the fall she returns to her family's apartment, rife with mold, mice, and cockroaches. Like clockwork, she is soon back at the hospital. Stories like this are not uncommon and new research is beginning to unravel the threads that link our home environments with our health.

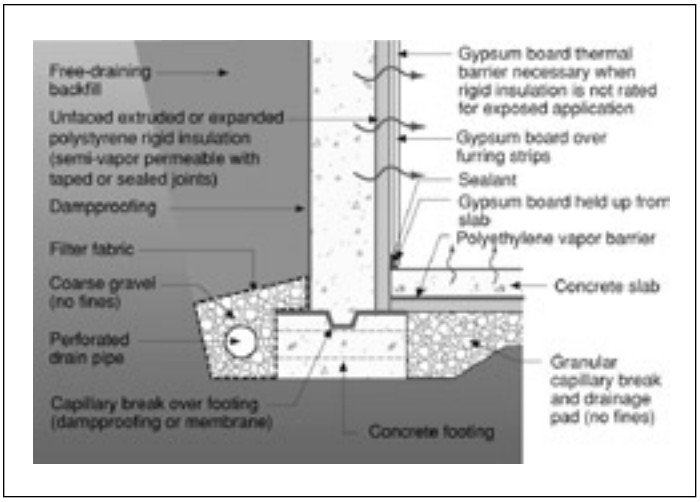
New England has the highest asthma rates in the country, according to the Asthma Regional Council of New England. One out of every nine children in our region suffers with asthma. Asthma is also the number one cause of missed school days. Those of us who coach children's sports or work in schools are familiar with the inhalers that have become commonplace. While health experts can't fully explain the doubling of childhood asthma over the past fifteen years, we do know that conditions in our home environments can trigger asthma attacks for children who are already sensitive to breathing problems.

According to the Institute of Medicine, chronic exposure to allergens in our homes and buildings from mold, pets, cockroaches, mice and rats, and dust mites can trigger asthma attacks. Excessive moisture in buildings helps to spur mold growth while also attracting cockroaches, mice and other pests. This spring the National Academy of Medicine (2004) confirmed that living with moisture and mold is linked to a number of respiratory problems and recommended that housing be built and maintained in order to reduce moisture problems.

A number of indoor air pollutants are

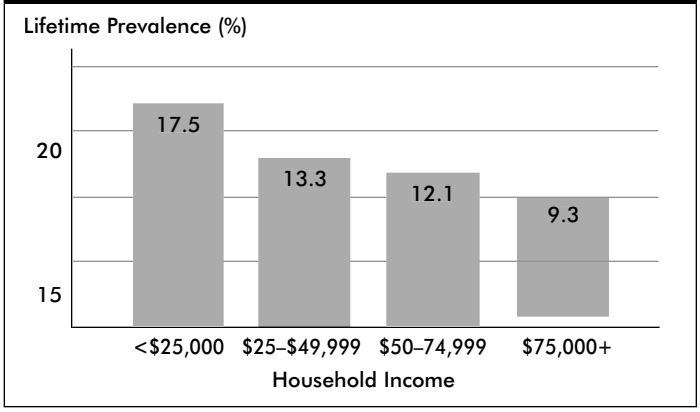
### Sample Moisture and Allergy Prevention Construction Practices

- Install pan flashings on all windows and exterior doors. Apply window pan flashings over building paper at sill and corner patches. *Flashing helps direct water away from wall cavities and toward the drainage plane.*
- Avoid putting plumbing in exterior walls. *It is easier to detect and repair leaks in interior walls.*
- Install hot water heaters in rooms with drains or catch pans and floor coverings that are not water sensitive. Install easy-to-use shut off valves for clothes washers and hot water heaters. *These precautions will minimize damage from leaks.*
- Use cement board, fiber cement board, or cement plaster as an air barrier in wet areas such as behind tubs or showers. *Do not use paper-faced gypsum board that can wick moisture.*
- Seal holes to prevent air flow (e.g., utility walls where they intersect exterior walls and ceilings). Seal bathtub and shower enclosures with rigid materials (e.g. sheathing or gypsum board). *This minimizes airflow that can bring in moisture and pests.*
- Avoid putting ductwork and air handlers in attics because of air leakage.
- If basement spaces or below-grade spaces (garden apartments) are likely to be occupied, they should be designed and constructed for occupancy. They should be dry and have appropriate heating/cooling. Do not use ceiling basement insulation. Instead, insulate basements at their perimeters. Install continuous rigid insulation under concrete floor slabs or above concrete floor slabs coupled with a floating floor. Insulate the wall assemblies in wet areas with semi-vapor permeable foam (e.g., rigid foam). *These strategies will raise the temperature of the floor coverings and below-grade walls to control mold and dust mites. Semi-vapor permeable insulation allows the basement wall assemblies to dry to the interior, releases capillary water to the interior in a controlled manner, protects interior finishes, and minimizes the growth of molds.*
- Insulate cold water pipes. Permeable foam insulation is recommended. *Insulation minimizes condensation in warm temperatures.*
- Do not install carpet in wet areas (e.g., bathrooms, laundry rooms, kitchens, entryways, and damp basements). Use smooth, washable surfaces that do not act as reservoirs for moisture/mold (e.g., vinyl, wood, tile, rubber). Whenever possible, install smooth and washable surfaces in other rooms/areas (e.g., common areas, at least one bedroom, living rooms). *Carpet can trap moisture and dust. They can become a breeding ground for mold; smooth and cleanable surfaces do not trap moisture and are easier to clean. In homes where people suffer from allergies, consider one room free from carpet.*




Source: ARC

**Asthma and Income** (Lifetime Childhood by Household Income, New England Region)




Source: ARC

also associated with the development and exacerbation of asthma. These include environmental tobacco smoke (ETS); nitrogen dioxide ($NO_2$), a by-product of high temperature combustion associated with unvented or poorly vented combustion appliances such as gas stoves; and volatile organic compounds (VOCs), products found in dry cleaning compound residues, plastics, paint thinners, pressed wood products, and some flooring products and adhesives.

Landlords and homeowners alike value buildings free from rot, mold, and pest infestation, and where utility bills are kept under control. New health concerns are bolstering the case to take greater care in how we design, construct and maintain our structures to help minimize health problems like asthma, lead poisoning, and carbon monoxide poisoning.

Those concerned with health are collaborating with building science experts to define construction techniques that can help keep people and buildings healthy. The Asthma Regional Council of New England has developed *Building Guidance for Healthy Housing* that describes construction practices to create living spaces that are healthy, durable, and energy efficient.

The building guidance was developed with affordable housing providers to be sure that it works for those on a tight budget where initial construction costs are critical. Over 1,500 units of affordable housing will be constructed in our region following the guidance and that number is likely to grow substantially as state housing finance authorities who distribute public funds for affordable housing and public housing authorities managing housing adopt these practices. The recommended construction practices will sound familiar to many, and a subset of these key practices are included with this article. Check out ARC's website for the full building guidance *www.asthmaregionalcouncil.org* and accompanying technical resource: *READ THIS Before You Design Build or Renovate*.

- Ensure that all exterior claddings have drainage planes between the cladding and the house wrap material. *Drainage planes provide a pathway for water to run away from the structure and avoid creating reservoirs behind cladding.*
- Backprime exterior siding materials (paint back, front, edges and ends of wood siding, cement siding and wood trim). *This helps prevent wood clapboard from absorbing moisture and eliminates a potential water reservoir.*
- Install a capillary break on top of the footing between the footing and the perimeter foundation wall. *A break helps minimize movement of moisture from the ground into the building assemblies.*

### Sample Ventilation Practices

- Install exterior exhausting fans in bathrooms and kitchens. Use durable and quiet fans (less than 3 sones). *Fans exhaust excess humidity that can spur mold development.*
- Install power vented fans or range hoods that exhaust to the exterior when gas cook tops and gas ovens are present. *These fans remove moisture, odors and other contaminants.*
- Seal forced air ductwork, particularly on the return side (suction side). *This helps avoid negative air pressures that can draw contaminants (radon and soil gas) into homes from below grade or smoke and odors from neighboring units.*

### Sample Pest Prevention Practices

- Seal utility openings and joints between openings. Avoid materials that rodents can chew. Use corrosion proof materials (e.g., copper or stainless steel mesh). *Reducing holes minimizes transit pathways for rodents and pests.*

## Seven Healthy Homes Principles

**Dry:** Reducing moisture minimizes mold growth and makes it difficult for pests to thrive.

**Cleanable**: Dust can cause allergic reactions that trigger asthma attacks. Clutter and debris make it difficult to remove dust and can be breeding grounds for pests.

**Well Ventilated:** Ventilation moves air to help reduce excess humidity and airborne contaminants. Spot ventilation exhausts humidity and contaminants from specific sources—bathroom showers, kitchen cooking—while dilution ventilation deals with low-level contamination throughout the home.

**Combustion By-Product Free:** Combustion by-products such as carbon monoxide have adverse health consequences.

**Pest Free:** Pests can cause allergic reactions that trigger asthma. Pesticides themselves can also create adverse health effects.

**Toxic Chemical Free:** Containers storing cleaning compounds, pesticides, oil- or alkyd-based paints and solvents can release toxics to the indoor air and exacerbate asthma.

**Comfortable:** An uncomfortable home can cause its occupants to take actions that exacerbate unhealthy conditions. When people are cold, they are less likely to ventilate properly. When people are dry or hot, they often open windows and/or run humidifiers, producing even more mold growth.

EPA's Energy Star brand is also getting on board with its new Energy Star Air+ standards which identify construction practices designed to improve indoor air quality. These guidelines are consistent with but more extensive than the ARC building guidance. The Energy Star program in New England is moving ahead with its Home Health Advisor Checklist which outlines healthier building techniques—*www.energystarhomes.com*. Finally, some weatherization programs are starting to look more systematically at housing-based health hazards and are seeking funding to address these problems, particularly in the homes of residents with breathing difficulties. Moving forward, the smart money is on building and maintaining housing that promotes healthy home environments and healthier occupants.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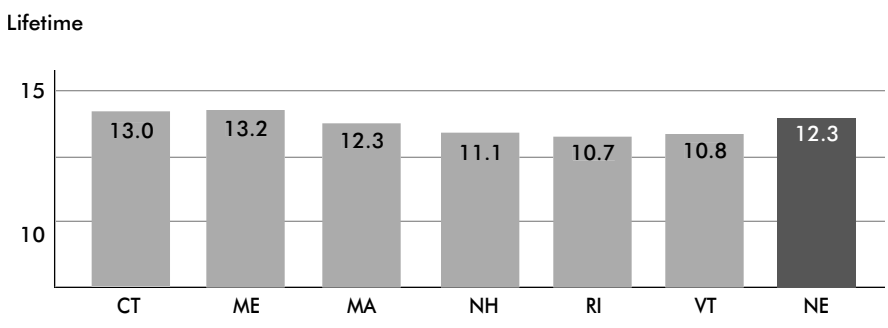
*The author invites your comments or questions to e.tohn@comcast.net.*


### Lifetime Childhood Asthma by State




Source: ARC