



Research & Development Highlights

Technical Series
90-243

Exploring Low-Pollution Design

Introduction

Individual sensitivity to chemical and biological indoor air pollutants will vary considerably depending on factors such as age, stress, nutrition, infection and genetics. Housing must therefore accommodate a wide range in chemical and biological tolerance and should not expose individuals to overloads that could precipitate a state of hypersensitivity in previously healthy people. A number of design and construction features can be used to advantage in standard housing without compromising cost or energy conservation. This study examines misconceptions about indoor air quality, and provides conclusions about construction techniques which help achieve lower indoor pollution levels while remaining compatible with the need to conserve energy.

Misconceptions About Indoor Air Quality

- 1) Misconception: Only the hypersensitive population needs specialized housing.
Fact: Indoor air pollution has the potential to cause or aggravate disease even in individuals not considered hypersensitive. People with allergies, emphysema and other lung diseases would also benefit from clean living environments.
- 2) Misconception: The hypersensitive population is a fixed group.
Fact: Factors such as genetic heritage, age, nutrition, stress and infection may cause changes in chemical or biological tolerance, even in a healthy population.
- 3) Misconception: Hypersensitivity cannot be triggered in healthy people.
Fact: Some indoor residential chemical exposures have been sufficient to trigger a state of hypersensitivity in otherwise apparently healthy individuals.
- 4) Misconception: Pollutant exposures must be high to cause symptoms.
Fact: Once hypersensitivity is triggered, by whatever means, individuals can become intolerant to a wide range of exposures, usually at relatively low levels of exposure that were previously well tolerated.

- 5) Misconception: Reducing indoor air pollution compromises energy conservation.

Fact: Many of the steps taken to build energy-efficient houses are also required (or desirable) for improvement in indoor air quality.

Construction Techniques

A number of basic building techniques can contribute to the minimization of both indoor pollution and energy loss.

- 1) Aerodynamic separation of combustion systems from indoor air.
 - Unhealthy conditions might be avoided by making it an accepted rule that all combustion equipment be “aerodynamically separated” from the rest of the indoor air in a home.
- 2) Provision of a continuous, repairable internal air barrier.
 - It is necessary to introduce deliberate exhaust and intake openings, along with fail-safe ventilation, to avoid a build-up of indoor pollution from other sources within the building. The air barrier should be a solid, continuous surface that eliminates air leakage and resists peak pressure variation in windy conditions.
- 3) Low emission materials and furnishings.
 - Materials with the least emissions for equivalent performance are the most beneficial choice for structural, finish and furnishing materials in homes that must be compatible with a wide range of environmental sensitivities.

Conclusions

Popular misconceptions about indoor air quality and housing were reviewed and reformulated in light of new facts concerning the health effects of indoor pollutants. Some of the new concepts have an important bearing on housing design:

- In addition to the hypersensitive individual, there is a larger sub-population of risk groups for whom continued exposure to various indoor pollutants is inadvisable.
- The sensitivity of occupants to indoor pollutants

within dwellings may change during the period of occupancy. Any one home may have to accommodate a broad range of sensitivities.

- Mixes of indoor pollutants, all at levels below accepted toxic limits, may cause some individuals to become ill. Reduction of levels of single pollutants may not always decrease symptoms of illness.
- Many of the steps which make a house more energy-efficient also help to improve indoor air quality.
- Occupants must choose appropriate furnishings and appliances, make suitable lifestyle choices (e.g. not smoking) and practice regular cleaning and maintenance to achieve the full benefit of low-pollution design.

Project Manager: Peter Russell

Research Report: Implications of Chemical Hypersensitivity for Housing Design

Research Consultant: Small and Associates

A full report on this research project is available from the Canadian Housing Information Centre at the address below.

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