BUILDING MATERIALS

For the Environmentally Hypersensitive

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Building Materials for the Environmentally Hypersensitive

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Abstract

Building Materials for the Environmentally Hypersensitive was prepared to help individuals and builders select building materials that have minimal negative effects on the health of environmentally hypersensitive occupants. The materials included are those typically used in residential construction in cold climates. Two kinds of information were used in evaluating the materials: 1) known or published information about the products; and 2) the experiences of hypersensitive individuals with these materials. The responses of hypersensitive individuals to the building materials were used as an indicator of how these materials affect the environmentally hypersensitive.

Disclaimer

The material contained in this document represents the best available information at the time of publication. The information is subject to change as new data become available.

No attempt has been made to include every product that is commercially available. Thus, non-inclusion of specific products is not an indication of their acceptability or non-acceptability.

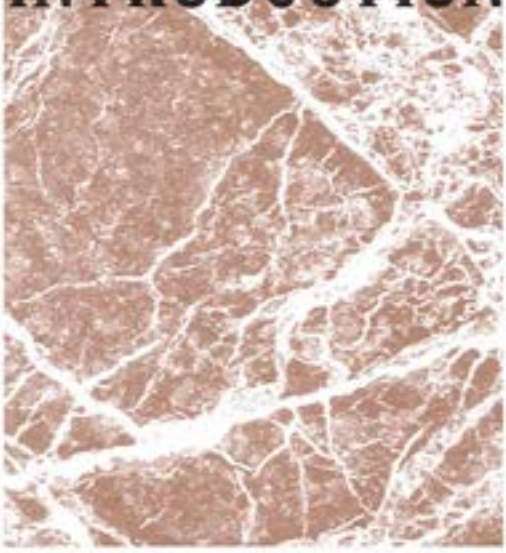
The information given about building materials in this document is limited by existing product information and experience related to their use in Canada. Since the chemical compositions of most products are proprietary, the typical components given are not necessarily complete. The named products also may not contain all the chemicals listed. All reasonable attempts were made to present accurate information.

Neither CMHC nor the consultants who assisted in the preparation of this document will be responsible for any damage, health reactions, or any other consequences as a result of using the information in this guide. Testing and using the building materials are the responsibility of the user and not of CMHC.

CMHC does not endorse any material or product whatsoever as safe for individual health or the environment, or to alleviate specific health problems. All health questions should be referred to a physician. Individuals who wish to design, construct, or alter homes or to relocate are advised that the methods, materials, and examples described in this report may not be appropriate for everyone. Readers are advised to evaluate materials cautiously for themselves and to seek design consultation and medical advice to determine whether methods and materials are safe and appropriate in their case.

TABLE OF CONTENTS

INTRODUCTION



INTRODUCTION

The home, where the majority of our time is spent, forms our immediate environment. Our health and well-being are significantly influenced by the home environment. Indoor air quality in our homes has been shown to have a major impact on our health.

Various factors contribute to the quality of indoor air: the outdoor air, the building materials and furnishings, the occupants' activities, materials used to maintain the home, and the heating and ventilating systems.

Purpose and Audience of this Guide

Some people experience serious health problems when exposed to even very low levels of contaminants. For these people, referred to as environmentally hypersensitive,[1,2*] superior air quality is critical to their well-being.

The environmentally hypersensitive account for a small fraction of the population at present. Our knowledge of the factors that lead to the development of the condition is far from complete. Genetics, nutrition, stress, and infections are recognized to have a role. Also, the onset of illness has been reported to result from isolated exposure to high levels of contaminants. People are known to become sick or "sensitized" after living in moldy houses or moving to newly built or renovated homes.

Knowledge of indoor air pollutants, including chemical contaminants emitted from building materials, is important for preventative purposes for these individuals.

Lifestyle, furnishings, personal products, cleaning chemicals, etc., can be altered to reduce indoor air contaminants. On the other hand, building materials are not easily replaced after the structure is built. For this reason, it is important to select materials which contribute to a better indoor environment before construction or renovation begins.

People interested in building homes with indoor air quality that meets the needs of hypersensitive individuals often have difficulty identifying appropriate building materials. Information is either unavailable, inaccurate, or incomplete. Thus, an acute need for a sourcebook of practical information has existed for some time.

The purpose of this guide is to help environmentally hypersensitive individuals, and those who build housing for them, select suitable building materials.

How this Guide was Developed

Builders, renovators and architects who work with environmentally hypersensitive people have acquired first-hand knowledge of the health effects of building materials and products and have experience in constructing suitable housing for them. To collect as much of this experience as possible into this guide, a broadly based project team, experienced in building and designing housing for the hypersensitive, was assembled. The team included a builder, an architect, a renovator/consultant, two engineers, a building consultant and a health consultant.

The members of the team had extensive experience in building and designing houses for the environmentally hypersensitive.

Two types of information were gathered to prepare this guide. The first was "experiential" information—the project team's observations and experiences with the materials used in renovating or building homes for environmentally hypersensitive individuals. The responses of hypersensitive individuals to the building materials are an indication of the types of reactions that other sensitive people may encounter in using these materials.

The second type is known or published "factual" information. This includes manufacturers' product literature; material safety data sheets, or MSDS; material emissions data; results from health and other studies; technical publications; and general knowledge from textbooks.

* *References can be found on page xv.*

The main body of this guide is a collection of product sheets grouped into different building component categories. Each product sheet contains the two types of information described.

The observations and experiences with the products and conclusions drawn by the project team are presented for use by the environmentally hypersensitive and those who build housing for them. They are incorporated into sections called *Comments based on experience of the environmentally hypersensitive* on the product sheets.

This experiential information is printed in *italics* so that it may be easily identified. The *Comments* contain practical information that will be especially useful to individuals with environmental hypersensitivities. They are meant to provide a starting point, to help those with extreme sensitivities begin to make informed choices. From this starting point, the user must test the building materials before selecting them.

The materials included in this guide were selected by the project team using these criteria: (1) the building materials are commonly used for residential construction, or (2) the materials are known to the team as specialty products for constructing homes with low levels of pollution.

Odours and emissions

Throughout this document, the terms **odours** and **emissions** are used interchangeably. However, there is a difference. Emissions are chemicals released into the air as gases from materials. These chemicals may or may not be perceived by the sense of smell. When they are perceived by the sense of smell, they are called odours.

The type and quantity of chemicals present in emissions from materials can only be measured with laboratory equipment. Although the chemicals emitted by some building materials are known from laboratory testing, the emissions from the majority of materials are unknown. As well, the health effects of many chemical emissions cannot be predicted because the medical research has not been done.

Most hypersensitive individuals do not have material emissions test data or laboratory equipment to verify the presence of chemicals in their home. For this reason, the sense of smell is the only practical, if imperfect, means to test for chemical emissions from materials.

The *Comments* sections in this publication continually refer to odours from materials. The presence of an odour is an indication that volatile substances have been released by the material into the air. The odour of a material is a proxy for its chemical emission.

The hypersensitive readily perceive odours and may find them troublesome. However, the presence of an odour does not necessarily mean that the material is unsafe. For some, an odour may be innocuous or even pleasant. For others, an odour may act as an irritant, an allergen, a toxin or simply a nuisance that can cause markedly different symptoms from one person to another.

As well, the absence of an odour does not necessarily mean that the material is safe for use by the environmentally hypersensitive. Some gases are odourless, or perceptible only at high concentrations.

The effect of odours (emissions) on the environmentally hypersensitive will depend upon the duration and intensity of the exposure, the toxicity to the individual, and the combination of chemicals present in the air.

Limitations of the Guide

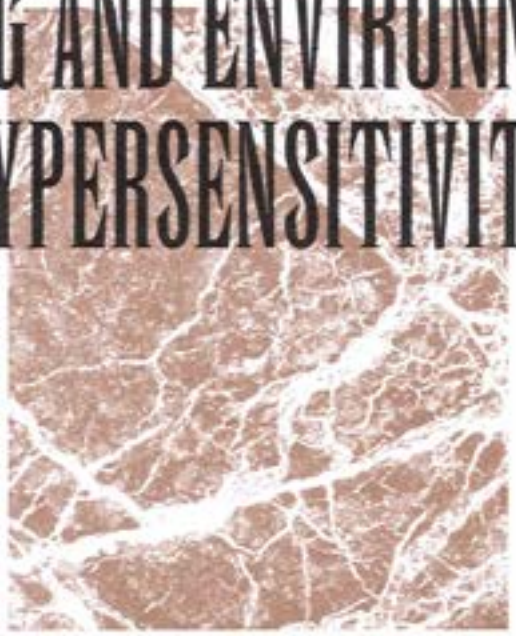
The guide includes selected building materials in use at the time of publication. New materials are continually being introduced to consumers. As well, the composition of essentially the same product can vary widely. This guide does not include all building products that are available to consumers.

This guide deals only with building materials and how their emissions contribute to air quality in the indoor environment of the environmentally hypersensitive. It should be noted that other pollution sources within a home can be of equal or greater concern than building materials. These include biological pollutants, particularly molds and dust mites, chemical pollutants from furnishings, consumer products and activities of the occupants. The heating, ventilating and air conditioning systems can also contribute to the pollutant load of the house. An indoor air quality assessment of a house should include an analysis of all sources of pollutants. The CMHC document, *The Clean Air Guide: How to Identify and Correct Indoor Air Problems in Your Home,*[3]* and a video, *This Clean House,*[4] give a good overview of the subject. A guide to mechanical equipment for healthy indoor environments is still in preparation.

The product listings in this guide are not intended to replace manufacturers' product information. It is suggested that manufacturers' information be consulted to evaluate the suitability of the product for the intended application. This document does not provide complete information concerning health risks during installation of a material. Information pertaining to health risks during installation is found in material safety data sheets (MSDS).

* *References can be found on page xv.*

HOUSING AND ENVIRONMENTAL HYPERSENSITIVITY



Housing and Environmental Hypersensitivity

A working definition for environmental hypersensitivity was established by the Ad Hoc Committee on Environmental Hypersensitivity Disorders, set up by the Ontario Ministry of Health in 1984 to study environmental hypersensitivity disorders. The committee's definition is:

> Environmental hypersensitivity is a chronic (i.e., continuing for more than three months) multisystem disorder, usually involving symptoms of the central nervous system and at least one other system. Affected persons are frequently intolerant to some foods and they react adversely to some chemicals and to environmental agents, singly or in combination, at levels generally tolerated by the majority. Affected persons have varying degrees of morbidity, from mild discomfort to total disability. Upon physical examination, the patient is normally free from any abnormal, objective findings. Although abnormalities of complement and lymphocytes have been recorded, no single laboratory test, including serum IgE, is consistently altered. Improvement is associated with avoidance of suspected agents and symptoms recur with re-exposure.[1*]

A small number of people react to low levels of indoor pollutants. Their condition may cause them mild discomfort or, in some cases, provoke severe reactions to indoor contaminants.[2]

What Affects People

Canadians spend upwards of ninety percent of their time indoors. Much of this time is spent in the home environment. Many of the materials we use to build, operate, furnish, and maintain our homes are sources of chemical contaminants. Conditions inside homes, such as humidity and heat, can encourage biological contaminants that pollute indoor air.

Examples of chemical contaminants are:

- formaldehyde gas—released by many glues, building materials, and furnishings;
- carbon monoxide gas—produced from improperly vented gas appliances;
- soil gases;
- volatile organic compounds—from many cleaning products, hobbies and building materials; and
- fibres from insulation and furnishing materials.

Biological contaminants include molds, dust mites, pollen, animal dander, viruses, and bacteria.

Why People are Affected

Individual sensitivities and reactions to materials are very complex. Many factors contribute to whether and how an individual reacts to contaminants of any kind. Personal factors include risk and degree of sensitivity.

Risk

Certain groups of people have increased vulnerability to the effects of contaminants. High-risk groups are:

- children;
- the elderly;
- people with medical problems; and
- pregnant women.[5]

Degree of Sensitivity

Among individuals, there is a broad range of sensitivity:

Slight—has no apparent effect, does not interfere with living.

Medium—has an apparent effect, such as allergy symptoms, but is not debilitating.

Severe—has multiple effects and is debilitating, as in the case of the environmentally hypersensitive. This is the group that this document is intended for.

* *References can be found on page xv.*

How Building Materials Affect People

Important factors in the health effects of materials found in the home are emissions, toxicity, quantities, and proximity to people. These cannot be considered separately. Usually, more than one factor is at work.

Emissions - Some building materials have higher emission characteristics than others. For example, paints or finishes are likely to have higher emissions than window glass.

As a rule, emissions are enhanced as the temperature is increased. Higher humidity can also lead to higher emissions because some materials have components that are unstable to moisture. Emissions from materials are also higher when they are new. For materials that are installed "wet," the emissions are greatest during application and the initial stages of curing and drying. Volatile emissions from paints, for example, decline rapidly within a few days or weeks (usually a curing process).

Toxicity - Materials that have few or no harmful effects on people are considered to have low toxicity. Materials that have some harmful or poisonous effects are considered to have some toxicity. The toxic effects can be acute (immediate) or chronic (long term). Some pollutants, such as lead, radon or asbestos, manifest their effects from long-term exposure, while most airborne pollutants found in homes can exert their effects from short-term exposure.

Quantity - Some materials are used in much greater quantities than others. Walls, floors, and ceilings make up the largest proportion of surfaces in a house. Large quantities of materials are used to cover these surfaces. Low emissions from large quantities of materials can result in high total amounts of chemicals in the air. When materials with significant emissions are used, their effects on indoor air quality can be substantial.

Several materials may emit substances that when combined are greater than the sum of their individual effects.[2*] This is called a synergistic effect.

Proximity - Materials inside the home are more likely to affect occupants than materials outside the living space. However, people who are very sensitive can be affected by small quantities of contaminants originating from materials that are outside the living space.

Unfortunately, these factors cannot be considered separately. Multiple factors are often present at any given time.

How Changes in Housing Affect People

The overall effect of pollutants in housing has become an issue in recent years because of changes in Canadian building methods.

Old building methods often allowed air to come in through cracks, open windows, and doors. The air movement diluted indoor pollutants but did not completely remove them. During the energy crisis in the seventies, many Canadians tightened up their houses by installing storm windows, sealing cracks, and upgrading insulation in walls and attics. One key element was often neglected in these improvements—ventilation.

Early energy-efficient renovations that did not include upgraded ventilation systems sealed in the indoor pollutants, thereby trapping contaminants in the homes.

Modern building techniques combine mechanical ventilation systems with energy-efficient construction. A house that is properly ventilated with a mechanical ventilation system can significantly reduce the amount of pollutants in the home. (See Introduction to Building Science, p. xii.)

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* *References can be found on page xv.*

How to Improve Indoor Air Quality

The environmentally hypersensitive should adopt an approach to clean air housing that consists of three basic ideas: eliminate, separate, and ventilate.

Eliminate the source of pollutants by substituting materials with the lowest possible emissions. This applies to many chemical products in the home in addition to building materials. The best way to avoid pollutants is to not use materials that produce them. This is critically important within the home's living space. It becomes less critical for exterior materials.

Separate problem materials from the living space, so that they will not cause problems for the occupants. This can be done with an air barrier or a seal (e.g., an acceptable sealer applied as a coating).

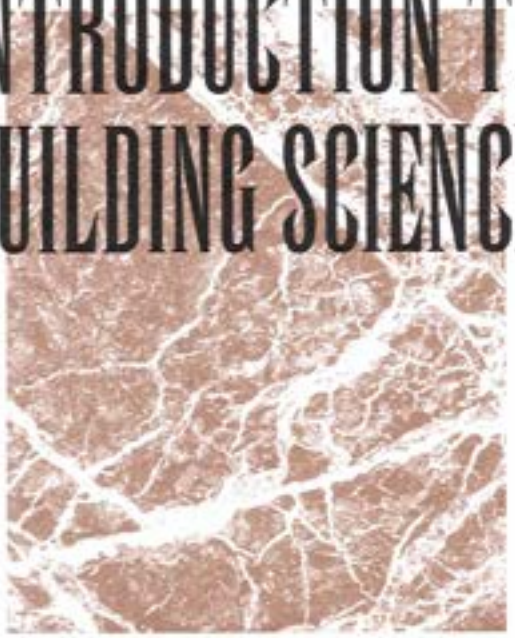
Ventilate with mechanical systems designed to remove pollutants and provide fresh air for the occupants.

Consider including these materials and features when building or renovating:

- manufactured wood products that do not emit formaldehyde;
- interior finishes that are low-toxicity, water-based formulations;
- hard-finish flooring, such as ceramic tiles or hardwood;
- low-toxicity installation and finishing products;
- a house location that avoids traffic and industrial pollution;
- modern building techniques and systems to reduce contaminants from the outdoors and positively ventilate the indoor environment;
- a properly drained, finished basement, or no basement at all;
- good natural lighting;
- a low-temperature electric heating system (including heat pumps). If gas or oil heating is used, the appliance should be located in a space sealed off from the lived-in area.
- ventilated closets or closets separated from bedrooms;
- an air purification system; and
- a central vacuum system with an outdoor exhaust.[2,3*]

* *References can be found on page xv.*

INTRODUCTION TO BUILDING SCIENCE



Introduction to Building Science

The following is an introductory tutorial on building science related to housing. It is unnecessary to read this chapter to use the guide effectively. However, the discussion will clarify the important influence various housing components have upon indoor air quality. Discussed are the concepts of the house as a system, the role of mechanical systems, the principles of heat, air and moisture flow, indoor air quality, types of barriers, and design considerations. For a more complete discussion, refer to Part 1 of the Canadian Home Builders' Association *CHBA Builders' Manual*. It can be obtained from: Canadian Home Builders' Association, 150 Laurier West, Suite 200, Ottawa, Ontario K1P 5J4.

The Concept of the House as a System

A house is more than the sum of its parts. It is a system. The components of the house are interlinked, and a change to one aspect of the house may affect the functioning of other components. As well, the house system itself interacts with the surrounding external environment.

The major components of the house system can be grouped into three basic areas:

- the building envelope;
- mechanical and electrical systems and equipment; and
- the occupants, their furnishings, and their activities.

When people think of a house, they generally think of the building envelope or shell of the house. The shell consists of all components that separate the outside environment from the inside environment.

The indoor space, defined by the building envelope, is controlled or conditioned by a variety of systems and devices in the house. The most obvious systems are those designed specifically to control the indoor environment. For example, the heating system is installed to maintain a comfortable temperature in the house throughout the heating season. Other obvious systems or devices are those intended specifically to cool the indoor space, add or remove moisture from the air, and to circulate or provide fresh air.

The less obvious systems or devices are those that affect other aspects of the indoor environment while performing their intended function. There are numerous systems and devices of this type in a house. Lighting, for example, can contribute significant heating both when this is beneficial and when it is not.

The occupants of a house include the people, pets, and plants living in the house. They release moisture into the indoor space and emit and absorb a variety of pollutants. People also exercise a wide range of control over the indoor environment by operating heating and cooling systems, cooking, washing, and undertaking various other activities.

Almost any change in one aspect of a house, either in the way it is constructed or the way it is used, will have an effect on other aspects of the house. Making the building envelope more airtight, for example, will inevitably affect the movement of air through the walls, as well as indoor air quality and humidity levels.

Mechanical Systems, Ventilation, and Depressurization

The mechanical systems of a house play a key role in creating and maintaining a clean indoor environment. They are not building materials, however, but rather building systems with many different components acting in a variety of ways to condition the air

inside the house. For this reason, mechanical and ventilation systems are not included in this document. A CMHC companion document to this guide, a guide to mechanical equipment for healthy indoor environments, will deal with mechanical systems and ventilation.

Although ventilation in general is not discussed here, understanding the concept of house depressurization is important to assessing the potential impact of building materials on the occupant.

When household exhaust equipment, such as exhaust fans, clothes dryers, and fireplaces, operate, they remove air from the house. This lowers the pressure of the indoor air relative to the outside. This lowering of indoor pressure is referred to as "house depressurization." The amount of house depressurization that occurs depends on the number and capacity of the exhaust devices in a house, and the ability of the house to supply air through intake devices and leaks in the building envelope. The greater the exhaust and the tighter the building, the more a house will be depressurized by unbalanced ventilation.

By simply turning on a bathroom exhaust fan and a kitchen range hood, the air pressure in the house can be significantly lowered. This can affect the draft of a combustion device that uses air from inside, possibly causing it to spill dangerous gases and degrade the air quality in the house. It may also cause soil or sewer gas to enter the house through the floor drain or basement floor, or other outdoor air pollutants to be drawn into the living space.

Taken in isolation, it is assumed that turning on the exhaust fan will improve indoor air quality. When the house is considered as a system, it becomes evident that turning on an exhaust fan could result in a significant reduction in indoor air quality and create a health or safety hazard.

Depressurization may cause the irritants from a substance that has been separated from the living space to be drawn back into the house. For example, volatile emissions from asphalt sheathing could be drawn around air and vapour barriers and enter the indoor living space.

Flows In and Through a House

Three types of flow are found in every house:

- heat or energy flow;
- air flow; and
- moisture flow.

Energy enters the house in the form of purchased energy (electricity, oil, natural gas, wood, etc.), solar energy (from the sun), and internal heat gains (from occupants). This energy is used to heat and cool the house, heat the water, illuminate lights, and run appliances. As the energy is used, waste heat is usually generated. This heat naturally flows from warm areas to cooler areas, resulting in heat flows.

In much the same manner as heat flows through a material because of a temperature difference, air will flow into or out of a structure due to a difference in air pressure. Air flows from higher to lower pressure.

The number, size, and location of holes in the building envelope significantly affect the volume of air flow resulting from pressure differences. Air flow will not occur if holes do not exist for the air to pass through. Air flowing in through these openings is called "infiltration" and air flowing out is called "exfiltration."

Moisture flows from one place to another in four ways:

- Water is drawn downward due to the effects of gravity.
- Water can wick upward or sideways through certain materials because of capillary action.
- Water vapour can move with air flows. Warm indoor air carries moisture as it flows throughout the house and through the building envelope.
- Water vapour can diffuse through apparently solid materials, moving from areas of high humidity to areas of lower humidity.

Warm air can support excess humidity levels indoors—one of the most frequent air quality problems in the home. While not always considered a contaminant or pollutant, excessive water vapour in the air can lead to aesthetic, structural, and even health problems. There is greater potential for molds, dust, mites, and chemical interactions to develop in environments with high indoor humidity. For example, the emission rate of formaldehyde from a composite wood material using urea-formaldehyde resin is enhanced by high moisture levels.

Indoor Air Quality

In the past, it was believed that natural ventilation through the holes and cracks in a building envelope always flushed out air contaminants produced in the home. We now know that this is often not the case. At many times during the year, "accidental" or natural ventilation, such as opening windows, is inadequate to remove the pollutants that build up in a house.

Some of the typical contaminants encountered in a home include moisture, carbon dioxide, carbon monoxide, formaldehyde, nitrogen dioxides, radon, volatile organic compounds, and respirable suspended particulates.

Ensuring good indoor air quality requires a combined approach using source control first and then ventilation.

Source control means selecting building materials with the lowest possible emissions. As well, a containment method, such as an air or vapour barrier, must be used to prevent emissions from entering the living space.

Ventilation is achieved by using a well-designed mechanical ventilation system to provide fresh air and remove stale air and pollutants.

Both source control and ventilation are necessary to ensure acceptable indoor air quality.

Barriers

Air barriers, vapour diffusion retarders, weather barriers, and moisture barriers play key roles in controlling the movement of pollutants. They separate the inside living space from the insulated spaces and outdoors.

Air barriers are designed to reduce the movement of air. The air barrier is a critical part of the building envelope and it must be impermeable to air flow. *It is extremely important that the air barrier be continuous over the entire building envelope and that no holes or tears are made in it while it is installed or when it is in place.* Air barriers can be made of either flexible or rigid membrane materials. Flexible air barriers are made by connecting materials such as polyethylene or aluminum foil. Rigid air barriers are made by assembling drywall or plywood, and are sealed with gaskets and sealants.

A ***vapour diffusion retarder,*** commonly called a vapour barrier, is a membrane, material, or coating that slows the diffusion of water vapour. A vapour diffusion retarder is used to help prevent the occurrence of moisture problems in the structure of the home. Polyethylene, aluminum foil, and certain kinds of coatings can be vapour diffusion retarders. The vapour diffusion retarder must be installed with at least two-thirds of the insulating value on the outside of the retarder to avoid problems with condensation.

Weather barriers protect the sheathing and insulation of the outside wall from the effects of wind, rain, and snow. Although they keep the weather out, weather barriers must permit the diffusion of water vapour from the inside of the wall structure. Spunbonded polyolefin and perforated polyethylene are two materials that act as weather barriers. Weather barriers are installed on the outside of the structure, underneath the exterior siding.

A ***moisture barrier*** is a below-grade material, membrane, or coating used to prevent moisture from migrating through building walls and floors. Asphalt emulsions and polyethylene are two types of moisture barriers.

When installing barriers of any type, it is important to use a compatible caulking, sealant, or adhesive for the job.

Design Considerations

A number of design decisions can have a significant impact on the performance and indoor environment of a house.

Careful selection of the site and situation of the house can avoid problems after the house has been built. Contaminants from abandoned landfill sites and high radon levels in the soil are two examples that may cause serious problems to the occupants of a house. Efforts should be made to identify the previous uses of the land and any contaminants that may be encountered on the site. High water tables could also present a problem. Techniques are available for separating or eliminating the potential for entry of contaminants through the foundation; however, these are most effective when incorporated at the design stage.

The surrounding environment should also be taken into consideration. Are there factories or other sources of contaminants in the vicinity? Highways and other major traffic routes produce significant contaminant levels. What are the plans for open or underused spaces in the area?

Making the best use of solar radiation can reduce not only the cost of heating during the winter season but also the operating time of combustion devices within the home. However, too much solar radiation in summer can rapidly overheat a house. Careful consideration must be given to the orientation of the house and the glazing.

A number of factors should be considered when determining the configuration of the house:

- site and climatic conditions;
- neighbourhood factors;
- direction of ventilation path;
- function of spaces and components;
- quality of the indoor environment;
- energy performance;
- capital and operating costs; and
- overall character and ambience of the home.

The house should be laid out in such a way that the potential areas of contaminant sources (mechanical room, laundry) are far removed, or separated if possible, from the sleeping and living space. These spaces should be separately ventilated.

In healthy home design, the sleeping area can be planned as a sanctuary—as free as possible from harmful agents.

From this brief discussion, it is easy to understand that a house is not just the sum of its parts. Instead, it is a complex system of interactions between materials, mechanical systems, flow patterns, construction features, and the occupants. All these interactions and their effects must be considered when designing or renovating any home. They become critically important when designing or renovating for environmentally hypersensitive individuals.

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[3] Canada Mortgage and Housing Corporation, *The Clean Air Guide: How to Identify and Correct Indoor Air Problems in Your Home* (Ottawa, 1998).

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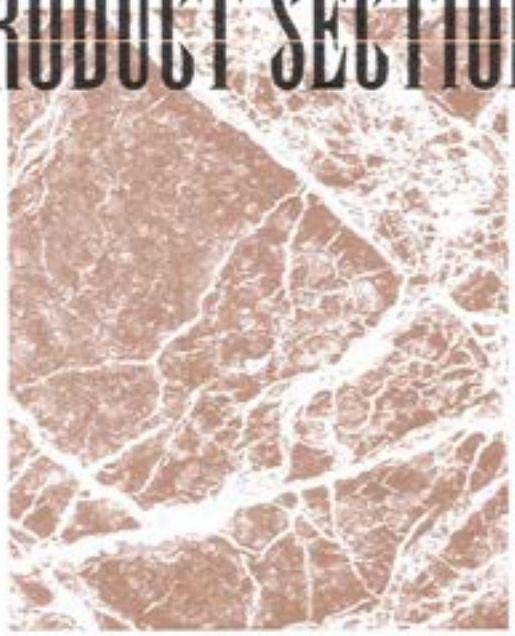
[6] Canadian Home Builders' Association, *CHBA Builders' Manual* (Ottawa, 1989).

PRODUCT SECTIONS



PRODUCT SECTIONS

SECTIONS

The products in this guide are grouped into sections that correspond either to parts of a house or types of products.

Some materials appear in more than one section because they have many uses. Concrete is an example of a material that has been included in several sections.

The sections and product sheets within each section are listed alphabetically.

INTRODUCTION TO THE PRODUCT SHEETS

The product sheets give general information about building materials including:

- common product names, some brand names when appropriate;
- typical uses;
- special properties;
- health issues;
- components of the material;
- product sources;
- a Masterformat number to assist professionals who are familiar with building specification categories; and
- *Comments based on experience of the environmentally hypersensitive* to provide information related to the material for people with environmental hypersensitivities.

The following page, An Explanation of a Product Sheet, shows the format used for each product sheet and explains the information contained in each item.

HOW TO SELECT MATERIALS

STEP 1

Identify the category the material belongs to and refer to the appropriate section. Read the preface to that section.

STEP 2

Study the descriptions of the individual listings.

STEP 3

Determine which materials are candidates based on the properties of the material and the intended use.

STEP 4

Review the *Comments*. Identify candidate materials for testing.

STEP 5

Identify product brand names from suppliers. Request MSDS (where available) and obtain samples. Study any additional information.

It is important to note that MSDS do not include information on health risks from continued or long-term use of the product. Furthermore, MSDS list mostly the chemicals that can be volatized during application, and not necessarily all the chemical constituents of the product. Formulations are usually proprietary.

STEP 6

Test the samples. Refer to Appendix A, "How to Conduct a Personal Test," before conducting a test of any material.

AN EXPLANATION OF A PRODUCT SHEET

GENERIC NAME OF MATERIAL

Common product names	Typical uses in construction
alternative generic names, occasionally *brand names**	how the material is used in construction

Description
A short description of the product, from product literature or manufacturers' information.

Additional considerations
Application, installation, curing, drying, or special properties related to the material, from product literature or manufacturers' information.

Health issues associated with this material
Information about health risks during installation or use, from material safety data sheets, existing emission data, published information, or properties based on the chemical composition of the material.

Although the installation is usually done by building tradespeople, emissions or particulates released during the application can affect environmentally hypersensitive individuals during or after the application.

Comments based on experience of the environmentally hypersensitive
Observations collected by the project team on the suitability of the material or concerns about its use for environmentally hypersensitive individuals.

The product can be rated as one of the following:

- *Generally tolerated — a product with this rating is likely to be tolerated by environmentally hypersensitive individuals. However, those who are extremely sensitive are still advised to personally test each material.*
- *User must test — personal testing of the material for acceptability is highly recommended. Some people may find this material acceptable while others may not.*
- *Not recommended — based on knowledge or experience of hypersensitive individuals, use of this material is not recommended.*

This section is in italics to indicate that the information is based on the experience of the project team.

See
other references in the guide

* Where brand names are given, these are meant to be starting choices for the environmentally hypersensitive. These products have generally been found to be more acceptable to hypersensitive individuals. However, the user must still test the product for individual acceptability.

Components: typical chemical composition (not necessarily complete since in most cases information is proprietary); formulations vary; named products may not contain all the chemicals listed	**Product Source:** where the product can be purchased	**Masterformat Number:** index number for people familiar with specification categories

ADHESIVES

ADHESIVES

The problems associated with adhesives are often caused by solvent vapours. Adhesives are either organic solvent-based or water-based. Solvents are liquids used to dissolve or disperse other substances such as paint pigments. The solvent eventually evaporates into the air.

Examples of organic solvents are mineral spirits, xylene, or toluene.

Chemical vapours from solvents can affect the respiratory and central nervous system and organs, such as the liver and kidneys. Exposure to the solvent vapours during application and curing can create a serious health risk.

Water-based adhesives use water as the predominant solvent but may also contain alcohol or other solvents that mix with water. Drying releases water, which is not toxic. However, the fact that an adhesive is water-based does not guarantee that it is safe. Other components, such as resins, biocides, other solvents, or some natural ingredients, can be irritants or toxins.

For example, some adhesives contain milk protein and corn starch. While these components may seem benign, individuals with milk or corn allergies may have difficulty with these adhesives.

Considerations

- Choose an adhesive with water as a solvent whenever possible but be aware of other ingredients and their potential effects.
- Some glues in common use have strong odours and are not recommended. Examples include epoxy, rubberized asphalt emulsions, and industrial glues used in the installation of carpets.
- Choose an adhesive that is designed for the job. Adhesives, such as epoxy, are not necessary for most construction uses. Make sure that the adhesives are compatible with both materials being bonded.
- In some cases, the adhesive may only affect an individual during drying and curing. If so, it may be possible to have someone else apply the adhesive, ideally outside the affected person's house.
- Conduct a personal test to see whether the cured adhesive can be tolerated. When testing, apply the adhesive to an inert surface such as glass, to isolate the effects of the adhesive.
- Several companies are producing low-toxicity flooring adhesives. These adhesives may be acceptable alternatives for certain individuals. However, formulations are often private (proprietary) information and are difficult to evaluate from the label. Conduct a personal test on the specific product before using it on a flooring installation.

ACRYLIC LATEX

Common product names	Typical uses in construction
AFM Almighty Adhesive	wood joinery, lamination

Description
Acrylic latex glue is a water-based adhesive.

Additional considerations
Acrylic latex glue is generally used in small quantities.

Health issues associated with this material
Acrylic latex glue emits slight odours that can be irritants for sensitive individuals.

Comments based on experience of the environmentally hypersensitive
Formulations vary among manufacturers and for different applications. Select an appropriate product for the job to be done.

This product is generally tolerated but user must test.

See
other adhesives

Components: acrylic emulsion; formulations vary, may contain binders, preservatives	**Product Source:** available from AFM distributors	**Masterformat Number:** 06050

CASEIN GLUE

Common product names	Typical uses in construction
natural white glue, milk glue	wood joinery

Description
Casein glue, derived from milk, is a common water-based adhesive that has many uses. It is marketed wet or dry, the dry powder being simply mixed with water for application.

Additional considerations
This glue gives off a mild, sweet odour during application and drying. It has poor durability in moist locations.

Health issues associated with this material
Sodium or calcium caseinate, the casein glue base, is a food product. It is freshly prepared in water. Rancid odours are not expected unless the material is spoiled.

The milk protein base of casein glue has the potential to support bacterial or fungal growth.

Comments based on experience of the environmentally hypersensitive
Some individuals are known to be allergic to milk protein (as food). Although the casein is used as a glue and not ingested, very sensitive individuals should test the casein if large amounts are to be used.

Use of this glue should be avoided where moisture is likely since mold growth can occur.

This product is generally tolerated, except by some people with milk allergies. User must test the product before use.

See
other adhesives

Components: calcium or sodium caseinate proteins derived from milk, water	**Product Source:** available from natural goods suppliers and art suppliers	**Masterformat Number:** 06050

CONTACT CEMENT, SOLVENT-BASED

Common product names	Typical uses in construction
	gluing laminates to wood bases, fabric coverings, cove base and trims

Description
Contact cement is a versatile adhesive, typically carried in an organic solvent, that provides a strong bond. A water-based contact cement is also available as a specialty product.

Additional considerations
Emissions of volatile substances are high during and shortly after application, but lower after drying. In typical use, such as applying hard plastic laminates to cabinets, the long-term emissions are retarded by the laminate. However, when used with a permeable material such as fabric, the volatile substances are not retarded and will continue to be emitted.

Health issues associated with this material
Contact cement may emit ethylene glycol, ammonia, ethyl alcohol, phenols and possibly xylene, depending on the formulation. These emissions are irritating and mildly intoxicating.

Comments based on experience of the environmentally hypersensitive
Emissions could be severe for environmentally hypersensitive individuals.

This product is not recommended.

See
contact cement, water-based

Components: vary by manufacturer. May contain water-dispersed latex, ethylene glycol and ammonia solvents and dispersants; may contain aromatics (xylene) and phenolic resins.	**Product Source:** available through hardware stores and building product suppliers	**Masterformat Number:** 06050

CONTACT CEMENT, WATER-BASED

Common product names	Typical uses in construction
Healthguard™ Waterbased Contact Adhesive (#WB-100), Earthbond™ 7700 Contact Cement, 3M Blue Glue	gluing laminates to wood bases, fabric coverings, trims

Description
Contact cement is a versatile adhesive that provides a strong bond. The water-based adhesive is an alternative to the more common solvent-based contact cement.

Additional considerations
Although the solvent is water, other volatile substances may also be released during and shortly after application. In typical use, such as applying hard plastic laminates to cabinets, the laminates may retard the drying process.

Health issues associated with this material
Skin and eye irritation may occur from vapours, particularly during and shortly after application.

Comments based on experience of the environmentally hypersensitive
Formulations vary by manufacturer. Water-based contact cement may be an acceptable alternative to solvent-based versions.

User must test. May be an alternative to solvent-based contact cement.

See
contact cement, solvent-based

Components: vary by manufacturer. May contain vinyl polymers, acrylic ester copolymers.	**Product Source:** available from Healthguard™ and Earthbond™ distributors	**Masterformat Number:** 06050

PLASTIC CONSTRUCTION TAPE

Common product names	Typical uses in construction
builder's tape, vapour barrier tape, contractors' tape (red)	sealing air and vapour barriers, electrical and plumbing penetrations, weather barriers

Description
Plastic construction tape is an adhesive-backed tape.

Additional considerations
Plastic construction tape is designed to seal air barriers. In some cases it may be used to seal vapour and weather barriers, though adhesion may be poor. It adheres to polyethylene with difficulty.

Health issues associated with this material
Some construction tapes release strong odours over time.

Comments based on experience of the environmentally hypersensitive
Tape formulations vary by manufacturer.

User must test the product and consider where it is used.

See
barriers

Components: plastic, adhesives. Materials vary by manufacturer.	**Product Source:** available through building product suppliers	**Masterformat Number:** 07940

POLYVINYL ACETATE (PVA)

Common product names	Typical uses in construction
white glue, *Lepage National Casein 6500, Weldwood*	cabinet making, wood joinery

Description
PVA (polyvinyl acetate) glue is a common water-based adhesive. It is soluble in water.

Additional considerations
PVA glue should not be used where it will be exposed to contact with water.

Health issues associated with this material
PVA glue is a low-toxicity material that is generally tolerated for dry wood joinery.

Comments based on experience of the environmentally hypersensitive
Most formulations of PVA glue are acceptable to sensitive individuals.

This product is generally tolerated but user should test specific product before use.

See
other adhesives

Components: polyvinyl acetate, water, stabilizers; formulations vary, may contain EVA (ethyl vinyl acetate)	**Product Source:** available through hardware and building product suppliers	**Masterformat Number:** 06050

STARCH-BASED GLUE

Common product names	Typical uses in construction
wallpaper paste, artist's glue	paper hanging

Description
Starch-based glue is an adhesive used to affix wallpaper. It is a dry powder that is mixed with water before application.

Additional considerations
Starch-based glue should be used only in dry or ventilated locations.

Health issues associated with this material
If moist, starch-based glue can support fungal or bacterial growth, which can also cause health problems. Many commercial varieties contain anti-fungal agents (fungicides). Products containing fungicide are usually labelled for "bathroom" application.

Comments based on experience of the environmentally hypersensitive
Products containing fungicides should be avoided by environmentally hypersensitive individuals. Without fungicides, starch-based glues can become moldy and, consequently, are not desirable.

Individuals who are sensitive to starch (as food) should also test their tolerance to starch-based glue applied on a wall.

Carefully evaluate this material.

See
other adhesives, wall coverings

Components: plant starches, i.e., wheat gluten, animal proteins, water, anti-fungal agents	**Product Source:** commonly available through paint and wallpaper stores, hardware stores, and building product suppliers	**Masterformat number:** 06050

THICK-SET MORTAR

Common product names	Typical uses in construction
thick-set concrete, tile mortar	tile setting on concrete floors

Description
Thick-set mortar is a cement mix used to set tiles on concrete slabs. The tiles are embedded in a layer of mortar.

Additional considerations
Large quantities of mortar are used to cover extensive floor areas.

Health issues associated with this material
Some additives (admixtures) to the mortar may have emissions.

Comments based on experience of the environmentally hypersensitive
Thick-set mortar, used as a tile adhesive, is generally tolerated, although admixtures may make it unacceptable to particularly sensitive individuals.

This product is generally tolerated and is preferable to other adhesives. Verify that there are no additives.

See
thin-set mortar: acrylic-modified, ceramic tile

Components: finely ground Portland cement, fine aggregates; may contain lime or gypsum	**Product Source:** available from building product suppliers and flooring suppliers	**Masterformat Number:** 09305

THIN-SET MORTAR

Common product names	Typical uses in construction
dry-set mortar, tile mortar, *Kerabond®* *(Mapei)*	tile setting on concrete floors

Description
Thin-set mortar is a cement-based mortar used to set tiles on concrete floors.

Additional considerations
It is sold as a dry mortar mix to be combined with water before application. Thin-set mortar is commonly available with an additive, typically acrylic. The additive improves the bonding and flexibility of the mortar.

Health issues associated with this material
There are no health concerns associated with thin-set mortar containing no additives.

Comments based on experience of the environmentally hypersensitive
Thin-set mortar (without an acrylic additive), used as a tile adhesive, is tolerated well by most hypersensitive people. However, the mortar is only one component of a ceramic tile system. The complete system, including grout and sealers, must be considered.

This product is generally tolerated. Avoid acrylic additives.

See
thin-set mortar: acrylic-modified, ceramic tile, cementitious grout, epoxy grout

Components: finely ground Portland cement, fine sand	**Product Source:** available through building product suppliers and flooring suppliers	**Masterformat Number:** 09305

THIN-SET MORTAR, ACRYLIC-MODIFIED

Common product names	Typical uses in construction
dry-set mortar, tile mortar, *Ultraflex, Kerabond® with Keralastic® additive (Mapei)*	tile setting on floors and walls

Description
Thin-set mortar with acrylic is a cement-based mortar used to set tiles on wood floors or subfloors. Thin-set mortar is also available without the acrylic additive but is only suitable for installation on concrete.

Additional considerations
The dry mortar mix is combined with the acrylic additive for application. The additive improves the bonding, flexibility, and strength of the mortar.

Health issues associated with this material
Moderate odours are emitted from the acrylic additives until cured (approximately 72 hours). When large areas of tile are installed, emissions can be significant. The sand in the mortar mix may be a source of radon.

Comments based on experience of the environmentally hypersensitive
Some sensitive individuals may not tolerate the acrylic additive. However, once cured, the mortar may be acceptable. If this system is selected, choose a thin-set mix and additive that has no odours. Also, mortar is only one component of a ceramic tile system. The complete system, including grout and sealers, must be considered.

Test the material for acceptability. If the type of installation permits, use additive-free mortar.

See
thin-set mortar, ceramic tile, cementitious grout, epoxy grout

Components: finely ground Portland cement, sand, acrylic additives; formulations vary, may contain lime and gypsum, glycols, ammonia.	**Product Source:** available from ceramic tile suppliers and Mapei Canada distributors	**Masterformat Number:** 09305

VINYL TILE ADHESIVE, LOW-TOXICITY

Common product names	Typical uses in construction
AFM 3 in 1 Adhesive, 7600 Earthbond™ All Vinyl Flooring Adhesive, Healthguard™ Thin-Spread Tile Adhesive (#2033)	installing vinyl composition and solid vinyl floor tiles

Description
Vinyl tile adhesives are high bonding and quick drying. Low-toxicity formulations are water-based.

Additional considerations
Low-toxicity additives are usually available from specialty flooring suppliers.

Health issues associated with this material
There are fewer odours than in commonly used adhesives. Slight odours, particularly during installation, may be irritants for sensitive individuals.

Comments based on experience of the environmentally hypersensitive
Low-toxicity adhesives are an alternative for installing vinyl tile flooring. However, formulations and installation practices vary by manufacturer.

User must test.

See:
other adhesives

Components: Formulations are proprietary but may contain vinyl polymers, synthetic latex, plasticizers, fillers, and water.	**Product Source:** available from AFM, Roberts, and W.F. Taylor distributors	**Masterformat Number:** 06050

VINYL SHEET FLOORING ADHESIVE, LOW-TOXICITY

Common product names	Typical uses in construction
7100 Earthbond™ All Vinyl Flooring Adhesive, Healthguard™ Vinyl Back Floorcovering Adhesive (#2090)	installing vinyl sheet flooring

Description
Low-toxicity adhesives for vinyl sheet goods are solvent-free alternatives for installing vinyl flooring.

Additional considerations
Formulations vary by manufacturer. The adhesive must be compatible with the flooring material.

Health issues associated with this material
There are fewer odours than in most commonly used vinyl adhesives. Slight odours, particularly during installation, may be irritants for sensitive individuals.

Comments based on experience of the environmentally hypersensitive
These adhesives are low-toxicity alternatives for installing vinyl sheet goods. However, formulations and installation practices vary by manufacturer.

User must test.

See
vinyl tile adhesive, vinyl sheet flooring

Components: Formulations are proprietary but may contain synthetic polymers, synthetic latex, plasticizers, fillers, and water.	**Product Source:** available from Roberts, and W.F. Taylor distributors	**Masterformat Number:** 06050

BARRIERS: AIR, VAPOUR, WEATHER, AND MOISTURE

BARRIERS: AIR, VAPOUR, WEATHER, AND MOISTURE

Air, vapour, weather, and moisture barriers are essential in controlling the air and moisture flow in houses. Properly installed barriers prevent contaminants from migrating into the home's living space.

For barriers to work properly, the joints must be well sealed. This is achieved by using gaskets, tapes, and caulking. Joint sealing products, such as gaskets or acoustical sealant, can emit some odours.

The barrier may contain additives such as ultraviolet inhibitors, plasticizers, and catalysts which may emit odours that can affect certain individuals.

Considerations

- A mechanical ventilation system is required to supply fresh air and exhaust stale or contaminated air in well-sealed buildings.
- There are situations when the home may be in a negative pressure condition (outside air pressure is greater than inside) and odours can be drawn into the home through barrier seams and electrical outlets.
- Conduct a personal test to determine individual tolerance to the barrier and joint-sealing materials.

For a more detailed discussion of air barriers, vapour diffusion retarders (commonly known as vapour barriers), and weather barriers, refer to "Barriers" in the chapter Introduction to Building Science, page xii.

AIRTIGHT DRYWALL APPROACH

Common product names	Typical uses in construction
ADA system	air barrier and vapour barrier for insulated walls and ceilings

Description
The airtight drywall approach (ADA) is primarily a method for producing an air barrier and finished wall. The use of gypsum board backed with a foil membrane or painted with alkyd paint as a vapour diffusion retarder, makes ADA both an air and vapour barrier.

Additional considerations
Well-sealed joints are the key element in an effective ADA system.

Health issues associated with this material
The materials used in the construction of an airtight drywall system emit various volatile substances. Alkyd paint is toxic to handle and has a long curing period. Particulates such as gypsum dust and joint compound dust are irritants.

Comments based on experience of the environmentally hypersensitive
Gaskets and large quantities of caulking are commonly used in ADA systems. These materials can cause problems for many people, and less toxic alternatives should be chosen. Aluminum foil tape and low-toxicity (silicone) caulk may be acceptable substitutes for joint sealing. Latex vapour retarder paints or foil-backed gypsum board can be alternatives for alkyd paint. ADA, installed with low-toxicity materials, can provide a tight air barrier system that reduces infiltration of contaminated air from insulation cavities.

Consider all components of the ADA system. Choose low-odour, low-toxicity materials.

See
gypsum board, joint tape, caulking, joint compound, gaskets, aluminum foil, paint

Components: may contain gypsum board, joint tape, caulking, joint compound, gaskets, aluminum foil and adhesive, alkyd paint, PVA, latex paint	**Product Source:** available from building product suppliers (installer should be trained in ADA system)	**Masterformat Number:** N/A

ALUMINUM FOIL

Common product names	Typical uses in construction
builder's foil, industrial foil	air and vapour barrier, radiant barrier in walls, ceiling, or floors

Description
Aluminum foil is a reflective foil and can be used as an air, vapour, and radiant barrier. The foil is sometimes coated with an oil or plastic layer to prevent oxidation and preserve the reflective and radiant properties of the aluminum. Because aluminum foil tears easily, it is also available in layered and paper-backed versions for strength.

Additional considerations
Aluminum foil may be used to block or contain surface emissions from other materials. Foil sheets are joined using adhesive-backed foil tape.

Health issues associated with this material
Aluminum is a contact irritant for some people and care may be required while handling the foil. Recycled or asphalt-coated paper, sometimes found in the layers and backing, and anti-oxidant coatings may cause problems for some people. Adhesives on the foil tape may emit odours that affect some individuals.

Comments based on experience of the environmentally hypersensitive
Some very sensitive people report reactions to exposure to aluminum, especially when it is heated.

Test various products. Avoid foils with asphalt-coated paper backing.

See
other barriers

Components: aluminum foil; may contain tar, paper, plastic	**Product Source:** available from building product suppliers—may need to be specially ordered	**Masterformat Number:** 07190

BUILDING PAPER

Common product names	Typical uses in construction
tar paper, sheathing paper, felt paper	weather barrier for exterior walls, under flooring, covering septic and drainage tiles

Description
Building paper is a heavy paper, sometimes impregnated with asphalt. It comes in perforated varieties, which are very vapour permeable.

Additional considerations
Large quantities of building paper are required if used as a weather barrier, under flooring, or to cover septic or drainage systems.

Health issues associated with this material
Asphalt is a strong irritant. It is not recommended for use in indoor spaces. Even when building paper is used outside the living space, heat may accelerate the release of odours, which can leak into the house or enter through ventilation openings.

Comments based on experience of the environmentally hypersensitive
Spunbonded polyolefins, such as Tyvek® or Typar®, are likely to be more acceptable air barriers in housing for the environmentally hypersensitive. Building paper without asphalt can be used under flooring.

Sensitive individuals should avoid asphalt-treated paper.

See
spunbonded polyolefin

Components: building paper; may contain asphalt-treated paper	**Product Source:** available from building product suppliers	**Masterformat Number:** 07191

PLASTIC CONSTRUCTION TAPE

Common product names	Typical uses in construction
builder's tape, vapour barrier tape, contractors' tape (red)	sealing air and vapour barriers, electrical and plumbing penetrations

Description
Plastic construction tape is an adhesive-backed plastic film.

Additional considerations
Plastic construction tape is designed to seal air barriers. It has been used to seal vapour and weather barriers, although adhesion has sometimes been poor.

Health issues associated with this material
Some construction tapes release strong odours especially when new.

Comments based on experience of the environmentally hypersensitive
Tape formulations vary among manufacturers.

User must test the product and consider where it is used.

See
barriers, adhesives

Components: plastics, adhesives; materials vary by manufacturer.	**Product Source:** available through building product suppliers	**Masterformat Number:** 07940

POLYETHYLENE FILM

Common product names	Typical uses in construction
plastic sheet, poly, cross-laminated poly sheeting (*tu-tuf*®)	air and vapour barrier, ground moisture barrier

Description
Polyethylene film is thin plastic sheeting used for air, vapour, and moisture barriers.

Additional considerations
The standard, CAN/CGSB-51.34, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction," is referenced in the National Building Code of Canada. The standard requires that polyethylene film used as an air and vapour barrier be stabilized against heat and sunlight (ultraviolet light), protected from direct exposure to sun, made with virgin resins, and of a minimum thickness of 6 mil. If the film is only to be used as a vapour barrier, the film can be less than 6 mil thickness.

Polyethylene is also available as a cross-laminated sheet that has superior physical characteristics.

Health issues associated with this material
Polyethylene film may emit volatile substances from anti-static agents, ultraviolet (UV) inhibitors, and plasticizers. When large amounts of film are used, as for air and vapour barriers in conventional construction, emissions can build up in the living space. Emissions are minimized when the film is covered by drywall.

Comments based on experience of the environmentally hypersensitive
Odours from polyethylene and additives may have adverse health effects. Because polyethylene film is often used in large quantities, it can cause significant problems for some people. Some brands may be better tolerated than others, depending on the additives used.

Test products for acceptability of odours. Odours are minimized if the material is not exposed.

See
airtight drywall approach, aluminum foil

Components: polyethylene; may contain phthalates or other plasticizers, metallic and other UV inhibitors	**Product Source:** available at hardware stores and building product suppliers	**Masterformat Number:** 07190

POLYETHYLENE FILM, PERFORATED

Common product names	Typical uses in construction
housewrap	exterior weather barrier for walls

Description
Perforated polyethylene is a sheathing membrane that keeps rain from entering the building envelope but allows some flow of water vapour through it and out of the building envelope.

Additional considerations
Large quantities of polyethylene are used for weather barriers. Some polyethylenes contain additives such as ultraviolet (UV) inhibitors.

Health issues associated with this material
Polyethylene film can emit volatile substances from anti-static agents, ultraviolet inhibitors, and plasticizers.

Comments based on experience of the environmentally hypersensitive
Low-grade polyethylene is made from leftover or scrap polyethylene. High-grade is made from virgin resins. Emissions may vary according to the composition of the polyethylene.

This product is generally tolerated when properly installed.

See
other barriers

Components: polyethylene; may contain UV inhibitors.	**Product Source:** available from building product suppliers	**Masterformat Number:** 07190

SPUNBONDED POLYOLEFIN

Common product names	Typical uses in construction
housewrap, *Tyvek®*, *Typar®*, air barrier	exterior weather barrier for walls, facing for exterior insulation board

Description
Spunbonded polyolefins are sheeting materials that shed rain and snow, act as wind barriers, and allow water vapour to pass through and out of the building envelope.

Additional considerations
Spunbonded polyolefin product compositions vary among manufacturers. Housewrap is usually coated with ultraviolet-resistant coatings.

Health issues associated with this material
Spunbonded polyolefin has minimal emissions, although tapes or caulking used to seal seams may have volatile emissions. Used as a weather barrier, it is located outside the living space.

Comments based on experience of the environmentally hypersensitive
Spunbonded polyolefin products may be used as alternatives to asphalt-impregnated sheathing paper.

This product is generally tolerated. Use low-odour tapes and caulking.

See
other barriers, caulking

Components: spun polyolefin fibres, ultraviolet-resistant coating	**Product Source:** available from building product suppliers	**Masterformat Number:** 07190

BUILDING STRUCTURE

BUILDING STRUCTURE

Structural materials are usually softwoods, manufactured wood products, combination wood products (e.g., wood truss with a steel joining plate), concrete or steel.

Emissions from these materials can be a source of problems for some hypersensitive individuals. Common emissions are wood terpenes from softwoods, organic vapours from glues and binders in manufactured wood products, terpenes and glues in combination wood products, and oil residues on steel surfaces.

The location of the material within the structure can affect whether the emissions will modify the indoor air quality. For example, emissions from softwood framing lumber in the roof assembly are sealed out of the living space and are less likely to pose a problem. Softwood lumber used as floor joists or as exposed framing in post and beam structures is within the living space and may affect indoor air quality.

The quantity of the material exposed to the living space is also a contributing factor.

Considerations

- Choose materials that have low odour.
- Consider the quantity and location of the materials. Some materials may not cause problems when they are used in small quantities or outside the living space.
- Oil residues on steel can be washed off with a low-toxicity detergent.
- Conduct a personal test to determine the acceptability of a material. (See "How to Conduct a Personal Test," Appendix A.)

COMPOSITE LUMBER

Common product names	Typical uses in construction
laminated veneer lumber, parallel strand lumber	floor and roof structure

Description
Composite lumber is a manufactured wood product made by layering veneer or strands together with glue. It uses adhesive similar to that used in construction plywood and is heat-cured.

Additional considerations
Composite lumber is used both inside and outside the living space. If it is used inside the living space, it can be sealed.

Health issues associated with this material
Composite lumber may emit wood terpenes and other volatile gases.

Comments based on experience of the environmentally hypersensitive
The lumber can be sealed with a water-based acrylic sealer if it is exposed to the living space. Solid wood may be a more acceptable alternative for sensitive people.

User must test.

See:
Acrylic sealer

Components: softwoods (fir, hemlock, aspen), phenol-formaldehyde glue	**Product Source:** available from building product suppliers; usually needs to be ordered	**Masterformat Number:** 06181

Concrete

Common product names	Typical uses in construction
concrete	foundations, slabs, commercial construction, fire and acoustic topping on wood floors

Description
Concrete is a mixture of Portland cement, aggregates (sand and gravel), water, and often additives (admixtures) to improve specific qualities of the concrete. Admixtures include air-entraining agents, retarders, plasticizers, and accelerators.

Additional considerations
Concrete mix will vary according to the specific job requirements.

Health issues associated with this material
Exposed concrete emits dust continuously. It can be sealed wtih a water-based sealer to reduce dust. Volatile substances may be emitted by form-release agents (oils) and some admixtures. These emissions can be a concern if large quantities of concrete are exposed to the indoor living space. The aggregates can be a source of radon. (Significance depends on the source strength and accessibility to the indoor space.) If not damp-proofed, concrete can wick moisture from the outside, providing growing conditions for molds and mildews.

Comments based on experience of the environmentally hypersensitive
Concrete suppliers can provide concrete without admixtures, if specified. The concrete will be harder to work, but will be better tolerated by sensitive individuals. Low-toxicity form-release agents (vegetable oils, some soaps) can also be specified.

Exposed, unsealed concrete surfaces are sources of dust. Lime, a principal component of concrete, is an irritant and may affect sensitive individuals and those with breathing disorders such as asthma and emphysema.

Concrete for interior use should be specified without admixtures and fly ash. Specify low-toxicity form-release agents.

See
concrete admixtures, form-release oil, low-toxicity sealer

Components: Portland cement, lime, sand, gravel; may contain admixtures, fly ash	**Product Source:** available from local concrete suppliers	**Masterformat Number:** N/A

CONSTRUCTION PLYWOOD PANELS

Common product names	Typical uses in construction
spruce, pine, fir plywood; softwood plywood; construction sheathing	structural wall and roof sheathing, subfloors, tile backing, concrete forms

Description
Construction plywood is a manufactured product comprising cross-laminations of softwood veneers glued together to form wood panels.

Additional considerations
In Canada, construction plywood (Douglas Fir Plywood and Canadian Softwood Plywood) is an unsanded product employing a waterproof adhesive for its production and is rated as an exterior grade product. In the U.S.A., grades are produced for two levels of exposure, for exterior exposure and for construction that will eventually be covered. Currently, all construction plywoods are made with phenol-formaldehyde resin adhesive.

Phenol-formaldehyde resin adhesive supplemented by fillers is used to bind the veneers together. Phenol-formaldehyde is more stable to moisture than urea-formaldehyde resin, and produces little formaldehyde emission when properly cured.

Health issues associated with this material
Cutting plywood, or any other wood product, creates dust that can be an irritant. The dust can come from the wood or the resin binders. Heat generated by cutting can volatilize the resinous material.

Comments based on experience of the environmentally hypersensitive
The heat of curing the adhesive under pressure will release terpenes, extractives and other volatile gases during manufacture, some residuals of which are slowly emitted subsequently. Lower rates of release of formaldehyde are expected from construction plywood than from manufactured wood products using urea-formaldehyde adhesives.

Most sensitive individuals find softwood plywood acceptable for interior use if all surfaces are sealed with a laminate or a low-toxicity sealant.

User must test. Sealing is recommended.

See
acrylic sealer, softwood sanded plywood

Components: spruce, pine, fir, poplar, hemlock; phenol-formaldehyde resin; inert fillers (ground bark, wheat flour)	**Product Source:** available from building product suppliers	**Masterformat Number:** 06120

FABRICATED STEEL SECTIONS

Common product names	Typical uses in construction
angle iron, steel joists, bar joists, tube joists, stamped-and-formed joists, web truss, I-beams	floor and roof joists, lintels, studs, commercial construction

Description
Fabricated steel sections are structural components most often found in commercial construction.

Additional considerations
Steel sections are sometimes used in residential construction for those who cannot tolerate terpenes in softwoods.

Health issues associated with this material
Oily residues and paints may be present on the steel. On-site welding and cutting create serious air pollutants.

Comments based on experience of the environmentally hypersensitive
Oily residues can be washed off with low-toxicity detergent and water.

This product may be an alternative for people with wood terpene sensitivities.

See
softwood lumber, kiln-dried; fabricated wood joists and trusses

Components: steel; may be zinc-plated or painted	**Product Source:** available from steel supply yards	**Masterformat Number:** 05200

FABRICATED WOOD TRUSSES

Common product names	Typical uses in construction
open web joists, I-type trusses, wood I-joists	floor or roof joists and trusses

Description
Wood trusses are structural components that can be used in floors and roofs. They are made with various softwoods and may be held together with plywood and glue. However, commercially, metal joining systems are used.

Additional considerations
When used as floor joists, these joists and trusses facilitate the installation of heating, plumbing, and wiring materials that run through the floors.

Health issues associated with this material
Roof trusses are outside the living space, so emissions from the wood are less important. Floor trusses are within the living space and emissions may be a factor as follows:

softwood lumber with steel truss plates—terpenes from softwood

softwood lumber laminated with nails—terpenes from softwood

softwood lumber with plywood gusset—terpenes from softwood and other emissions from plywood.

I-joists—terpenes from softwood and emissions from plywood. Some are made with oriented strand board (OSB). Joints are usually glued with phenol-resorcinol resin, considered to be stable to moisture.

Comments based on experience of the environmentally hypersensitive
Select fabricated joists and trusses made from a personally acceptable softwood preferably constructed without glues, especially for indoor use. Kiln-dried spruce or hemlock are generally acceptable to sensitive people.

User should select the softwood most tolerated. For use in indoor space, select joists and trusses without glues.

See
softwood lumber

Components: softwoods (spruce, pine, fir), steel, zinc plating, sometimes plywoods, phenol-formaldehyde or phenol-resorcinol resins	**Product Source:** available from local truss suppliers	**Masterformat Number:** 05260

FIBREBOARD, RECYCLED

Common product names	Typical uses in construction
	roof decking, exterior sheathing, flooring underlayment, insulating sheathing, sound-isolation board

Description
Recycled fibreboard is a sheet material made from 100% recycled newsprint or cardboard boxes.

Additional considerations
Recycled fibreboard may contain glue, ink, formaldehyde, and other residues from the original product. It may also be treated for termites, moisture, rot, and fungi.

Health issues associated with this material
Slight to moderate odours may be noticed, possibly from ink residues and binders.

Comments based on experience of the environmentally hypersensitive
The large amount of fibreboard used as underlayment is a potential source of odours. There are only a few distributors for this product in Canada.

This product is not generally tolerated for indoor use by sensitive individuals.

See
softwood plywood

Components: recycled newsprint; adhesive; may contain fire retardant, biocide (often copper metaborate); may be asphalt-impregnated	**Product Source:** N/A	**Masterformat Number:** 06115

GLUE-LAMINATED TIMBERS

Common product names	Typical uses in construction
glue lam	arches, architectural work

Description
Glue-laminated timbers are made by layering dimension lumber (38 mm) or boards (19 mm) with glue.

Additional considerations
Steel studs can be used to frame interior partitions.

Health issues associated with this material
Wood terpenes and other volatile organic compounds may be released. This would be a concern if used inside the house.

Comments based on experience of the environmentally hypersensitive
For interior use, test the wood for acceptability and seal the surfaces with a low-toxicity acrylic sealer.

User must test. Solid woods may be a better choice.

See
composite lumber, acrylic sealer

Components: softwoods (fir, hemlock, spruce), phenol-resorcinol resin	**Product Source:** available from building product suppliers; usually needs to be ordered	**Masterformat Number:** 06181

GYPSUM BOARD, FIBRE

Common product names	Typical uses in construction
fibre gypsum, gypsum sheathing, *FiberBond®*	exterior wall sheathing

Description
Gypsum fibreboard is a rigid, moisture-resistant exterior sheathing material. It is made from gypsum, recycled newsprint, and perlite (expanded volcanic mineral). Sheathing may be chemically treated for water resistance.

Additional considerations
Dust is released by cutting during installation.

Health issues associated with this material
Emissions may be released from residual inks in the newsprint, but this is not a major concern when gypsum fibreboard is used on the exterior.

Comments based on experience of the environmentally hypersensitive
Some moisture-proofing treatments of gypsum fibre sheathing, such as asphalt, may cause problems for some people.

User must test.

See
high-density hardboard

Components: gypsum (calcium sulphate), recycled newsprint, perlite; FiberBond® uses siliconate sealer for sheathing; other products may use asphalt	**Product Source:** available from Louisiana Pacific and other building product suppliers	**Masterformat Number:** 06115

LIGHTWEIGHT GALVANIZED STEEL STUDS

Common product names	Typical uses in construction
steel studs	non-bearing partition framing (heavier gauge can be structural)

Description
Lightweight steel studs are an alternative to wood studs for framing.

Additional considerations
Steel studs can be used to frame interior partitions.

Health issues associated with this material
Oily residues from manufacturing may be present on the stud surface.

Comments based on experience of the environmentally hypersensitive
Steel studs are a good substitute for wood when wood is not tolerated. Oil residues may be problematic to some people. Oil can be washed off with detergent or trisodium phosphate and water if desired.

This product is generally tolerated.

See
softwood lumber

Components: steel (iron with carbon), electroplated zinc coating	**Product Source:** available from building product suppliers; may need to be ordered	**Masterformat Number:** 09100

ORIENTED STRAND BOARD PANELS (WAFERBOARD)

Common product names	Typical uses in construction
flakeboard, *Aspenite*®, OSB	structural wall and roof sheathing, subfloors

Description

Oriented strand board (OSB) and its predecessor product, waferboard (non-oriented wafers), is a manufactured panel product. Strands, flakes, or wafers of hardwood, usually aspen, are bonded together under heat and pressure to form these wood panels.

Additional considerations

In Canada, the raw material used is usually aspen (poplar) although some other hardwoods may also be included. Bark and other "bits" may also be included. Other hardwoods and southern yellow pine are the raw material source for OSB produced in the southern U.S.A.

Phenol-formaldehyde, or MDI (4,4'-Diphenylmethane di-isocyanate), is used to bind the pieces of wood together. Wax is also added during manufacture to inhibit water absorption. Phenol-formaldehyde adhesive is more stable to moisture than urea-formaldehyde, producing little formaldehyde emission when properly cured. MDI does not contain formaldehyde.

Health issues associated with this material

Cutting OSB or waferboard, or any other wood product, creates dust that can be an irritant. The dust can come from the wood or the resin binders. Heat generated by cutting can volatilize the resinous material.

Comments based on experience of the environmentally hypersensitive

Although aspen is known to have very low levels of terpenes, the heat curing and pressing process during manufacture will release terpenes, extractives and other volatile gases from the wood and adhesive, some residuals of which are slowly emitted subsequently.

Variations in odours have been observed among different samples of materials. Sealing with a low-toxicity sealant can reduce the odours. The number of coats required will depend on the strength of the source and the sensitivity of the individual.

User must carefully test this material, particularly if it will be used in the interior.

See

construction plywood panels

Components: aspen bonded and heat-cured with phenol-formaldehyde resin, wax; may contain birch or southern yellow pine: binder may be MDI-type resin	**Product Source:** available from building product suppliers	**Masterformat Number:** 06103

SOFTWOOD LUMBER, "S-DRY" (KILN-DRIED)

Common product names	Typical uses in construction
framing lumber, kiln-dried, dimensional lumber, "S-Dry," MC15	wall and floor framing, roof framing, cabinet construction, trim, panelling

Description
Kiln-dried softwood lumber is lumber that has been heated under controlled conditions to reduce the moisture content of the wood.

Additional considerations
Generally, kiln-dried lumber for use in construction is dried to a moisture content of 19% or less. The grade mark "S-Dry" indicates it was dried, planed, and graded at a mean moisture content of 15%, with up to 5% of a shipment permitted to exceed 19% moisture content. MC15 is dried lower to guarantee that it does not exceed 15%. Kiln-dried lumber sold in Canada is not usually subjected to fungicidal or other chemical treatment.

Health issues associated with this material
Some people are allergic to wood terpenes. Moisture-resistant coatings, anti-check paint, and fungicides can be sources of irritant odours. Large quantities of some species of lumber used in the living space may release significant amounts of odours and terpenes.

Comments based on experience of the environmentally hypersensitive
Because there are wide variations in wood types, treatments, and individual tolerances, all lumber should be personally tested. The low moisture content in kiln-dried lumber is less likely to promote mold growth than the higher moisture content of undried lumber. Kiln-dried lumber surfaces can also be sealed with a water-based acrylic sealer to prevent the emission of terpenes.

User must test the type of softwood and verify the presence of treatments used on the wood. User should consider where wood will be used.

See
softwood lumber, "S-GRN," acrylic sealer

Components: softwoods; may be treated with moisture-resistant wax coatings (water-based), sometimes fungicides	**Product Source:** available through building and lumber suppliers	**Masterformat Number:** 06101

SOFTWOOD LUMBER, "S-GRN"

Common product names	Typical uses in construction
wet or green lumber, air-dried lumber, framing lumber	wall, roof, and floor framing; sheathing, boards

Description
"S-GRN" softwood lumber is lumber that has a moisture content likely to be over 30% when it is surfaced at the mill. It may subsequently be air-dried before sale.

Additional considerations
Wood with a high moisture content will shrink as it dries. "S-GRN" lumber sold and used in Canada does not receive chemical treatment unless the customer requests it. "S-GRN" lumber shipped overseas is usually chemically treated.

Health issues associated with this material
Green lumber is more likely to support mold growth because of the high moisture content. Some people are allergic to wood terpenes.

Comments based on experience of the environmentally hypersensitive
Anti-sapstain chemicals, fungicides and anti-check end-coatings can be irritants. Since large quantities of lumber are commonly used within the air space, the effects can be significant to sensitive individuals. Because there are wide variations in wood types and individual tolerances, green lumber should be personally tested. Verify whether the lumber is chemically treated.

Kiln-dried wood is preferable.

See
softwood lumber, "S-Dry" (kiln-dried)

Components: softwoods (spruce, pine, fir, hemlock): may contain 25-90% moisture, anti-sapstain chemicals, anti-check end coatings, and moisture-resistant waxes	**Product Source:** available from building and lumber suppliers	**Masterformat Number:** 06101

STEEL, PRIMED

Common product names	Typical uses in construction
steel, structural steel	structural components, posts, trusses, timber connectors

Description
Primed steel is steel that has been painted with a priming paint to prevent rust.

Additional considerations
This material has many useful applications.

Health issues associated with this material
Primed steel emits paint odours while the primer is drying, and releases vapours when welded or flame cut.

Comments based on experience of the environmentally hypersensitive
Paint odours during drying may be unacceptable to sensitive individuals. Any negative impact on health is likely to arise from the primer, not the steel. Once the primer has dried, the effects are minimal.

This product is generally tolerated. However, the primer should be tested, particularly if large quantities of the steel will be used or exposed.

See
softwood lumber

Components: primer may contain zinc chromate, lead oxide, iron oxide, solvents, oils, drying agents	**Product Source:** available from steel fabricators	**Masterformat Number:** 05120

CABINETS AND COUNTERTOPS

CABINETS AND COUNTERTOPS

Emissions from cabinet and countertop materials can affect some sensitive individuals. They can be a significant source of volatile organic compounds in the living space. Most cabinets are made from manufactured wood products such as particle board and plywood. Cabinets and countertops made with manufactured wood products often have exposed and unsealed surfaces. Common emissions associated with cabinets and countertops are wood terpenes and plastic resin vapour from sheet materials, and emissions from wood binders.

Considerations

Emissions from cabinet and countertop materials can be significant, especially in the kitchen and confined areas of the bathroom. Certain glues are unstable to moisture. High humidity in the air can promote a reaction of the glue and water, releasing gases. An increase in the temperature of the room also enhances emissions. Emissions generally reduce with time.

- Choose materials that have low odour. Solid hardwood is preferable. Alternative choices are solid softwood or softwood plywood coated with an appropriate sealant.
- Low-toxicity sealers can be used to retard the emissions from the manufactured wood products such as from the underside of pre-formed countertops. All exposed edges and surfaces should be thoroughly sealed.

ACRYLIC SHEET

Common product names	Typical uses in construction
Corian®	countertops

Description
Acrylic sheet is a hard, solid, non-porous surface material used primarily for countertops. It is made of natural minerals and acrylic.

Additional considerations
Acrylic sheet is durable, stain resistant and easy to clean. It is also highly resistant to impact damage. Surface stains can be removed by fine sanding. Although it is unaffected by normal cleaners, it does not resist some strong acids, chlorinated solvents and paint removers.

Special joint adhesives to join horizontal sheets are recommended. Solvent-based adhesives are suggested for installation on a base or substrate. Most sealants are compatible with this material, but special sealants are suggested by the manufacturer for colour matching.

Health issues associated with this material
The acrylic sheet is odourless. Odours may be produced by joint adhesives during and shortly after installation. Since small amounts of joint adhesives are normally used, the odour dissipates after curing. However, if the sheets are installed on a base such as in vertical applications, larger quantities of solvent-based adhesives are required and are sources of emissions.

Comments based on experience of the environmentally hypersensitive
The low-maintenance, durability and absence of odour makes this material desirable for sensitive individuals. With suitable framing support for countertops, a base is not required. Allow sufficient time for the joint adhesive to dry out.

This material costs more than other countertop materials.

This product is generally tolerated but user should test for acceptability. Select low-odour sealants.

See
polyester sheet

Components: methyl meth-acrylate resin, dyes, inert materials, additives	**Product Source:** available from kitchen suppliers and DuPont Canada distributors	**Masterformat Number:** 06650

FIBREBOARD, FORMALDEHYDE-FREE

Common product names	Typical uses in construction
Medite II®, Medex®	cabinet construction, substrate for laminates

Description
Formaldehyde-free fibreboard is a medium density fibreboard made from softwood chips with a resin binder. Formaldehyde-free means that the binder used in the manufacture of the fibreboard does not contain formaldehyde.

Additional considerations
Products vary by manufacturer. In *Medex®* and *Medite II®*, the wood chips are bound together by polyurea resins. MDI-type resins (MDI refers to 4,4'-diphenylmethane-di-isocyanate) react with wood to form polyurea resins.

Health issues associated with this material
Wood terpenes may be released by formaldehyde-free fibreboard. Cutting or sanding produces dust.

Comments based on experience of the environmentally hypersensitive
Compared to standard particle board or MDF, formaldehyde-free fibreboard has reduced odours. Residual odours from the wood can be sealed by lamination or sealing with an appropriate sealant. Some companies laminate the fibreboard in the factory.

Sensitive individuals should test this material for acceptability.

See
plywood

Components: softwood chips, polyurea resin, parafinnic and mineral wax	**Product Source:** available from building product suppliers and Medite Corporation distributors	**Masterformat Number:** 06102

HIGH-PRESSURE LAMINATE

Common product names	Typical uses in construction
Arborite®, Formica®	countertops, cabinet facings, shelving surface

Description
High-pressure laminate is a highly durable, finished sheeting material essentially made of paper and thermosetting resins. The top layers of the laminate are of paper, impregnated with melamine-formaldehyde, and the bottom layers, with phenol-formaldehyde. This assembly is subjected to high pressure and temperature during manufacture. Volatile gases are driven off by the process.

Additional considerations
The laminate is usually glued on site to a sturdy base (typically particle board or medium density fibreboard) or obtained pre-laminated onto the base materials. Post-formed countertops (having a curved drip edge and splash) have the laminate only on one side.

The surface is washable, but it does not resist cuts, impact or high heat.

Health issues associated with this material
On-site installation requires adhesives which may emit chemical vapours. Gases and dust may be released when laminates are machined or cut.

Comments based on experience of the environmentally hypersensitive
Some odour may be detected by sensitive individuals in new installations. Subsequent odours are probably from the base material, particularly if all surfaces are not laminated or sealed.

If this material is used, select low-odour, water-based adhesives and base material with glues that are stable to moisture, e.g., construction plywood. Laminate all surfaces and edges, or seal unlaminated surfaces with low-toxicity sealant.

User must test. Generally, concerns are on emissions from the base material.

See
fibreboard, formaldehyde-free, contact cement, water-based, construction plywood

Components: melamine-formaldehyde, phenol-formaldehyde, dyes, contact adhesives	**Product Source:** available through kitchen and building product suppliers	**Masterformat Number:** 06240

PARTICLE BOARD AND MEDIUM DENSITY FIBREBOARD (MDF)

Common product names	Typical uses in construction
particle board—pressed wood, industrial board, chipboard, medium density fibreboard (MDF)	cabinet and countertop base, shelving

Description
Particle board and MDF are manufactured wood products typically made from softwood. Particle board is made from chips and shavings using a dry process, while MDF is made from milled fine particles using a wet process.

Additional considerations
Urea-formaldehyde resin is commonly used in the manufacture of particle board and MDF. Urea-formaldehyde resin is less stable to moisture than phenol-formaldehyde resin used in other composite wood products. In the presence of water, such as high humidity in the air, urea-formaldehyde undergoes a process called hydrolysis, resulting in the release of formaldehyde.

Health issues associated with this material
Particle board and MDF emit wood terpenes (as most wood does), formaldehyde and other volatile gases. Cutting, shaping and sanding produces dust and gases which can cause respiratory, eye, and skin irritation.

In 2004, the World Health Organization's International Agency for Research on Cancer (IARC) classified formaldehyde as carcinogenic to humans.

Comments based on experience of the environmentally hypersensitive
Laminates, either factory-applied or installed to particle board on site, retard emissions from the surface that is covered. However, emissions from the particle board or MDF can escape from unfinished surfaces, including edges and holes. All surfaces have to be sealed with the laminate or a low-toxicity acrylic sealant.

Solid hardwood is the best alternative, softwood plywood the next best. If particle board is used, all exposed surfaces and edges should be sealed.

See
formaldehyde-free fibreboard, acrylic sealer, high pressure laminate

Components: softwood chips and shavings, urea-formaldehyde resin; some brands may contain hardwood	**Product Source:** available from building product suppliers	**Masterformat Number:** 06102

PLYWOOD, HARDWOOD

Common product names	Typical uses in construction
finishing plywood, decorative plywood, wall panelling	cabinet frames, doors, wall panelling, specialty uses

Description
Hardwood plywood is a manufactured product comprising hardwood outer veneers bonded to a core consisting of other cross-ply veneers, or a composite consisting of particleboard or fibreboard, all glued together to form wood panels. For the purposes of this document, this broad classification includes hardwood plywood with cores that may consist of solid sawn wood.

Additional Considerations
Hardwood plywood is typically used for interior purposes, for cabinets, door skins, and furniture. The most common adhesive used is urea-formaldehyde resin, which may be fortified with melamine. However, other traditional non-waterproof adhesives may also be found in use.

Health issues associated with this material
Cutting hardwood plywood, or any other wood product, creates dust that can be an irritant. Some wood terpenes and emissions from the resins used to bind the veneers may be released if cutting generates sufficient heat.

Manufactured wood products in this class which contain urea-formaldehyde resins have higher emission rates of formaldehyde than that released from phenol or phenol-resorcinol formaldehyde resins. Fortification by melamine reduces the amount of urea resin required and the emissions produced. Emissions are subject to greater release under humid conditions.

Comments based on experience of the environmentally hypersensitive
The heat of curing the wood panels and the adhesive will release terpenes, extractives and other volatile gases during manufacture, some residuals of which are slowly emitted subsequently. The rates of release of formaldehyde from hardwood plywood containing substantial proportions of urea-formaldehyde adhesives are higher than for wood-based panels using more stable adhesives. Products imported from offshore may have been produced under less stringent curing conditions than in Canada or the U.S.A. and may use wood species that have inherently higher natural emissions.

Because there are fewer glue lines per unit volume of finished material, a core of solid wood is preferable to a core of manufactured composite wood.

Sealing of all surfaces with a low-toxicity sealer can minimize these emissions.

User must test. Select products with more stable glues. Seal all surfaces to reduce emissions.

See
acrylic sealer, softwood sanded plywood, construction plywood panels, particle board

Components: oak, maple, birch for facings; veneer plywood, particle board or medium density fibreboard, solid wood for core; urea-formaldehyde resin	**Product Source:** available from building product suppliers	**Masterformat Number:** 06421

PLYWOOD, SOFTWOOD (SANDED)

Common product names	Typical uses in construction
sanded plywood, good one side (G1S) plywood	cabinets, panelling, furniture, specialty uses

Description

Sanded softwood plywood has the face pre-sanded at the mill. These plywoods are used for structural purposes and can be used for single layer combined subfloor/underlayment flooring. Thinner sanded plywoods are used for underlayment under finished sheet or tile flooring. The grade of veneers used in the face and first layer in the core may be of a higher grade and clear, or may be patched to provide a solid surface. They are also used as a base for high quality cabinets and furniture.

Additional considerations

The smooth solid face provides a suitable surface for many finishes, including laminates. Sanded softwood plywood may be made from Douglas fir or Canadian Softwood Plywood. Southern yellow pine plywood is also available.

Currently all sanded softwood plywood is made with phenol-formaldehyde resin adhesives, as are all construction plywoods. Phenol-formaldehyde resin adhesive supplemented by fillers is used to bind the veneers together. Phenol-formaldehyde adhesive is more stable to moisture than urea-formaldehyde, producing little formaldehyde emission when properly cured.

Health issues associated with this material

Cutting plywood, or any other wood product, creates dust that can be an irritant. Some wood terpenes and emissions from the resin used to bind the veneers may be released if cutting generates sufficient heat.

Comments based on experience of the environmentally hypersensitive

Most sensitive individuals find softwood plywood acceptable for interior use if all surfaces are sealed with a laminate or a low-toxicity sealant.

User must test. Sealing is recommended.

See

construction plywood, formaldehyde-free fibreboard, acrylic sealer

Components: Douglas fir, southern yellow pine, western larch; phenol-formaldehyde; inert fillers (ground bark, wheat flour)	**Product Source:** available from building product suppliers	**Masterformat Number:** 06120

POLYESTER SHEET

Common product names	Typical uses in construction
monolithic polyester sheet	countertops

Description
Polyester sheet is a moulded synthetic material primarily used for countertops.

Additional considerations
Polyester sheet is more brittle and less heat resistant than other countertop materials.

Health issues associated with this material
Except when very new, polyester sheet does not emit odours. However, it may emit slight odours if heated. Dust is released when polyester sheet is cut or machined.

Comments based on experience of the environmentally hypersensitive
Polyester sheet is seamless and easy to clean.

User must test.

See
polyester sheet, mineral filled; acrylic sheet

Components: moulded polyester: may contain small amounts of plasticizers and flame retardants	**Product Source:** available through kitchen cabinet suppliers	**Masterformat Number:** 06271

POLYESTER SHEET, MINERAL-FILLED

Common product names	Typical uses in construction
synthetic marble	one-piece moulded countertops, sinks

Description
Polyester sheet is a moulded material containing marble dust and generally used for countertops and sinks.

Additional considerations
Dust is released when polyester sheet is cut or machined during installation.

Health issues associated with this material
Mineral-filled polyester sheet is usually used in small quantities in well-ventilated areas, but may smell of uncured polyester resin. Odours may linger for an extended period.

Comments based on experience of the environmentally hypersensitive
Emission characteristics may vary considerably among lots and manufacturers.

User must test.

See
polyester sheet

Components: polyester resin, dyes, mineral fibres, and marble dust (calcium carbonate); dyes may contain heavy metals	**Product Source:** available from kitchen specialty stores	**Masterformat Number:** 06271

STEEL, STAINLESS

Common product names	Typical uses in construction
stainless steel	countertops, sinks, hardware

Description
Stainless steel is a durable, easily cleaned surface material for countertops and sinks.

Additional considerations
Light gauge stainless steel used for countertops is usually mounted on a solid backing (such as plywood) for strength. Countertops can be specially ordered from a heavy gauge stock that can be mounted without a wood or plywood backing. Soundproofing materials are sometimes applied to the underside of the countertop.

Health issues associated with this material
Oily residues may be present on the surface. These can be washed off. If plywood is used for the backing material, emissions may be present. Soundproofing material is a tar-like coating that can also emit odours.

Stainless steel is available in many grades with differing metallurgical content. Nickel is a key ingredient and may be a contact allergen to some people.

Comments based on experience of the environmentally hypersensitive
Stainless steel itself is generally acceptable, but the backing material must be assessed for suitability.

This product is generally tolerated, but user should test.

See
acrylic sheet, polyester sheet

Components: steel with more than 10% chromium; added elements: nickel, manganese, silicon, selenium, etc.	**Product Source:** special order from restaurant equipment suppliers	**Masterformat Number:** 06271

CAULKING AND FILLERS

CAULKING AND FILLERS

Emissions from caulking and fillers commonly affect many individuals. Noxious fumes released by caulking can affect even those without any known sensitivities.

Common noxious emissions are from volatile solvents such as xylene and toluene. These chemicals are known to affect the respiratory and central nervous systems and can damage organs, such as the liver and kidneys.

Considerations

- Choose caulking and fillers that have the lowest emissions or odours. Some caulkings are to be used only outdoors.
- Select low-toxicity materials whenever possible. Product labels provide some information that can help a person determine the main components of the caulking or filler. **The labels do not necessarily list all ingredients.**
- Avoid chlorosulphonated rubber caulking, neoprene rubber caulking, and polysulphide caulking, which are known to have noxious odours.
- For a material to perform as intended, it is essential to follow application instructions. Caulking and fillers must be applied to clean surfaces and be allowed to dry and cure properly.
- Natural Resources Canada has produced a consumer fact sheet on caulking, and a pamphlet, *Caulking*.

ACOUSTICAL SEALANT

Common product names	Typical uses in construction
vapour barrier sealant	sealing air and vapour barriers, sound dampening applications

Description
Acoustical sealant is an elastic, non-setting sealing compound. Although it is still used in acoustical applications, it is now more commonly used as an air and vapour barrier sealant.

Additional considerations
Acoustical sealant cannot be painted. It is slow to cure when used for air and vapour barrier joints, and the large amount required means odours may linger for extended periods.

Health issues associated with this material
Volatile solvents are released by acoustical sealant. Odours from acoustical sealant are a common source of complaint from sensitive people.

Comments based on experience of the environmentally hypersensitive
Manufacturers' formulations of acoustical sealant vary and some formulations may cause fewer problems. Proper installation of acoustical sealant in air and vapour barriers can prevent its emissions from entering the indoor living space.

User must test. This product may be tolerated in exterior use.

See
other caulking

Components: manufacturers' formulations vary	**Product Source:** available at building product suppliers	**Masterformat Number:** 09531

Acrylic latex caulking

Common product names	Typical uses in construction
acrylic, monoacrylic	interior crack filling; sealing air and vapour barriers; sealing window and door casings, baseboards, electrical outlets

Description
Acrylic latex caulking is an elastic sealing compound.

Additional considerations
Acrylic latex caulking can be painted when it has been dried and cured. It is generally used in small quantities except when used to draft seal older homes.

Health issues associated with this material
Latex caulking emits many volatile substances, including solvent and resin odours. Products labelled for bath and kitchen use are likely to contain fungicides.

Comments based on experience of the environmentally hypersensitive
Latex caulking is generally safer to handle than neoprene, urethane, polysulphide, and other caulking with a higher solvent content, but emissions may affect hypersensitive individuals.

User must test before using large quantities inside. Avoid fungicide-treated caulking. Instead, replace caulking frequently.

See
other caulking

Components: acrylonitrile or methacrylate resins, ethylene or propylene glycol solvents; may contain silicones, colourants, fillers, fungicides	**Product Source:** available from building product suppliers	**Masterformat Number:** 07920

BUTYL RUBBER CAULKING

Common product names	Typical uses in construction
butyl caulk, butyl	rain gutters, flashings, metal roofing and siding seams, vinyl siding, window installation

Description
Butyl rubber caulking is a flexible waterproof caulking with excellent weathering properties.

Additional considerations
Butyl rubber caulking can be painted after drying and curing. However, this can vary according to its use. Butyl caulking is affected by temperature fluctuations and exposure to sunlight. It lasts longer than oil caulk.

Health issues associated with this material
Butyl caulking cures slowly and releases noxious solvent odours.

Comments based on experience of the environmentally hypersensitive
It is not recommended for indoor use. If used indoors, butyl rubber caulking can be highly problematic for sensitive individuals. It should not be used in areas subject to high moisture.

Select a less odorous caulking for indoor use.

See
other caulking

Components: polyisobutylene resins, solvent; may contain acrylics and chlorosulphonated rubber	**Product Source:** available from building product suppliers	**Masterformat Number:** 07900

GYPSUM JOINT COMPOUND, DRY-MIX

Common product names	Typical uses in construction
joint compound	drywall filler, plaster repair

Description
Dry-mix gypsum joint compound is mixed with water to form a joint compound.

Additional considerations
Large quantities of this filler are used in a drywall installation. Formulations vary. Setting and drying compounds are chemically different.

Setting compounds contain essentially gypsum and inorganic fillers and are chemically similar to plaster. The setting time is typically 45-90 minutes and is often part of the trade name, e.g., *Rapid 90, Gyproc 45* or *Durabond 90.*

Dry-mix drying compounds do not set but rely on drying (often 24 hours). Dry-mix drying compounds are a powder form of the pre-mix compounds but contain considerably less preservative and fungicide than the pre-mix.

Health issues associated with this material
Sanding creates a great deal of fine dust.

Comments based on experience of the environmentally hypersensitive
Some odours are released. Since the material is exposed to the living space, the emissions can be a major concern. A drywall system presents large quantities of many materials within the living space. All components should be considered (gypsum board, joint tape, joint filler, primer, paint and wall covering). Installation and upkeep are other major factors to evaluate (sanding, painting, patching).

User must test. Select a compound without preservatives.

See
gypsum joint compound, low-toxicity; gypsum joint compound, pre-mix; gypsum board, paints

Components: calcium sulphate (gypsum); may contain calcium oxide (lime), polyvinyl acetate, other agents; may contain preservatives and fungicides	**Product Source:** available from building product suppliers	**Masterformat Number:** 09280

GYPSUM JOINT COMPOUND, LOW-TOXICITY

Common product names	Typical uses in construction
AFM Joint Compound, Murco M-100 Hypo	drywall joint filler, crack filler, plaster repair

Description
Low-toxicity gypsum joint compound is specially formulated for finishing drywall joints and repairing plaster.

Additional considerations
Sanding creates a great deal of fine dust.

Health issues associated with this material
Low-toxicity joint compound may emit minor odours while drying. These are more a nuisance than a health concern.

Comments based on experience of the environmentally hypersensitive
Low-toxicity joint compound is often well tolerated. However, since a drywall system represents large quantities of many materials within the living space, all components should be considered: gypsum board, joint tape, joint filler, primer, paint, and wall covering. Installation and upkeep are other major factors to evaluate (sanding, painting, patching).

Manufacturers' formulations vary.

Low-toxicity compounds are preferable to compounds containing preservatives. These products are not generally available in Canada. Readily available setting compounds are a suitable alternative to these products.

See
gypsum joint compound, dry-mix, gypsum joint compound, pre-mix, gypsum board, paints

Components: calcium sulphate (gypsum); may contain calcium oxide (lime), other additives; M-100 contains mica, calcium carbonate, attapulgite clay.	**Product Source:** This is a specialty product available from AFM and Murco distributors.	**Masterformat Number:** 09280

GYPSUM JOINT COMPOUND, PRE-MIX

Common product names	Typical uses in construction
pre-mix filler, joint compound	drywall filler, crack filler

Description
Pre-mix gypsum joint compound is a ready-to-use joint compound.

Additional considerations
Pre-mix gypsum joint compound emits odours while drying. Sanding causes serious exposure to dust.

Health issues associated with this material
Alcohol, glycol and other odours released while pre-mix drywall filler is drying are irritants, as is the dust created by sanding. Drywall filler may also contain fungicides.

Comments based on experience of the environmentally hypersensitive
A drywall system represents large quantities of many materials within the living space. All components should be considered: gypsum board, joint tape, joint filler, primer, paint, and wall covering. Installation and upkeep are other major factors to evaluate (sanding, painting, patching).

Setting compounds or low-toxicity gypsum joint compounds are preferable to pre-mix joint compounds.

See
gypsum joint compound, dry-mix, gypsum joint compound, low-toxicity, gypsum board, paints

Components: calcium sulphate (gypsum), polyvinyl acetate, alcohols, glycols, fungicides	**Product Source:** available from building product suppliers	**Masterformat Number:** 09280

OIL- OR RESIN-BASED CAULKING

Common product names	Typical uses in construction
regular caulk, *AFM Caulking Compound*	crack sealing, wood sash work

Description
Caulking is an elastic sealing compound.

Additional considerations
Oil- or resin-based caulking can be painted when dried and cured. It emits oily odours, but dries fairly rapidly. It is generally used in small quantities in exposed locations. It has poor durability.

Health issues associated with this material
The oils and resins may be moderately irritating to some people.

Comments based on experience of the environmentally hypersensitive
Low-toxicity varieties without petroleum solvents are available.

User must test.

See
other caulking

Components: oleoresins, linseed oil, talc, alkyd oils, petroleum solvents	**Product Source:** available from building product suppliers	**Masterformat Number:** 07920

POLYURETHANE CAULKING

Common product names	Typical uses in construction
urethane caulk, 1 part urethane, 2 part urethane	crack sealant; air and vapour barrier sealing; airtight and other drywall systems

Description
Polyurethane caulking is an elastic sealing compound.

Additional considerations
It can be painted after drying and curing. Polyurethane performs well even when subjected to joint movement.

Health issues associated with this material
Polyurethane caulking emits odours. The solvents and plasticizer emissions may be irritating or neurotoxic (i.e., have adverse effects on the nervous system).

Comments based on experience of the environmentally hypersensitive
Indoor use should be limited.

Not recommended. Choose a caulking with fewer emissions.

See
other caulking

Components: polyisocyanate resins, solvents, colourants, fillers, toluene, naphthol	**Product Source:** available from building product suppliers	**Masterformat Number:** 07920

SILICONE CAULKING, ACETIC ACID CURE

Common product names	Typical uses in construction
regular silicone	glass setting, flashing and gutter sealing

Description
Silicone caulking is an elastic sealing compound. The label on the caulking will usually include acetic acid as an ingredient or state that acetic acid will be released during curing.

Additional considerations
Silicone adheres well to glass and metal but poorly to gypsum board, wood, and concrete. Most silicones cannot be painted. It is generally used in small quantities indoors. Silicone caulking, designed for use in moist locations, such as tubs and bathrooms, usually contains fungicides.

Health issues associated with this material
Acetic acid cure silicone caulking emits acetic acid and solvents while curing. It is stable once cured. Emissions from silicone caulking can be moderately irritating during the curing period.

Comments based on experience of the environmentally hypersensitive
Neutral cure silicone is a better choice than acetic acid cure for sensitive people. Silicone caulking should be watched for evidence of fungal growth and cleaned frequently or replaced.

Neutral cure silicone is better tolerated by sensitive people. Use caution if the caulking contains fungicides.

See
other caulking

Components: siloxanes (organic polymers of silicon), acetic acid, colourants, solvents, fillers; fungicides, if labelled for tub and tile, bath, etc.	**Product Source:** available from building product suppliers	**Masterformat Number:** 07920

SILICONE CAULKING, NEUTRAL CURE

Common product names	Typical uses in construction
CSL 343, CGE Silicone II, neutral cure silicone	glass setting, flashing and gutter sealing, tub and tile sealing

Description
Silicone caulking is an elastic sealing compound. An ammonia smell is a by-product of the curing process.

Additional considerations
Silicone caulking is generally used in small quantities indoors. Because fungal growth may occur on caulking in moist locations, some bathtub caulking contains fungicides.

Health issues associated with this material
Neutral cure silicone caulking cures rapidly. Ammonia odours may be present for a short time. Users should be aware of the presence of fungicides in bathtub caulking.

Comments based on experience of the environmentally hypersensitive
Neutral cure silicone is generally well tolerated by people with sensitivities and is a good alternative to acetic acid cure silicone. It should be watched for evidence of fungal growth and cleaned frequently or replaced. Some hypersensitive people report irritation from bathtub caulking during bathing. Odours may persist over a long period.

This product is generally tolerated. If used in the bathtub, the bathroom must be ventilated. Replace when fungal growth is evident.

See
other caulking

Components: siloxanes (organic polymers of silicon), colourants; CSL 343 and CGE Silicone II (for doors and windows) are fungicide-free; other tile, tub, and bath caulking may contain fungicides	**Product Source:** available from Webco (CSL 343 only) and building product suppliers	**Masterformat Number:** 07920

WATER-BASED CAULKING, LOW-TOXICITY

Common product names	Typical uses in construction
AFM Caulking Compound, *Phenoseal®* *Series 100*, and *Surpass®*	Caulking joints in wood, metal, masonry, tile, ducts

Description
Water-based caulking is specially formulated for low-toxicity and environmental safety.

Additional considerations
This caulking should only be applied to clean, dry surfaces.

Health issues associated with this material
Some products may contain substances that are skin irritants to some people.

Comments based on experience of the environmentally hypersensitive
These are specialty products formulated to reduce emissions and to maintain a low level of toxicity in use.

This product is generally tolerated because of low odours and emissions, but user should test specific products.

See
other caulking

Components: manufacturers' formulations vary; may contain vinyl, acrylic copolymer, pigments	**Product Source:** AFM product distributors and Gloucester Co. Inc.	**Masterformat Number:** 07920

DOORS AND WINDOWS

DOORS AND WINDOWS

Emissions related to door and window assembly are usually from the frame material, glues and insulation. Wooden doors and windows often are treated with wood preservative.

Common emissions from door and window materials are natural wood terpenes, organic vapours as from manufactured wood products, and odours from plastics.

The impact on sensitive people from the glazing (glass) is a developing area of study. Sensitive individuals may have different responses to the level and the quality of light in the living area.

Some energy-efficient windows have a specialized coating called low-emissivity (low-E) coating, which prevents re-radiation of heat from the house to the outside. Coatings on the glass alter the level and spectrum of light transmitted into the house. Hypersensitive individuals may wish to consider the trade-off in energy efficiency from using clear glass windows.

Windows with poor energy efficiency ratings, however, can increase energy use in your home and promote condensation that can lead to mold growth. Note that the energy efficiency of the window depends not only on the glazing but also on the frame and how it is constructed.

Considerations

- Choose door and window materials that have the lowest emissions.
- If the window or door is made with wood, check with the manufacturer to make sure no toxic wood preservatives or treatments have been used.
- Low-toxicity sealers can be used to retard emissions from wood and manufactured wood products.
- Sensitive individuals should check their responses to light levels.

ALUMINUM, BAKED-ON ENAMEL

Common product names	Typical uses in construction
aluminum extrusions, aluminum sash	window frames, patio doors, storm doors, siding, gutters and downpipes, flashings

Description
Aluminum with baked-on enamel is a durable, low-maintenance material for doors and windows.

Additional considerations
Metal has a much higher heat conductivity than wood. Select thermally broken windows; otherwise, condensation may occur on the frames in cold weather.

Health issues associated with this material
Emissions from aluminum with baked-on enamel are not a concern.

Comments based on experience of the environmentally hypersensitive
Although this material may be present in large quantities throughout a house, the emission level is very low.

This product is generally tolerated.

See
roofing, siding

Components: aluminum and synthetic resin coatings (usually alkyds, vinyls, or acrylics) baked above 66 degrees C	**Product Source:** available from door and window suppliers and building suppliers	**Masterformat Number:** 08120

ALUMINUM, UNFINISHED

Common product names	Typical uses in construction
aluminum, extrusions and sheet	window and door frames, flashings, roofing, eavestrough, siding

Description
Aluminum is a material used for window and door frames, and for many other building construction purposes.

Additional considerations
The heat conductivity of aluminum frames is high. For window and door frames, select thermally broken frames. Unfinished aluminum is subject to oxidation, especially if the air and precipitation is acidic.

Health issues associated with this material
Oil residues from the manufacturing process can be irritating to some individuals. Unfinished aluminum can be a contact irritant for some people.

Comments based on experience of the environmentally hypersensitive
Oil residue can be washed off.

This product is generally tolerated. User must test.

See
aluminum, baked-on enamel, roofing, siding

Components: aluminum	**Product Source:** available from door and window suppliers	**Masterformat Number:** 08120

FIBRE-REINFORCED PLASTIC

Common product names	Typical uses in construction
fibreglass, glass-reinforced polyester	doors, window frames and sashes

Description
Plastic materials are reinforced with glass fibres. The reinforcement provides strength, dimensional stability, and other properties, depending on the type of plastic.

Additional considerations
Fibre-reinforced framing components of windows and doors are formed in a process called fibreglass pultrusion. The pultrusion process involves coating each fibre with a resin mixture, assembling the coated fibres and drawing them through a heated die.

Health issues associated with this material
Fibreglass pultruded frames are usually supplied with a baked enamel finish on the exposed surfaces to protect the plastic. The uncoated inner surfaces and the insulation are sealed and not normally a source of emissions. Since the frames are pre-cut and supplied to the sizes required, there should be no need for cutting. In rare cases when cutting is required, eye and respiratory protection should be worn.

Comments based on experience of the environmentally hypersensitive
Installed frames with baked enamel coating appear to be acceptable to sensitive individuals.

User must test.

See
bath fixtures, roofing

Components: polyester or other resins, dyes, catalysts (methyl ethyl ketone peroxide), glass fibre, fillers, additives	**Product Source:** available from door and window suppliers	**Masterformat Number:** 08221

GAS-FILLED WINDOWS

Common product names	Typical uses in construction
gas-filled thermal glazing	high-performance windows

Description
Gas-filled windows are a more energy-efficient alternative to air-filled windows.

Additional considerations
Most gas-filled windows have glass with low-emissivity (low-E) coatings for energy conservation. The coatings can affect the amount and quality of light transmitted through the window.

Health issues associated with this material
The gas in gas-filled windows does not produce emissions. Argon gas, commonly used to fill windows, is inert, non-toxic, and sealed in. However, there may be odours from the seals.

Comments based on experience of the environmentally hypersensitive
Gas-filled glazings are only one component of a window unit. Generally, the frames and seals are the potential problems, not the gas-filled glazing itself. When selecting a window unit, the entire window must be taken into consideration.

There are no concerns with the gas.

See
glass, clear and insulated

Components: glass, argon gas (sometimes krypton), aluminum, butyl or vinyl spacers, sealants, desiccant (silica gel)	**Product Source:** available from door and window suppliers	**Masterformat Number:** 08650

GLASS, CLEAR AND INSULATED

Common product names	Typical uses in construction
thermal glazing, double or triple glazing, sealed units	insulating windows

Description
Insulated glass is usually sealed in a glazing unit composed of multiple panes separated by spacers and an air space.

Additional considerations
The insulated glass is only one component of a window unit.

Health issues associated with this material
The glass itself is inert and not associated with any health issues. However, other components of the window unit may be associated with health issues, for example emissions from the sealants and frames.

Comments based on experience of the environmentally hypersensitive
When selecting a window unit, the entire window must be taken into consideration, not only the glass area.

This product is generally tolerated.

See
glass, coated

Components: glass, aluminum, butyl or vinyl spacers, sealants, desiccant (silica gel)	**Product Source:** available from door and window suppliers	**Masterformat Number:** 08823

GLASS, COATED, TINTED, AND FILM

Common product names	Typical uses in construction
low-E glass, soft coat low-E, hard coat low-E	high-performance windows

Description
Coatings are applied to glass to increase the energy efficiency of window units.

Additional considerations
The coating prevents heat energy in the infra-red region from being re-radiated through the window to the outdoors. Coatings also block most of the ultraviolet rays and reduce transmittance in the visible region. The efficiency of the window unit is further increased by an air space, usually gas-filled, between the panes of glass.

Health issues associated with this material
The sealants used with coated windows may emit odours. Since a window unit has many components that can affect people, testing is advised. A unit with the least potential problems for any one individual should be chosen.

Comments based on experience of the environmentally hypersensitive
It is not yet known how reduced quality and amount of transmitted light affects sensitive people.

User must test.

See
gas-filled windows

Components: glass, silver, tin, and other coatings	**Product Source:** available from door and window suppliers	**Masterformat Number:** 08826

METAL DOORS, INSULATED

Common product names	Typical uses in construction
steel doors	exterior doors

Description
Insulated metal doors are energy-efficient and can be produced in many decorative designs.

Additional considerations
Doors are usually insulated with polyurethane or polystyrene. Decorative mouldings are often plastic. Metal doors usually come with a primer coat of paint and require a finish coat.

Health issues associated with this material
Insulation emissions are usually well sealed within the door and do not present any problems. Mouldings may have plastic odours that can bother sensitive people.

Comments based on experience of the environmentally hypersensitive
Sensitive individuals may want to select an insulated door that does not have mouldings. Choose a paint with low emissions for the finish coat.

This product is generally tolerated.

See
wood doors, solid

Components: steel, zinc, primer paint	**Product Source:** available from door suppliers	**Masterformat Number:** 08100

POLYVINYL CHLORIDE

Common product names	Typical uses in construction
PVC, PVC windows, vinyl windows	window frames, cladding over wood frames, electrical and plumbing, soffits, gutters

Description
Polyvinyl chloride resins are used in the manufacture of all-vinyl window extrusions (also called profiles) and vinyl cladding over wood windows.

Additional considerations
As cladding, vinyl which does not require painting offers the benefit of low maintenance over natural wood. Solid vinyl windows are reported to be durable.

Health issues associated with this material
Some odours may be produced when PVC is exposed to heat and sunlight.

Comments based on experience of the environmentally hypersensitive
Sensitive individuals may find PVC emissions a problem.

User must test. Sensitive individuals may prefer more inert materials.

See
aluminum, fibre reinforced plastic, steel, and wood

Components: polyvinyl chloride, pigments, ultraviolet stabilizers (Window frames may contain steel or wood cores or facings.)	**Product Source:** available from door and window suppliers	**Masterformat Number:** 08600

Screening

Common product names	Typical uses in construction
window screen, door screen	window and door screening

Description
Screening in screen doors and window screens provides ventilation while preventing insects from entering the home. Screen materials are generally either fibreglass or aluminum.

Additional considerations
Fibreglass screening is sometimes chemically treated to deter insects.

Health issues associated with this material
Emissions from chemical treatments on screens may bother sensitive individuals. The screen frame may produce emissions that are not acceptable to some people.

Comments based on experience of the environmentally hypersensitive
Choose screen materials without chemical treatment. Consider the screen frame and screen retaining strip material for acceptability.

User must test.

See
other doors and windows

Components: may contain fibreglass, aluminum, steel, copper, brass, chemical treatment	**Product Source:** available from door and window suppliers	**Masterformat Number:** 10240

STEEL, BAKED-ON ENAMEL

Common product names	Typical uses in construction
enamelled steel	industrial windows, metal roofing, siding, wall panels

Description
Steel covered with baked-on enamel is a durable material with many uses.

Additional considerations
The enamel provides a protective and decorative surface for doors and windows.

Health issues associated with this material
Emissions are not a concern with enamelled steel. Oily residues sometimes present may bother some people.

Comments based on experience of the environmentally hypersensitive
Any oily residue present can be washed off with a low-toxicity soap or trisodium phosphate (TSP). Over time, rain will often wash oil off the exterior surface.

This product is generally tolerated.

See
steel, galvanized

Components: steel, zinc, enamel (alkyd, vinyl, or acrylic) baked above 66 degrees C	**Product Source:** available from door and window suppliers	**Masterformat Number:** 08120

STEEL, GALVANIZED

Common product names	Typical uses in construction
galvanized steel, satin coat	doors, roof flashing, roofing, heating ducts and vents, framing clips and anchors

Description
Galvanized steel is zinc-coated steel sometimes used for door and window assemblies.

Additional considerations
An oily residue is often present on the surface of galvanized steel products.

Health issues associated with this material
Galvanized steel has no significant emissions. Some people are bothered by emissions from oily residues.

Comments based on experience of the environmentally hypersensitive
The oil can be easily washed off with a low-toxicity soap or trisodium phosphate (TSP).

This product is generally tolerated.

See
steel, baked-on enamel

Components: steel (iron, carbon), zinc	**Product Source:** available through door and window suppliers, sheet metal suppliers	**Masterformat Number:** 08100, 08510

WINDOW SPACERS

Common product names	Typical uses in construction
thermal spacers, butyl, PVC, or aluminum	spacers for insulating glass

Description
Window spacers keep the panes of glass separated within a window unit.

Additional considerations
The spacers, sealed within the unit, usually contain a desiccant to dry the air between the panes.

Health issues associated with this material
Window spacers, particularly butyl spacers, may have volatile emissions, but these are sealed within the window.

Comments based on experience of the environmentally hypersensitive
Window spacers are only one component of a window unit. The entire window unit should be evaluated in relation to an individual's sensitivities.

Spacers sealed in a frame generally are not a concern.

See
caulking and fillers

Components: may contain butyl, PVC, or aluminum	**Product Source:** available from door and window suppliers	**Masterformat Number:** N/A

WOOD, TREATED

Common product names	Typical uses in construction
wood sash	wood window and door frames

Description
Manufactured wood windows and door frames are treated with wood preservative to prevent deterioration.

Wood preservatives are applied on wood by pressure and non-pressure processes. Non-pressure processes include brushing, spraying or dipping. Window sash and other exterior trim are dipped in water-repellent preservative.

Additional considerations
Pentachlorophenol was once the most widely used preservative in uses such as millwork, fenceposts, decking, and siding. As of December 1990, registration of pentachlorophenol in Canada was discontinued. In 1994, some window and door manufacturers were still using their existing stock of the chemical.

For wood joinery, these wood preservatives are registered pesticides under the Pest Control Products Act: tributyl tin oxide (TBTO), phenylmercuric oleate and copper and zinc naphthanate dispersed in organic solvents.

Health issues associated with this material
Dust mask, goggles, and gloves should be worn when handling treated wood material. Inhalation and ingestion of airborne machining dust are two routes of entry of the preservatives to the body. Direct skin contact with wood surfaces treated with wood preservatives should be avoided.

Comments based on experience of the environmentally hypersensitive
Custom woodworking shops can provide untreated wood products.

Select wood frames without preservatives but which have less potential for mold growth (e.g., cedar or redwood if tolerated) or use alternative materials such as aluminum or enamel-coated fibreglass frames.

See
wood, untreated softwood

Components: Wood used may be treated with pentachlorophenol or other biocides	**Product Source:** available from door and window suppliers	**Masterformat Number:** N/A

WOOD, UNTREATED SOFTWOOD

Common product names	Typical uses in construction
solid wood	sashwork, doors, jamb sets, trims

Description
Softwood without preservative treatment has many building uses. Common softwoods for building include spruce, pine, fir, cedar, redwood, and hemlock.

Additional considerations
Softwoods are usually finished with sealers or paints to create a durable surface.

Health issues associated with this material
Some unfinished softwoods emit volatile chemicals that can affect sensitive people.

Comments based on experience of the environmentally hypersensitive
Finger joints are sometimes used to make longer sections of wood from short pieces of wood joined with glue.

User must test for sensitivity to softwood.

See
wood, treated

Components: spruce, pine, fir, red cedar, redwood, hemlock	**Product Source:** available from window and building product suppliers	**Masterformat Number:** N/A

WOOD DOORS, HOLLOW-CORE

Common product names	Typical uses in construction
hollow-core, plywood, hardboard, fibre-reinforced plastic, or pressboard doors	interior doors

Description
Hollow-core wood doors usually have a thin hardwood plywood or hardboard exterior skin with an interior core, separated by cardboard honeycomb or lumber spacers.

Additional considerations
Door layers can be glued, jointed, or assembled by a combination of gluing and jointing. Commonly, urea formaldehyde glue is used. Hardboard panels contain less glue than plywood. Doors are usually finished with sealers or paints to create a durable surface.

Health issues associated with this material
Hollow-core wood doors emit wood terpenes and possibly emissions from the glue used in their construction. Fibre-reinforced plastic and finishes may also release volatile substances.

Comments based on experience of the environmentally hypersensitive
Low-toxicity sealers can be applied to retard emissions.

Hollow-core doors may require sealing to reduce emissions. Solid wood doors are an alternative.

See
wood doors, solid; low-toxicity sealer; metal doors

Components: plywoods (lauan, oak, fir); hardboard, lumber cores (spruce, pine, fir, and hemlock); resin binders	**Product Source:** available from door and window suppliers	**Masterformat Number:** 08200

WOOD DOORS, SOLID-CORE

Common product names	Typical uses in construction
wood doors, solid or panel	interior and exterior doors

Description
Solid wood doors can be made with hardwood or softwood cores, and have no added insulation. They may have hardboard or hardwood plywood faces.

Additional considerations
Doors are usually finished with sealers or paints to provide a durable surface. Exterior doors may also be treated with preservatives to protect against moisture. Exterior wood doors require regular maintenance.

Health issues associated with this material
Some unfinished softwoods emit volatile chemicals some of which can be allergenic to some individuals. The finishes used (sealers, paints, etc.) can cause problems.

Comments based on experience of the environmentally hypersensitive
Exterior wood doors may require painting or sealing due to weathering. Sanding dust, paints, or sealers encountered during this maintenance can be problematic for some individuals.

User must test the wood for personal tolerance. Select doors without wood preservatives.

See
wood, hollow-core; low-toxicity sealer

Components: spruce, pine, fir, cedar, ash, birch, oak, maple, etc.	**Product Source:** available from door and window suppliers or by special order from woodworking shops	**Masterformat Number:** 08210

ELECTRICAL

ELECTRICAL

Most air quality problems associated with electrical materials are related to emissions from the wire insulation and other plastic materials.

Some sensitive individuals may react to electrical and magnetic fields generated around wiring, fixtures, plugs, and appliances.

Considerations

- Choose electrical materials with the lowest odours possible.
- Emissions from wiring in walls and ceilings will be retarded by a thoroughly sealed air barrier. People with severe sensitivities may need to take additional measures to keep emissions from affecting their health. For example, choosing wiring in metal conduit may be a more acceptable choice than wiring with plastic conduit.
- Locate the electrical feed and distribution panel distant from areas where most time is spent.
- Keep electrical wiring separated from plumbing and metal ducting.
- Electrical installations must conform to local codes. Consult with a qualified electrical contractor about the specific installation and prudent avoidance strategies.

Conduit, plastic and metal

Common product names	Typical uses in construction
PVC conduit, steel or aluminum conduit	underground wiring, exterior service conduit, telephone and cable in concrete, built-in vacuum systems

Description
Conduit is tubing used to encase electrical wires.

Additional considerations
The wire is often greased with a lubricant to help it slide through the conduit.

Health issues associated with this material
Plastic conduit itself has minimal emissions. Electrical codes do not allow it to be used in significant quantities within the living space of a house, though a thinwall version is used for built-in vacuums. Solvent glue used for PVC conduit connections emits odours.

Steel conduit has minimal emissions but may carry an oily residue that can be washed off.

Comments based on experience of the environmentally hypersensitive
Steel conduit may be an alternative to plastic conduit for sensitive individuals. The lubricant odours may cause problems for some people.

User must test.

See
N/A

Components: polyvinyl chloride, steel, pigments, ultraviolet stabilizers, glues and caulks, fire stops (i.e., intumescent foams), lubricants	**Product Source:** available from electrical product suppliers	**Masterformat Number:** 16111

Electrical boxes, polyvinyl chloride (PVC)

Common product names	Typical uses in construction
polyvinyl chloride boxes	electrical outlets, telephone cable, underground and outdoor wiring

Description
PVC (polyvinyl chloride) electrical boxes are used for switch and receptacle boxes and light fixtures.

Additional considerations
Substantial amounts of these products may be used in the indoor living space.

Health issues associated with this material
There are minimal volatile emissions associated with PVC electrical boxes at room temperature. When heated (for example, by ceiling lamps), they may produce slight odours. Other odours may come from gaskets and sealants and from unsealed cavities.

Comments based on experience of the environmentally hypersensitive
Wiring configurations in electrical boxes are a likely source of very low-frequency electromagnetic fields and should be situated as far as possible from bedroom and living spaces. Grounded metal boxes may help shield adjacent areas from electric fields generated. Electrical codes usually require a fixed number of boxes in specific locations. Local inspectors may allow the boxes to be moved to locations that will minimize personal exposure to electrical fields.

User must test. Metal boxes are more inert at higher temperatures.

See
electrical boxes, steel

Components: polyvinyl chloride, pigments, ultraviolet stabilizers, gaskets (urethane or polychloroprene); solvent glues	**Product Source:** available from electrical and building product suppliers	**Masterformat Number:** 16130

ELECTRICAL BOXES, STEEL

Common product names	Typical uses in construction
steel boxes	electrical switch, outlet, junction and lamp boxes

Description
Steel electrical boxes are used for switch and receptacle boxes, light fixtures, and main service boxes.

Additional considerations
Substantial amounts of these products may be used in the indoor living space.

Health issues associated with this material
There are minimal emissions from this product, although the steel often carries an oily residue.

Comments based on experience of the environmentally hypersensitive
Wiring configurations in electrical boxes are a likely source of very low-frequency electromagnetic fields and should be situated as far as possible from bedroom and living spaces. Grounded metal boxes may help shield adjacent areas from electric fields generated. Electrical codes usually require a fixed number of boxes in specific locations. Local inspectors may allow the boxes to be moved to locations that will minimize personal exposure to electrical fields.

This product is generally tolerated.

See
electrical boxes, PVC

Components: steel, zinc plating, paint	**Product Source:** available from building and electrical product suppliers	**Masterformat Number:** 16130

METAL-SHEATHED CABLE

Common product names	Typical uses in construction
BX, MS-1, Flex, armoured wire	wiring in locations exposed to physical damage, e.g., water heaters

Description
Metal-sheathed cable is electrical wiring enclosed in a flexible, spiral-wound metal casing.

Additional considerations
The quantity typically used in residential construction is small.

Health issues associated with this material
Oily residues from the manufacture of this cable may emit odours and be difficult to wash off. However, because of the small quantities used, these odours are not likely to be significant.

Comments based on experience of the environmentally hypersensitive
Shielding on the cable and grounding of the cable reduces the electrical field component, but does not affect the more significant magnetic fields. The health effects of these alterations are uncertain.

This product is generally tolerated.

See
plastic conduit, steel conduit, vinyl-sheathed cable

Components: steel or aluminum, mylar sheet, cross-linked polyethylene insulation, copper wire	**Product Source:** available from electrical and building product suppliers	**Masterformat Number:** 16120

VINYL-SHEATHED CABLE

Common product names	Typical uses in construction
NMD (gauge varies), Vinylex, Loomex	general and branch circuit wiring in wood frame construction

Description
Vinyl-sheathed cable consists of electrical wires, usually three, grouped within a vinyl covering.

Additional considerations
Substantial quantities of this material are used inside walls and, if not sealed off, have significant presence in the living space.

Health issues associated with this material
The soft vinyl and plasticizers used in vinyl-sheathed cable emit minor odours. Sealing the cable within the walls may be acceptable for sensitive individuals.

Comments based on experience of the environmentally hypersensitive
Some people report problems with odours released from vinyl-sheathed cable.

Metal-sheathed cable is preferable for use in exposed locations.

See
conduit, metal-sheathed cable

Components: vinyl polymer jacket and insulation, copper wire; may contain plasticizer, polyurethane, and mylar (polyester) film	**Product Source:** available from electrical and building product suppliers	**Masterformat Number:** 16120

EXTERIOR WALL

EXTERIOR WALL

Exterior wall materials fall into the general groupings of masonry, wood, metal, vinyl, and stucco. Sheathing materials, which usually provide some structural strength, have been described in the Building Structure section of the guide.

Most air quality problems associated with exterior wall materials are related to emissions from finishes and siding.

Considerations

- Exterior wall materials are exposed to extremes of temperature and sunlight, which enhance emissions and eventually may cause the materials to deteriorate.
- A thoroughly sealed air barrier will retard emissions from entering the home through the wall. However, it is possible for emissions to enter through openings such as windows, doors, and air intakes.
- It is important to consider the long-term care of the exterior wall materials. Many materials require frequent maintenance with paints, stains, and coatings. Application of these substances can produce emissions that sensitive people cannot tolerate.
- The location of the home and local weather conditions may increase the maintenance required for some sidings. For example, materials that never dry out because they are shaded or in moist climates can encourage insects and fungal growth.

CLAY BRICKS

Common product names	Typical uses in construction
bricks	exterior wall cladding, fireplace construction, patio construction; formerly used in basement double brick (load bearing) walls

Description
Clay bricks are made from kiln-fired clay and are typically used as an exterior finish.

Additional considerations
Bricks are set with mortar.

Health issues associated with this material
The exterior use of bricks has no negative effects on health. Old brick exposed below grade may wick water, which can encourage mold growth.

Comments based on experience of the environmentally hypersensitive

This product is generally tolerated.

See
mortar

Components: kiln-fired clay, pigments, mortar (sand, cement, lime)	**Product Source:** available from masonry and building product suppliers	**Masterformat Number:** 04211

HIGH-DENSITY HARDBOARD

Common product names	Typical uses in construction
Masonite®, hardboard, etc.	siding, door skins, pre-finished wall board, utility walls (pegboard), panelling

Description
High-density hardboard is a manufactured wood product. Wood fibres are heated and pressed to form hardboard. The natural wood lignin holds the fibres together.

Additional considerations
A small amount of dust is released by cutting. The rough back surface of the hardboard is difficult to seal.

Health issues associated with this material
High-density hardboard emits slight odours from the wood fibres, resins used to bind the fibres and surface treatments. Dust released by cutting may be an irritant to some individuals.

Comments based on experience of the environmentally hypersensitive
Special hardboard products such as pre-finished wallboard may contain materials that should be tested by sensitive individuals.

User must test.

See
N/A

Components: wood pulp, lignin; formulations vary, special surfaces and "tempered" varieties may contain resins, such as phenol- or urea-formaldehyde, melamine	**Product Source:** available from building product suppliers	**Masterformat Number:** 06102

METAL LATH

Common product names	Typical uses in construction
expanded metal, wire mesh, diamond mesh	base for exterior wall plaster and stucco, reinforcement for mortar and thin concrete

Description
Metal lath is used as a base for applying plaster, cement, and stucco.

Additional considerations
Standard metal lath is sold with an asphalt-treated paper backing. Expanded metal lath is sold without paper backing.

Health issues associated with this material
There are no negative health properties associated with the use of metal lath itself, although the asphalt-treated backing can be a source of odours.

Comments based on experience of the environmentally hypersensitive
Sensitive individuals may find metal lath without asphalt paper backing more acceptable.

This product is generally tolerated. Select lath without asphalt paper backing.

See
N/A

Components: stamped steel (may be copper, zinc, or polymer coated); aluminum	**Product Source:** available from building product and masonry suppliers	**Masterformat Number:** 09203

MORTAR

Common product names	Typical uses in construction
mortar, pre-mix mortar	stone, brick, and block laying, concrete patching, tile setting on wood or concrete floors

Description
Mortar is a mixture of cement, sand, water and, typically, lime.

Additional considerations
Mortar mix is commonly available in a dry form to be mixed with sand and water on site. Pre-mix contains sand and other ingredients and requires only the addition of water.

Health issues associated with this material
Plain mix mortar has minimal emissions, although some masons may use volatile additives as entraining agents and colourants, and for cold weather use or moisture control. Mortar is often sealed with silicone or other polymer sealers; these may be a source of emissions.

Comments based on experience of the environmentally hypersensitive
Generally, no negative effects are experienced from pure mortar.

Pure mortar is generally tolerated. Check for the presence of additives.

See
cement, concrete block, brick, tile flooring

Components: sand, Portland cement, lime, water; may contain additives or colourants (acrylic, latex, silicone)	**Product Source:** available from building product and masonry suppliers	**Masterformat Number:** N/A

SHINGLES, WOOD

Common product names	Typical uses in construction
cedar and oak shingles, shakes	rustic siding, steep-pitch roofing

Description
Wood shingles are usually made from cedar, but may also be made of pine or oak. Shakes are thicker than shingles. Shingles are usually sawn and are flat, while shakes are usually split and are rough.

Additional considerations
Wood shakes and shingles are subject to fungal attack and may be treated with preservatives and fire retardant. Stains, if used, must be reapplied from time to time, so their use results in higher maintenance costs. Some stains contain wood preservatives. Shingles are often applied over asphalt roofing paper.

Health issues associated with this material
Natural volatile chemicals from cedar or pine can be allergenic for some people. Health effects may be associated with exposure to the solvents and wood preservatives in the stains used for their upkeep.

Comments based on experience of the environmentally hypersensitive
Although the shingles are used on the exterior, odours can enter the house through ventilation openings.

User must test for sensitivity. Check for presence of chemical treatments.

See
clay brick, steel, stucco

Components: cedar or other decay-resistant woods (white oak, cypress, etc.), pine; may contain fire retardants, anti-bleeding treatments, etc.	**Product Source:** available from roofing suppliers and lumber mills	**Masterformat Number:** 07313

SIDING, METAL

Common product names	Typical uses in construction
aluminum siding, steel siding	exterior siding, soffits, fascia, trim, eavestrough, etc.

Description
Metal siding is a durable, low-maintenance siding.

Additional considerations
The siding often has a finish such as baked-on enamel or polyvinyl chloride. Large quantities of siding are used to cover the exterior of a house.

Health issues associated with this material
Emissions from the finish materials may cause problems for some people.

Comments based on experience of the environmentally hypersensitive
A baked-on enamel finish is generally more acceptable than a vinyl finish to sensitive individuals.

User must test.

See
clay brick, steel, stucco

Components: may contain aluminum, steel, polyvinyl chloride, pigments, ultraviolet stabilizers, fibreboard or foam backers	**Product Source:** available from siding and building product suppliers	**Masterformat Number:** 07460

SIDING, VINYL

Common product names	Typical uses in construction
vinyl, PVC siding	exterior sheathing, soffits, fascia, trim, eavestrough, etc.

Description
Vinyl siding is made by coextrusion of two layers of polyvinyl chloride. The top layer contains a pigment, titanium oxide, to provide resistance to breakdown from ultraviolet light. The lower layer contains about 15% calcium carbonate and a small amount of stabilizer to chemically tie up any hydrochloric acid that is produced as the siding ages.

Additional considerations
Vinyl siding is a low maintenance siding, requiring no painting or staining. As it ages, some yellowing, bleaching or "chalking" occurs as a result of exposure to heat, UV light and moisture. It also becomes somewhat more brittle over time.

Health issues associated with this material
Some odours characteristic of vinyl products are produced and enhanced by hot weather and exposure to the sun.

Comments based on experience of the environmentally hypersensitive
Sensitive individuals may find the odours a problem, especially since extensive amounts cover the exterior of a house. The odour may be carried into the interior of the house through ventilation openings.

User must test.

See
clay brick, steel, stucco

Components: polyvinyl chloride, pigments, ultraviolet stabilizers	**Product Source**: available from siding and building product suppliers	**Masterformat Number:** 07464

STUCCO, CEMENT-BASED

Common product names	Typical uses in construction
traditional stucco, 3-coat stucco	exterior wall cladding

Description
Cement-based stucco is a traditional exterior wall finish.

Additional considerations
Asphalt-treated paper and reinforcing wire mesh are often part of a stucco system. Stucco may be modified with plasticizers and additives.

Health issues associated with this material
Cement-based stucco has no negative health properties, although it can be mildly caustic to skin during installation. Asphalt-treated paper has odours. Odours from the paper will be sealed by the stucco finish and are unlikely to result in odours indoors, but asphalt paper is not recommended for use by the environmentally sensitive.

Comments based on experience of the environmentally hypersensitive
Stucco mix (made with sand, Portland cement, lime, and water) is well tolerated by most people. Any other mixes should be individually tested. The asphalt-treated paper may cause problems for some individuals.

This product is generally tolerated and requires low maintenance. Modifiers should be avoided.

See
metal lath, building paper, spunbonded polyolefin

Components: 1st or scratch coat: sand, Portland cement; 2nd or brown coat: sand, Portland cement; may contain lime; 3rd or top coat: sand, Portland cement or white cement, lime; may contain gypsum, lime putty, perlite, mica, colourant, asphalt-treated paper or substitute, metal or expanded metal mesh	**Product Source:** local masonry contractors	**Masterformat Number:** 09203

FLOOR

FLOOR

Floor materials are important in a clean-air home because they cover large areas and require frequent maintenance.

Floors are usually systems with many components, such as underlay, adhesives, wood, carpet or resilient flooring, and often a surface finish. All these elements are potential sources of emissions during installation, in use, and when cleaning and waxing.

Common problems associated with floor systems are emissions from solvents in adhesives, organic vapours from manufactured wood products, volatile compounds from carpets, linoleum and vinyl flooring, and organic vapours from cleaning materials.

Fibrous floor coverings such as carpets can act as sponges to collect, then re-emit odours and emissions from other materials. As well, fibrous floor coverings act as reservoirs for dirt, dust, and moisture. These conditions provide a breeding ground for dust mites, molds, and bacteria, which can be allergenic.

Considerations

- Choose floor systems that contain the lowest emissions possible. The most inert floorings are hard floorings, such as ceramic tile or terrazzo. Polished concrete and hardwood flooring require finishing but are good alternatives.
- Conduct a personal test to see whether the materials are tolerated. Bear in mind that test results using a small sample may not indicate the actual effect of the large quantities used for floors.
- Emissions can come from many components of the floor system. Emissions from the subfloor may be retarded by non-porous floor coverings or sealers. The exposed undersides of the subfloor can still be a source of emissions.
- Consider maintenance and durability when choosing a floor covering. Frequent waxing, sanding, sealing, or replacement of flooring can produce emissions that can adversely affect a sensitive individual.

CARPET

Common product names	Typical uses in construction
carpet, broadloom	floor covering

Description
Carpet is a textile floor covering woven, needle-punched, or felted from natural or synthetic fibres.

Additional considerations
Carpet is often used in large quantities within the living space. Installation may require the use of glues. Cleaning and maintenance may involve the use of chemical products.

Health issues associated with this material
Carpets can be a major source of gaseous emissions and particulates within the living space. Various volatile chemicals have been identified to be emitted by carpets. Sources of these emissions include the chemicals used to bind the fibres together, and treatments used for anti-static and odour control and for soil, stain and pest resistance. Adhesives used to install carpets are also sources of emissions. Underpads and chemical cleaning products are additional sources of emissions.

Carpets trap dirt and allergens such as animal dander and provide a favourable environment for dust mites, fungi and bacteria.

Comments based on experience of the environmentally hypersensitive
The environmentally hypersensitive should avoid the use of carpets. If carpets must be used, choose those made of natural fibres and without chemical treatment. New horizontally woven carpet uses far less material, has fewer emissions, is tightly woven, and is not as likely to hold dirt. Woven or felted carpets generally contain no chemical bonding agents. Nail strips can be used as a fastening alternative to glues. Area rugs that are easy to clean may be an acceptable alternative.

User must test for personal tolerance. Consider cleaning and maintenance required.

See
other flooring materials

Components: may contain nylon, polyester, polypropylene, natural fibres, dyes (face fibre); polypropylene or jute backing; latex, styrene butadiene rubber, calcium carbonate (bonding agents); treatments for anti-static, odour-control, fire, soil and stain resistance; pesticides	**Product Source:** available from carpet and flooring dealers and building product suppliers	**Masterformat Number:** 09680

Ceramic tile, glazed

Common product names	Typical uses in construction
ceramic tile, glazed tile	floor and wall covering, countertops, etc.

Description
Glazed ceramic tile is a clay tile with a fused, glassy surface. The glaze protects the tile from moisture and is decorative.

Additional considerations
Tiles are made specifically for wall or floor use—the right ones should be used. A tile system includes the base, the tile, the adhesive, grout, and possibly a sealer to protect the grout surfaces. On a concrete base, the tile can be set with mortar, which also serves as the grout. Thick-set mortar and thin-set mortar without acrylic are only suitable for installations on concrete. On other surfaces, acrylic modifiers added to the mortar provide a strong, flexible bond.

Grout sealer can be avoided in some instances if the grout is properly cured (according to the manufacturer's instructions) to form a durable joint with a hard surface. Only acid-resistant "sanded" grouts are recommended for durable floors.

Health issues associated with this material
Modified thin-set mortars release volatile emissions during curing (roughly 72 hours). Some grouts may produce emissions. Some glues release intoxicating volatiles. Grout sealers emit solvent vapours.

Comments based on experience of the environmentally hypersensitive
Low-toxicity installations are tolerated well by most people. Non-porous tiles, thin- and thick-set mortars without acrylic modifiers, and well-cured grout can provide a very acceptable system. Acrylic-modified mortars may be acceptable after proper curing but must be tested. Choose larger tiles when possible. This will reduce the amount of grout that is needed. Mildew growth on grout in damp areas (bathrooms) can be prevented by adequate ventilation and frequent cleaning.

Tiles are generally tolerated. Other components of the system must be considered.

See
thin-set mortar (adhesives), thick-set mortar, grout

Components: clay, mineral glaze	**Product Source:** available from ceramic tile, flooring, and building product suppliers	**Masterformat Number:** 09310

CERAMIC TILE, UNGLAZED

Common product names	Typical uses in construction
ceramic tile, quarry tile, unglazed tile	floors, walls

Description
Unglazed ceramic tile is a clay tile without a fused glassy surface. Unglazed tiles are available in many varieties and colours. Tiles range from very porous (absorb water easily) to very dense (do not absorb water).

Additional considerations
Very dense (vitreous or impervious) tiles are the easiest to clean and do not require sealing. Thin-set mortar with acrylic modifiers provide a strong, flexible bond to most surfaces. Unmodified thin or thick-set mortars are only suitable for installations on concrete. In some instances grout sealer can be avoided if the grout is properly cured (according to manufacturer's instructions) to form a durable joint with a hard surface. Whether or not tiles can be cleaned easily is an important consideration for floors. Consult a tile professional when selecting the tile, mortar, and grout.

Health issues associated with this material
Modified thin-set mortars release volatile emissions during curing (roughly 72 hours). Thin-set mortar without modifiers and thick-set mortar installations on concrete produce minimal emissions. Some grout may produce emissions. Some glues release intoxicating volatiles. Grout sealers emit solvent vapours.

Comments based on experience of the environmentally hypersensitive
Low-toxicity installations are tolerated well by most people. Non-porous tiles, low-toxicity mortars, and well-cured grout can provide a very acceptable system. Acrylic-modified mortars may be acceptable after proper curing, but must be tested. Choose larger tiles when possible. This will reduce the amount of grout that is needed. Mildew growth on grout in damp areas (such as bathrooms) can be prevented by adequate ventilation and frequent cleaning.

Tiles are generally tolerated. Other components of the system must be considered.

See
ceramic tile, glazed; thick-set concrete, thin-set mortar, acrylic sealer, grout

Components: clay (high fired)	**Product Source:** available from ceramic tile and flooring suppliers	**Masterformat Number:** 09310

Concrete

Common product names	Typical uses in construction
ready mix, concrete	foundations, slabs, commercial construction

Description
Concrete is a mixture of Portland cement, aggregates (sand and gravel), water, and sometimes admixtures to improve specific qualities of the concrete. Admixtures include air-entraining agents, retarders, plasticizers, and accelerators. Concrete may also contain ash, slag, and glass by-products from industry.

Additional considerations
Concrete mix will vary according to the specific job requirements. Slabs can be polished to a smooth, hard surface.

Health issues associated with this material
Exposed concrete emits dust continuously. It can be sealed with a water-based sealer to reduce dust. Volatile substances may be emitted by form-release agents (oils) and some admixtures. These emissions can be a concern if large quantities of concrete are exposed to the indoor living space. The aggregates can be a source of radon. (Significance depends on the source strength and accessibility to the indoor space.) If not damp-proofed, concrete can wick moisture from the outside, providing growing conditions for molds and mildews.

Comments based on experience of the environmentally hypersensitive
Try to use concrete without admixtures. The concrete will be harder to work, but will be better tolerated by sensitive individuals. Form-release agents, such as vegetable oils or non-toxic soaps, should also be specified. Exposed, unsealed concrete surfaces are sources of dust. Lime, a principal concrete component, is an irritant and may affect sensitive individuals and those with breathing disorders such as asthma and emphysema.

This product is generally tolerated if admixtures, ash, and slag are not used.

See
concrete admixtures, form-release oil

Components: Portland cement, sand, gravel; may contain admixtures, detergents (air entrainment), mica, light perlite, ash, slag, glass, etc.	**Product Source:** available from local concrete suppliers	**Masterformat Number:** N/A

CONSTRUCTION PLYWOOD PANELS

Common product names	Typical uses in construction
spruce, pine, fir plywood; siftwood plywood; construction sheathing	subfloors, structural wall and roof sheathing, tile backing, concrete forms

Description
Construction plywood is a manufactured product comprising cross-laminations of softwood veneers glued together to form wood panels.

Additional considerations
In Canada, construction plywood (Douglas Fir Plywood and Canadian Softwood Plywood) is an unsanded product employing a waterproof adhesive for its production and is rated as an exterior grade product. In the U.S.A., grades are produced for two levels of exposure: for exterior exposure and for construction that will eventually be covered. Currently, all construction plywoods are made with phenol-formaldehyde resin adhesive.

Phenol-formaldehyde resin adhesive supplemented by fillers is used to bind the veneers together. Phenol-formaldehyde is more stable to moisture than urea-formaldehyde resin and produces little formaldehyde emission when properly cured.

Health issues associated with this material
Cutting plywood, or any other wood product, creates dust that can be an irritant. The dust can come from the wood or the resin binders. Heat generated by cutting can volatilize the resinous material.

Comments based on experience of the environmentally hypersensitive
The heat of curing the adhesive under pressure will release terpenes, extractives and other volatile gases during manufacture, some residuals of which are slowly emitted subsequently. Lower rates of release of formaldehyde are expected from construction plywood than from manufactured wood products using urea-formaldehyde adhesives.

Most sensitive individuals find softwood plywood acceptable for interior use if all surfaces are sealed with a laminate or a low-toxicity sealant.

User must test. Sealing is recommended.

See
acrylic sealer, urethane

Components: spruce, pine, fir, poplar, hemlock; phenol-formaldehyde resin; inert fillers (ground bark, wheat flour)	**Product Source:** available from building product suppliers	**Masterformat Number:** 06120

DYED AND SEALED CONCRETE SYSTEMS

Common product names	Typical uses in construction
Lithocrome®	finished concrete floors

Description
Concrete with dyes can provide an attractive finished floor. The surface must be sealed to prevent the release of dust.

Additional considerations
Application of waxes or sealers may be required as routine maintenance.

Health issues associated with this material
Waxes and sealers used with concrete emit volatile substances and can affect health.

Comments based on experience of the environmentally hypersensitive
Sealed concrete with no admixtures poses no health problems. The user must test for personal tolerance to dyes, although the sealer should prevent exposure to the dyes. The visual impact of the colour should also be considered for (negative) psychological effects.

User must test waxes and sealers for personal tolerance.

See
paints, sealers, and coatings, especially acrylic sealers

Components: cement, sand, dyes, sealers (acrylics), and waxes (petroleum solvents)	**Product Source:** L.M. Scofield Co.	**Masterformat Number:** N/A

FIBREBOARD, FORMALDEHYDE-FREE

Common product names	Typical uses in construction
MediteII®, Medex®	underlay, cabinet construction, substrate for laminates

Description
Formaldehyde-free fibreboard is a medium-density fibreboard made from softwood chips with a resin binder. Formaldehyde-free means that the binder used in the manufacture of the fibreboard does not contain formaldehyde.

Additional considerations
Products vary by manufacturer. In *Medex* and *Medite II*, the wood chips are bound together by polyurea resins. MDI-type resins (MDI refers to 4,4' -Diphenylmethane-di-isocyanate) react with the wood to form polyurea resins.

Health issues associated with this material
Wood terpenes may be released by the formaldehyde-free fibreboard. Cutting or sanding produces dust.

Comments based on experience of the environmentally hypersensitive
Formaldehyde-free fibreboard has fewer odours than standard particle board or MDF. Residual odours from the wood can be sealed by lamination or sealing with an appropriate sealant. Some companies laminate the fibreboard in the factory.

Sensitive individuals should test this material for acceptability.

See
plywood

Components: softwood chips, polyurea resin, paraffinic and mineral wax	**Product Source:** available from building product suppliers, Medite Corporation distributors, Rodman Industries	**Masterformat Number:** 06102

FIBREBOARD, RECYCLED

Common product names	Typical uses in construction
	flooring underlayment, roof decking, insulating sheathing, sound isolation board

Description
Recycled fibreboard is a sheet material made from 100% recycled newsprint or cardboard boxes.

Additional considerations
Although there are no urea-formaldehyde or asbestos additives, recycled fibreboard may contain glue, ink, formaldehyde, and other residues from the original product. It may also be treated to resist termites, moisture, rot, and fungi.

Health issues associated with this material
Slight to moderate odours may be noticed, possibly from ink residues and binders.

Comments based on experience of the environmentally hypersensitive
There is a potential for significant odours within the living space when large quantities of fibreboard are used as underlayment.

This product is not generally tolerated for indoor use by sensitive individuals.

See
construction plywood

Components: recycled newsprint, non-formaldehyde binder; may contain fire retardant, biocide (often copper metaborate)	**Product Source:** N/A	**Masterformat Number:** 06120

Flagstone, slate, and stone

Common product names	Typical uses in construction
flagstone, slate, slate tile, stone	flooring, patio surface

Description
Flagstone and slate are "flat" stones used for flooring. Flagstone is usually soft, porous sandstone, while slate is hard and non-porous. Synthetic or composite "stone" is now available.

Additional considerations
A flagstone and slate system includes several elements: the base, stone, mortar, grout, and possibly a sealer to protect the grout and stone surfaces. Low-toxicity mortars and grouts can be chosen to avoid glues and acrylic-modifiers.

Health issues associated with this material
Installations using unmodified or specially modified mortar to set the stone, and Portland cement mortar to grout the joints, are the best choices for people who want a low-toxicity system. Unmodified thin-set mortar adhesive produces low emissions. Some grout may produce emissions. Grout sealer can be avoided in some instances if the grout is properly cured (according to manufacturer's instructions) to form a durable joint with a hard surface. Acid-resistant "sanded" grouts are recommended for durable floors.

The stone is inert, although it may be a source of radon. Powdering may also occur, depending on the type of stone.

Comments based on experience of the environmentally hypersensitive
Low-toxicity installations with natural stone are tolerated well by most people. Flagstone or slate, low-toxicity mortars, and well-cured grout can provide a very acceptable system. It should be tested for radon if intended for extensive indoor use.

This product is generally tolerated. Consider all components of the system.

See
thin-set mortar, acrylic sealer, grout

Components: natural stone	**Product Source:** available from flooring and ceramic tile suppliers	**Masterformat Number:** 04440

GROUT

Common product names	Typical uses in construction
tile or floor grout	grouting ceramic tile or slate floors and walls

Description
Grout is used to fill in the joints between ceramic tiles or slate. It provides additional bonding and strength to the floor or wall installation.

Additional considerations
Grouts for floors are often sand and Portland cement-based to provide a durable joint. Some grouts have acrylic additives that reduce the water absorption and setting time and increase the strength. Grout is usually sold "dry" to be mixed with water before application. Epoxy grouts also provide an extremely hard joint.

Health issues associated with this material
Some individuals may be affected by the emissions sometimes produced in the curing process by additives in sand and cement. Epoxy grout produces volatile emissions and is very irritating to skin during installation and while curing. Once cured (roughly 72 hours), it is considered to be inert and is approved for direct use in potable water.

Comments based on experience of the environmentally hypersensitive
When choosing a commercial grout, select a type that has the least odour. Ventilation during the curing period may allow the use of a grout with some additives; however, personal testing is essential for sensitive individuals.

Select a grout that has the least odour. Seal if necessary.

See
thick-set mortar

Components: may contain sand, Portland cement, polymers, acrylic modifiers	**Product Source:** available from ceramic tile suppliers and Mapei Canada Inc. distributors	**Masterformat Number:** 03600

HARDWOOD FLOORING, PARQUET

Common product names	Typical uses in construction
parquet	finish flooring

Description
Hardwood parquet flooring is a "tile" of small hardwood strips that may be wired or glued together. Some parquet flooring consists of veneer hardwood bonded onto a plywood base.

Additional considerations
Parquet flooring is available in both pre-finished and unfinished wood. If unfinished, sanding will be required and a finishing product, such as urethane, acrylic, or "Swedish" oil, will have to be applied. Parquet is bonded to a panel subfloor with an adhesive.

Health issues associated with this material
Sanding the flooring creates dust that may be irritating to some people. Adhesives, sealers, and finishes emit volatile substances that may have negative health effects. These emissions can be significant from large floor areas. Some individuals may have sensitivities to the wood types used in the flooring.

Comments based on experience of the environmentally hypersensitive
The parquet flooring itself is only one component of a parquet flooring system. All components—subfloor material, adhesives, tile (wood type, glue, pre-finish), and finishing—must be considered and tested for personal tolerance before choosing this system. If low-toxicity adhesives are used to apply pre-finished flooring, parquet is often tolerated by sensitive individuals. However, because of the quantities and varieties of the materials used in a parquet flooring system, personal testing is essential.

User must test.

See
adhesives; paints, sealers, and coatings; other flooring types

Components: hardwoods, glues (polyvinyl acetate), oils, acrylic, urethane, waxes	**Product Source:** available from flooring and building product suppliers	**Masterformat Number:** 09570

HARDWOOD FLOORING, PLANK OR STRIP

Common product names	Typical uses in construction
solid maple, oak, and birch floor, strip oak floor, tongue-and-groove flooring	finish flooring

Description
Hardwood plank or strip flooring is solid wood flooring, usually 3/4" thick. Hardwood laminated flooring is a thinner flooring, 3/8" thick*. Some veneer hardwood on a base of composite wood may have the appearance of plank flooring.

* typically made of three layers of wood.

Additional considerations
Types of hardwood used vary. Hardwood flooring is available in both unfinished and finished wood. Unfinished flooring requires sanding and finishing with a protective coating, such as polyurethane. Flooring is usually edge-nailed into the subfloor.

Health issues associated with this material
Sanding the flooring creates irritating dust. Sealers, fillers, and finishes emit volatile substances that may have negative health effects. Emissions from large floor areas can be significant. Some individuals may have sensitivities to the wood types used in the flooring. Pre-finished flooring is often laid over felt or waxed kraft paper.

Comments based on experience of the environmentally hypersensitive
The hardwood flooring itself is only one component of the flooring system. All components—subfloor material, wood type, pre-finish, and finishing—must be considered for suitability before choosing this system. Because of the quantities used and the many materials in a hardwood flooring system, personal testing is essential.

This is a good floor system if all the materials are chosen carefully. Verify that the plank flooring is not veneer.

See
paints, sealers, and coatings; other flooring types

Components: hardwoods (oak, maple, beech, ash, etc., or hard softwoods); may use fillers, levellers, and finishes ,	**Product Source:** available from hardwood flooring companies	**Masterformat Number:** 09561

LINOLEUM

Common product names	Typical uses in construction
traditional "battleship" linoleum, natural linoleum	finish floors, wet and heavy traffic areas

Description
Linoleum is a sheet flooring made from natural materials. It may have a pre-waxed surface, usually of a metallic wax.

Additional considerations
Linoleum can be laid "dry," avoiding glues. It does not slip or shrink. Regular maintenance is recommended.

Health issues associated with this material
The use of linoleum avoids some of the significant problems associated with other flooring systems, such as the volatile emissions from large amounts of synthetic flooring materials. However, odours are also emitted by wood and cork dusts, linseed oil, resins, and the sealers and waxes used. The odours may pose problems for some people.

Comments based on experience of the environmentally hypersensitive
Linseed oil is mildly anti-bacterial and helps prevent sour smells from food spills. Odours from linoleum may be unacceptable to sensitive individuals.

Most products have distinct odours. User must test.

See:
vinyl sheet flooring

Components: linseed oil, jute, cork dust, wood dust, chalk, pigments; may have a polyurethane coating or metallic polish	**Product Source:** available by special order from flooring suppliers	**Masterformat Number:** 09665

Softwood flooring, plank or strip

Common product names	Typical uses in construction
spruce, pine, fir, hemlock, etc.	finish flooring, subflooring

Description
Softwood planking consists of solid wood strip flooring. Boards used for finish flooring are tongue-and-groove, while those used for subfloors have butt joints.

Additional considerations
Unfinished softwood used as final flooring will require sanding and finishing with a protective coating. According to the moisture content in the air, softwood plank flooring will expand and shrink more than hardwood and possibly expose the untreated subfloor and plank edges to the living space. All wood flooring should be acclimatized before installation by being stored under the same conditions as where it will be installed.

Health issues associated with this material
Softwoods release volatile chemicals that can be allergenic for some people. Finishes used on softwood flooring may release various volatile substances.

Comments based on experience of the environmentally hypersensitive
Some softwoods used as flooring are more easily damaged than hardwood and may require more frequent maintenance. Regular maintenance can be problematic for some individuals.

User must carefully test the softwood.

See
urethane, acrylic sealer, hardwood flooring, plank or strip

Components: spruce, pine, fir may be anti-sapstain treated (less likely if kiln-dried)	**Product Source:** available from flooring suppliers	**Masterformat Number:** 09550

Terrazzo, Portland cement system

Common product names	Typical uses in construction
terrazzo	finish floors (commercial)

Description
Terrazzo flooring (Portland cement system) is a hard, polished flooring divided into "tiles" by brass strips.

Additional considerations
Terrazzo is a mixture of marble chips and cement. Once the mixture hardens, the surface is ground and sealed. Unsealed marble is porous and can adsorb and release volatile contaminants. This flooring is rarely used in large quantities in residential construction.

Health issues associated with this material
Grinding during application creates dust. The sealers and waxes used with terrazzo emit volatile substances that may have negative health effects.

Comments based on experience of the environmentally hypersensitive
The user must test sealers and waxes for personal tolerance.

This product is generally tolerated, but user must test.

See
ceramic tile

Components: Portland cement, sand, dyes, marble chips, brass	**Product Source:** available through specialty flooring suppliers	**Masterformat Number:** 09410

VINYL COMPOSITION TILE

Common product names	Typical uses in construction
vinyl tile	finish floor, wet and heavy traffic areas

Description
Vinyl tiles are made from polyvinyl chloride resins, usually by injection moulding or dispersion coating. Vinyl tile is available as true or homogeneous vinyl tile, or vinyl composition tile. True vinyl tile contains a higher proportion of polyvinyl chloride resins to fillers than does vinyl composition tile. Typical vinyl composition tile is approximately 15% polyvinyl chloride and 85% calcium carbonate, an inert filler. Plasticizers are generally not needed or are used in much smaller amounts in vinyl composition tiles than in true vinyl tile or sheet vinyl flooring. Some other additives, such as pigments and stabilizers, may be added.

Additional considerations
Vinyl composition tile requires regular maintenance, such as waxing. Heavy wear may necessitate periodic replacement of tiles.

Health issues associated with this material
Low-level emissions from vinyl products are enhanced by heat and exposure to the sun. The adhesives used to install the tiles may be a source of offgassing. The odours of some adhesives, which are formulated to remain flexible, may persist for a long time. The sealers and waxes used are also a source of emissions.

If installed on a substrate which is likely to have some dampness, e.g., concrete without a vapour barrier, fungi can grow underneath the tile.

Comments based on experience of the environmentally hypersensitive
Vinyl composition tile is preferable to homogeneous vinyl tile. Select vinyl composition tile with the lowest polyvinyl chloride content and the least odour. Select a low odour adhesive. Old formulations of vinyl tile contained asbestos and require caution when handling. Vinyl composition tile has less odour than sheet vinyl flooring.

User must test.

See
ceramic tile, vinyl sheet flooring, adhesives, acrylic sealer

Components: polyvinyl chloride, inert filler (glass, calcium carbonate or other mineral fibre), plasticizer, pigment, stabilizer; may have urethane finish coating	**Product Source:** available from flooring suppliers	**Masterformat Number:** 09360

VINYL SHEET FLOORING

Common product names	Typical uses in construction
resilient floor, cushion floor	finish floor, wet and heavy traffic areas

Description

Sheet vinyl flooring is made by layering polyvinyl chloride resin over a backing material such as paper or foamed plastic. Plasticizers are added to the resin to impart flexibility. Other additives such as fungicides may be present.

Vinyl sheet flooring has a much higher content of polyvinyl chloride than vinyl composition tile.

Additional considerations

Vinyl flooring can be installed on many surfaces, but installation requirements vary with the specific flooring. Vinyl sheet flooring requires use of maintenance products such as cleaners and waxes.

Health issues associated with this material

Volatile chemicals are released by vinyl sheet flooring. Emissions that have been identified include solvents carrying the plasticizers, and decomposition products from the plasticizers. The adhesives used to install vinyl sheet flooring can be a source of emissions, especially in new installations and possibly for an extended period of time after. As some adhesives are formulated to remain flexible, they can be a source of odours for a prolonged period. Waxes and cleaners used for maintenance contribute their own emissions.

If installed on a substrate that is likely to have some dampness, e.g., concrete without a vapour barrier, fungi can grow underneath the vinyl sheet.

Comments based on experience of the environmentally hypersensitive

The strong odours from new vinyl flooring can affect sensitive individuals.

Residual odours from older vinyl sheet flooring may be due to the slow degradation of the polyvinyl chloride polymer.

This product is not recommended.

See

adhesives, vinyl composition tile

Components: polyvinyl chloride, plasticizers, coatings (urethanes), backings (natural and synthetic textile fibre), glues	**Product Source:** available from flooring suppliers	**Masterformat Number:** 09650

FOUNDATION

FOUNDATION

Concrete is the most widely used foundation material. Poured concrete is used for foundation walls and slabs; prefabricated concrete blocks are used for walls. Pressure-treated wood is also being used for foundations in some regions.

Emissions from foundation materials exposed to the interior can reduce the air quality in a home. Common problems associated with foundation materials are related to emissions from concrete and concrete mortar additives, form-release oil residues, and asphalt-based damp-proofing materials.

Moisture-related problems, often associated with improper foundation drainage, may also affect health. To avoid conditions that will promote the growth of molds and mildews, use a proper backfill system, including drainage materials, such as drain pipe and crushed rock to drain away excess water.

Considerations

- Concrete mixtures vary greatly. There is often a choice in types and amounts of additives that are needed to make the concrete for a specific job.
- Vegetable oils, non-toxic detergents spread on forms, or tightly stretched 6 mil polyethylene film can be substituted for form-release oil.

CEMENT

Common product names	Typical uses in construction
Portland cement, white cement	concrete, mortar, grout, stucco

Description
Cement is the component of concrete that causes hardening. It hydrates with part of the water in concrete mixes, but can dehydrate (especially if poorly cured) and become slush again.

Additional considerations
Cement generates dust continuously. Precautions should be taken to prevent respiratory or skin irritation.

Health issues associated with this material
There are generally no volatile emissions from cement, but cement dust can be an irritant.

Comments based on experience of the environmentally hypersensitive
Cement dust should be avoided, especially by people who suffer from respiratory conditions such as asthma.

This product is generally tolerated. Ensure there are no additives in the concrete.

See
concrete, mortar

Components: lime, silica, alumina, iron oxide, magnesia	**Product Source:** available from building product suppliers and concrete product suppliers	**Masterformat Number:** 03050

CONCRETE

Common product names	Typical uses in construction
ready mix, concrete	foundations, slabs, commercial construction, fire and acoustic topping on wood floors

Description
Concrete is a mixture of Portland cement, aggregates (sand and gravel), water, and sometimes admixtures to improve specific qualities of the concrete. Admixtures include air-entraining agents, retarders, plasticizers, and accelerators. Concrete may also contain ash, slag, and glass by-products from industry.

Additional considerations
Concrete mix will vary according to the specific job requirements. Slabs can be polished to a smooth, hard surface.

Health issues associated with this material
Exposed concrete emits dust continuously. It can be sealed with a water-based sealer to reduce dust. Volatile substances may be emitted by form-release agents (oils) and some admixtures. These emissions can be a concern if large quantities of concrete are exposed to the indoor living space. The aggregates can be a source of radon. (Signifigance depends on the source strength and accessibility to the indoor space.) If not damp-proofed, concrete can wick moisture from the outside, providing growing conditions for molds and mildews.

Comments based on experience of the environmentally hypersensitive
Concrete suppliers can provide concrete without admixtures. The concrete will be harder to work, but will be tolerated better by sensitive individuals. Form-release agents, such as vegetable oils or non-toxic detergents, should also be specified. Lime, a principal concrete component, is an irritant and may affect sensitive individuals and those with breathing disorders such as asthma and emphysema.

This product is generally tolerated if admixtures are not used. Specify concrete without industrial ash and slag.

See
concrete admixtures, form-release oil

Components: Portland cement, sand, gravel; may contain admixtures, detergents (air entrainment), mica, light perlite, ash, slag, glass, etc.	**Product Source:** available from local concrete suppliers	**Masterformat Number:** 03300

Concrete admixtures

Common product names	Typical uses in construction
fluidizers, retardants, water reducers, accelerators, air-entraining agents, plasticizers	high-strength concrete, slabs, cold weather concrete, topping or self-levelling concrete

Description
Concrete admixtures are ingredients added to Portland cement, water and aggregate mixture. Their purpose is to modify certain characteristics of concrete such as strength, frost resistance, curing time and workability.

Additional considerations
Various chemicals are used for each type of admixture. Air-entraining admixtures may be synthetic detergents, sulphonated lignin salts, salts of petroleum acids or salts of sulphonated hydrocarbons. Superplasticizers may consist of melamine-formaldehyde or phenol-formaldehyde condensates. Examples of water reducers are lignosulphates or hydroxylated carboxylic acids.

Health issues associated with this material
Any emissions would depend on the types of chemicals added.

Comments based on experience of the environmentally hypersensitive
Experience of hypersensitive individuals has shown that concrete without admixtures is better tolerated.

With the exception of mineral additives, such as gypsum, mica, and calcium chloride, admixtures for concrete exposed to the living space should be tested.

See
concrete

Components: *fluidizers and water reducers*: e.g. melamine-formaldehyde, sulphonate, lignosulphonates; water soluble oils, latex; *retardants*: e.g., gypsum; *extenders*: e.g., mica; *accelerators*: e.g., calcium chloride; *air-entraining agents*: e.g., detergents	**Product Source:** available from concrete suppliers	**Masterformat Number:** 03062

CONCRETE BLOCK

Common product names	Typical uses in construction
block, cinder block	foundation walls, commercial construction, landscaping

Description
Concrete block is block made from cement, aggregates, and water.

Additional considerations
Sand and gravel are the common aggregates used in concrete; however, lightweight aggregates such as cinders, mica, and polystyrene beads are also used.

Health issues associated with this material
Concrete block itself has negligible emissions. Concrete block is very porous and absorbs moisture and odours that may bother some people. Sealers can be used but their properties must be considered. The lightweight aggregates may contain contaminants. Extensive amounts of concrete block in the indoor space may be a source of radon.

Comments based on experience of the environmentally hypersensitive
Special concrete blocks using selected constituent materials can be made for applications that require them.

Check aggregates used. Test sealers if used.

See
concrete, mortar

Components: concrete—low water content; sometimes lightweight aggregates	**Product Source:** available from local concrete and building product suppliers	**Masterformat Number:** 04220

Crushed rock

Common product names	Typical uses in construction
gravel, navvy jack, landscape gravel	foundation base, concrete, landscaping, roofing

Description
Crushed rock is used in many areas and applications on a building site.

Additional considerations
The size and type of crushed rock will depend upon the specific application.

Health issues associated with this material
The handling of crushed rock releases dust that may be more or less hazardous depending on the rock itself. Chronic exposure to dust may cause respiratory problems.

Comments based on experience of the environmentally hypersensitive
Crushed rock may be a source of radon. This can be a significant problem indoors, for example when crushed rock is used for thermal storage.

This product is generally tolerated.

See
N/A

Components: crushed granite, basalt, limestone, etc.	**Product Source:** available from local aggregate suppliers	**Masterformat Number:** 03061

DAMP-PROOFING, ASPHALT

Common product names	Typical uses in construction
foundation coating, damp-proofing, asphalt emulsion	damp-proofing foundations below grade

Description
Asphalt damp-proofing is a petroleum-based waterproofing material.

Additional considerations
The application of asphalt damp-proofing, especially by spraying, releases asphalt particles and dispersants.

Health issues associated with this material
Asphalt releases substances that are hazardous if inhaled or absorbed through the skin. Asphalt damp-proofing may contain irritants and carcinogens, e.g., polynuclear aromatics. Since it is used outside and below ground level, it is relatively safe once applied, but if the interior is not sealed, odours may be apparent to the very sensitive. Odours can also enter the building through cracks, floor drains, door sills, air intakes, etc.

Comments based on experience of the environmentally hypersensitive
Asphalt damp-proofing should not be used above ground.

This product is not recommended. If used, ensure that it is sealed out of the interior space. Cementitious coatings are an alternative.

See
damp-proofing, cementitious

Components: asphalt; may contain glycol dispersants and detergents	**Product Source:** available from building product suppliers	**Masterformat Number:** 07160

DAMP-PROOFING, CEMENTITIOUS

Common product names	Typical uses in construction
foundation sealer, *Xypex®*, *Sta-Dri*, *Thoroseal*	foundation coatings; also formulated for crack sealer, interior basement repairs, water leak plugging

Description
Cementitious damp-proofing is a Portland cement-based waterproofing material.

Additional considerations
Cementitious coatings do not have the elasticity of asphalt-based coatings but are more resistant to water and aging. Products vary by manufacturer.

Health issues associated with this material
Cementitious damp-proofing has negligible volatile emissions, although damp-proofing containing acrylic additives may produce some. Since foundation coatings are applied outside, this is not a significant concern. If repairs are done inside, emissions may occur. Cementitious damp-proofing is preferable to asphalt-based for sensitive people.

Comments based on experience of the environmentally hypersensitive
Acrylic additives may be irritants to sensitive individuals.

This product is generally tolerated but user must test.

See
damp-proofing, asphalt

Components: modified Portland cement; other silicates; formulations vary, may contain acrylic additive	**Product Source:** available from building product suppliers	**Masterformat Number:** 07175

DRAIN PIPE, FOUNDATION

Common product names	Typical uses in construction
Big O	perimeter drains, drain leads, window wells

Description
Foundation drain pipe may be flexible or rigid plastic.

Additional considerations
Drain pipe is used primarily outside the foundation.

Health issues associated with this material
No negative health properties are associated with this material. However, foundation drains are sometimes interconnected with sump and basement drains. If so, a secure trap must be used to prevent drains from being a source of soil gases.

Comments based on experience of the environmentally hypersensitive
Proper foundation drainage is essential for preventing moisture conditions that promote the growth of molds and mildews in basements.

This product is generally tolerated.

See
drain tile

Components: high-density polyethylene; may be perforated; may contain pigments; may be wrapped with geotextile	**Product Source:** available from building product suppliers	**Masterformat Number:** 02723

Drain tile

Common product names	Typical uses in construction
clay drain tile, concrete drain tile, plastic drain tile	perimeter drains, foundation drains, septic fields

Description
Drain tile is pipe used to drain the foundation, site, and septic fields.

Additional considerations
Concrete drain tile may be reinforced with asbestos or other fibre additives.

Health issues associated with this material
No negative health effects are associated with clay or concrete drain tile. Drains connected to basement floors, however, can be a source of soil gas if a secure trap is not used.

Comments based on experience of the environmentally hypersensitive
Proper foundation is essential for preventing moisture conditions that promote the growth of molds and mildews in basements.

This product is generally tolerated.

See
drain pipe, foundation

Components: kiln-fired clay, concrete, or polyvinyl	**Product Source:** available from building product, concrete, and masonry suppliers	**Masterformat Number**: 02700

FORM-RELEASE OIL

Common product names	Typical uses in construction
form oil, release coating	coating concrete forms to aid removal

Description
Form-release oils are petroleum-based oils used to coat concrete forms. The oils prevent the concrete from sticking to the forms.

Additional considerations
The use of form-release oils results in an oily residue on the concrete surface.

Health issues associated with this material
Oil odours from form-release oils cause problems for many people.

Comments based on experience of the environmentally hypersensitive
Concrete suppliers are sometimes willing to use coated plywood instead of form-release oils or to substitute alternatives to petroleum, such as an odourless vegetable oil (olive), wax, or polyethylene film stretched tight in the forms. Another alternative that has been used successfully is Nature Clean, a concentrated biodegradable detergent. Block walls do not require forms.

This product is not recommended. Use alternative release agents.

See
concrete, cement block

Components: petroleum oils	**Product Source:** available from local concrete suppliers; alternative oils available from food stores	**Masterformat Number:** 03151

MORTAR

Common product names	Typical uses in construction
mortar, pre-mix mortar	stone, brick, and block laying, concrete patching, tile setting on wood or concrete floors

Description
Mortar is a mixture of cement, sand, water, and lime.

Additional considerations
Mortar mix is commonly available in a dry form to be mixed with sand and water on site. Pre-mix contains sand and other ingredients and requires only the addition of water.

Health issues associated with this material
Unmodified plain mix mortar has negligible emissions, although some masons may use volatile additives as entraining agents and colourants, and for cold weather use or moisture control. Mortar is often sealed with silicone-based or other polymer sealers. These can off-gas into the living space when the mortar is used indoors.

Comments based on experience of the environmentally hypersensitive
Aggregate materials (sand or gravel) may be a source of radon. The significance depends on the source strength and accessibility to the interior space.

This product is generally tolerated without additives.

See
cement, concrete block, brick, tile flooring

Components: sand, Portland cement, lime or mortar cement, water	**Product Source:** available from building suppliers	**Masterformat Number:** 04130

PRESSURE-TREATED LUMBER

Common product names	Typical uses in construction
oxide treated lumber, CCA-treated lumber	treated wood foundations, mud sills, deck framing, deck surface

Description

Pressure-treated lumber is softwood lumber treated with wood preservatives to protect against decay. The most common preservative is chromated copper arsenate, CCA, a formulation of chromium, copper, and arsenic salts. The preservative is applied as a water-borne solution under high pressure in special treatment plants. The chemicals retained by the lumber undergo chemical reactions within the wood, which are referred to as fixation. The characteristic greenish colour of CCA is imparted to the treated wood. CCA is a pesticide registered for pressure treatment of wood in Canada under the Pest Control Products Act.

Ammoniacal copper arsenate (ACA) is also registered for pressure treatment of wood but is less commonly used. Lumber for outdoor uses or industrial applications is sometimes treated with creosote.

Additional considerations

Some of the chemicals may not be fixed and can leach out. A white surface residue indicates that CCA precipitated out of the solution.

Health issues associated with this material

Health concerns relating to pressure-treated wood include inhalation and eye or skin contact with sawdust or CCA surface residues or leachable CCA. Moisture (in wet wood or perspiration from hands) increases the skin absorption of CCA.

Pressure-treated wood should not be burned in an open fire or wood stove. Pressure-treated wood should not be handled, stored or used inside the house.

Comments based on experience of the environmentally hypersensitive

Decay-resistant woods, such as cedar, have been used outdoors without treatment. Alternative designs can minimize or avoid the use of wood in areas which are subjected to moisture.

The environmentally hypersensitive should not use this material.

See

concrete, treated wood

Components: softwood treated with chromated copper arsenate (CCA), or other pesticides, may contain pigments, water repellents	**Product Source:** available from building product suppliers	**Masterformat Number:** 06301

PRESSURE-TREATED PLYWOOD

Common product names	Typical uses in construction
CCA-treated plywood	pressure-treated wood foundations

Description
Pressure-treated plywood is softwood plywood that has been chemically treated with preservatives, under high pressure, in special treatment plants. The most common preservative used is chromated copper arsenate, or CCA. The pressure treatment forces the aqueous solution of the preservative into the wood.

CCA is a pesticide registered for pressure treatment of wood in Canada under the Pest Control Products Act.

Additional considerations
Not all the CCA may be fixed and can leach out. Plywood with a large surface-to-volume ratio will leach more CCA than wood with a low surface-to-volume ratio, such as a 4 X 4 post.

Health issues associated with this material
Health concerns relating to pressure-treated plywood for installers include eye or skin contact, inhaling or ingesting sawdust, CCA surface residues or unfixed CCA. Moisture (in wet wood or perspiration from hands) increases the skin absorption from CCA.

Pressure-treated plywood should not be burned in an open fire or wood stove. Pressure-treated plywood should not be handled, stored or used inside the house.

Comments based on experience of the environmentally hypersensitive
Pressure-treated plywood is used primarily for exterior basement sheathing. Alternative designs can minimize or avoid the use of wood in areas which are subjected to moisture.

The environmentally hypersensitive should not use this material.

See
pressure-treated lumber, concrete

Components: softwood plywood, typically Douglas fir, made with phenol-formaldehyde resins and treated with chromated copper arsenate (CCA)	**Product Source:** available from building product suppliers	**Masterformat Number:** 06301

REINFORCING STEEL

Common product names	Typical uses in construction
Rebar, slab mesh, steel mesh, wire mesh	concrete reinforcement

Description
Reinforcing steel is used to give concrete additional strength.

Additional considerations
Coated reinforcing steel will release hazardous substances if welded or flame cut.

Health issues associated with this material
Reinforcing steel has minimal volatile emissions. Once encased in concrete, it has no contact with the living space of the house.

Comments based on experience of the environmentally hypersensitive

This product is generally tolerated.

See
concrete

Components: steel; may have corrosion-resistant coatings: zinc chromate, epoxy resin	**Product Source:** available from scrap metal yards and steel suppliers	**Masterformat Number:** 03200

GASKETS AND WEATHERSTRIPS

GASKETS AND WEATHERSTRIPS

Gaskets and weatherstrips are used to seal joints to prevent air leakage. Gaskets are used as sill plate seals, in airtight drywall systems, and in post-and-beam construction. Weatherstrips are used as window and door seals.

Gaskets and weatherstrips are made from various rigid and semi-rigid materials that are chemically more stable than flowable sealants, such as caulking. However, emissions from gaskets and weatherstrips inside the home, such as weatherstrip heated by sunlight, can affect sensitive individuals.

Considerations

- Choose gaskets and weatherstrips with the lowest odours.
- Choose the appropriate product for the job to be done. Natural Resources Canada has produced a consumer fact sheet, *Weatherstripping*.

Magnetic seals

Common product names	Typical uses in construction
magnetic strips	weather seal for windows and doors

Description
Magnetic seals are two-part systems: a magnetic strip inside vinyl or other material, attached to the door or window, and a metal strip attached to the frame.

Additional considerations
Magnetic seals may not provide a good seal in cold temperatures.

Health issues associated with this material
If vinyl is a component, it may emit odours in the living space.

Comments based on experience of the environmentally hypersensitive
Consider the number of magnetic seals to be used and whether odours will be a problem.

For extensive door and window use, select less odorous products.

See
other weatherstrips

Components: vinyl, magnetic strip, metal	**Product Source:** part of door or window assemblies	**Masterformat Number:** 07900

NEOPRENE RUBBER SEALS

Common product names	Typical uses in construction
building gasket	air seals between frame members, post-and-beam construction, weatherstrip, cast iron (and other) pipe, mechanical joints

Description
Neoprene rubber is used in compression seals.

Additional considerations
Seals may be installed with adhesives or by mechanical means (staples or nails).

Health issues associated with this material
Neoprene rubber seals emit a characteristic rubber odour.

Comments based on experience of the environmentally hypersensitive
Neoprene should be avoided by individuals with environmental sensitivities. If there is no alternative for the intended use, seal off from the indoor living space.

Indoor use should be avoided.

See
PVC gasket

Components: polychloroprene rubber: may be foamed; may use adhesives	**Product Source:** N/A	**Masterformat Number:** 07911

PLASTIC WEATHERSTRIP

Common product names	Typical uses in construction
V-strip, *O-strip*, *P-strip*, tube seals	sliding or compression seals for doors and windows

Description
Plastic weatherstrips are made of various plastics and are typically used as compression seals or sliding seals.

Additional considerations
Plastic weatherstrip can become brittle in cold weather.

Health issues associated with this material
Plastics used are typically stable and are ultraviolet and temperature resistant. The amounts of plastic weatherstrip used in the living space are small and therefore are not critical.

Comments based on experience of the environmentally hypersensitive
Since materials vary greatly, each product should be tested for individual acceptability.

Test individual products.

See
other weatherstrips

Components: polypropylene, polyvinyl chloride; may use adhesive; may contain UV retardants; plasticizers	**Product Source:** part of door and window assemblies; available from weathersealing suppliers	**Masterformat Number:** 07911

PVC GASKET

Common product names	Typical uses in construction
gasket	airtight drywall installation, draft sealing of framing members, post-and-beam construction, door and window weatherstrip

Description
PVC (polyvinyl chloride) gaskets are used to seal joints to prevent air leakage.

Additional considerations
The gaskets are semi-rigid.

Health issues associated with this material
PVC gasket is generally present in small quantities in the living space, although some airtight drywall approach (ADA) systems may use large amounts. The adhesive used to install it may release a slight odour.

Comments based on experience of the environmentally hypersensitive
The gasket is only one component in an ADA system. The user must test not only the gasket, but also all other components.

User must test.

See
airtight drywall approach

Components: polyvinyl chloride foam, blowing (foaming) agents, adhesive	**Product Source:** available through building product suppliers	**Masterformat Number:** 07910

URETHANE GASKET

Common product names	Typical uses in construction
urethane gasket	airtight drywall installation, draft sealing of framing members, post-and-beam construction, door and window weatherstrip, log construction

Description
Urethane gaskets are open-cell, semi-rigid foam gaskets used to seal joints.

Additional considerations
Urethane gaskets form a pressure seal to prevent air leakage.

Health issues associated with this material
Urethane gaskets have minimal emissions, although there may be a slight odour. Adhesives used to install the gasket may release odours.

Comments based on experience of the environmentally hypersensitive
Gaskets and adhesives should be tested for acceptability.

User must test.

See
other gaskets

Components: polyisocyanurate foam, adhesives	**Product Source:** available through building product suppliers; may need to order from manufacturer	**Masterformat Number:** 07910

INSULATION

INSULATION

There are many insulation materials available in the marketplace. Insulation can be loose (e.g., blown glass or cellulose fibre and poured rock wool), in batts (e.g., glass fibre or rock wool), or rigid (e.g., polystyrene board or glass fibre board). The insulation may also be in a "wet" form as a slurry or suspension that is pumped into the space being insulated. The insulative value (R-value) depends on the insulation material and its form.

Insulation materials can release particulate and gaseous pollutants. Particulate contaminants can come from the insulation material or chemical additives used to treat the insulation. Gaseous contaminants can come from the resin binders holding the insulation fibres together, from chemical treatments, or from gaseous propellants used in the installation of certain types of insulation.

Considerations

- When choosing insulation materials, the specific requirement may limit your insulation choices. Select a material appropriate for the job, with the least possible emissions.
- A well-sealed, continuous air barrier will prevent the infiltration of contaminants into the living space.
- Most fibrous insulation products are hazardous during installation. Proper respiratory equipment and protective clothing should be worn by the installer.
- Insulation products vary greatly by manufacturer, production lot, and region.
- New types of insulation using recycled materials and "waste" products are appearing in the marketplace. While recycled materials may be an environmentally sound choice, they should be carefully screened for unexpected odours before they are used by people with environmental sensitivities.

CELLULOSE FIBRE

Common product names	Typical uses in construction
loosefill insulation	ceiling insulation; sometimes blown into walls, especially in old construction

Description

Cellulose fibre insulation is loose insulation made from recycled newspaper. The paper is shredded and subjected to fiberization, a process to disaggregate the paper to the original fibres.

Chemicals, up to 20% by weight, are added to provide fire-retarding properties to the insulation. The most common chemicals used are boric acid, sodium borate (borax) and ammonium sulfate. Cellulose has the ability to absorb moisture. Boric acid and sodium borate provide not only fire retardancy to the insulation, but also resistance to mold, insects, rodents and corrosion.

Additional considerations

Cellulose insulation can be installed dry-blown or wet-sprayed. It is blown or poured into attics or dry-blown into walls. Wet-spray has water and sometimes binders added to make it stick when sprayed into wall cavities. With wet-spray process, a drying period may be required prior to enclosing the cavity.

Health issues associated with this material

Cellulose fibre insulation is dusty and those who work with it require proper respiratory protection. The dust from the insulation consists of cellulose dust and fire-retardant chemicals. Borates and boric acid can be absorbed in the skin through a cut or bruise. It is possible that inhaled dust can release boric acid into the lung tissues. During installation, proper clothing and dust protection should be worn.

Dust may infiltrate the indoor living areas if the walls and ceilings are not well sealed. It should be installed with a continuous air-tight barrier between the insulation and the living area.

Comments based on experience of the environmentally hypersensitive

The chemical additives may not be tolerated by sensitive individuals.

Carefully test this material for tolerability.

See

other insulation

Components: shredded used newspaper, fire retardant and fungicides; anti-insect treatment (typically sodium borate); corrosion inhibitors	**Product Source:** available from insulation contractors and building product suppliers	**Masterformat Number:** 07200

EXPANDED MINERAL

Common product names	Typical uses in construction
vermiculite, perlite, *Zonolite®*	loosefill insulation in concrete block or masonry walls

Description
Expanded mineral insulation is loose insulation material made of minerals that have been heated and "puffed up." Vermiculite and perlite are small particles of volcanic rock.

Additional considerations
Expanded mineral insulation releases silicate dust when handled. For safety it must be kept from the house living space. Vermiculite absorbs moisture readily and dries out slowly. Untreated vermiculite will lose insulation value if exposed to heavy moisture and is not recommended where moisture is likely to be a problem. Moisture-resistant, i.e., asphalt-coated, formulations of this product are also available.

Health issues associated with this material
Expanded mineral insulation is an inert material but there is the risk of lung injury from prolonged inhalation of silicate dust. The asphalt treatment can release volatile emissions.

Comments based on experience of the environmentally hypersensitive
The moisture-proofing chemicals may be unacceptable for sensitive individuals.

This product is generally tolerated unless asphalt-coated. Ascertain that there are no fungicides.

See
other insulation

Components: mineral silicates (sodium, potassium, and aluminum silicates), magnesium, iron; formulations vary, may be asphalt-coated	**Product Source:** available from insulation and building product suppliers	**Masterformat Number:** 07200

FOAMED SILICATE

Common product names	Typical uses in construction
Air-Krete	concrete block cavity insulation, frame cavity insulation

Description
Foamed silicate insulation is a cementitious foam insulation that is made of completely inorganic minerals (sodium silicate and magnesium oxychloride), which when expanded with compressed air produces a foam suitable for cavity fill applications. It contains no asbestos or irritative fibres, formaldehyde or fluorocarbons. It is resistant to pests and is stable to moisture and high humidity conditions.

Additional considerations
Foamed silicate has good fire characteristics, high thermal resistance and is rated to have zero shrinkage. The standard density (RSI 6.8) is friable, but the compressive strength increases at higher density.

Foamed silicate releases moisture as it cures. Long drying times of any insulation containing water can be a concern in installations in existing wood frame cavities. However, the new formulations of foamed silicate have reduced the curing period to about five days. It must be applied by trained crews.

The foam is dyed with the addition of food colouring.

Health issues associated with this material
Foamed silicate does not release any organic vapours during or after installation.

Comments based on experience of the environmentally hypersensitive
Foamed silicate may have the lowest emission rate of the common insulation types.

This product is generally tolerated but the user must test.

See
other insulation

Components: sodium silicate (waterglass), magnesium oxychloride, foaming agents, food colour, water	**Product Source:** available in Ontario from I.F. Insulation—not available in the West; must be installed by insulation contractors	**Masterformat Number:** 07200

GLASS FIBRE, BATT

Common product names	Typical uses in construction
batt insulation, blanket fibreglass	wall cavity insulation, ceiling and floor insulation

Description

Fibreglass is typically made by spinning a molten blend of ground sand, soda ash and boron and forcing it through tiny bushings into ductile, hairlike fibres. Resin binders hold the fibres together. Manufacturers add colour to the fibres by using dyes. The bound fibres are then processed into batts or blankets.

Batts have a vapour-retarder facing the kraft paper or foil and kraft paper, while blankets are unfaced and meant for friction-fit installations where a separate vapour barrier will be installed.

Additional considerations

Typical binders for the glass fibres are phenol-formaldehyde and urea-formaldehyde resins.

Health issues associated with this material

There is a risk of fibre inhalation when handling fibreglass batts during installation. Inhalation of glass fibres may result in irritation of the respiratory tract or injury to the lungs. Skin or eye contact may produce irritation. The resin binders can release volatile organic compounds into the air.

Manufacturers recommend that a mask, eye protection, gloves, a cap and a long-sleeved shirt be worn during installation.

Comments based on experience of the environmentally hypersensitive

To prevent infiltration of fibres and volatile organic compounds into the interior, it is very important to isolate the insulation from the house living space by using a well-sealed air barrier.

The product is generally tolerated when properly installed with a well-sealed air barrier. User must test.

See

other insulation

Components: spun glass fibre, phenol-formaldehyde and urea-formaldehyde resins, processed oils, dye; composition varies by manufacturer	**Product Source:** available from insulation and building product suppliers	**Masterformat Number:** 07200

GLASS FIBRE, BOARD

Common product names	Typical uses in construction
rigid fibreglass insulation, insulating exterior sheathing	exterior insulation board, roof deck insulation

Description
Glass fibre board is a semi-rigid insulation material made of glass fibres. The fibres are bound with resin binders, which are phenol-formaldehyde and urea-formaldehyde resins. Typically, glass fibre boards contain higher amounts of resin binders than fibreglass batts.

Additional considerations
Glass fibreboard is primarily for exterior use, but it may be used to insulate heating ducts within the living space.

Health issues associated with this material
There is a risk of fibre inhalation when handling fibreglass boards during installation. Inhalation of glass fibres may result in irritation of the respiratory tract or injury to the lungs. Skin or eye contact may produce irritation. The resin binders can release volatile organic compounds into the air.

Manufacturers recommend that a mask, eye protection, gloves, a cap and a long-sleeved shirt be worn during installation.

Comments based on experience of the environmentally hypersensitive
If glass fibre boards are used to insulate heating ducts, the increase in temperature can increase the release of volatile emissions into the air. In this application, the boards should be completely wrapped or enclosed. If used as an insulation in the building envelope, care should be taken to seal it completely from the indoor space.

Insulation with lower resin binder content is preferable. Proper installation must be followed.

See
other insulation

Components: spun glass fibre, phenol-formaldehyde and urea-formaldehyde resins; may have air barrier facing (a spunbonded polyolefin, or plastic)	**Product Source:** available through building product suppliers	**Masterformat Number:** 07200

GLASS FIBRE, LOOSE

Common product names	Typical uses in construction
chopped fibreglass, loosefill glass, blowing wool fibreglass, *Insulsafe®*	ceiling insulation, blown-in insulation: batt (with binder) or loosefill

Description
Fibreglass is typically made by spinning a molten blend of ground sand, soda ash and boron and forcing it through tiny bushings into ductile, hairlike fibres. Manufacturers add dye to colour the fibres. Loose glass fibre insulation is chopped spun glass fibre that can be blown into attics and sealed walls or hard-to-reach parts of the envelope of a house.

Additional considerations
Canadian loose fibreglass contains binders and processed oils. One company in the U.S.A. manufactures loose glass fibre without binders.

Health issues associated with this material
There is a risk of fibre inhalation when handling loose fibreglass during installation. Inhalation of glass fibres may result in irritation of the respiratory tract or injury to the lungs. Skin or eye contact may produce irritation. Loose glass fibre with resin binders may release volatile organic compounds.

Manufacturers recommend that a mask, eye protection, gloves, a cap and a long-sleeved shirt be worn during installation.

Comments based on experience of the environmentally hypersensitive
It is important to isolate glass fibre from the living space.

Extra care is needed during installation to prevent infiltration into living space.

See
mineral fibre

Components: spun glass fibre, oil-based dust retardants; may contain phenol-formaldehyde and some urea-formaldehyde resins; composition varies by manufacturer	**Product Source:** available from insulation and building product suppliers; Insulsafe® distributed by Certain Teed Corp.	**Masterformat Number:** 07200

Mineral fibre

Common product names	Typical uses in construction
rock wool, mineral wool, chopped mineral wool, basalt insulation, slag wool, *Roxul®*, *Paroc®*	ceiling insulation, blown-in wall insulation, batt and board insulation for thermal, sound and fire resistance

Description

Mineral fibre insulation is an insulation material made from volcanic rock or recycled steel slag. The volcanic rock or slag is melted and spun into fibres in a manner similar to the process used to make glass fibres.

Rock wool resembles glass fibres, but its much higher melting point makes it usable as a firestop. Its higher density gives it better sound insulating properties.

Additional considerations

Mineral fibre insulation is available in loose, batt or rigid board forms. Loose rock wool is typically treated with mineral oil to reduce dust. The batt and rigid board forms use phenol- and urea-formaldehyde resin binders.

It does not support the growth of mold or bacteria.

Health issues associated with this material

Dust and fibres can irritate the skin, eyes and respiratory system and possibly injure the lungs. The resin binders in batts and rigid boards can release volatile organic compounds.

Manufacturers recommend that a mask, eye protection, gloves, a cap and a long-sleeved shirt be worn during installation.

Comments based on experience of the environmentally hypersensitive

*Because of the larger particle size, mineral fibre may be preferable to glass fibre for blown applications. *Ensure that the insulation is sealed from the indoor space.*

Mineral fibre in loose form (without resin binders) is one of the more desirable insulation materials for sensitive individuals if properly installed.

**Loose rock wool without mineral oil may be ordered from the supplier.*

See

glass fibre

Components: volcanic rock; may contain recycled steel slag (varies with manufacturer); mineral oil to reduce dust; batts contain resin binders (phenol-formaldehyde and urea-formaldehyde)	**Product Source:** available from insulation and building product suppliers	**Masterformat Number:** 07200

POLYSTYRENE FOAM BOARD, EXPANDED

Common product names	Typical uses in construction
bead board, EPS board, rigid polystyrene board	exterior insulation, foundation insulation, roof deck insulation, concrete cavity insulation, building panel systems

Description
Polystyrene, mixed with liquid pentane, is formed into beads which are expanded in the presence of steam. The expanded beads are poured into a mould and formed into a block from which boards are carved.

Additional considerations
Expanded polystyrene foam board is available in a range of thicknesses and densities. It has good moisture resistance properties and it does not support the growth of microorganisms. Due to its moisture permeability, it will not trap moisture within walls. It is commonly used as an exterior sheathing. High density expanded polystyrene foam board is used in below-grade applications.

Polystyrene foam products are combustible. Flame retardants are added to inhibit accidental ignition from small fire sources. If used inside, a half-hour fire barrier covering is required by the National Building Code of Canada.

Health issues associated with this material
Gases are released when polystyrene is heated, as by hot wire cutting.

Some residual styrene, the monomer from which polystyrene is made, may be released over time. Styrene is classified by the International Agency for Research on Cancer (IARC) as a possible human carcinogen (class 2B). Residual blowing agents (pentane, etc.) and fire retardants may also be released. Emissions are enhanced at higher temperatures.

Respiratory and eye protectors and adequate ventilation are necessary when cutting this material.

Comments based on experience of the environmentally hypersensitive
Polystyrene should be sealed off from living spaces both for fire barrier requirements and to contain any low-level emissions.

Hypersensitive individuals should be aware of emissions prior to selecting this material for interior use.

See
other insulation

Components: styrene polymer, pentane (disperses after manufacture), fatty acids (i.e., stearic), fire retardants (i.e., brominated compounds)	**Product Source:** available from building product suppliers	**Masterformat Number:** 07200

POLYSTYRENE FOAM BOARD, EXTRUDED

Common product names	Typical uses in construction
blue extruded polystyrene foam board, pink extruded polystyrene board	foundation insulation, under-slab insulation, roof deck insulation, high performance building panels, basement (inside) insulation, airtight drywall blocking

Description
Extruded polystyrene board is a rigid insulation material made from polystyrene mixed with solvent and pressurized gas. The mixture is forced through a die, then cut into sheets.

Additional considerations
Extruded polystyrene has low air and moisture permeability. Its tough, closed cell structure makes it suitable for below-grade insulation for footings and under slabs.

Polystyrene foam products are combustible. Flame retardants are added to inhibit accidental ignition from small fire sources. If used inside, a half-hour fire barrier covering is required by the National Building Code of Canada.

Health issues associated with this material
Low levels of volatiles (styrene, HCFCs, ethyl chloride, etc.) may be released over a prolonged period of time. Styrene, the monomer from which polystyrene is made, is classified by the International Agency for Research on Cancer (IARC) as a possible human carcinogen (class 2B). The long-term toxic effects of ethyl chloride are not established. Emissions from materials are enhanced by higher temperatures.

Respiratory and eye protectors and adequate ventilation are necessary when cutting this material.

Comments based on experience of the environmentally hypersensitive
Polystyrene foam boards should be sealed off from the living spaces both for fire barrier requirements and to contain any low-level emissions.

Hypersensitive individuals should be aware of emissions prior to selecting this material for interior use. User must test.

See
other insulation

Components: styrene polymer, ethyl chloride, blowing agent (hydrogenated chlorofluorocarbons and others), fire retardants (i.e., brominated compounds)	**Product Source:** available from building product suppliers	**Masterformat Number:** 07200

POLYURETHANE FOAM BOARD

Common product names	Typical uses in construction
urethane foam board	foundation insulation, under-slab insulation, roof deck insulation, high performance building panels, basement (inside) insulation, airtight drywall blocking

Description
Polyurethane board is a rigid insulation material derived from a reaction between an isocyanate and a resin in the presence of catalysts, surfactants, blowing agents and other additives. A closed cellular structure is obtained, with the blowing agent trapped in the form of bubbles.

Additional considerations
Polyurethane board has low thermal conductivity and high resistance to compression. A half-hour fire barrier covering is required due to its combustibilty. A vapour barrier should be used on the insulation's warm side. The blowing agents are released slowly over time, resulting in a decrease in thermal resistance.

Health issues associated with this material
Dust is released when polyurethane board is cut. Gases are released as the insulation ages.

Comments based on experience of the environmentally hypersensitive
Sensitive individuals should be aware of low levels of emissions over a long period of time.

This product is not recommended for use within the living space.

See
other insulation

Components: polyols, isocyanate, catalysts, surfactants, blowing agent, fire retardants; may have paper or foil backing	**Product Source:** available from building product suppliers	**Masterformat Number:** 07200

POLYURETHANE FOAM, ONE-PART

Common product names	Typical uses in construction
spray foam	crack filling, window and door air sealing, air sealing of older homes

Description
Polyurethane foam is a foaming insulation material derived from the reaction of an isocyanate and a resin. The material containing the blowing agent is in pressurized containers and the foam is dispensed with an applicator gun.

Additional considerations
The foam is used to fill block wall cracks, window and door frames and utility line openings. Discharged, the foam expands. The expansion rates of different products vary. Once cured, a resilient skin which will not crack or pull away is formed.

Health issues associated with this material
Polyurethane foam releases odours, especially when curing. The emissions include the blowing agents and also other gases adsorbed on the foam.

Comments based on experience of the environmentally hypersensitive
This material may be tolerated by sensitive individuals if used outside the living space or covered with a non-porous material.

User must test.

See
N/A

Components: polyols, isocyanate, surfactants, catalysts, blowing agent (e.g.; CO_2), fire retardants	**Product Source:** available from building product suppliers	**Masterformat Number:** 07200

INTERIOR WALL AND CEILING

INTERIOR WALL AND CEILING

Interior walls and ceilings represent the largest surface areas within a home. Emissions from materials used to cover these surfaces can have a significant impact on indoor air quality.

Wood panelling, wall covering, ceiling tiles, paints, fillers, adhesives and other finishes produce gases and particles that can affect the quality of the air.

Considerations

- Choose wall and ceiling finishes that produce the lowest possible odours. The most inert materials are hard coverings, such as ceramic tile or plaster. However, cost and appearance should be considered. A gypsum board system, finished using low-toxicity joint compounds and paints, is often acceptable. Some natural woods may be acceptable but should be tested first. Wallpaper may not be an acceptable choice for sensitive people.
- Consider ease of maintenance when choosing a wall finish. Frequent cleaning or repainting can produce emissions that can adversely affect a household.
- Conduct a personal test to see whether the materials are tolerated. Bear in mind that test results using a small sample may not indicate the actual effect of the large quantities used for walls and ceilings.

ACOUSTICAL CEILING TILES

Common product names	Typical uses in construction
ceiling tile, suspended ceiling	ceiling covering

Description
Acoustical tiles are usually square-edged tiles or tongue-and-groove tiles that interlock. The tiles are made from either cellulose materials or artificial fibres.

Additional considerations
Urea-formaldehyde or phenol-formaldehyde resins are used to bind the tile fibres together. Acoustical tiles may have a plastic facing and a foil backing.

The tongue-and-groove tiles interlock and are installed using staples or glue. The square-edged tiles fit into a T-bar suspension frame. When a T-bar system is used, there is a space created between the suspended tiles and the ceiling or floor above.

Health issues associated with this material
With a suspended ceiling system, the tiles may vibrate, giving off fibres into the return-air stream. If not captured by the air filtration system, the fibres will circulate throughout the house. The binders can release volatile organic compounds. Residual inks in recycled cellulose tiles may release odours. Plastic odours may be noticeable if tiles have a vinyl facing.

Comments based on experience of the environmentally hypersensitive
An acoustical tile system may be unacceptable to sensitive individuals.

User must test.

See
gypsum board

Components: may contain glass fibre, mineral fibre, cellulose materials, urea- or phenol-formaldehyde resins, vinyl, foil	**Product Source:** available from building product suppliers	**Masterformat Number:** 09512

CEMENT BACKER BOARD

Common product names	Typical uses in construction
tile backer board, cement board	wall tile backing, tub and shower enclosures, fire shields for wood stoves, furnaces

Description
Cement backer board is a moisture- and fire-resistant, rigid sheet material made of cement, sand, glass fibre and other additives.

Additional considerations
Dust, including glass fibre dust, is released when cement backer board is cut.

Health issues associated with this material
Inhalation of glass fibre dust may cause lung injury. Dust and odorous emissions are minimized by covering the backer board with tile and by ventilating bathrooms.

Comments based on experience of the environmentally hypersensitive
Some people complain of prolonged odours.

User must test.

See
cement fibreboard, gypsum board

Components: cement, sand, glass fibre; may contain gypsum, calcium silicate, fluidizers (formula varies with manufacturer and intended use)	**Product Source:** available from building product suppliers	**Masterformat Number:** 09290

CEMENT BONDED PARTICLE BOARD

Common product names	Typical uses in construction
Pyrok	fire-rated walls, flooring underlayment, exterior cladding, tile backer board, heat shield, other interior and exterior panel uses

Description
Cement bonded particle board is a fire-resistant, low-emission rigid panel sheeting material made from 70% Portland cement, wood chips or fibres, and mineralizing agents compressed into a dense structure.

Additional considerations
Cement bonded particle board contains no asbestos and has good fire resistance and sound attenuation. It can be cut, sanded, drilled, etc., with normal tools. It is unaffected by fungi and therefore does not rot. It is also resistant to termites and other insects and rodents.

Health issues associated with this material
Dust is released when cement bonded particle board is machined or cut. A dust mask should be worn when working with this and other materials that produce dust.

Comments based on experience of the environmentally hypersensitive
Cement bonded particle board has been found by sensitive people to have no significant or very low odour compared to most other wood products. When the application permits, it is an alternative to pressed wood products that have unacceptable emissions.

Cement fibreboard has been more widely used in Europe.

Generally tolerated but user must test.

See
cement backer board, gypsum board

Components: Portland cement, wood chips or fibre; formulations vary, may contain waste fibre from pulping process	**Product Source:** See specialty suppliers list.	**Masterformat Number:** 09290

CERAMIC TILE, GLAZED

Common product names	Typical uses in construction
ceramic tile, mosaic tile	wall and floor covering

Description
Glazed ceramic tile is a clay tile with a fused, glassy surface. The glaze protects the tile from moisture and is decorative.

Additional considerations
Tiles are made specifically for wall or floor use—the right ones should be used. A tile system includes base, tile, adhesive, grout, and possibly a sealer to protect the grout surfaces. On a concrete base, the tile can be set with mortar, which also serves as the grout. Thick-set mortar and thin-set mortar without acrylic are only suitable for installations on concrete. On other surfaces, acrylic modifiers added to the mortar provide a strong, flexible bond.

Health issues associated with this material
Modified thin-set mortars release volatile emissions during curing (roughly 72 hours). Some grouts may produce emissions. Some glues release intoxicating volatiles. Grout sealers emit solvent vapours.

Comments based on experience of the environmentally hypersensitive
Low-toxicity installations are tolerated well by most people. Non-porous tiles, thin- and thick-set mortars without acrylic modifiers, and well-cured grout can provide a very acceptable system. Acrylic-modified mortars may be acceptable after proper curing, but must be tested. Choose larger tiles when possible. This will reduce the amount of grout that is needed. Mildew growth on grout in damp areas (bathrooms) can be prevented by adequate ventilation and frequent cleaning.

This product is generally tolerated, but consider all components of the system.

See
thick-set mortar, thin-set mortar, mortar, grout

Components: clay, flint, feldspar, mineral glaze; may contain talc and pyrophyllite	**Product Source:** available from ceramic tile, flooring, and building product suppliers	**Masterformat Number:** 09310

CERAMIC TILE, UNGLAZED

Common product names	Typical uses in construction
ceramic tile, quarry tile, unglazed tile	floors, walls

Description
Unglazed ceramic tile is a clay tile without a fused glassy surface. Unglazed tiles are available in many varieties and colours. Tiles range from very porous (absorb water easily) to others that are very dense and do not absorb water.

Additional considerations
Very dense (vitreous or impervious) tiles are the easiest to clean and do not require sealing. Grout sealer can be avoided in some instances if the grout is properly cured (according to manufacturer's instructions) to form a durable joint with a hard surface. Consult a tile professional when selecting the tile, mortar, and grout.

Health issues associated with this material
Modified thin-set mortars release volatile emissions during curing (roughly 72 hours). Thin-set mortar and thick-set mortar installations on concrete produce minimal emissions. Some grout may produce emissions. Some glues release intoxicating volatiles. Grout sealers emit solvent vapours.

Comments based on experience of the environmentally hypersensitive
Low-toxicity installations are well tolerated by most people. Non-porous tiles, low-toxicity mortars, and well-cured grout can provide a very acceptable system. Acrylic-modified mortars may be acceptable after proper curing, but must be tested. Choose larger tiles when possible. This will reduce the amount of grout that is needed. Mildew growth on grout in damp areas (bathrooms) can be prevented by adequate ventilation and frequent cleaning.

This product is generally tolerated, but consider all components of the system.

See
thick-set concrete, thin-set mortar, mortar, silicone sealer, acrylic sealer

Components: clay (high fired)	**Product Source:** available from ceramic tile, flooring, and building product suppliers	**Masterformat Number:** 09310

GYPSUM BOARD

Common product names	Typical uses in construction
drywall, sheetrock, wallboard	walls and ceilings

Description
Gypsum board is a rigid interior sheeting material. It has a gypsum core and is faced with Kraft paper.

Additional considerations
The gypsum core can contain recycled wallboard, or FGD (flue gas desulphurization) gypsum, recovered from scrubbers at coal-fired thermal power plants. The paper face is often made from recycled newsprint and other waste paper.

"Green" drywall is a moisture-retardant drywall impregnated with asphalt for use in bathrooms and kitchens.

Joints between sheets must be taped, coated with joint compound, then sanded. Walls can be finished with paint or wall covering.

Health issues associated with this material
Dust released by cutting and handling is an irritant. The recycled materials sometimes found in gypsum board can contain inks. Composition of the board varies greatly, and the user can verify from the manufacturer whether their drywall contains recycled gypsum.

Comments based on experience of the environmentally hypersensitive
Gypsum board is only one component of this interior finish system. For example, people often cite problems with odours from the joint compound or from paints. Because large quantities of several materials are used in a gypsum board finishing system, the overall impact of all components must be considered.

User must test entire system.

See
ceramic tile, joint compound

Components: gypsum (calcium sulphate), starch; may contain boric acid, potassium sulphate, and dispersing, foaming, or wetting agents; special wallboards may contain fibres; Kraft paper	**Product Source:** available from building product suppliers	**Masterformat Number:** 09250

GYPSUM BOARD, FIBRE

Common product names	Typical uses in construction
fibre gypsum, drywall, gypsum wallboard, *FiberBond™ wallboard*	interior wall and ceiling sheathing

Description
Gypsum fibreboard is a wallboard made by blending gypsum, recycled newsprint, and perlite (expanded volcanic mineral). There are no separate paper facings like those found on conventional gypsum board.

Additional considerations
Gypsum fibreboard is chemically stable. Joints must be finished with joint tape and compound.

Health issues associated with this material
Dust is released by cutting during installation. Some people may be bothered by emissions from residual inks in the newsprint.

Comments based on experience of the environmentally hypersensitive
Gypsum fibreboard is only one component of an interior finish system. For example, people often cite problems with odours from the joint compound or from paints. Because large quantities of several materials are used in a gypsum fibreboard finishing system, the overall impact of all components must be considered before choosing this system.

User must test.

See
gypsum board

Components: gypsum (calcium sulphate), recycled newsprint, perlite	**Product Source:** available from Louisiana Pacific and other building product suppliers	**Masterformat Number:** 09250

GYPSUM LATH

Common product names	Typical uses in construction
rock lath	interior wall sheeting for plaster finishing

Description
Gypsum lath is a rigid interior sheeting material. It has a gypsum core between two sheets of absorbent, fibrous paper. It is available in large sheets.

Additional considerations
The outer ply of face paper causes capillary action, causing the plaster to adhere while it dries. The inner plies are water-resistant to moderate the drying time. The gypsum lath can be installed with screws or nails or stapled with a pneumatic gun. Joints are usually reinforced with joint tape. The lath is finished with a gypsum and lime plaster, usually two coats. The plaster coat is durable and does not have to be painted. However, if it is to be painted, it requires significant curing time first.

Health issues associated with this material
Additives to the paper and gypsum core can bother some individuals.

Comments based on experience of the environmentally hypersensitive
Gypsum lath is only one component of a plaster system. The finish coats of plaster tend to seal in potential problem materials and prevent them from entering the living space. The plaster also provides a durable finish that does not require any further treatment. A gypsum lath-and-plaster system is generally tolerated well by most people. However, because these systems represent large quantities within the living space, the overall impact of all components needs to be considered.

This product is generally tolerated, but user must test the entire system.

See
gypsum veneer plaster base, plaster, gypsum and lime

Components: gypsum core: calcium sulphate, starch; may contain boric acid, potassium sulphate, and dispersing, foaming, and wetting agents; paper facing	**Product Source:** available at building product suppliers	**Masterformat Number:** 09202

GYPSUM VENEER PLASTER BASE

Common product names	Typical uses in construction
"blue board," *Grand Prix gypsum base*, *Gyproc® veneer plaster base*, plaster base	interior wall sheeting for veneer plaster finishing

Description
Gypsum veneer plaster base is a rigid interior sheeting material. It has a gypsum core and a highly absorbent, blue paper face encouraging a maximum bond for plaster finishing.

Additional considerations
"Blue board" can degrade if left exposed to sunlight for a long period of time. The gypsum veneer plaster base can be installed with screws, nails, or a combination of screws, nails, and adhesives. Joints are usually reinforced with joint tape. The plaster base is finished with veneer plaster. The plaster coat is durable and does not have to be painted. However, if it is to be painted, it requires significant curing time first.

Health issues associated with this material
No concerns are known. The paper facing has less chemical sizing than wallboard.

Comments based on experience of the environmentally hypersensitive
Gypsum veneer plaster base is only one component of a plaster system. The finish coat of plaster tends to seal in potential problem materials and prevent them from entering the living space. The plaster also provides a durable finish that does not require any further treatment. Because these systems represent large quantities within the living space, the overall impact of all components needs to be considered.

This product is generally tolerated, but user must test the entire system.

See
plaster

Components: gypsum core: calcium sulphate, starch; may contain boric acid, potassium sulphate, and dispersing, foaming, and wetting agents; absorbent paper facing with blue dye	**Product Source:** available at building product suppliers	**Masterformat Number:** 09202

HARDWOOD STRIP PANELLING

Common product names	Typical uses in construction
solid maple, birch, oak, tongue-and-groove	wall panelling

Description
Hardwood panelling is solid wood boards. The panelling is usually 1" x 4" or 1" x 6", although some pre-finished types are thinner. It may be tongue-and-groove, V-joint, or ship lap.

Additional considerations
Types of hardwood used vary. Unfinished panelling requires sanding and finishing with a protective coating.

Health issues associated with this material
Sanding the walls creates irritating dust. Sealers, fillers, and finishes emit volatile substances that may have negative health effects. These emissions can be significant from large wall areas. Some individuals may have sensitivities to the wood types used in the panelling.

Comments based on experience of the environmentally hypersensitive

User must test wood panelling and finishes for acceptability.

See
acrylic sealer, urethane

Components: hardwoods (oak, maple, beech, ash, etc.); may use fillers and finishes	**Product Source:** available from lumber and building product suppliers	**Masterformat Number:** 06420

HIGH-DENSITY HARDBOARD

Common product names	Typical uses in construction
hardboard, *Masonite®*	wall panelling, pre-finished wallboard, utility walls (pegboard), door skins, siding

Description
High-density hardboard is a manufactured wood product. Wood fibres are heated and pressed to form hardboard. The natural wood lignin holds the fibres together.

Additional considerations
Hardboard panelling often has a decorative face, sometimes in vinyl or wood veneer.

Health issues associated with this material
High-density hardboard generally emits slight odours. The surface of some hardboards is coated with resins or vinyl. Odours from resins or vinyl may be unacceptable to some individuals. Dust released by cutting may be an irritant to some individuals.

Comments based on experience of the environmentally hypersensitive
High-density hardboard is generally tolerated well by most people. However, special hardboard products, such as pre-finished panelling, may contain materials that are problematic to some individuals.

User must test specific products.

See
gypsum board

Components: wood pulp; formulations vary, special surfaces and "tempered" varieties may contain resins such as phenol-formaldehyde, melamine, wood veneer, vinyl coatings	**Product Source:** available from building product suppliers	**Masterformat Number:** 06102

METAL LATH

Common product names	Typical uses in construction
expanded metal, wire mesh	base for interior wall and ceiling, plaster reinforcement for mortar and thin concrete

Description
Metal lath is a wire base for applying traditional plaster, cement, or stucco.

Additional considerations
Metal lath can be used to reinforce corners in a gypsum lath-and-plaster system. Standard metal lath is sold with asphalt-treated paper backing. Expanded metal lath is sold without paper backing.

Health issues associated with this material
There are no negative health properties associated with the use of metal lath itself, although the asphalt-treated backing can be a source of odours.

Comments based on experience of the environmentally hypersensitive

Metal lath is generally tolerated.

See
gypsum lath

Components: stamped steel, may be copper- or zinc-coated or polymer-coated	**Product Source:** available from building product suppliers	**Masterformat Number:** 09203

MORTAR

Common product names	Typical uses in construction
mortar, pre-mix mortar	stone, brick, and block laying, concrete patching, tile setting on wood or concrete floors

Description
Mortar is a mixture of cement, sand, water and, typically, lime.

Additional considerations
Mortar mix is commonly available in a dry form to be mixed with sand and water on site. Pre-mix contains sand and other ingredients and requires only the addition of water.

Health issues associated with this material
Unmodified plain mix mortar has minimal emissions, although some masons may use volatile additives as entraining agents and colourants or for cold weather use and moisture control. Mortar is often sealed with silicone-based or other polymer sealers that can produce emissions in the living space.

Comments based on experience of the environmentally hypersensitive

This product is generally tolerated but user must test. Check for the presence of additives.

See
cement, concrete block, brick, tile flooring

Components: sand, Portland cement, lime or mortar cement, water; may contain additives or colourants (acrylic, latex, silicone)	**Product Source:** available from building suppliers	**Masterformat Number:** 04130

PLASTER, LIME AND GYPSUM

Common product names	Typical uses in construction
plaster, finish coat	interior wall and ceiling finishes

Description
Plaster is a hard, durable interior wall finish. This traditional plaster system was widely used in older homes, but in recent years it has been replaced by wallboard.

Additional considerations
Plaster is usually applied over metal or gypsum lath. Applied over metal, it is a three-coat system: a brown base coat, a gray second coat, and the finish coat. Skill is required to achieve a durable, quality finish. No painting is required.

Health issues associated with this material
Plaster is present in large quantities in the living space when it is used for interior walls and ceilings, but it has minimal emissions. Lung and skin exposure to plaster dust during installation may cause problems. It is usually tolerated by most individuals after curing, but this can take a long time.

Comments based on experience of the environmentally hypersensitive
A traditional plaster system is a highly desirable alternative to painted wallboard, but it is becoming increasingly hard to find people skilled in the traditional system. An alternative plaster installation using veneer plaster simplifies plaster application.

This product is generally tolerated when cured. It is recommended, as no painting is needed.

See
plaster, veneer, gypsum lath, metal lath

Components: calcium oxide (lime), calcium sulphate (gypsum), sand, water; may contain Portland cement and additives	**Product Source:** available from masonry and plaster suppliers	**Masterformat Number:** 09210

PLASTER, VENEER

Common product names	Typical uses in construction
plaster, veneer coat, *Cameo Veneer Plaster*, *Diamond Veneer Plaster*	interior wall and ceiling finishes

Description
Veneer plaster is a durable interior wall finish.

Additional considerations
Veneer plaster is applied over veneer plaster base (blue board). It is tougher and more flexible than lime and gypsum plaster. It is also less labour-intensive than traditional plaster—only one coat is needed. No painting is required.

Health issues associated with this material
Plaster is present in large quantities in the living space when it is used for interior walls and ceilings, but it has minimal emissions. Additives present in some products may bother some people, but veneer plaster is usually tolerated by most individuals.

Comments based on experience of the environmentally hypersensitive
Veneer plaster is gaining popularity because application is simpler than in traditional plaster systems.

This product is generally tolerated, but user must test the entire system. It is an alternative to traditional plaster.

See
plaster, lime and gypsum; gypsum lath

Components: gypsum; may contain lime or other alkaline materials, pigment, retarder (cream of tartar, other)	**Product Source:** available from masonry and plaster suppliers	**Masterformat Number:** 09210

SOFTWOOD STRIP PANELLING

Common product names	Typical uses in construction
spruce, pine, fir, cedar, tongue-and-groove, v-joint, etc.	interior wall and ceiling finish

Description
Softwood panelling is solid wood boards. The panelling is usually 1" x 4" or 1" x 6", although some prefinished types may be thinner. It may be tongue-and-groove, V-joint, or ship lap.

Additional considerations
Unfinished softwood used as a wall covering will require sanding and finishing with a protective coating. Softwood panelling will expand and shrink, according to the moisture content in the air. It should be dry before installation.

Health issues associated with this material
Softwoods release wood terpenes that are allergenic for some people. Finishes used on softwood panelling may release various volatile substances.

Comments based on experience of the environmentally hypersensitive
Wood terpenes from some softwoods may be unacceptable for sensitive individuals.

User must test the type of softwood and sealer if used.

See
urethane, acrylic sealer; hardwood flooring, plank or strip

Components: spruce, pine, fir; may be anti-sapstain treated (less likely if kiln-dried)	**Product Source:** available from lumber and building product suppliers	**Masterformat Number:** 06420

STEEL, BAKED-ON ENAMEL

Common product names	Typical uses in construction
enamelled steel	wall panels, roofing, siding, windows

Description
Steel covered with baked-on enamel is a durable material with many uses. The enamel provides a protective and decorative surface.

Additional considerations
Steel with baked-on enamel is a durable, low-maintenance material that is easy to clean.

Health issues associated with this material
Emissions from enamelled steel are not a concern.

Comments based on experience of the environmentally hypersensitive
Steel with baked-on enamel is easy to clean and will not support biological growth, but extensive use in the indoor space may give rise to aesthetic concerns.

This product is generally tolerated.

See
other interior wall materials

Components: steel, zinc, enamel (often alkyd) baked above 66 degrees C	**Product Source:** available from door and window suppliers	**Masterformat Number:** 08120

WALL COVERINGS

Common product names	Typical uses in construction
wallpaper	interior wall covering

Description
Wall coverings are surface coverings for walls, traditionally made of paper but now most commonly of vinyl, or occasionally of mylar or foil. Natural fibre wall coverings and fabrics are also available.

Additional considerations
Large amounts of wallpaper are often used in the living space, so emissions are a significant concern. Starch-based and synthetic adhesives can be used to apply wall coverings, although many wallpapers are pre-pasted.

Health issues associated with this material
Wall coverings emit a variety of volatiles and irritants depending on the material and adhesives used. These include hexane, plasticizers from vinyl, and sulphite odours from paper. Vinyls and vinyl coated paper generally have higher emissions than mylar or foil. Some natural fibres can be allergens for some people. Starch-based adhesives used to apply wallpaper can support fungal growth when damp. Some adhesives contain fungicides.

Comments based on experience of the environmentally hypersensitive
Sensitive individuals should carefully select the wallcovering material and adhesive.
Wallpaper made of 100% cellulose is not widely available but sometimes can be ordered through specialty shops.

User must test for personal tolerance.

See
starch-based glue

Components: paper, dyes; vinyls; mylar (polyester) sheet, metals, natural fibres; may contain self-adhesives, usually starch-based	**Product Source:** available from paint and building product suppliers	**Masterformat Number:** 09970

WOOD LATH

Common product names	Typical uses in construction
lath	traditional plaster base, screen walls, trims, etc.

Description
Wood lath is rough-cut softwood strips traditionally used as a base for applying plaster.

Additional considerations
Wood lath, seldom used nowadays, has been replaced by metal lath or gypsum lath board. Applying plaster over wood lath is a very labour-intensive process.

Health issues associated with this material
Wood lath emits softwood odours. Irritating wood dust is released when lath is cut.

Comments based on experience of the environmentally hypersensitive
Large quantities of lath are used under plastered surfaces. Although the wood is plastered over, sensitive individuals should ascertain the acceptability of the wood.

User must test.

See
gypsum lath, plaster

Components: cedar, fir, pine, spruce, hemlock	**Product Source:** available from building product suppliers	**Masterformat Number:** 09200

MISCELLANEOUS

Product Sections

MISCELLANEOUS

Mechanical systems are very important in providing a healthy environment in your home. These systems will be dealt with in detail in a future guide to mechanical systems for healthy environments. However, some components of the mechanical system have specific relevance to this guide. These items are grouped in this section.

For health issues associated with products in this section, refer to the individual product sheets.

Considerations

- Refer to individual product sheets.

RADIANT HEATING SYSTEMS, ELECTRIC

Common product names	Typical uses in construction
Canray®, Eswa®, Flexwatt®	electrically heated radiant ceilings

Description
Radiant electric heating systems are grids of electric heating cable, embedded in gypsum panels, that radiate heat.

Additional considerations
Materials used in the panels are subject to heating whenever the system is in use.

Health issues associated with this material
There may be significant emissions from the heating of the gypsum, joint compound, plastic insulators, and the paint used on the panels. When in use, the panels may introduce low-level electromagnetic fields.

Comments based on experience of the environmentally hypersensitive
Some people complain of odours from new installations. Little is known about the effects of low-level electromagnetic fields.

User must test.

See
radiant heating systems, hot water

Components: gypsum board panels (calcium sulphate and Kraft paper); electrical resistance wires (nickel-chromium); mylar and other plastic insulators	**Product Source:** available from heating suppliers	**Masterformat Number:** 15805

RADIANT HEATING SYSTEMS, HOT WATER TUBING

Common product names	Typical uses in construction
radiant floor heating	floor heating: in concrete or attached to wood joists

Description
Radiant hot water heating systems are grids of hot water tubing that give off heat. They are usually installed in concrete so that the entire floor becomes a radiant heater.

Additional considerations
Early installations used copper tubing, which in some conditions was subject to scale build-up or corrosion from chemicals in the cement used as the heat-storage medium. More recent installations use new types of plastic pipe, most often a cross-linked polyethylene, developed to withstand thermal stress and corrosion.

Health issues associated with this material
Volatile emissions from the tubing and the materials that make up the floor system may be a concern when the tubing is installed on joists. Odours will be minimal if the tubing is encased in concrete. Volatile substances and odours are emitted at different rates according to the composition of the product used. EPDM (ethylene-propylene-diene monomer) tubing releases strong odours, especially when hot. Cross-linked polyethylene tubing emits minimal odours, while polybutylene emits a slight odour, especially when hot.

Comments based on experience of the environmentally hypersensitive
Some sensitive people who have EPDM systems installed within the house living space have found emissions from the tubing objectionable.

User must test. Choose a non-odorous piping, especially in exposed installations.

See
radiant heating systems, electric

Components: ethylene-propylene-diene monomer (EPDM); cross-linked polyethylene and aluminum; isobutene polymer (polybutylene); copper tubing; solvent glues	**Product Source:** available from heating suppliers	**Masterformat Number:** 15805

STEEL, GALVANIZED

Common product names	Typical uses in construction
galvanized sheet, bar, tube	ducts, roof flashing, roofing, framing clips and anchors, doors

Description
Galvanized steel is sheet steel that has a zinc coating to prevent corrosion.

Additional considerations
Galvanized steel is available in a plain or corrugated sheet. It is easily fabricated into many shapes, such as ductwork.

Health issues associated with this material
An oily residue may be present on the surface of formed galvanized steel products. This can be washed off. Zinc oxides may be given off when steel is heated, as with a furnace heat exchanger.

Comments based on experience of the environmentally hypersensitive
Galvanized steel ductwork can be present in significant quantities within the living space. Oil residue on the inner and outer duct surfaces may need to be washed off, using a low-toxicity detergent or trisodium phosphate (TSP).

This product is generally tolerated. Oil residues can be removed from ductwork before it is used.

See
N/A

Components: iron, carbon, zinc	**Product Source:** available through heating product suppliers	**Masterformat Number:** 07600

PAINTS, SEALERS, COATINGS

PAINTS, SEALERS, COATINGS

Paints, sealers, and coatings can be both the cause of indoor air problems and a means to improve the quality of the air in the home.

Toxic solvent vapours and additives can cause health problems. Conversely, paints, sealers, and coatings can be used to seal materials, thereby reducing emissions.

There are three important stages to consider when evaluating paints, sealers, and coatings.

During application - Solvent odours and vapours are strongest when first applied.

While curing - The solvent continues to evaporate. Heat and good ventilation can speed the curing process and prevent odours from building up, to be absorbed by other materials.

After drying and curing - Residual odours vary with the type of coating.

Considerations

- There are two basic categories of paints: oil-based and water-based. Oil-based paints are odorous when fresh, but very durable when dry. They require the use of solvents for clean-up. Water-based paints can be cleaned up with water. Paints sometimes have odours that last for a long time.
- Since paints, sealers, and coatings as interior finishes are used in large quantities, they can contribute significant emissions into the indoor environment. Some products take a few days to dry or cure while others take months. Select materials with the least possible emissions when dry.
- Sensitive individuals should avoid exposure to the products until they are fully cured.
- Individual tolerances to each product vary greatly. Paints, sealers and coatings made with natural ingredients should also be checked for odours.
- Conduct a personal test to determine the acceptability of the material.
- Proper application of these products is very important if they are to perform well.
- Manufacturers' formulations and product lots vary widely.

ACRYLIC SEALER, WATER-BASED

Common product names	Typical uses in construction
Pace Crystal Aire®, Palmer 86001® SEAL, AFM Water Seal, Phenoseal® Liquid Waterproofing	sealing old and new woodwork, sealing gypsum board, sealing composition wood products—Type 2 diffusion barrier for airtight drywall, grout sealer

Description
Water-based acrylic sealers are specially formulated low-toxicity sealers. They are designed to reduce emissions from wood, gypsum board, and grout, and to reduce the moisture permeability of surfaces.

Additional considerations
Manufacturers' formulations vary and some products are designed to seal specific materials only. Sealers meeting Canadian standards* may be used in airtight drywall as a low-toxicity vapour diffusion retarder.

Health issues associated with this material
Dispersants in acrylic sealer release slight odours and may be irritating during application. After curing there is a very low emission rate. Use of acrylic sealer reduces terpene emission from softwoods and formaldehyde emissions from wood products.

Comments based on experience of the environmentally hypersensitive
Sensitive individuals may want to avoid exposure during application and drying to avoid sensitization to the product.

User must test individual products.

Test data for AFM Water Seal and Palmer 86001® SEAL indicate the products meet Canadian standards for use as a vapour diffusion retarder. Data are unavailable for Pace Crystal Aire®.

See
low-toxicity urethane, softwood lumber, airtight drywall approach

Components: formulations vary; may contain acrylic polymers, low-toxicity glycols, urethanes	**Product Source**: available from specialty suppliers	**Masterformat Number:** 09930

BEESWAX

Common product names	Typical uses in construction
natural wood polishes, *GLEIVO® Liquid Beeswax (Livos)*	finish on wood trims, doors, floors

Description
Beeswax is a natural product that is used in wood polishes.

Additional considerations
Beeswax itself is a "food-grade" material.

Health issues associated with this material
Beeswax finishes are generally tolerated well by most people. The solvents used to dissolve them may give off emissions for an extended period and may be objectionable to some individuals.

Comments based on experience of the environmentally hypersensitive
Pollen residues, if present, may cause problems for some people. Beeswax and other odours may be objectionable. Solvents may be emitted for extended periods.

User must test.

See
carnauba wax

Components: beeswax; solvents	**Product Source:** available from specialty product suppliers	**Masterformat Number:** N/A

Carnauba wax

Common product names	Typical uses in construction
paste wax	wood flooring, wood trim

Description
Carnauba wax is a hard paste wax made from the leaves of the carnauba palm and used to finish wood surfaces.

Additional considerations
Carnauba is extremely hard and is sold mixed with a softer wax or dissolved in mineral spirits.

Health issues associated with this material
Carnauba wax contains petroleum solvents that are released during application and drying. Strong odours may persist for up to a year.

Comments based on experience of the environmentally hypersensitive

This product is not recommended.

See
beeswax

Components: carnauba (from Brazilian palm); petroleum naphtha (Stoddard solvent)	**Product Source:** available at hardware stores	**Masterformat Number:** N/A

LACQUER, TRADITIONAL SOLVENT

Common product names	Typical uses in construction
lacquer	finishing wood floors

Description
Lacquer is a wood finish used for low-wear surfaces and as a base for waxes.

Additional considerations
Lacquer is a professional product requiring controlled application. Lacquer can be used to reduce volatile emissions from wood products.

Health issues associated with this material
Lacquer contains highly toxic solvents, including butyl acetate, isobutyl acetate, toluene, and methyl ethyl ketone. The solvents evaporate quickly, leaving a very stable finish.

Comments based on experience of the environmentally hypersensitive
Some lacquer odours persist for a long period. Most commercially available lacquers pose problems to sensitive individuals even after drying.

User must test dried and cured samples.

See
sanding sealer

Components: nitrocellulose, lacquer solvent (butyl acetate, possibly toluene, xylene), plasticizers; may contain synthetic resins, drying oils, other solvents	**Product Source:** available from flooring suppliers	**Masterformat Number:** 09930

Oil finish, European-type (non-acid curing)

Common product names	Typical uses in construction
oil finish, drying oil, Swedish oil finish, Danish oil finish	natural floor finish, wood trim, doors, sashwork

Description
Oil finishes are made from various oils and are used to protect wood surfaces.

Additional considerations
Oil finishes are slow to cure and slow to stabilize. Some Swedish oil finishes are being reformulated into water-based products.

Health issues associated with this material
Volatile petroleum solvents (naphtha) in oil finishes are toxic, and the oil odours linger.

Comments based on experience of the environmentally hypersensitive
Tung oil is a suspected immune suppressant and may induce a sensitivity.

User must test cured products for sensitivity to odours. Avoid products containing tung oil.

See
beeswax

Components: alkyd oils, soybean and castor oils, linseed oil; may contain petroleum solvent, tung oil, driers	**Product Source:** available from hardware and building product suppliers	**Masterformat Number:** 09930

PAINT, ALKYD

Common product names	Typical uses in construction
oil paint, oil enamel	bathroom and kitchen painting, exterior painting, trim and sash paint

Description
Alkyd is a common oil-based paint.

Additional considerations
Interior alkyd paint is slow curing but very stable once cured. Ensure there is good ventilation when applying alkyd paint and wear a mask with gaseous absorbents. Allow plenty of time for curing.

Health issues associated with this material
Solvents and driers in alkyd paint can be irritating or neurotoxic (i.e., adversely affect the nervous system).

Comments based on experience of the environmentally hypersensitive
Exterior and industrial paints may also contain heavy metals and should not be used indoors.

Handle with caution and allow adequate time for curing. Test dried and cured paint for acceptability.

See
other paints

Components: alkyd oils from synthetic or plant sources, petroleum naphtha, titanium dioxide, other mineral and polymer pigments, driers	**Product Source:** available from paint and building product suppliers	**Masterformat Number:** 09220

Paint, Environmental Choice

Common product names	Typical uses in construction
EcoLogo paint	walls and ceilings, trim

Description
Environmental Choice paints have met reduced ambient pollution criteria set out in guidelines established by Environment Canada. Qualifying paints are allowed to use the EcoLogo (three intertwined doves).

Additional considerations
A number of paints, both water-based and solvent-based, have qualified as reduced pollution paints under the Environmental Choice program. Water-based EcoLogo paints meet a standard for levels of volatile organic compounds and of metals, organic dyes, and fungicides.

Solvent-based EcoLogo paints meet a standard for levels of petroleum solvents and contain alternative ingredients to formaldehyde, aromatic hydrocarbons, halogenated solvents, and heavy metals.

Health issues associated with this material
Volatile or semi-volatile chemicals contained in these products can have irritating effects.

Comments based on experience of the environmentally hypersensitive
Different manufacturers' formulations vary widely. The Environmental Choice guidelines are based on reduced pollution of the outdoor (ambient) environment and do not guarantee that a paint is acceptable for sensitive individuals. For example, scents added to the paint may be irritating to some people.

Some brands of paint that meet or exceed EcoLogo standards may not be labelled as such.

User must test. Formulations vary greatly.

See
other paints

Components: may contain latex, acrylic resins, propylene and other glycols, zinc oxide, titanium dioxide, solvents, ammonia, pigments, phenyl ether, etc.	**Product Source:** available at paint and hardware suppliers	**Masterformat Number:** 09220

PAINT, LATEX

Common product names	Typical uses in construction
latex paint	walls, ceilings, trims (matte and semi-gloss)

Description
Latex paints are water-based paints, with widely different formulations possible. Some products are formulated for low toxicity.

Additional considerations
Latex paint is fairly durable and less toxic during application than alkyd paint. Some latex paints have a strong smell that may linger. Latex usually contains biocides that may not be listed on the label.

Health issues associated with this material
Possible emissions from water-miscible solvents or other chemicals contained in the paint may present a minor health risk during application. Slight odours may linger afterwards. Even low levels of biocides may be problematic for sensitive individuals.

Comments based on experience of the environmentally hypersensitive
Because brands and individual tolerances vary widely, personal testing of any paint is recommended. Low-toxicity water-based paints are considered safer than conventional latex paint.

User must test.

See
other paints

Components: synthetic resins, pigments, thinners, emulsifiers, stabilizers, anti-foam agents, drying oils; may contain fungicides; unlimited variations in composition	**Product Source:** available from paint supply stores	**Masterformat Number:** 09920

PAINT, LOW-TOXICITY WATER-BASED

Common product names	Typical uses in construction
AFM Safecoat, GF 1000, Glidden LifeMaster 2000®	walls, ceilings, trims (matte and semi-gloss)

Description
Low-toxicity water-based paints are specially formulated to be more acceptable to sensitive individuals.

Additional considerations
No biocides are added to these paints, but small amounts of biocides are sometimes present in the base materials, leaving a small amount of biocide in the formulation.

Health issues associated with this material
Possible emissions from water-miscible solvents or other chemicals contained in the paint may present a minor health risk during application. Slight odours may linger afterwards. Even low levels of biocides may be problematic for sensitive individuals.

Comments based on experience of the environmentally hypersensitive
Because brands and individual tolerances vary widely, personal testing of any paint is recommended. Low-toxicity water-based paints are considered safer than conventional paints.

User must test.

See
other paints

Components: composition varies with manufacturer; vinyl acetate and acrylic copolymer; may contain titanium oxide, talc, calcium carbonate, etc.	**Product Source:** available from specialty product suppliers (AFM, Murco, Glidden)	**Masterformat Number:** 09920

PAINT, NATURAL OIL-BASED

Common product names	Typical uses in construction
natural resin paint, linseed paint, *DUBRON (Livos)*	interior sashes and trim, doors, walls and ceilings (semi-gloss and gloss)

Description
Natural oil-based paints are specially formulated from natural ingredients for low toxicity.

Additional considerations
Most formulations contain no petroleum products, but some contain small amounts of de-aromaticized petroleum solvents (isoparaffinic solvent). The paint usually has an extended drying and curing time.

Health issues associated with this material
The ingredients in the paints are carefully selected for low toxicity and have been in traditional use for centuries. Citrus oil and linseed oil odours may be present while the paint is drying and may cause irritation.

Comments based on experience of the environmentally hypersensitive
Some natural ingredients can be problematic for certain allergic individuals. Because brands and individual tolerances vary widely, personal testing of any paint is recommended.

User must test.

See
other paints

Components: natural resins (tree resins, plant oils); wood tars; talcum; citrus oils; casein; alcohol; borax; latex; ammonia; mineral and plant pigments; driers, etc.	**Product Source:** available from specialty product suppliers	**Masterformat Number:** 09920

PAINT, NATURAL WATER-BASED

Common product names	Typical uses in construction
Old Fashioned Milk Paint, VALETIA casein paint (Livos), casein paint	wall and ceiling

Description
Natural water-based paint is specially formulated for low toxicity from natural ingredients.

Additional considerations
Natural water-based paints may not wash well and surfaces may require more frequent repainting than with other paints.

Health issues associated with this material
Minimal negative health effects are associated with these paints, although ammonia may be released during application. Milk proteins are allergens for some individuals.

Comments based on experience of the environmentally hypersensitive
Some brands are very well tolerated by chemically sensitive people. However, natural ingredients can be problematic for certain allergic individuals. Because brands and individual tolerances vary widely, personal testing of a paint is recommended.

These paints are good starting choices. User must test.

See
other paints

Components: casein, mineral pigments; formulations vary; may contain latex	**Product Source:** available from specialty suppliers	**Masterformat Number:** 09920

SANDING SEALER, SOLVENT-BASED

Common product names	Typical uses in construction
sanding sealer	hardwood floor sealing, wood trim and door preparation

Description
Sanding sealer is used to seal wood surfaces before the final finishing product is applied. It is similar to lacquer.

Additional considerations
Sanding sealer is fast drying and is stable when cured.

Health issues associated with this material
During application, solvent-based sanding sealer releases solvent vapours, such as petroleum naphtha, butyl acetate, toluene, and xylene.

Comments based on experience of the environmentally hypersensitive
Alternative water-based sealers are available but tend to cause wood fibres to stand up, leaving a furry surface that must be sanded.

Sensitive individuals should not handle this product. The cured product should be tested for personal sensitivity.

See
lacquer, shellac

Components: alkyd or nitrocellulose resins, solvents (petroleum naphtha) or lacquer solvents (butyl acetate, toluene, xylene)	**Product Source:** available from building product suppliers	**Masterformat Number:** 09930

Shellac

Common product names	Typical uses in construction
shellac	sanding sealer, knot sealer, wood primer, sealer to reduce formaldehyde odours from wood products, traditional furniture finishes (French polish)

Description
Shellac is the purified excretion of the lac beetle dispersed in an alcohol solvent, usually methyl alcohol, though some manufacturers blend methyl and ethyl alcohol.

Additional considerations
During application and drying, shellac releases alcohol vapours. Irritating dust is released by sanding.

Health issues associated with this material
Alcohol vapours can affect the central nervous system. Methyl alcohol is toxic if ingested or absorbed through the skin. Ethyl alcohol formulations are safer.

Comments based on experience of the environmentally hypersensitive
Shellac resin may be an allergen for a few sensitive people. Shellac is a moderately effective sealer for reducing formaldehyde emissions from particle board and plywood. Powdered shellac in ethyl alcohol is usually acceptable.

User must test.

See
lacquer, sanding sealer

Components: lac beetle excretion, methyl alcohol; may contain ethyl alcohol	**Product Source:** available from paint and specialty suppliers	**Masterformat Number:** 09930

SILICONE SEALER 5%, SOLVENT-TYPE

Common product names	Typical uses in construction
brick and tile sealer, grout sealer	water and stain proofing, tile grout, brick mortar and porous tile

Description
5% silicone sealer is used to seal porous bricks, tile, and grouted joints.

Additional considerations
Silicone sealer emits toxic vapours during installation. Silicone is pushed out by moisture and must be re-applied periodically.

Health issues associated with this material
Volatile petroleum vapours are released during application. This is especially significant when treating large areas such as porous floors. The sealer is stable after drying.

Comments based on experience of the environmentally hypersensitive
Water-based acrylic sealers are a preferable alternative to silicone.

Sensitive individuals should not handle this product. They should test the cured product for acceptability, or choose an alternative product.

See
acrylic sealer, urethane sealer

Components: organosiloxanes, petroleum solvent (Stoddard)	**Product Source:** available from hardware suppliers	**Masterformat Number:** 03064

URETHANE, WATER-BASED, ONE-PART

Common product names	Typical uses in construction
Pace Crystal Shield, AFM Hard Seal, Varathane Flecto Diamond Elite, Last-N-Last, Bona Kemi Pacific One	sealing wood floors, sealing porous tile or concrete

Description
Water-based urethane sealers are specially formulated sealers. Some are designed to provide a hard finish for wood floors and reduce emissions from wood. Others seal the surface of porous tile and concrete and can be an alternative to solvent-based grout sealers.

Additional considerations
Manufacturers' formulations vary and some products are designed to seal specific materials only. Priming may be required. These sealers may only be applied to clean surfaces and will not bond to waxes, etc.

Health issues associated with this material
Dispersants in urethane sealer release slight odours and are mildly irritating during application. After curing there is a very low emission rate. Use of urethane sealer may reduce terpene emissions from woods and formaldehyde emissions from wood products.

Comments based on experience of the environmentally hypersensitive
This material may be acceptable for sensitive individuals but user must test the specific product.

See
acrylic sealer, ceramic tile,

Components: formulations vary; may contain acrylic polymers, low-toxicity glycols, urethanes	**Product Source:** available from specialty suppliers	**Masterformat Number:** 09930

URETHANE, WATER-BASED, TWO-PART

Common product names	Typical uses in construction
Bona Kemi Pacific Strong	hardwood floors

Description
Two-part water-based urethane contains a catalyst as well as urethane. The urethane and catalyst are dispersed in water.

Additional considerations
The catalyst alters the chemical bond of the urethane and results in a product that gives a very durable finish.

Health issues associated with this material
Two-part water-based urethane releases glycols and other solvents during application. This can be significant if used in large areas. It is stable when cured.

Comments based on experience of the environmentally hypersensitive
Provide good ventilation during application.

Sensitive individuals must test the cured product.

See
urethane, water-based, one-part

Components: water-dispersed polyisocyanurate, glycols, ethers, crosslinking agent (catalyst)	**Product Source:** available from wood flooring companies	**Masterformat Number:** 09930

PLUMBING

PLUMBING

Plumbing products include fixtures and pipe. Water filtration systems are not included as part of this guide.

Emissions into the water or living space from plastics and solvent glues in pipes and fixtures can cause problems for environmentally hypersensitive persons. These effects are enhanced when the materials are heated with hot water.

Considerations

- When deciding on a specific plumbing product or fixture, choose materials with the least possible emissions. This is especially important when choosing products that will be used for drinking and bathing water.
- Conduct a personal test to determine the acceptability of the material.

ABS PIPE

Common product names	Typical uses in construction
sewer and drainpipe	drain and vents—single family residential

Description
ABS (acrylonitrile-butadiene-styrene) pipe is hard black plastic pipe used in residential construction.

Additional considerations
Joints must be glued with solvent glues.

Health issues associated with this material
ABS drainpipe may release some odours. The solvent glue used with the pipe releases emissions during application, but these evaporate quickly.

Comments based on experience of the environmentally hypersensitive
Some hypersensitive people find that wrapping exposed ABS pipe with aluminum foil and foil tape reduces emissions and makes ABS more acceptable.

Minimize use in exposed areas. Copper pipe is preferable.

See
copper pipe

Components: acrylonitrile-butadiene-styrene co-polymer, solvent glues; may contain fire retardants, colourants	**Product Source:** available from plumbing and building product suppliers	**Masterformat Number:** 15410

ACRYLIC BATH FIXTURES

Common product names	Typical uses in construction
moulded baths	tub and shower enclosures, tubs (usually one-piece)

Description
Acrylic bath fixtures use moulded acrylic resin to form tubs and tub and shower enclosures.

Additional considerations
Acrylic fixtures often have glass fibre-reinforced polyester backings.

Health issues associated with this material
Emissions occur from the acrylic resins. Hot water enhances emissions.

Comments based on experience of the environmentally hypersensitive
Hidden surfaces, e.g., the backs of fixtures, are not sealed and may have some emissions. Acrylic bath fixtures probably have lower emission rates than other fibre-reinforced plastics, but even low-level emissions may affect sensitive individuals.

User must test. Porcelain-coated bath fixtures may be the preferred choice.

See
fibre-reinforced plastics, porcelain bath fixtures

Components: glass-reinforced polyester resin core (glass fibre), polymethacrylate resin surface (acrylic), dyes	**Product Source:** available from bath and building product suppliers	**Masterformat Number:** 10821

Cast iron and steel plumbing fixtures

Common product names	Typical uses in construction
enamelled porcelain steel or cast iron	baths, sinks, shower stalls

Description
Cast iron and steel are used to make tubs, sinks, and showers.

Additional considerations
The tubs and sinks are usually coated with a porcelain finish.

Health issues associated with this material
Porcelain is an inert, stable, ceramic-like surface created by firing at high temperatures.

Comments based on experience of the environmentally hypersensitive
Porcelain-finished cast iron and steel plumbing fixtures are generally tolerated well by sensitive people.

See
acrylic bath fixtures

Components: formed steel or moulded cast iron, inorganic porcelain (contains silicates such as potassium, aluminum silicate)	**Product Source:** available from plumbing product suppliers	**Masterformat Number:** 10821

COPPER PIPE

Common product names	Typical uses in construction
water pipe	water supply piping, drains in commercial and multi-family residential

Description
Copper pipe is commonly used for water supply pipes and sometimes for drains in housing and commercial buildings.

Additional considerations
Solders must be used to join pipes. Lead-free solder should be used. Odours are released from soldering and fluxes during installation.

Health issues associated with this material
Copper pipes leach copper in acidic water, which may exceed the safe limit for human consumption.

Comments based on experience of the environmentally hypersensitive
Older installations contain lead solder, but most codes now prohibit it.

This product is generally tolerated.

See
solder

Components: copper, solder: older solder contains lead and tin; new code solder contains tin and antimony or silver; flux (acid paste, ammonia salts, etc.)	**Product Source:** available from building and plumbing suppliers	**Masterformat Number:** 15063

FIBRE-REINFORCED PLASTICS

Common product names	Typical uses in construction
fibreglass, glass fibre, GRP, FRP	tubs, showers and enclosures, laundry sinks, tiles, panels

Description
Fibre-reinforced plastics are moulded fibre-reinforced resins used to form tubs, sinks, and bath enclosures. They are coated with modified polyester resins (Gelcoat).

Additional considerations
Hot water will enhance plastic emissions.

Health issues associated with this material
Some individuals have contact sensitivity to the materials. Polyester catalysts are highly toxic and are corrosive to the cornea (important to note, especially if any cutting is done).

Comments based on experience of the environmentally hypersensitive
Fibre-reinforced plastic tubs, sinks, etc., probably have more emissions than acrylic products, though this may vary with the manufacturer. Hot water increases the emissions.

User must test.

See
acrylic and cast iron fixtures

Components: glass-reinforced polyester resin, catalysts, dyes	**Product Source:** available from building and plumbing suppliers	**Masterformat Number:** 10821

MINERAL-FILLED POLYESTER FIXTURES

Common product names	Typical uses in construction
cultured marble	shower floors, moulded sinks and vanity tops, tub and shower wall panels

Description
Mineral-filled polyester fixtures are moulded from polyester resins with various minerals added for decoration.

Additional considerations
Hot water may increase resin emissions.

Health issues associated with this material
Although bathrooms are usually ventilated and mineral-filled polyester fixtures are usually used in small quantities, fixtures may give odours from uncured polyester resin. Emission characteristics may vary considerably by lot and manufacturer. Polyester catalysts are highly toxic and are corrosive to the cornea (important to note, especially if any cutting is done).

Comments based on experience of the environmentally hypersensitive
Low-level emissions may cause problems for sensitive individuals.

User must test.

See
cast iron and steel plumbing fixtures

Components: polyester resins, catalysts, dyes, marble chips, other minerals	**Product Source:** available from bath product suppliers	**Masterformat Number:** N/A

SOLDER

Common product names	Typical uses in construction
plumbing solder	joining copper plumbing

Description
Solder is a metal or alloy used to bond metal surfaces. The solder melts when heated, then cools and hardens to create a bond between the two surfaces.

Additional considerations
Heating solder during the installation of pipes releases lead and flux vapours (acids).

Health issues associated with this material
The leaching of lead from lead solders into water is a hazard. Acidic water leaches out more lead.

Comments based on experience of the environmentally hypersensitive
Codes now specify the use of low-lead or lead-free solders.

Drinking water may need to be purified.

See
copper pipe

Components: older solders: lead 50%, tin 50%; new code solders: tin 95%, antimony 5% (for example)	**Product Source:** available from building and plumbing product suppliers	**Masterformat Number:** 05055

ROOF

ROOF

Emission from roofing materials can cause problems for some hypersensitive people. Roofs are exposed to sunlight. The combination of absorbed heat and UV rays accelerates degradation and emissions from the materials. Common emissions are from asphalt materials and wood shingles.

Although roof materials are located outside the living space, odours can enter the home through doors, windows and vents. Very sensitive individuals may detect these roofing odours.

Considerations

- Maintenance and replacement should be considered when choosing roofing materials. Most roofing products are very durable and last a long time (more than 15 years). However, the roof structure and local weather conditions can greatly affect how well or how poorly the product wears.
- Conduct a personal test to determine whether the material is acceptable.
- When choosing a roof material, particularly when replacing an old roof material, make sure the roof structure is designed to bear the weight of the product you choose. Low odour roofing materials such as slate and concrete tile are heavier than shingles or steel roofing.

ALUMINUM ROOFING

Common product names	Typical uses in construction
aluminum	roofing

Description
Aluminum roofing is a sheet of pressed-tile roofing material that is often finished with baked-on enamel, usually acrylic.

Additional considerations
Without enamel, aluminum is subject to attack by acid rain.

Health issues associated with this material
Enamelled aluminum for roofing does not present any concerns.

Comments based on experience of the environmentally hypersensitive
Aluminum roofing is generally tolerated by most people.

See
other roofing

Components: aluminum sheet (may be finished with baked-on enamel, usually acrylic)	**Product Source:** available from roofing and siding suppliers	**Masterformat Number:** 07412

Concrete tile

Common product names	Typical uses in construction
concrete roofing tile	roofing tile

Description
Concrete roofing tile is a waterproof concrete roof material. Tiles may be coated or glazed for special effects.

Additional considerations
Dust is emitted when the tiles are cut. Concrete tiles are more expensive than many roofing materials.

Health issues associated with this material
Dust created during installation can be avoided by using protective equipment. No negative health effects are associated with the use of concrete tile.

Comments based on experience of the environmentally hypersensitive
Old tiles may contain asbestos.

This product is generally tolerated.

See
other roofing

Components: cement, sand, polymer enamel, dyes; may contain fibre reinforcement; may be coated or glazed	**Product Source:** available from roofing product suppliers	**Masterformat Number:** 07322

Membrane roofing

Common product names	Typical uses in construction
plastic membrane, EPDM, glue-on, silicone (*i.e., General Electric [G.E.]*)	flat or low-pitch roof membranes, flexible flashings

Description
Membrane roofing is an increasingly popular material for flat roofs and flexible flashing.

Additional considerations
Many types of membrane are available, including butyl and EPDM rubber, polyvinyl chloride, polyester, reinforced vinyl, and silicone.

Health issues associated with this material
Some materials release strong odours during installation and when in use. These occur outside the living space, but may be introduced if the roofing is warmed near ventilation openings. EPDM and chlorosulphonate rubber are typically the most odorous, and silicone the least.

Comments based on experience of the environmentally hypersensitive
Sensitive individuals should avoid odorous roof systems.

Many membrane materials are not generally tolerated. Silicone may be acceptable. User must test.

See
other roofing

Components: manufacturers' formulations may vary; may contain vinyls, polyesters, or rubber (butyl or EPDM, i.e., ethylene-propylene-diene monomer)	**Product Source:** available from roofing suppliers	**Masterformat Number:** 07500

Modified asphalt torch-on roofing

Common product names	Typical uses in construction
torch-on membrane	flat roof membranes (or low-pitch)

Description
Modified asphalt torch-on roofing is a roll roofing system for flat roofs. The asphalt-impregnated roll roofing is applied by heat; the joints are sealed with a torch.

Additional considerations
Modified asphalt is a high temperature, refined asphalt with less aromatic content than ordinary asphalt, though strong odours (polynuclear aromatics) are emitted during installation.

Health issues associated with this material
Aromatic odours emitted during installation are both irritants and possible carcinogens. Once the roofing is installed, emissions are moderate to low. They occur outside the living space but may be introduced into the house if roofing is warmed near ventilation openings. The roof can be covered with gravel to keep it cooler.

Comments based on experience of the environmentally hypersensitive
Modified asphalt torch-on roofing is preferable to tar and gravel and other flat roof membranes, but the odours from asphalt can be very bothersome to some people. Sensitive individuals report detecting odours at ground level. Choose more inert roofing systems if possible.

Select an alternative roofing system.

See
other roofing

Components: high-temperature asphalt, glass fibre reinforcement, asphalt additives, i.e., rubber modifiers	**Product Source:** available from roofing suppliers	**Masterformat Number:** N/A

SHINGLES, ASPHALT

Common product names	Typical uses in construction
shingles	roofing

Description
Asphalt shingles are a common residential roofing material.

Additional considerations
Asphalt shingles come in different weights and types that affect their longevity. Shingles need to be replaced periodically.

Health issues associated with this material
All asphalt products emit some residual volatiles (e.g., polynuclear aromatics) when warm. These volatiles are irritants and possible carcinogens. Shingles are used outside the living space, but in warm weather the odour may be introduced through ventilation openings.

Comments based on experience of the environmentally hypersensitive
People with asphalt sensitivities are often bothered by emissions from asphalt shingles, particularly during warm weather and when shingles are new. This may be especially noticeable where an overhang is adjacent to a window. Shingles with different rated lives (10 years versus 25 years) may display very different emission characteristics, as they are reformulated for improved performance.

User must test.

See
other roofing

Components: asphalt-saturated felt, crushed slate surfacing; may contain glass fibre reinforcement	**Product Source:** available from building product suppliers	**Masterformat Number:** 07311

SHINGLES, GLASS FIBRE

Common product names	Typical uses in construction
fibreglass shingles	roofing

Description
Glass fibre shingles are an alternative to asphalt shingles as a roofing material.

Additional considerations
Glass fibre shingles require periodic replacement. Local conditions will affect how long the shingles last.

Health issues associated with this material
Glass fibre shingles emit typical polyester odours and excess catalyst. Polyester catalysts are highly toxic and are corrosive to the cornea (important to note, especially if any cutting is done). Shingles are outside the living space, but exposure to sunlight may produce odours. These can enter the living space if they occur near ventilation openings.

Comments based on experience of the environmentally hypersensitive
Sensitive individuals should use more inert roofing materials. Corrugated fibreglass sheet roofing panels have similar properties.

User must test.

See
other roofing

Components: glass-reinforced polyester resin, dyes, catalysts, gelcoat (polyester) surface, ultraviolet retardants	**Product Source:** available from roofing suppliers; may need to be ordered	**Masterformat Number:** 07315

SHINGLES, WOOD

Common product names	Typical uses in construction
shingles, shakes	steep pitch roofing, rustic siding

Description
Wood shingles are usually made from cedar, but may also be made of pine or oak. Shakes are thicker than shingles. Shingles are usually sawn and are flat, while shakes are usually split and are rough.

Health issues associated with this material
Natural volatile chemicals from cedar or pine can be allergenic for some people. Health effects may be associated with exposure to the solvents and wood preservatives in the stains used for their upkeep.

Comments based on experience of the environmentally hypersensitive
The odours generally occur outside the living space but may be introduced through ventilation openings when the roof is warmed by sunlight. Sensitive individuals can also detect cedar odours outside the house.

User must test.

See
shingles, glass fibre; shingles, wood

Components: cedar, white oak or other rot-resistant woods; pine is used in areas of low rainfall; may contain fire retardants, anti-bleeding treatments, wood preservatives	**Product Source:** available from roofing suppliers and lumber mills	**Masterformat Number:** 07313

Slate

Common product names	Typical uses in construction
slate, slate tile	roofing, flooring, patio surface

Description
Slate is cut or split rock used for roof tile and other surfaces.

Additional considerations
Slate tile is more expensive than many other roofing systems.

Health issues associated with this material
Slate is inert and does not give off emissions.

Comments based on experience of the environmentally hypersensitive
Slate is generally tolerated by sensitive individuals.

See
other roofing

Components: natural cut or split slate	**Product Source:** available from specialty roofing suppliers	**Masterformat Number:** 07314

STEEL, BAKED-ON ENAMEL

Common product names	Typical uses in construction
enamelled steel, porcelain steel	roofing, siding, wall panels, windows, fixtures, cabinets

Description
Steel covered with baked-on enamel is a durable material with many uses. The enamel provides a protective and decorative surface for roofing.

Additional considerations
Enamelled steel roofing is extremely durable.

Health issues associated with this material
Enamelled steel has minimal emissions.

Comments based on experience of the environmentally hypersensitive
Enamelled steel roofing is recommended for environmentally sensitive individuals.

This product is generally tolerated.

See
other roofing

Components: steel, zinc, enamel (often alkyd) baked above 66 degrees C	**Product Source:** available from building product suppliers	**Masterformat Number:** 08120

STEEL, GALVANIZED

Common product names	Typical uses in construction
galvanized sheet, bar, tube, satin coat	roof flashing, roofing, ducts, framing clips and anchors, doors

Description
Galvanized steel is sheet steel that has a zinc coating to prevent corrosion.

Additional considerations
Galvanized steel is available in a plain or corrugated sheet. It is easily fabricated into many shapes.

Health issues associated with this material
There are no health concerns with galvanized steel used as roofing. Any oily residue present will weather off.

Comments based on experience of the environmentally hypersensitive
Galvanized steel is recommended for environmentally sensitive individuals. It eliminates the odours associated with asphalt roofing.

This product is generally tolerated.

See
other roofing

Components: iron, carbon, zinc	**Product Source:** available through building product suppliers	**Masterformat Number:** 07600

TAR AND GRAVEL

Common product names	Typical uses in construction
flat roof membrane, hot asphalt, built-up roofing	flat or low-pitch roofing membrane

Description
Tar and gravel is a roofing system for flat roofs.

Additional considerations
Flat roofs are prone to leaking. They are high-maintenance roofs.

Health issues associated with this material
Emissions of asphalt, benzene, polynuclear aromatics, aromatics (toluene, xylene, etc.) result in exposure to carcinogens during installation of hot asphalt roofing. Odours linger and are more pronounced when the roofing is warm. These occur outside the living space but may be introduced through ventilation openings. Very sensitive people may detect odours from low roofs outside on hot days.

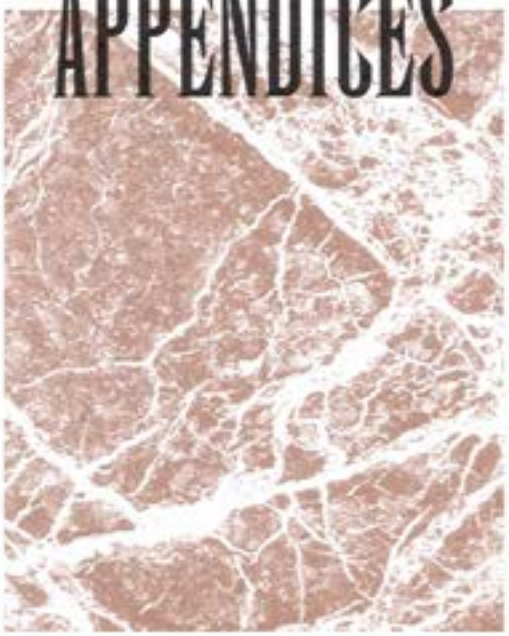
Comments based on experience of the environmentally hypersensitive
Very old roofs may have reduced emissions.

This product is not generally tolerated.

See
modified asphalt torch-on roofing, membrane roofing

Components: oxidized asphalt, asphalt-saturated felt, pea gravel, or crushed rock	**Product Source:** available from roofing contractors	**Masterformat Number:** N/A

APPENDICES



APPENDIX A:
HOW TO CONDUCT A PERSONAL TEST

Many of the product sheets recommend conducting a personal test. Even though a product may be "generally tolerated," there is no guarantee that the material will be tolerated by a hypersensitive individual.

Testing beforehand reduces the possibility of incorporating materials into the building structure which later may be discovered to be a source of difficulties. From a personal test, one gets an idea of the kind of reaction or lack of reaction that may occur as a result of having the material in one's surroundings. However, the effects from testing a sample may be minimal compared to those from living with the total amounts used in a building. Furthermore, over time, the actual conditions in the house may alter the material.

CAUTION
Exercise caution when conducting a personal test. Consult your physician. You are responsible for testing and using the materials.

Some people, particularly those who are extremely sensitive, may experience strong reactions to some materials. Though testing may provoke symptoms of illness, these people are the ones who have the greatest need to test the materials.

Sensory testing makes use of the body's responses. For building materials, the sense of smell (olfactory) is commonly used. Relying primarily on the sense of smell has several limitations. Some people have a poor sense of smell. Not all contaminants have odours. Odourless gases or gases that are only detectable in high concentrations may escape detection. To supplement olfactory sensing, the sense of touch is often used. Some individuals may experience other sensory reactions by touching the material or being in close proximity to the material.

The following approach is suggested. With a small sample, cautiously determine whether the material has an odour and observe any sensory responses provoked by the material. If no adverse reaction is produced, proceed to the sealed jar method. Testing a larger sample can also make the sensory responses more distinct.

Conduct the test in a place that has relatively clean, unpolluted air to prevent confusion by conflicting smells. Use a small, manageable piece of the material. Test samples that are in their final state. For example, if paint is being tested, it should be completely dry and allowed to cure for a period of time (e.g., a week).

1. Preliminary test with a small sample

A.
- Hold a sample of the material at arm's length.
- Note any odour or sensory response.

If an adverse reaction is observed, the material is probably not a good choice. Test other materials.

B.
- If no odour or reaction is noticed at arm's length, slowly bring the material closer to the body.
- Note any odour or sensory response.

If an adverse reaction is produced, do not test the material any further. If no response is elicited, go on to Step C.

C.
- Select a clean, empty jar with a tight-fitting lid. Check to make sure that the jar is free from odours.
- Place the dried and cured sample in the jar. Seal it tightly with the lid and place it in a spot exposed to the sun or in a warm place for an hour or longer.
- Using the same procedure as above, test the material with the jar partially open.
- If no odour or reaction is noticed, repeat the test with the jar completely open.
- Evaluate whether any odour is noticed or any body reaction occurs.

If the material passes the sealed jar test, a decision can be made whether to do more testing. This is especially important if the material will be used extensively inside the house.

2. Testing a larger sample

- Obtain a larger sample of the material.
- Follow the basic test procedure, testing the material several times or for longer periods to ensure that it does not provoke negative reactions.

NOTES:

1. Test one sample at a time.
2. Conduct the test when you are well rested, relaxed, and free from distractions.
3. Evaluate on the basis of your responses whether the material is suitable for the intended application.
4. Sensitivity may develop after continuous and prolonged exposure to a material. It is possible that products that seem acceptable when tested may become problems later. Do not let this factor discourage you from testing. Initial reactions will screen out many unacceptable choices.

APPENDIX B:
DEGREASING MATERIALS

Some building materials, such as steel or aluminum roofing, aluminum foils, and steel structural products, have an oily surface residue. Individuals who are sensitive to emissions from the oils may want the oil washed off.

Suggested washing agents are:

- **Baking Soda:** Baking soda is readily available in supermarkets (recently has been introduced in large containers).
- **TSP—Trisodium phosphate:** Wear rubber gloves when using. TSP is caustic. It is available from most hardware stores.
- **Castile Soaps**
- **Heavenly Horsetail Soap**
- **Nature Clean**—Frank T. Ross & Sons

Castile soap, Heavenly Horsetail Soap, and Nature Clean are available at health, natural food, and specialty product stores.

CAUTION
Some individuals may be sensitive to the washing material. Conduct a personal test before using a particular cleaning or degreasing product.

APPENDIX C:
TERMS USED IN THE GUIDE

air barrier—a flexible or rigid membrane designed to reduce the movement of moisture-laden air between the interior and exterior of a building
allergen—a substance that causes allergy
allergy—an exaggerated or pathological body reaction (e.g., sneezing, itching, skin rash, breathing difficulties) to substances that do not affect the average individual; the reaction is indicated by immunoglobulin E
carcinogen—a cancer-causing substance
emission—a substance discharged from a particular material into the air, e.g., gas, dust, or odours
irritant—a substance which causes physical irritation (e.g., soreness, redness, roughness, inflammation) of a body part
moisture barrier—a material, membrane, or coating used on the inside of the foundation, below grade, to keep moisture from penetrating interior wall or flooring materials
odour—the characteristic smell of a particular substance
particulate—a substance made up of minute separate particles, e.g., sand, gravel, dust
sensitivity—the degree to which a person is physiologically responsive to the presence of a substance
sensitizer—a substance, exposure to which causes increased sensitivity or susceptibility to that substance on re-exposure
solvent—a liquid, either natural (e.g., water) or petroleum-derived, capable of dissolving or dispersing another substance
synergy—the combined action of two or more substances that exceeds the sum of individual effects
tolerance—the level of ability to endure the effects of an agent without unfavourable effects
toxicity—the quality or degree to which a substance is toxic (poisonous)
toxin—a poison
vapour barrier—see vapour diffusion retarder
vapour diffusion retarder—commonly called a vapour barrier, a material, membrane or coating that slows the diffusion of water vapour to prevent problems from moisture build-up in the building structure; it may also slow the movement of other vapours, gases, and odours
volatile—readily given off as a gas
volatile organic compound—organic compounds, such as solvents, which vapourize readily (often seen as the short form VOC)
weather barrier—a flexible membrane installed on the exterior of a building to protect the building from wind, rain, and snow; it is permeable to allow the diffusion of vapour from inside the wall

Some Chemical Terms Defined

acrylic—polymer or co-polymer of acrylic acid, methacrylic acid, esters of these acids, or acrylonitrile
alkyd—a type of polyester resin formed from dibasic acids or anhydrides with polybasic alcohols
catalyst—a substance that alters the velocity of a reaction, and that may be recovered unaltered in nature and amount at the end of the reaction
co-polymer—polymer formed from the union of two or more varieties of monomers
epoxy resins—a class of synthetic resins made by the reaction of epichlorohydrin with phenol compounds
latex acrylics—water emulsion of synthetic resins and rubbers
melamines—synthetic resin made from melamine and formaldehyde
monomer—the simple molecule that forms larger molecules called polymers
neoprene—a type of synthetic rubber, made from polychloroprene
olefins—unsaturated hydrocarbons
petrochemicals—chemicals derived from petroleum—a heavy, liquid oil consisting chiefly of carbon and hydrogen in the form of hydrocarbons; petroleum is stored under the surface of the earth and formed as the by-product of the action of bacteria on marine plants and animals

phenol—also known as carbolic acid, obtained from the distillation of coal tar
phenol-formaldehyde resin—a resin formed from the condensation of phenol or substituted phenols with aldehydes such as formaldehyde
plastics—products of synthetic origin capable of being shaped by flow in some stage of manufacture, and which are not rubber, wood, glass, natural resin, leather, or metal
polyester—a special type of alkyd resin formed from the polycondensation of dicarboxylic acids with hydroxy alcohols
polyethylene—derived from the polymerization of ethylene with peroxide catalysts
polymer—a synthetic substance composed of giant molecules that have been formed by the union of a considerable number of simple molecules with one another; the union of monomers to form polymers is called polymerization
polystyrene—polymer formed from styrene (similar to ethylene with one of the hydrogens replaced by benzene; also called vinyl benzene)
polyurethane—polymer formed from the condensation reaction of a polyisocyanate and a hydroxyl-containing material
polyvinyl—resin derived by polymerizations of copolymerization of vinyl monomers, including vinyl chloride and acetate, acrylonitrile; may include plastics made from styrene or other chemicals
resins—a group of substances obtained naturally or manufactured synthetically; the synthetic resins are constantly changing and being improved
silicone—any of the large group of organic siloxane polymers
urea-formaldehyde resin—urea and formaldehyde are reacted in the presence of pyridine, ammonia, or certain alcohols to form intermediates that are converted to resins by heat and pressure in the presence of catalysts

APPENDIX D:
SUPPLIERS OF SPECIALTY PRODUCTS

The following list of suppliers is provided for information purposes only. It is neither complete nor comprehensive. CMHC and the authors do not endorse or warrant any product whatsoever for any purpose. The suitability of a product for purchase or use is the responsibility of the purchaser.

ADHESIVES

CANADA

Domco
1001, rue Yamaska est
Farnham, QC J2N 1J7
Tel : (800) 363-9276
Fax : (450) 293-6779
water-based flooring adhesive

Mapei Inc.
2900 Francis-Hughes
Laval, QC H7L 3J5
Tel: (450) 662-1212
Fax: (450) 662-0444
solvent-free flooring adhesives

Roberts Co. Canada Ltd.
2070 Steeles Avenue
Bramalea, ON L6T 1A7
Tel: (905) 791-4444
Fax: (905) 791-1998
supplier of Earthbond™ flooring adhesives

The Healthiest Home
384 Richmond Road
Ottawa, ON K2A 0E8
Tel: (613) 715-9014
Fax: (613) 715-9056
supplier of environmentally-sound products including AFM

UNITED STATES

AFM Enterprises Inc.
3251 Third Avenue
San Diego, CA 92103
Tel: (619) 239-0321
Fax: (619) 239-0565
manufacturer of low-toxicity adhesives, etc.

NEEDS
P.O. Box 580
East Syracuse, NY 13057
Tel: (800) 634-1380
distributor of AFM products

W.F. Taylor Company Inc.
11545 Pacific Avenue
Fontana, CA 92335
Tel: (909) 360-6677
Fax: (909) 360-1177
manufacturer of Envirotec Healthguard™ adhesives

BARRIERS: AIR, VAPOUR, WEATHER, AND MOISTURE

UNITED STATES

ALL FOILS Inc.
4597 Van Epps Road
Brooklyn Heights, OH 44131
Tel: (800) 521-0054
Fax: (216) 398-4161

Sto-Cote Products, Inc.
Drawer 310
Richmond, IL 60071
Tel: (815) 675-2358
Fax: (815) 675-6713
manufacturer of tu-tuf® poly sheeting

FLOOR

CANADA

Carpet

Floor Work International
365 Dupont Street
Toronto, ON M5R 1W2
Tel: (416) 961-6891
Fax: (416) 961-3881
natural fibre and specialty carpets

Linoleum (natural source)

Erv Parent Ltd.
791 Caldew Street
Annacis Industrial Park
New Westminster, BC V3M 5S3
Tel: (604) 525-4142
Fax: (604) 525-3777
Western distributor for floor covering

Forbo Industries
8300 Keele Street
Concord, ON L4K 4T1
Tel: (416) 661-2351
Fax: (416) 661-5362
manufacturers of linoleum with linseed oil

Phoenix Wall & Floor Products
111 Westmore Drive
Rexdale, ON M9V 3Y6
Tel: (416) 745-4200
Fax : (416) 745-4211
Eastern distributor for Forbo

Nairn Floors International Ltd.
560 Weber Street N.
Waterloo, ON N2L 5C6
Tel: (519) 884-2602
Fax: (519) 888-6548

Rigid Vinyl Tile

Domco
1001, rue Yamaska est
Farnham, QC J2N 1J7
Tel: (800) 363-9276
Fax : (450) 293-6779

UNITED STATES

Forbo Industries
P.O. Box 667
Hazelton, PA 18201
Tel : (800) 233-0475
natural linoleum and marmoleum

Sierra Pine Limited
2151 Professional Drive #200
Roseville, CA 95661
Tel: (800) 676-3339
Medex & Medite II® formaldehyde-free fibreboard

See also Adhesives suppliers

FOUNDATION

Coatings

CANADA

U.S.E. Hickson Products Ltd.
15 Wallsend Drive
Scarborough, ON M1E 3X6
Tel: (416) 724-2000
Fax: (416) 724-6818
supplier of Thoroseal

Weber Supply Company Inc.
P.O. Box 1418, 675 Queen Elizabeth Street South
Kitchener, ON N2G 4H6
Tel: (519) 888-4200
Fax: (519) 888-4205
Sta Dri waterproof masonry paint (basement interiors, cisterns, etc.)

Xypex Corp. Inc.
13731 Mayfield Place
Richmond, BC V6V 2G9
Tel: (604) 273-5265
Fax: (604) 270-0451
concrete waterproofing

INSULATION

CANADA

I.F. Insulation
1426 Wallace Road Unit 4
Oakville, ON L6L 2Y2
Tel: (905) 827-6358
Fax : (905) 827-9342
supplier of Air Krete cementitious foam and K-13 recycled cellulose insulation

Roxul Inc.
551 Harrop Dr.
Milton, ON L9T 3H3
Tel: (905) 878-8474
loose wool, rock wool batt and board insulation

Thermo-Cell Insulation
2015 Lanthier Drive
Orléans, ON K4A 3V2
Tel : (613) 837-9797
Fax: (613) 837-5537
Weathershield™ recycled cellulose fibre insulation

Thermo-Cell Insulation
P.O. Box 517
Truro, NS B2N 5E1
Tel: (902) 662-3600
Fax: (902) 662-2882
Weathershield™ recycled cellulose fibre insulation
Weathershield™ is widely available through local building product suppliers.

Fibret Insulations Ltd.
581 Scott Road
Sarnia, ON N7T 7L4
Tel: (800) 265-7514
Fax: (800) 363-4440
Paro® rock wool batt, board and pipe insulation

Prosumex Inc.
Mr. Russell Fiset
820 Elligham Street
Pointe-Claire, QC H9R 3S4
Tel: (514) 694-1485
Fax: (514) 694-3999
Fibrex R-2000

Fibrex R-2000 is also available in New Brunswick, Québec, and Ontario through insulation contractors. It is also available through hardware stores in Québec and Ontario. Call toll free 1 800 363-7876 to order.

UNITED STATES

Air Krete Inc.
P.O. Box 380
Weedsport, NY 13166
Tel: (315) 834-6609
silicate-based cementitious foam insulation

CertainTeed Corp.
Insulation Group
P.O. Box 860
Valley Forge, PA 19482
Tel: (610) 341-7000
loose glass fibre without binders

INTERIOR WALL AND CEILING

CANADA

CGC Inc.
P.O. Box 4034, Terminal A
Toronto, ON M5W 1K8
Tel: (905) 803-5600
manufacturer of Durock®

UNITED STATES

FibreCem Corp.
P.O. Box 411368
Charlotte, NC 28241
cement fibreboard, Handy board

PAINTS, SEALERS, COATINGS

CANADA

Canadian Old Fashioned
Milk Paint Co.
163 Queen street E.
Toronto, ON M5A 1S1
Tel: (416) 364-1393
Fax: (416) 364-1170
casein paint

Earthright
79 F 3rd Avenue North
Williams Lake, BC V2G 2A5
Tel: (604) 392-7119
or (604) 620-3510
supplier of AFM & Livos products

Eco-House (1988) Inc.
P.O. Box 220, Stn. A
Fredericton, NB E3B 4Y9
Tel: (506) 366-3529
Fax: (506) 366-3577
manufacturer of mineral silicate paints and natural wood finishes, sealers and solvents

UNITED STATES

AFM Enterprises Inc.
3251 Third Avenue
San Diego, CA 92103
Tel: (619) 239-0321
Fax: (619) 239-0565
manufacturer of low-toxicity paints and sealers, water seal, etc.

Bona Kemi USA
14805 E. Moncrieff Place
Aurora, CO 80011-1207
Tel : (303) 371-1411
Fax: (303) 371-6958
manufacturer of « Pacific » water-based urethane wood finishes and maintenance products

Bona Kemi products are available in Canada from floor finishing companies

Eco Design Co.
1330 Rufina Circle
Santa Fe, NM 87501
Tel: (505) 438-3448
Fax: (505) 438-0199
natural paints and sealers

Miller Paints Co.
317 S.E. Grand Avenue
Portland, OR 97214
Tel: (503) 233-4491
Fax: (503) 233-7463
low-toxicity paints

Murco Drywall Co.
2032 North Commerce
Fort Worth, TX 76106-8528
Tel: (817) 626-1987
Fax: (817) 626-0821
manufacturer of paints and drywall filler

Old Fashioned Milk Paint Co.
Box 222
Groton, MA 01450
Tel: (978) 448-6336
Fax: (978) 448-2754
natural paints and sealers

Pace Chem Industries Inc.
3050 Westwood Drive Unit 310
Las Vegas, NV 89109
Tel: (805) 499-2911
low-toxicity paints and sealers, makers of Crystal Aire®

Sinan Co.
P.O. Box 857
Davis, CA 95617-0857
Tel: (530) 753-3104
importer of Auro natural paints and sealers

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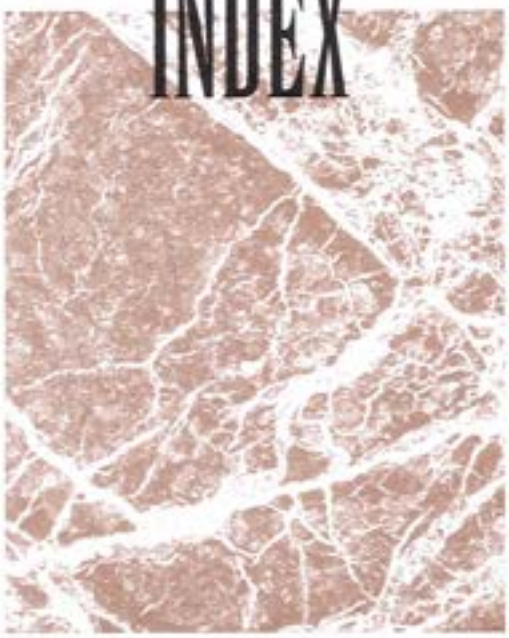
INDEX



INDEX 1
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INDEX 2
BY TERM

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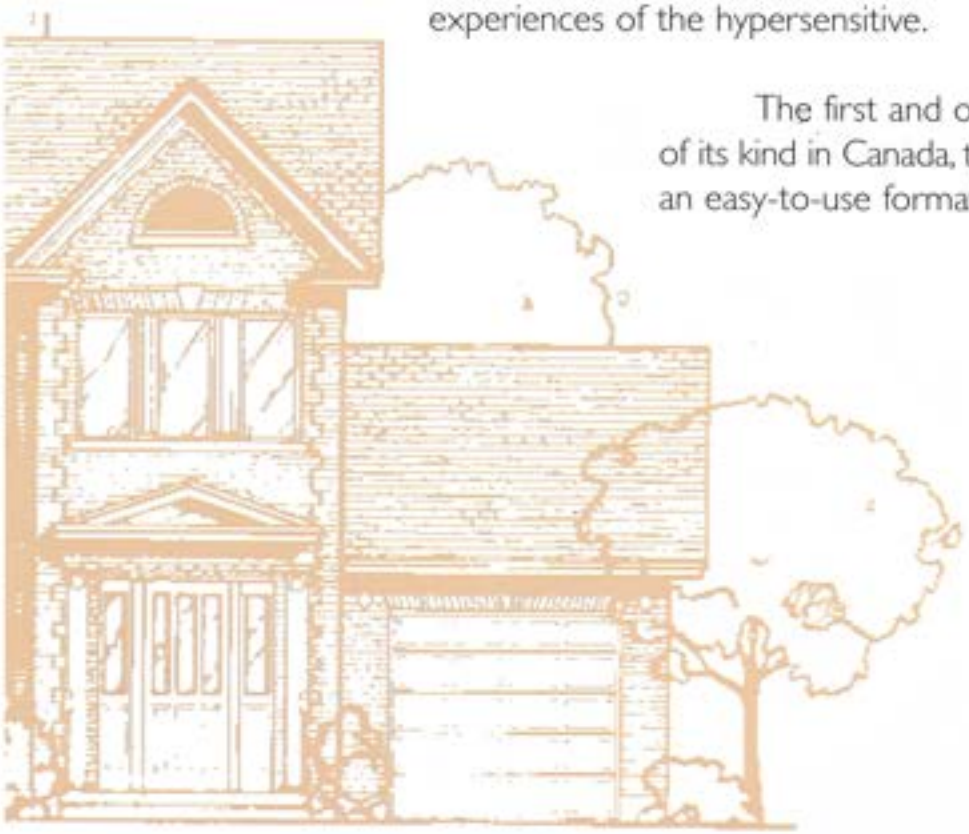

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