

RESEARCH REPORT



CMHC's Healthy House in Toronto



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CMHC'S HEALTHY HOUSE IN TORONTO

NO CONNECTIONS TO MUNICIPAL ELECTRICITY, WATER OR SEWERS

Picture this: a three-bedroom family home built on a small downtown lot in Metro Toronto, independent of city water, sewer, hydro and natural gas. Sound like a hardship? Think again. Because these are just a few of the many features that make this home a clean, comfortable, environmentally responsible haven in the heart of the city.

Five years ago architect Martin Liefhebber's off-grid self-sufficient house was one of two winners of Canada Mortgage and Housing Corporation's (CMHC) Healthy Housing Design Competition. The winning design met CMHC's criteria that new housing technologies and design be workable, available and affordable for the occupants and the community while going easy on the planet.

"Our team responded to the Healthy Housing Design Competition not as an academic exercise, but as a real challenge," says Liefhebber. Each person on the team lives in the city and is part of the economic and psychological gridlock that has become anathema to the modern urban existence. We live and work in our neighbourhoods and worry about where our children are going to live." The next step was to make the award-winning design a reality.

Although there are many Canadian homes that have energy and water conservation features, Liefhebber's design integrates the additional Healthy Housing principles of good indoor air quality, affordability and environmental responsibility. The four-storey, semi-detached house is located in an established neighbourhood in downtown Toronto. And because the house requires no hydro, water or sewer connections, it was possible to build on a lot that normally would be too expensive to develop.

Some of the features of CMHC's Healthy House in Toronto include:

- water consumption in this house is reduced to one-tenth of that in a typical household; 720 L of water are used in the house each day, 600 of which are recycled
- rain and snow are the sole sources of water for the house
- the dishwasher and washing machine use 50 percent less water than that of standard appliances
- the toilets use six litres of water per flush
- 75 percent of the space heating energy required in the house comes from the sun
- energy efficiency is achieved through the appliances selected, airtight wall and roof construction, thermally efficient windows, high levels of insulation in the building envelope, the tall and narrow orientation of the house and the optimum use of solar energy and thermal mass to maintain a stable temperature
- the corrugated metal decking in the suspended floor/ceiling system holds 45 metric tonne (50 tons) of concrete, which provides adequate thermal mass for the passive solar system
- the thermal mass of the house absorbs heat during the day and releases it during the cooler hours of the night, thereby reducing daily swings in indoor temperature
- radiant hot water floor heating is used when there is not enough sunlight to provide passive heating
- a back-up co-generator is used when there is insufficient sunlight for more than four days; the expected cost to operate the co-generator is \$80 a year
- the refrigerator uses 40 percent less energy than a modern energy efficient refrigerator
- the heat recovery ventilator exhausts stale air to the outside to maintain good indoor air quality
- materials with reduced or negligible emissions, such as veneer plaster, were used to reduce air pollution at the source
- many recycled materials were used, including recycled glass in the flooring, slag from steel production in the mineral wool insulation, waste wood fibres in the concrete wall forms and cellulose in the fibre-cement siding.

"This house may appear revolutionary, but it is actually based on ideas that are not new or high-tech," says Chris Ives, project manager for CMHC. "The result is not a demonstration house of tomorrow, but rather of housing choices that are do-able and affordable today. These housing choices can apply to both new and renovated homes, and even to rental accommodation. Despite the home's high-tech appearance, most of the products and systems are simple and straightforward. Off-grid houses do not necessarily require hours of labour for upkeep. In fact, everything in the house is easy to maintain and available in today's marketplace. All of the components in the house have proven track records, but have just never been used together in one house before as an integrated system."

The inner city lot that was chosen posed a challenge for various reasons. The 161 m² house sits on a 6.86 x 21.84 m lot with a 6.1 m cliff in the backyard. The tall design of the house meant that it would be more visible than the garages typically built on the back lane where the lot was situated. Liefhebber's research confirmed that neighbours to the rear of the property would prefer to look out at a roof line with skylights, rather than at a straight wall with windows. Originally, the swallowtail back roof was to be made of metal. However, because the neighbours were concerned about glare, a plastic resin roofing material that resembles slate was substituted. Fortunately for the project, neighbours in the Riverdale area where the house is situated — many of whom are environmentalists — were very supportive of the project. In fact, they actually submitted a petition to the city supporting it.

When the project began, the Ontario Ministry of Environment and Energy, the City of Toronto Public Health and Ontario Hydro were concerned: here was a house that would treat all of its own sewage on site and would use photovoltaic systems for electricity. Generally, building code requirements dictate that a house in an urban centre such as Toronto must be hooked up to municipal services. Within the approval agencies champions for the project came forward. These visionary people saw that this house could demonstrate how to minimize the environmental impact of housing and yet make homes more affordable to build and operate. It is expected that the total operating costs for one year for CMHC's Healthy House in Toronto will be between \$200 and \$300. These costs are primarily for back-up heating, replacement filters and ultraviolet light bulbs in the water treatment system.

The Water Treatment Systems

The most difficult obstacle in the approval process was the waste water treatment system and the use of reclaimed water for bathing. The design team looked for a system that would be easy to maintain, provide safeguards should any problems develop, and fit in a small space. We know that Canadians use a lot of water. In fact, water has the potential to be the most expensive utility we have. The average house is built anticipating consumption of 1600 L per day. This is a heavy volume for chemical treatment.

Finding an effective waste water treatment system that would meet environmental and health concerns was not the key problem — there are several excellent systems on the market. The problem was space. Only 11 m² was available for disposal of waste water. And because the house would depend on rainfall and snow for its water supply, it was possible that there would not be enough fresh water available. A conventional Class 6 septic system with an absorption trench leaching system on soil and using conservation measures (low flow fixtures and appliances) required 76.8 m² plus distribution area for disposal. Adding a sand filter leaching system reduced the requirement to 16.9 m². The final solution included all of the preceding measures plus a water reclaiming system, which eliminated the disposal problem and meant that the house could be totally independent from municipal water and sewer services. By recycling 600 L of the 720 L of water available for consumption per day, the volume of disposal water is equal to treated potable water of only 120 L per day and the disposal area required is 1.69 m².

The system selected was developed by Dr. Craig Jowett at the University of Waterloo and is appropriately called the Waterloo Biofilter™ system. It is a highly efficient waste water treatment system which is able to digest biological loading effectively in a small basement space — 7 m² in the case of CMHC's Healthy House in Toronto. There are no chemicals involved in this system. Primary treatment in a septic system ferments and biodegrades large organic molecules into smaller dissolved organics which are more readily treated in the aerobic Waterloo Biofilter™. A recirculation tank downstream from the septic system achieves denitrification in an aerobic environment. The secondary treatment in the Biofilter is an aerobic biological process which removes organic matter and effects nitrification. The Biofilter effluent passes through the recirculation tank several times.

Advanced treatment and disinfection of the waste water uses a staged approach typical of drinking water treatment technology. The multi-stage filtration unit does not rely on the use of chemicals. A roughing filter of gravel layers, graded from coarse at the bottom to fine at the top, removes a large percentage of suspended solids by filtration throughout the depth of the bed. Then the effluent passes through a slow sand filter. This consists of a fine sand bed that develops a thin, biologically-active layer at the sand surface, which becomes very effective in adsorbing particulates, bacteria and cysts. A significant percentage of dissolved organic matter is also consumed. Finally, the water passes through an activated carbon contactor to adsorb colour, taste and odour. The unique aspect of the filter is that all three elements have been incorporated into a single tank.

The slow sand filter is cleaned by automatic back flushing about once a month and the carbon needs to be replaced about once a year. If the filter is not cleaned when required it will simply become plugged-up and gradually produce less and less effluent. Water quality is not affected. If the carbon is not replaced only the aesthetic quality will be affected. This serves as a reminder to the occupants that attention is required.

As a final barrier to pathogens, the effluent from the filter is passed twice through an ultraviolet disinfection unit. The ultraviolet unit is equipped with a sensor that will automatically shut down the supply if there is insufficient disinfection due to a burnt-out or fouled lamp. Treated water is discharged to a 1200 L storage tank and is then pumped into the reclaimed water system.

Rolf Paloheimo of Creative Communities Research Inc., the builder and owner of the house, says that it was vital that the system produce safe and aesthetic water reliably. "While waste water technology is dedicated to removing waste from water, drinking water technology is dedicated to ensuring that water is safe for human consumption. For me, the purpose of the polishing of the water in the reclamation stage is to ensure that the finished water is always acceptable."

Not only is Paloheimo's company selling the waste water treatment system developed for CMHC's Healthy House in Toronto, but he and his family are living in the house. He therefore has a personal interest as well as business interest in the quality of water being produced. "As a result of this project, I as a builder, have become aware of the need for alternatives to existing on-site waste water systems and also to large scale collection, treatment and disposal as currently practiced by our cities and towns. I have great confidence in this system's ability to deliver safe and aesthetic water."

The first waste water treatment system cost about \$15,000, but Mr. Paloheimo anticipates that the next residential application of the system would be about \$10,000. The cost could be reduced even further if demand warranted quantity production of the system.

The source of potable water is from rainfall and snow. The water purification system mimics the natural path that rain follows when it passes through the ground to a spring. Rainwater from the roof of the house is collected in a 20,000 L concrete cistern. Its size is based on Toronto's average annual precipitation and, when full, should be sufficient for the household's potable needs for five months if there is no rainfall. In the unlikely event of a shortfall, levels can be supplemented from outside sources. The cistern contains a layer of limestone to neutralize acid rain, a problem prevalent in the Toronto area. The water passes through a sand filter, a charcoal filter to remove odour, organics and low levels of hydrogen sulfide, and finally ultraviolet treatment.

The potable and reclaimed water systems are independent of each other to ensure purified rainwater is being consumed while reclaimed water is only used for secondary purposes. The potable water supplies all the sinks and the dishwasher. The reclaimed water supplies the tubs, showers, toilets and washing machine. Water is reclaimed and recycled three to five times. The purified surplus water — 120 L — is discarded daily and used to water the front garden.

The Electrical System

Generating electricity using photovoltaic (PV) panels is not new. Solar energy has become a more appropriate and acceptable option for heating and electricity because of improvements in materials and equipment technology and the greatly reduced requirements of energy efficient housing. To determine how many panels are required, the amount of power needed for the equipment and appliances in a home must first be calculated. The more power needed, the more PV panels and batteries are required, and the greater the expense. CMHC's Healthy House in Toronto has eight PV panels mounted on a metal structure attached to the roof. The panels act as an awning for the south facing windows on the fourth floor of the house to ensure that the rooms are not too bright or too hot. The PV panels can generate up to 2.3 kW of power on sunny days. The electricity is stored in batteries in the basement utility room. A 4 kW inverter changes direct current from the 48 volt battery to household alternating current at 120 volts.

It is expected that on the worst grey day of winter the house will consume 9 to 12 kWh of electric energy over a twenty-four hour period. On a typical day with five to eight hours of sunlight, it is possible to generate a total of 10 to 15 kWh of energy. If there is no sun at all, the batteries can provide about four days of energy before they need recharging. Toronto has many grey days between November and April. However, there is usually enough sunheat to provide sufficient power to meet 75 percent of the household needs. Overall, this house will use about 3,600 kWh of energy in one year, 900 of which will be provided by a back-up generator that burns a standard fuel such as gasohol.

The floors in the house, which absorb the sun's rays, are a key component of the heating system. The thermal mass provided by 45 t of concrete poured into corrugated metal decking in the suspended floor/ceiling system, is essential to the passive solar system performance. When solar heating is inadequate, radiant floor and ceiling heating provide back-up space heat. Loops of composite metal/plastic pipe are evenly embedded in the concrete floors. Water is circulated through these pipes. The water in the pipes is a closed system, independent of the house water system. The concrete floor is poured in a light corrugated steel pan with reinforcing bars. The steel pan surface becomes the ceiling of the room below. The heat radiates into the rooms from the ceiling and the floor, providing even temperature without drafts and without raising dust.

The floor absorbs excess heat during the day and releases heat during the night when it is needed. A 2,200 L water thermal store retains the surplus heat energy. Thermostatic controls trigger the radiant floor heating system to supply heat to, or withdraw it from, the thermal store during the natural daily cycle of the house. If solar heat is not sufficient, thermostat controls trigger circulation of warm water from the thermal store through the floors and ceiling.

Reducing the electrical demands was a prime consideration in choosing such items as the bathroom fans, refrigerator, freezer, stove, washing machine, dishwasher, office equipment, circulatory pumps, fans and even the light bulbs. There is one appliance noticeably missing. The clothes dryer found in a traditional house has been replaced with a drying closet. The heat recovery ventilator supplies hot air to dry the clothes hanging in the drying closet and exhausts the moist air to the outside. Drying time will be about two hours, which is longer than the usual forty-five minutes in a traditional dryer. But the cost is almost zero and the clothes last longer with such gentle treatment. The washing machine uses 50 percent less water and half the electricity of a standard machine. It also extracts more water in the spin cycle which helps to reduce drying time.

An energy efficient refrigerator would still consume one-quarter of the PV panel output on a sunny winter day. The compressor and condenser of the custom-built refrigerator in this house are positioned outside the envelope of the house to improve efficiency in winter, reduce heat gain in summer and help decrease noise levels inside the house. Along with increased insulation, these modifications achieve a 40 percent reduction in energy requirements for this appliance.

Many features of the house provide more than one benefit. For instance, the large, south-facing windows provide passive solar heating and enough light for daily activities without the need for additional lighting. Solar panels provide the energy needed to heat water for domestic use, and heat the water in the closed-loop radiant floor heating system. Because the solar panels are located on the third level and the storage tank is in the fourth-floor bathroom, the system uses gravity rather than electric pumps to return cold water to the panels. The solar panels are hung on the third floor of the house and act as a shade for the windows. The position of the PV panels and the hot water solar panels allows air to flow through them and prevents overheating of the panels.

Indoor Air Quality

"The most important Healthy Housing guideline to follow concerns occupant health by providing a clean indoor environment" says Chris Ives. "This need not be difficult but it certainly helps to have a keen sense of smell to do a "sniff test" on every item that is brought into the house. If a building material does not smell good to you, it probably is not good for your health. Much attention has been given to ventilation to provide good indoor air quality. CMHC's research has shown that source control must go hand-in-hand with continuous, controlled ventilation."

Researchers are finding that more people are becoming increasingly sensitive to their indoor environment. With at least 25 percent of the population bothered by asthma, allergies or chemical sensitivity of some kind, researchers believe that there is a link between a home's air quality and the health of the occupants. In any house, the lifestyle of the occupants and the chemicals brought into the home have an impact on indoor air quality. Even just normal household cleaning products can add undesirable chemicals to the indoor environment. Through careful selection of building materials, biological and chemical contaminants have been reduced or eliminated in CMHC's Healthy House in Toronto. For example, a thin finish coat of veneer plaster, which has no additives, is applied over "blue board" on all of the walls of the house. Veneer plaster is faster to install than traditional plaster, and provides a harder, abuse-resistant surface which does not need to be painted. Solid surface countertops in the bathroom and glass impregnated concrete countertops in the kitchen are benign. Water-based floor and trim finishes have a low content of volatile organic compounds (VOC). The radiant floor heating provides a comfortable, dust-free heating system.

Ventilation was also carefully considered. Air is continuously filtered to remove pollutants. The balanced ventilation system is continuously controlled and always turned on. One fan exhausts stale air while a second one draws in outside air. The "ramped" control system, which progressively increases the fan speed, also permits lower energy consumption. A heat exchanger recovers energy from the exhaust air and preheats the incoming air.

Open for Tours

CMHC's Healthy House in Toronto will be completed mid-November 1996. Once all of the systems are operational they will be monitored by CMHC and its partners for one year. The City of Toronto Public Health will undertake water sampling, the Ontario Ministry of Environment and Energy will analyze water quality and the Ontario Ministry of Health will do microbiological testing on the water. Toronto Hydro and the Environment and Sustainable Development Division of Ontario Hydro have consulted on active solar systems for the house and will be monitoring the efficiency of the PV panels and the complete electrical system.

CMHC's Healthy House in Toronto is located in the Broadview and Danforth area of Toronto. To book a free tour Tuesday through Sunday 10:00 a.m. to 8:00 p.m. call 416-218-3343.

CMHC'S Healthy House in Toronto Project Team

Chris Ives, Sue Ann Rothwell, Peter Russell, Debra Wright
CMHC project leaders

Martin Liefhebber, Martin Liefhebber Architect Incorporated
architect

Rolf Paloheimo, Creative Communities Research Inc.
developer

Major Partners

City of Toronto Public Health
Ontario Ministry of Environment and Energy
Ontario Ministry of Health
consultation on water quality
technical support on drinking water and waste water
sampling, water quality analysis and microbiological testing

Ontario Hydro, Environment and Sustainable Development Division
Toronto Hydro
consultation on active solar systems
financial support for photovoltaic system

Design Team

Doug Hart

solar heating and cooling systems, thermal design

Ken Fong – Read Jones Christoffersen Ltd., Engineers

structural frame

Per Drewes – Ontario Hydro

electrical system

RAL Engineering Ltd., Creative Communities Research Inc., Technical University of Nova Scotia

potable water system

Waterloo Biofilter Systems Inc., Creative Communities Research Inc., RAL Engineering Ltd.

waste water treatment systems

Al Townshend – Blue Heron Environmental Technology, Creative Communities Research Inc.,

Martin Liefhebber Architect Incorporated

integration of all water systems

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CMHC's Healthy House in Toronto

CMHC's Healthy House in Toronto is:

- Designed to promote "inner city" living, reducing the need for suburban growth and the resultant loss of productive agricultural lands.
- A 1,700-square-foot, semi-detached three bedroom family dwelling with four floors of living space on an infill lot in the Riverdale area of Metropolitan Toronto.
- Totally self-sufficient. It is not dependent upon existing water and sewer systems or hydro and gas utilities.
- Designed and constructed to promote occupant health, enhance energy and resource efficiency and encourage environmental responsibility.
- Affordable for the homebuyer and viable for the builder.

Features:

- The house taps the power of the sun for 75% of its energy needs.
- Solar photovoltaic panels provide electricity, which can be stored for later use. There is a back-up system for cloudy days.
- Energy efficiency is achieved through the appliances selected, airtight wall and roof construction, thermally efficient windows, high levels of insulation in the building envelope, vertical orientation of the house and the optimum use of solar energy and thermal mass to maintain a stable temperature.
- Water consumption in this house is reduced to one-tenth of that in a typical household. Eighty per cent of this is achieved by recycling.
- The house depends on rainfall for its water supply and recycles much of the water used.
- Its water purification system mimics the natural path that rain follows when it passes through the ground to a spring.
- Materials used to furnish and decorate the house emit few chemicals and vapors, improving indoor air quality.

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Who will own CMHC's Healthy House in Toronto?

- Creative Communities Research Inc., a home building company.
- Rolf Paloheimo, owner of Creative Communities, and his family will live in the house.

Who assembled the Project Team?

- Martin Liefhebber of Martin Liefhebber Architect Inc. designed the house, including the envelope and the passive solar heating and cooling system. He not only established the project team, he also found a suitable site, obtained the regulatory approvals and developed working drawings.

The Design Team:

- Doug Hart:
solar heating and cooling systems, thermal design.
- Ken Fong, Reid Jones Christofferson Ltd., Engineers:
structural frame.
- Per Drewes, Ontario Hydro:
electrical system.
- RAL Engineering Ltd. and Creative Communities Research Inc., with assistance from the Technical University of Nova Scotia:
potable water system.
- Waterloo Biofilter Systems Inc., Creative Communities Research Inc. and RAL Engineering Ltd.:
waste water treatment systems.
- Blue Heron Environmental Technology, Creative Communities Research Inc. and Martin Liefhebber:
integration of all water systems.
- Dr. Tim Myles of the Urban Entomology Lab at the University of Toronto:
non-toxic termite barrier.

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CMHC's Healthy House in Toronto is sponsored by:

- Canada Mortgage and Housing Corporation
- The City of Toronto Public Health
- Ontario Ministry of Health
- Ontario Ministry of Environment and Energy
- Ontario Hydro, Environment and Sustainable Development Division
- Toronto Hydro

Over 80 companies have generously donated services, materials and expertise to the project.

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CMHC's Healthy House in Toronto

Thermal Energy System

Introduction

Solar energy has become a more appropriate and acceptable option for supplying heating and electricity needs because of improvements in materials and equipment technology and the reduced requirements of energy efficient housing.

CMHC's Healthy House in Toronto interacts with the environment to provide comfortable interior temperatures. Purchased energy is used as a last resort.

Modest loads on the heating and cooling systems result from an efficient building envelope. Therefore, natural energy sources can generally meet the demand with auxiliary heat and power being provided by a cogenerator.

Features

Windows

- Windows are positioned high on the walls of the house to ensure that the sun's rays reach deep into the house, and to allow the low rays of the winter sun to warm the interior floors.
- South facing windows are emphasized, with good exposure also on the west face.
- Frames are made of pultruded fiberglass, which is a strong, non-conducting, stable and warp resistant material.
- Windows are argon gas-filled, triple-glazed and have insulating spacers between glass panes.
- All windows are low-E coated. North-facing windows have an extra low-E coating.

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Passive Heating

The floors, which absorb the sun's rays, are a key component of the heating system. When solar heating is inadequate, radiant floor and ceiling heating is a back-up.

- Loops of metal-reinforced plastic pipe are evenly embedded in the concrete floors. Water is circulated through these pipes. The water in the pipes is independent of the house water system (closed system).
- The concrete floor is poured into a light corrugated steel pan with reinforcing bars.
- The steel pan surface becomes the ceiling of the room below.
- The heat radiates into the rooms from the ceiling and the floor, providing even temperature without drafts and without raising dust.
- The floor absorbs excess heat during the day and releases heat during the night when it is needed.
- A 2,200-litre water tank (the thermal store) stores surplus heat energy.
- Thermostat controls trigger the radiant floor heating system to supply heat to, or withdraw it from, the thermal store during the natural daily cycle of the house.
- If solar heat is not sufficient, thermostat controls trigger circulation of warm water from the thermal store through the floors and ceiling.

Passive cooling

The stack effect operates without forced ventilation (the house acts as its own chimney).

- Natural ventilation causes warmer air to be exhausted through the open windows on upper levels.
- The door on the west side of house can be opened to allow cooler air at ground level into the house provided the patio door on the top level is open to let warm air escape.
- Natural convection currents assist in cooling the house.
- Vegetation strategically planted outside the house will absorb heat from the sun, keeping the house cool.

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Active cooling

- Loops of pipe placed in the ground around the house are connected to the thermal store. Excess heat from the house is collected in the thermal store, and can be transferred from the heated water into the ground.

Ventilation

- Clean indoor air is achieved by reducing pollutants at their source. Through careful selection of building materials, biological and chemical contaminants are reduced or eliminated.
- Air is continuously filtered to ensure removal of pollutants.
- The house's balanced ventilation system is continuously controlled and always turned on. One fan exhausts stale air while a second one draws in outside air. The "ramped" control system progressively increases the fan speed to minimize energy consumption.
- A heat exchanger recovers energy from the exhaust air and preheats the incoming air. The heat exchanger is easily cleaned.

Photovoltaic (PV) Panels

- A 2.3-kW array of PV panels is attached to the roof and overhangs the upper level of the house. Each of the 8 panels provides 285 watts of electricity at midday.
- Gelcell batteries can provide up to 4 days of electricity.
- A 4-kW inverter converts DC power into AC house current.
- A cogenerator generates electricity and heat in the winter when there is not much sunlight. It can be powered by liquid fuel (gasohol) or by gaseous fuel.
- The PV panels are positioned to shade the windows below during the summer months.

Solar Panels

- Solar panels heat the water supply.
- The panels are positioned to shade the windows below during the summer.

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CMHC's Healthy House in Toronto

Water Systems

Introduction

CMHC is always encouraging new solutions for efficient use of resources in housing.

The water systems of CMHC's Healthy House in Toronto is one such solution – a unique design of proven technology. The demonstrated system is a result of a partnership between CMHC, Creative Communities Research Inc., RAL Engineering Ltd., the Technical University of Nova Scotia, Blue Heron Environmental Technology and Waterloo Biofilter Inc.

Source & Supply

- Rain is collected off the roof of the house to make it self-sufficient in household water, independent of the municipal water supply.
- Rain water is stored in a 20,000 litre cistern (storage tank) in the ground at the back of the house. Its size is based on Toronto's average annual precipitation.
- In the unlikely event of a shortfall, levels can be supplemented from outside sources.

Water Efficiency

- Water is reclaimed and recycled three to five times. Purified surplus water is discarded daily and used to water the front garden.
- Waste water from laundry facilities, bathtub, and kitchen and bathroom taps is collected, purified and recycled for use in toilets, washing machine, tubs and showers.
- Water efficient fixtures are installed – ultra low flush toilets, low flow showerheads and taps, and a washing machine that uses a minimal amount of water.
- Potable (drinkable) and recycled water systems are independent of each other to ensure purified rain water is being consumed while reclaimed water is used for secondary uses such as the toilet. Filtration and ultra violet disinfection are used for water treatments to eliminate use of chemicals.

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Potable Water System

- A roughing filter, slow sand filter, and activated carbon filter are housed in a common unit in each water stream.
- Water is purified through a combination of straining, adsorption and biological breakdown.
- Water flows from the cistern through a limestone bed and up through the slow sand filter unit, passing progressively through several layers of coarse to fine sand, a biologically active layer, and then into an activated carbon contactor.
- Filtered potable water passes through the ultra violet disinfection unit on its way to the potable water storage tank. Potable water is pumped from this storage tank through the same UV unit for a second time before it is consumed. Double UV exposure ensures complete disinfection, guarding against bacterial regrowth in the storage tank.
- Filter units are cleaned by backflushing into the waste water disposal system. Cleaning is required every one to two months. The homeowner turns one lever and the process takes about 10 minutes.
- Potable water is piped to all sinks and the dishwasher.

Waste Water Recycling System

- CMHC's Healthy House in Toronto is not connected to the municipal sewage system.
- Waste and waste water are filtered and biologically treated in a self-contained sewage treatment system located on the lowest floor level.
- Biological digestion by natural anaerobic organisms (organisms that thrive without oxygen) reduces contaminants by breaking down complex molecules into their simpler components in much the same way as sugar is fermented into alcohol.
- Aerobic bacteria in the Waterloo Biofilter further treats the waste water by causing biodegradation – the process by which living matter decomposes substances so that it can be absorbed back into the environment. The Biofilter is an alternative to a conventional septic system tile bed. It reduces contaminants to less than one part per million (ppm).
- Waste water passes through slow sand filter, carbon filter and UV systems.
- Purified waste water is piped to all toilets, tubs, showers and the washing machine.

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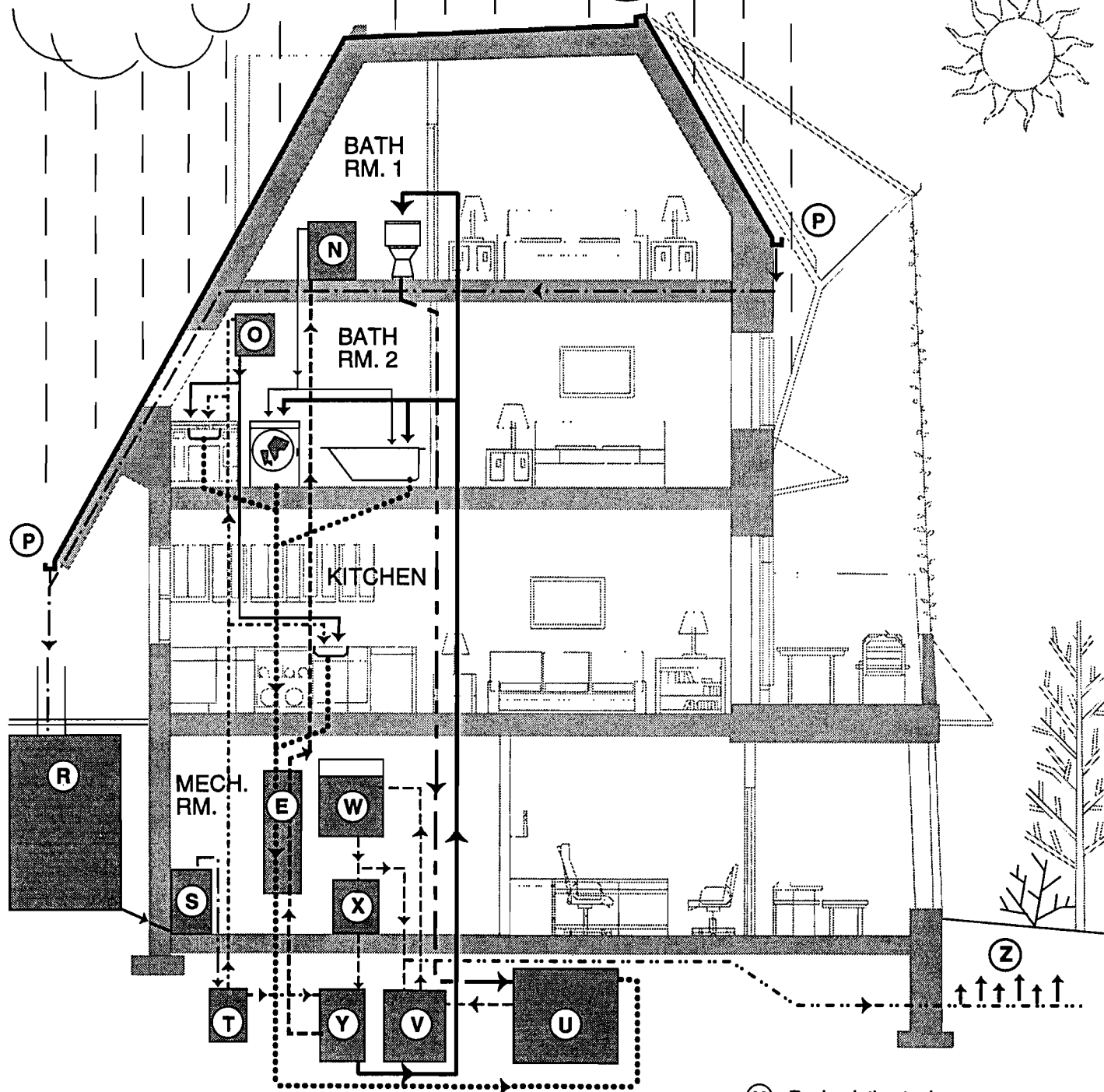
Costs

- Cost of the complete water system is approximately \$25,000, a major saving when compared to the estimated \$155,000 cost to hook up both units of the semi-detached house to conventional services.
- The cost includes:
 - \$10,000 for the potable water system, including the cisterns.
 - \$15,000 for the treatment and recycling waste water, including tanks.
- Future costs of potable water system, based on rainwater collection, will not change as the major cost component is the cistern. However, a ground water collection system will only cost \$4,000.
- Costs for the waste water treatment system will likely decline by approximately one-third in the future.
- Components of the waste water system are available through Waterloo Biofilter Inc. and RAL Engineering Ltd. Complete water systems will be available through Creative Communities, the builder of CMHC's Healthy House in Toronto.

CMHC'S HEALTHY HOUSE IN TORONTO

CMHC SCHL
Helping to house Canadians

DRINKABLE WATER AND WASTE WATER MANAGEMENT



- (E) Grey water heat exchanger
- (N) Reclaimed-hot-water tank
- (O) Drinkable-hot-water tank
- (P) Eaves troughs

- (R) Rainwater cistern
- (S) Combination filter
- (T) Drinkable-cold-water tank
- (U) Septic tank

- (V) Recirculation tank
- (W) Waterloo Biofilter™
- (X) Twin combination filters
- (Y) Reclaimed-cold-water tank
- (Z) Garden irrigation

CMHC'S HEALTHY HOUSE IN TORONTO



DRINKABLE WATER AND WASTE WATER MANAGEMENT

DRINKABLE WATER SYSTEM

- (P) Eaves troughs**
Collect roof rainwater, which passes through filter screens and then to cistern.
- (R) Rainwater cistern**
20,000 litres (normally sufficient for 6 months consumption).
- (S) Combination filter**
The rainwater passes through a combination roughing, slow sand, and carbon filter, and then through an ultra violet light disinfection unit before being stored for drinking.
- (T) Drinkable-cold-water tank [600 L]**
Supplies kitchen and bathroom sinks; overflow to reclaimed-cold-water tank.
- (O) Drinkable-hot-water tank [140 L]**
Supplies kitchen and bathroom sinks.

WASTE WATER SYSTEM

- (E) Grey water heat exchanger**

SYSTEM TO RECLAIM WATER

- (U) Septic tank [3,600 L] (under driveway)**
Anaerobic bacteria transforms waste water for treatment by the Waterloo Biofilter.™
- (V) Recirculation tank [2,000 L] (under floor)**
Provides de-nitrification in an aerobic environment.
- (W) Waterloo Biofilter™**
Aerobic bacteria transforms the effluent to a semi-treated condition.
- (X) Twin combination filters**
Water passes through two combination roughing, slow sand and carbon filters.

RECLAIMED WATER

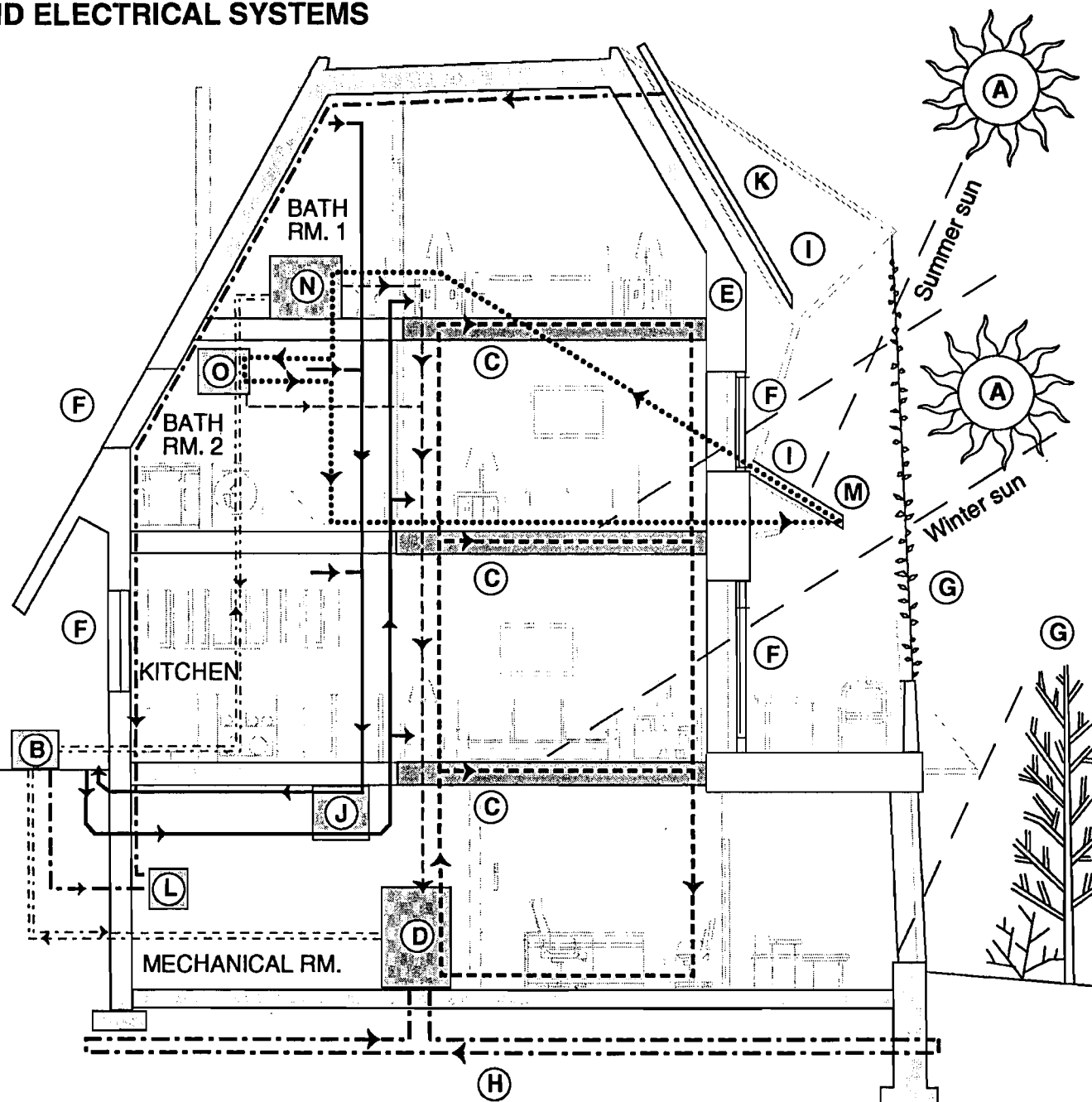
Water is recycled 3 to 5 times.

- (Y) Reclaimed-cold-water tank [1,200 L]**
Supplies tub, laundry, showers and toilets.
- (N) Reclaimed-hot-water tank [450 L]**
Supplies tub, showers and laundry.
- (Z) GARDEN IRRIGATION**
Site gravel pack disperses overflow water under front garden (about 120 litres per day.)

CMHC'S HEALTHY HOUSE IN TORONTO

CMHC SCHL
Helping to house Canadians

HEATING, COOLING, VENTILATION, AND ELECTRICAL SYSTEMS



- | | | |
|--|-------------------------------------|---|
| (A) Sun | (F) Super efficient windows | (K) Solar photovoltaic panels |
| (B) Co-generator unit | (G) Ivy trellis and deciduous trees | (L) Batteries |
| (C) Radiant solar floors | (H) Ground loop | (M) Solar thermal panels |
| (D) Thermal storage tank | (I) Shades | (N) Reclaimed and (O) drinkable-hot-water tanks |
| (E) Super insulated walls, floors and roof | (J) Heat recovery ventilator (HRV) | |

CMHC'S HEALTHY HOUSE IN TORONTO



HEATING, COOLING, VENTILATION, AND ELECTRICAL SYSTEMS

HEATING

- (A) Sun
- (B) Co-generator unit
Provides heat (and electricity) when passive solar heat or photovoltaic (PV) generated electricity is insufficient.
- (C) Radiant solar floors
In passive solar mode, water transfers heat to the thermal storage tank. In non-passive mode, (on sunless days and at night), water transfers heat from thermal storage tank.
- (D) Thermal storage tank [1,800 L]
Stores warm water in winter.
- (E) Super insulated walls, floor, and roof
Keeps heat in during winter.
- (F) Super efficient windows
Triple glazed, argon gas filled windows provide more solar gain than heat loss in winter.
- (G) Ivy trellis and deciduous trees
Allows sun to shine through in winter.

VENTILATION

- (J) Heat recovery ventilator (HRV) _____
Fresh supply air from exterior is pre-heated by exhaust air from house.
- () Internal stair well (not shown)
Supplies return air to HRV.

ELECTRICAL SYSTEM

- (K) Solar photovoltaic panels
Provides approx. 80% of electrical requirements.
- (B) Co-generator unit
Generates 6kW of electricity (and hot water) when photovoltaic supply is insufficient.
- (L) Batteries
Sufficient electrical energy storage for 4 days without sunshine.

COOLING

- Cooled water circulated from thermal storage tank. -----
- Stores cool water in summer.
- Keeps heat out in summer.
- Excludes heat in summer.
- Provides shade and cooling in summer.
- (H) Ground loop
Circulating water provides cooling to the thermal storage tank.
- (I) Shades
Photovoltaic and solar collector panels are located to provide shade in summer, and in winter, to let sun shine in.
- In summer, fresh supply air from exterior is pre-cooled via the garden.
- The stack effect of hot air rising and cool air in at the first floor provides non-mechanical ventilation.

WATER HEATING

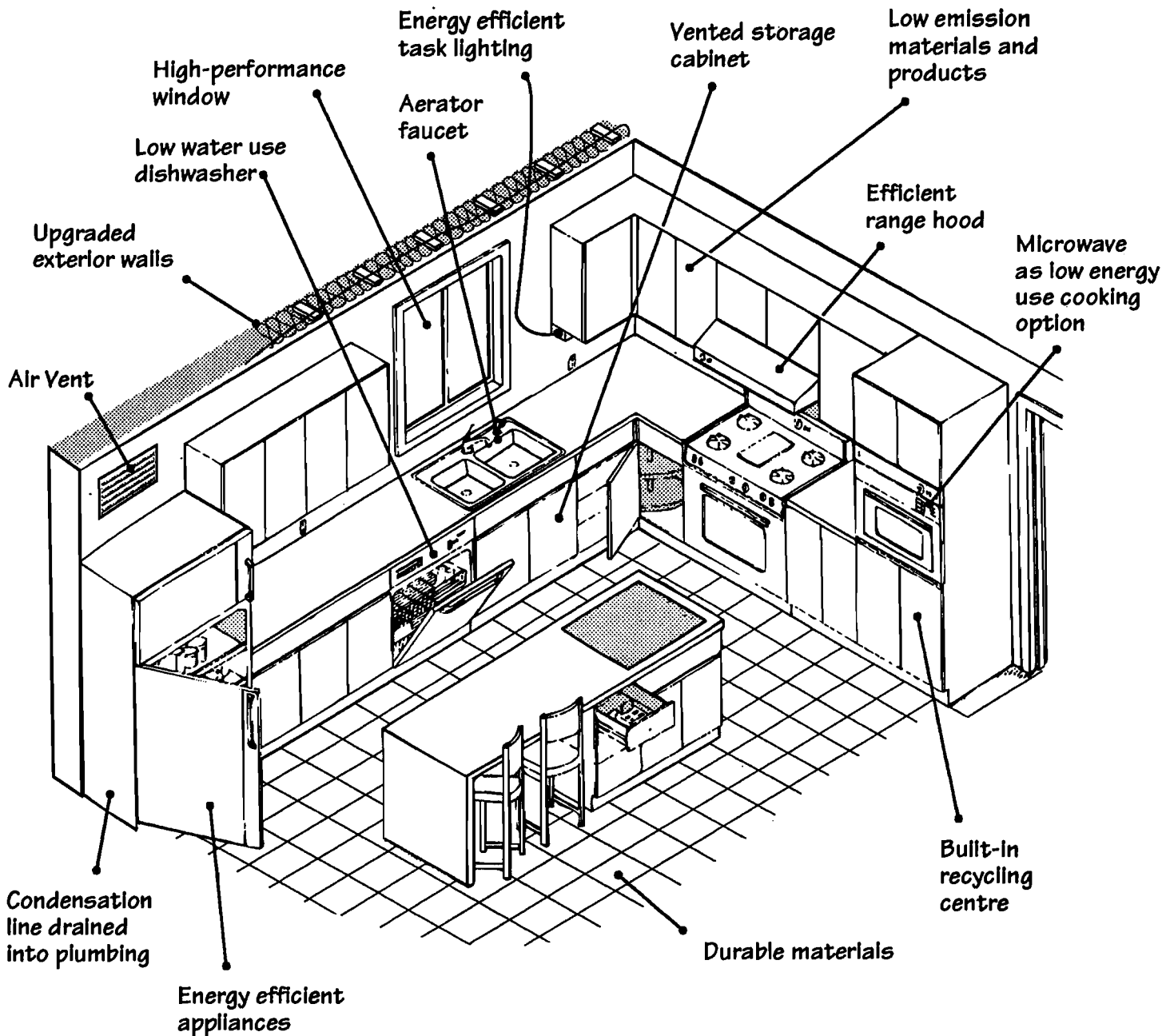
- (M) Solar thermal panels
Heats reclaimed and drinkable water separately.
- (N) Reclaimed and (O) drinkable-hot-water tanks
Also heated by co-generator unit.
- Surplus solar heat from both tanks is directed to the thermal storage tank. -----



Healthy Housing Kitchens

Healthy
Housing
Fact Sheet
1

Occupant Health • Energy Efficiency • Resource Efficiency • Environmental Responsibility • Affordability



• Managed construction waste

Healthy Housing Kitchens



Occupant Health

Low emission materials and products

- When selecting materials for the kitchen, minimize the use of products and materials with high levels of volatile organic compounds (VOCs). Use paints, stains, sealants and adhesives that don't emit VOCs. Use pre-glued or water-based adhesives for vinyl composition flooring tiles, or consider more durable, non-porous ceramic flooring.
- Hardwood cabinets and solid surface countertops have few of the toxic characteristics of synthetic materials. If using formaldehyde-based particle board products, laminate or seal all surfaces and edges to reduce outgassing.
- Cover the underside of the countertop above the dishwasher with galvanized metal to protect it from humidity.

Efficient range hood

- Normal activities in kitchens produce water vapour and odours. Install a range hood, vented to the exterior, to improve the air quality of your kitchen. Look for low noise, energy efficient products.

Air vent

- Replace stale or exhausted air with fresh air



Energy Efficiency

Energy efficient appliances

- Use the EnerGuide ratings to compare energy consumption characteristics among similar appliances. Low energy consumption can provide long-term savings.

Energy efficient task lighting

- When redesigning, think about your lighting needs. Compact fluorescent fixtures are four times more efficient than standard incandescent bulbs. Design your lighting system to provide higher lighting levels over work areas.

Upgraded exterior walls

- Design for high levels of energy efficiency in the exterior walls and windows. Make certain that an effective air barrier system is provided to prevent air leakage. Even minor renovations should include air sealing around windows, electrical boxes and at all penetrations, such as for exhaust fans. If replacing or installing windows, consider high-performance energy rated windows.



Resource Efficiency

Low water use dishwasher

- New dishwasher designs can reduce water consumption by 50%.

Aerator faucet

- Cut down on wasted water. An aerator faucet can reduce water use by up to 60%.



Environmental Responsibility

Construction waste

- Ensure that the materials or products you're replacing don't become a burden on landfill sites. Reduce, reuse or recycle whenever possible.

Built-in recycling centre

- Consider including a recycling centre in your renovated kitchen, making it easier to separate materials for your recycling service and for your composter.

Durable materials

- More durable materials (e.g., ceramic floors, solid surface countertops) last longer, minimizing future replacement, which wastes materials and resources.



Affordability

Life cycle analysis

- Improving the energy and water efficiency of your kitchen will reduce the costs of operating your home and enhance its resale value. The incorporation of more durable materials will reduce the potential for future repair and replacement expenses. Many healthy materials and products are competitively priced. Consider their long-term benefits to your family and the environment.

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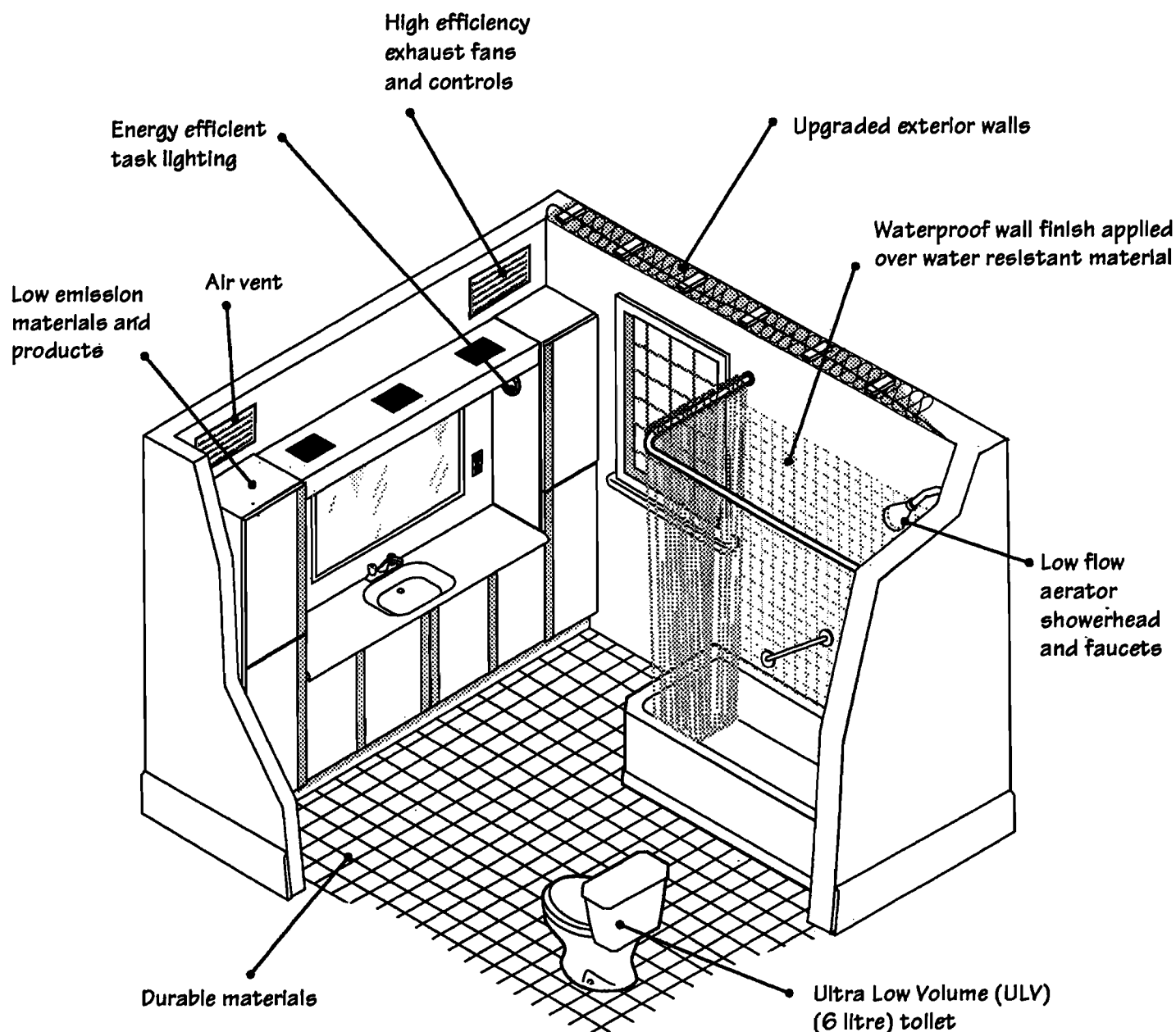


Healthy Housing Bathrooms

Healthy Housing
Fact Sheet

2

Occupant Health • Energy Efficiency • Resource Efficiency • Environmental Responsibility • Affordability



• Managed construction waste

Healthy Housing Bathrooms



Occupant Health

Low emission materials and products

- When selecting materials for the bathroom, minimize the use of products and materials with high levels of volatile organic compounds (VOCs). Use paints and sealants that don't emit VOCs. Use pre-glued or water-based adhesives for vinyl composition flooring tiles, or consider more durable, non-porous ceramic flooring.
- Hardwood cabinets have few of the toxic characteristics of synthetic materials. If using formaldehyde-based particle board products, laminate or seal all surfaces and edges to reduce outgassing.

High efficiency exhaust fans and controls

- Moisture problems are common in bathrooms where condensation can gather and molds can grow. Select a good quality, direct-vent exhaust fan with low noise characteristics (under 2 sones).
- Automatic controls (either timers or dehumidistat controls) ensure that excess moisture is removed from the bathroom.
- Make sure that the ducting from the fan goes directly to the outside or heat recovery ventilator (HRV) with minimal bends to restrict air flows.

Air vents

- Replace stale or exhausted air with fresh air.



Energy Efficiency

Energy efficient task lighting

- Compact fluorescent fixtures are four times more efficient than standard incandescent bulbs. Task lighting around mirrors allows for extra light when and where it's needed.

Upgraded exterior walls

- Design for high levels of energy efficiency in the exterior walls and windows of the bathroom. Make certain that an effective air barrier system is provided to prevent air leakage. Even minor renovations should include air sealing around windows, electrical boxes and at all penetrations, such as for exhaust fans.



Resource Efficiency

Ultra Low Volume (ULV) (6 litre) toilet

- Replacing large-volume toilets with 6-litre/flush models can result in a saving of more than 70% of water per flush. While lower-volume toilets cost slightly more than standard fixtures, the savings on your water bills will easily justify the upgrade.

Low flow showerhead and faucet aerators

- Installing a low 'flow showerhead can save as much as 60% of the water used by a conventional fixture. Faucet aerators are also easy to install and are easier on your water bill. Reducing water consumption will decrease your utility bills and reduce the burden you place on the sewage treatment facilities in your community.



Environmental Responsibility

Construction waste

- Old plumbing fixtures can be refurbished or sold. Old porcelain fixtures can be crushed and recycled as granular fill. Old metal tubs can be recycled for steel making.

Durable materials

- More durable materials (e.g., better backing for wall tiles, ceramic floors) last longer, minimizing future burdening of landfill sites.



Affordability

Life cycle analysis

- Enhancing energy and water efficiency will reduce the cost of operating your home. The incorporation of more durable materials will reduce the potential for future repair and replacement expenses. Many healthy materials and products are competitively priced. Consider their long-term benefits to your family and the environment.

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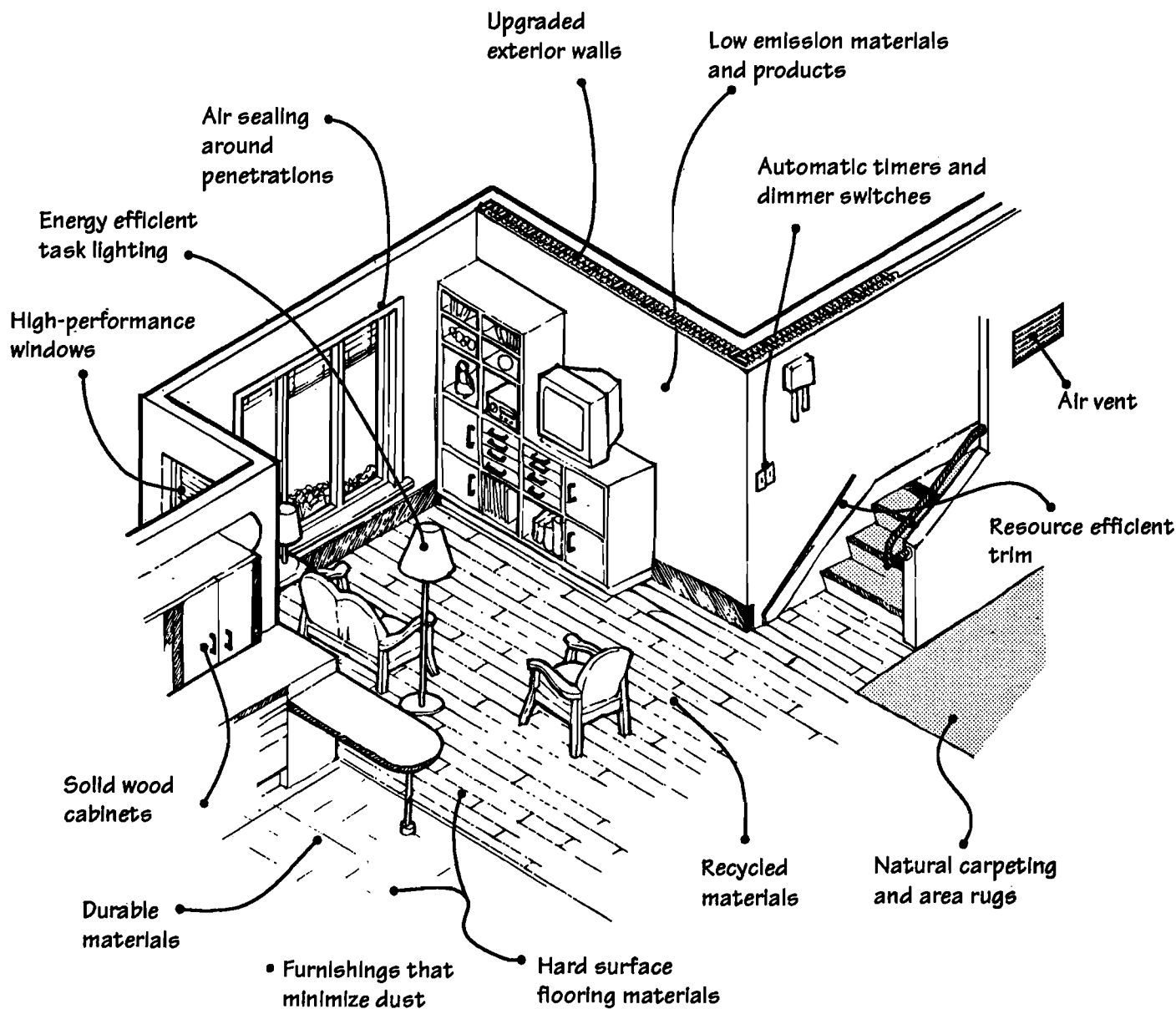


Healthy Housing Interiors

Healthy
Housing
Fact Sheet

3

Occupant Health • Energy Efficiency • Resource Efficiency • Environmental Responsibility • Affordability



- Resource efficient materials
- Managed construction wastes
- Chemical-free cleansers

Healthy Housing Interiors



Occupant Health

Low emission materials and products

- When selecting materials for the interior, minimize the use of products and materials with high levels of volatile organic compounds (VOCs). Use paints, stains and sealants that don't emit VOCs. Use pre-glued or water-based adhesives for vinyl composition flooring tiles.

Natural carpeting and area rugs

- Area rugs are preferable where dust allergies or asthma are a concern since they can be removed for proper cleaning. Carpeting and underpadding made from natural fibres do not outgas.

Hard surface flooring materials

- Consider durable, inert ceramic flooring. Hardwood is another option and can be finished and maintained with low-VOC materials.

Solid wood cabinets

- Cabinets and furniture made from solid hardwood or softwood have few of the toxic characteristics of composite or synthetic materials. Some plywoods and particle boards are available without formaldehyde. If formaldehyde-based material is used, laminate or seal all edges and surfaces to reduce outgassing.

Furnishings that minimize dust

- Minimize the use of wallpaper, textured finishes and fibrous materials if allergies are a concern. Natural fibre fabrics for soft furnishings are preferred.



Energy Efficiency

Air sealing around penetrations

- Provide basic air sealing even when simply redecorating. Use low-VOC caulking and gaskets to seal around window and door openings, baseboards, electrical outlets, ventilation openings and ceiling light fixtures.

Upgraded exterior walls

- Add insulation when renovating walls. Make certain that an effective air barrier system is provided to prevent air leakage.

Energy efficient task lighting

- When redesigning, think about your lighting needs. Compact fluorescent fixtures are four times more efficient than standard incandescent bulbs. Design your lighting system to provide higher lighting levels over work areas.



Resource Efficiency

Resource efficient materials

- Emphasize renewable materials such as wood, or those made from plentiful raw materials, such as quarry tile.
- Choose finger-jointed wood trim made from domestic lumber. Avoid tropical hardwoods.

Recycled materials

- Where possible, use trim and interior doors from a reuse centre or demolition sale.



Environmental Responsibility

Construction waste

- Reduce, reuse and recycle to minimize renovation waste.

Durable materials

- Durable materials (hardwood or ceramic floors) last longer, minimizing future burdening of landfill sites. Individual tiles may be replaced or worn sections of hardwood refurnished instead of replacing the whole floor.

Chemical-free cleansers

- Use materials such as hardwood floors and washable fabrics that can be maintained easily without the use of harsh chemicals.



Affordability

Life cycle analysis

- Enhanced energy efficiency will reduce the cost of operating your home. Selecting more durable finishing materials will reduce future repair and replacement expenses.

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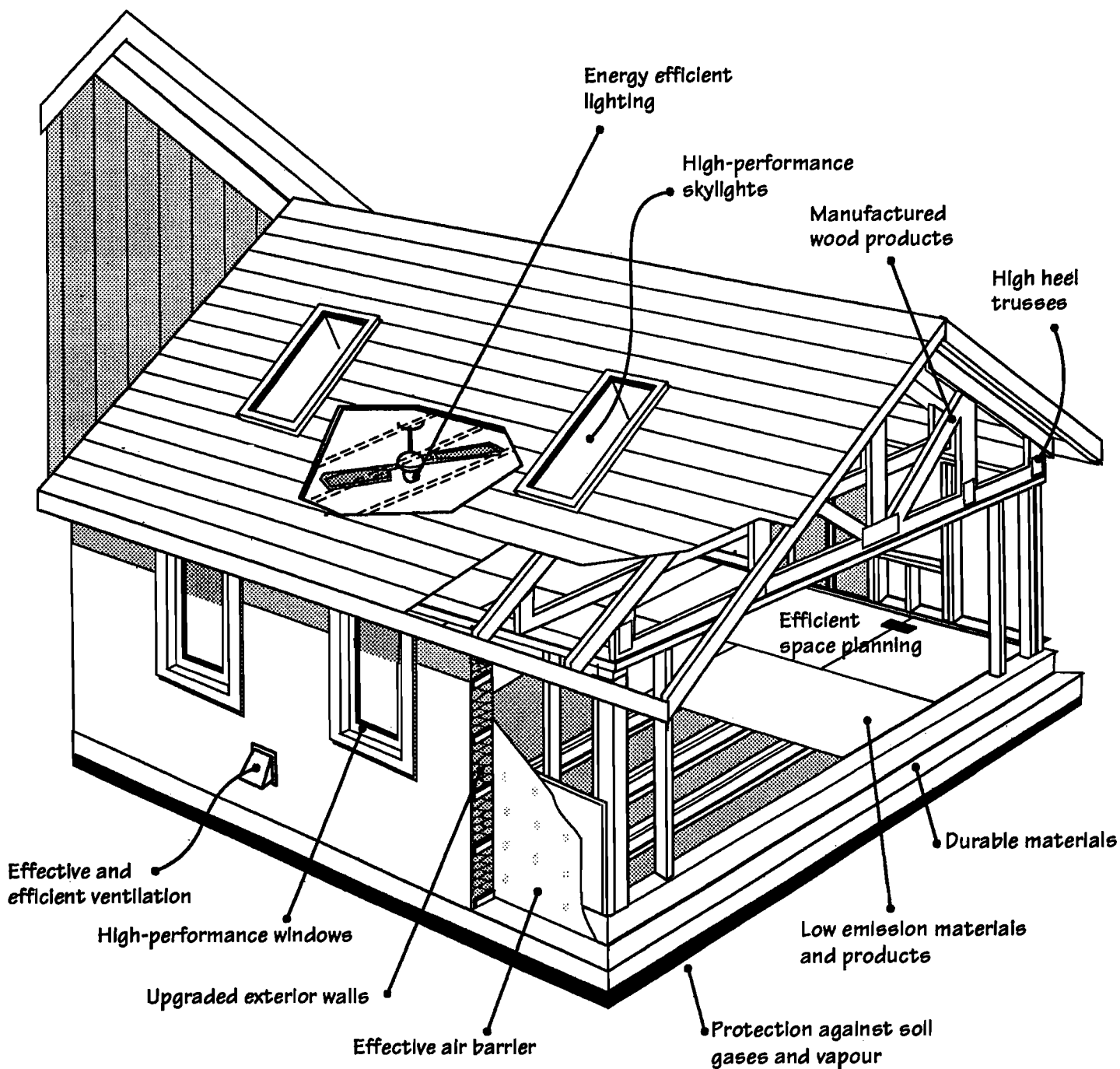


Healthy Housing Additions

Healthy
Housing
Fact Sheet

4

Occupant Health • Energy Efficiency • Resource Efficiency • Environmental Responsibility • Affordability



- Managed construction waste
- Materials with recycled content

Healthy Housing Additions



Occupant Health

Protection against soil gases and vapour

- Ensure a sealed separation between the soil and the interior space of the addition using polyethylene or high strength concrete. If constructing over a crawl space, provide ventilation to remove excess moisture.

Low emission materials and products

- Concrete slabs can be finished with a water-based wax sealer to contain concrete dust. Kiln-dried spruce lumber has lower moisture and lower chemical content than other green softwoods. Most particle boards will have higher emission levels than exterior grade forms of plywood, waferboard or oriented strandboard (OSB). Specify paints, sealants and flooring materials that don't emit volatile organic compounds (VOCs).

Effective air barrier

- Air barriers will reduce the amounts of dust and outside contaminants entering the living space. Air barriers placed on the interior face of the wall will prevent the entry of any contaminants within the building envelope.

Effective and efficient ventilation

- When adding space, ensure that your existing heating and ventilation system has adequate capacity to serve the new space, providing fresh air and exhausting stale air.



Energy Efficiency

Upgraded exterior walls

- Regardless of the condition of the rest of the house, the design of additions should reflect high levels of energy efficiency. Consider R-2000 insulation and airtightness standards.

High-performance windows and skylights

- Consider the long-term benefits of energy rated windows with gas fills, insulating spacer bars, and insulated, thermally-broken window frames. Locate windows to allow winter sunshine into the living space, while minimizing summer overheating.

Energy efficient lighting

- Optimize natural daylight through skylights or light pipes. Compact fluorescent fixtures are four times more efficient than standard incandescent bulbs. Task lighting will allow for extra light when and where it's needed.



Resource Efficiency

Manufactured wood products

- Wood-I joists and roof trusses, finger-jointed lumber and birch trim all represent means of reducing burden on old growth forests. Wood products within the living space should be manufactured with low emission adhesives.

Materials with recycled content

- Cellulose or glass fibre batt insulation, drywall, roof shingles and a host of other products are available with recycled content.



Environmental Responsibility

Efficient space planning

- Careful attention to design can result in optimal use of purchased materials and reduced construction wastes.

Construction waste

- In most markets, scrap wood, drywall and metal can be either reused or recycled. Careful ordering will minimize wastage.

Durable materials

- Materials requiring minimal maintenance will last longer and minimize future burdening of landfill sites.



Affordability

Life cycle analysis

- Careful design, the use of durable materials and good construction practices will result in a long-lasting structure. High levels of energy efficiency will provide long-term savings on utility bills.

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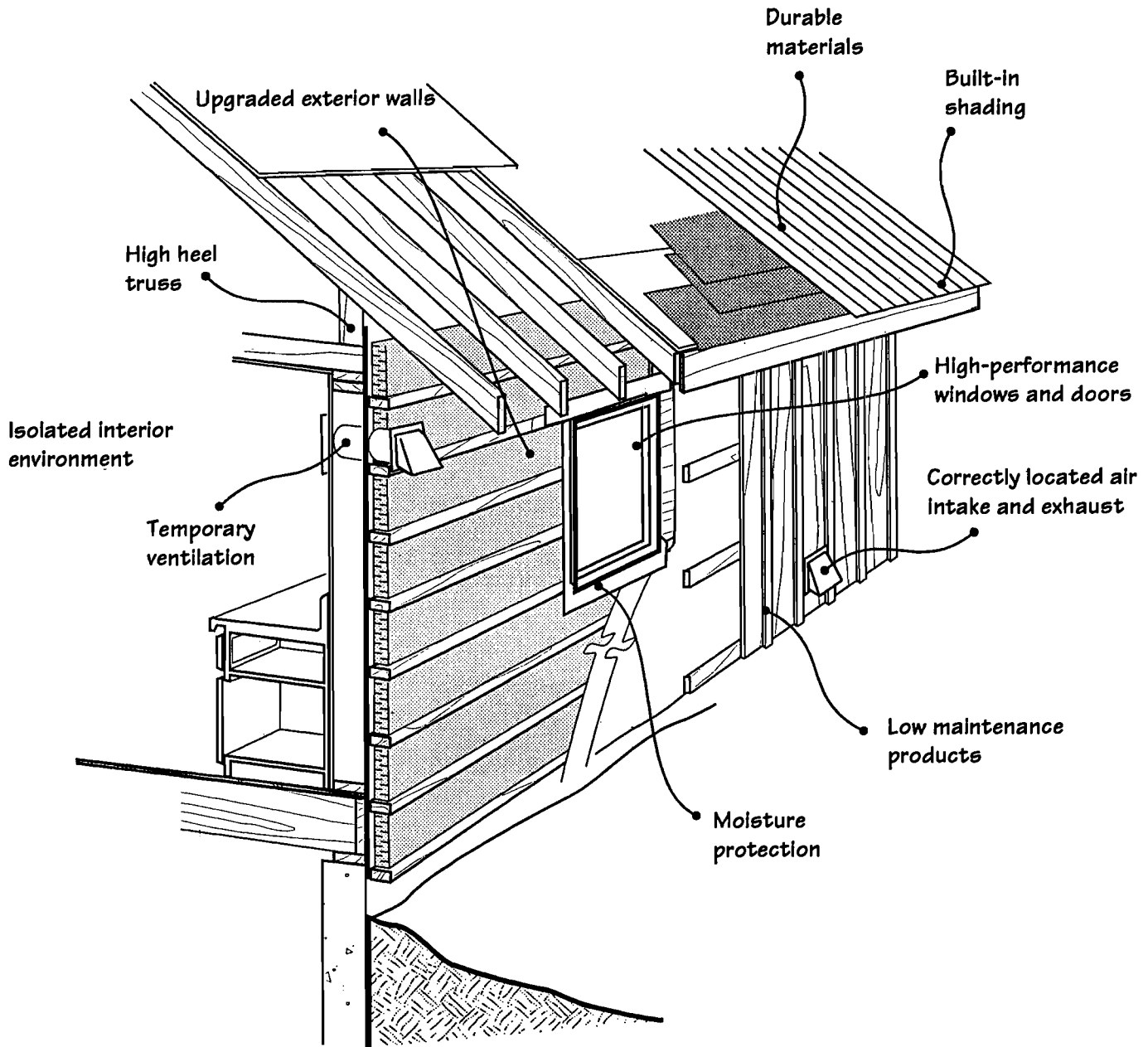
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Healthy Housing Exteriors

Healthy
Housing
Fact Sheet
5

Occupant Health • Energy Efficiency • Resource Efficiency • Environmental Responsibility • Affordability



- Appropriate materials
- Managed construction waste
- Managed hazardous waste

Healthy Housing Exteriors



Occupant Health

Isolated interior environment

- Some exterior cladding and roofing materials will outgas or produce emissions that can cause adverse reactions to some homeowners. Ensure that the interior of the home is sealed against air and gas entry. An exterior air barrier and sealing of air leakage penetrations will improve occupant health.

Temporary ventilation

- When renovation work might create noxious fumes and odours, plan a temporary ventilation strategy.

Correctly located air intake and exhaust

- Ensure that intake and exhaust vents are installed correctly and removed from nearby sources of contamination. Adequate clearances and separations between the intake and exhaust, and an understanding of air flows at building corners, will ensure good intake air quality.



Energy Efficiency

Upgraded ceilings and exterior walls

- Increasing insulation levels when replacing siding is almost always justifiable. Rigid insulation can be added over wall sheathing, or new exterior frame walls can be constructed to accommodate new batt insulation. The installation of an effective air barrier, which permits vapour diffusion, can improve comfort levels and reduce energy use.

High-performance windows and doors

- Older windows should be upgraded with high-performance windows. Specify energy rated windows with gas fills, insulated spacers and insulated frame materials.

Built-in shading

- Overhangs, trellises and awnings can reduce summer overheating by shading south- and west-facing windows in summer.



Resource Efficiency

Durable materials

- More durable materials such as 30-year shingles, metal, slate or tile roofing can save resources and costs, especially when the costs of reinstallation are considered.

Appropriate materials

- Products made from renewable materials such as wood, or plentiful materials such as brick, are preferable to products made from scarce, non-renewable materials. Using locally produced materials will reduce burdens on transportation systems.

Moisture protection

- Ensure sufficient overhangs, flashing and sealants to prevent damage from water and ice damming.



Environmental Responsibility

Construction waste

- Send used materials in good condition to a reuse centre or have a yard sale on site. Recycle other used materials.

Low maintenance products

- Select siding and roofing materials with minimal maintenance requirements (e.g., prefinished materials). These products will exhibit greater durability and require less maintenance.

Hazardous waste

- Dispose of containers of waste products (sealers, paints, etc.) through the municipality's hazardous waste program.



Affordability

Life cycle analysis

- Enhanced energy efficiency will reduce the cost of operating your home and will improve comfort. Low maintenance materials, such as brick or metal siding, may cost less over the life of the product than wood siding, which requires repainting every few years.

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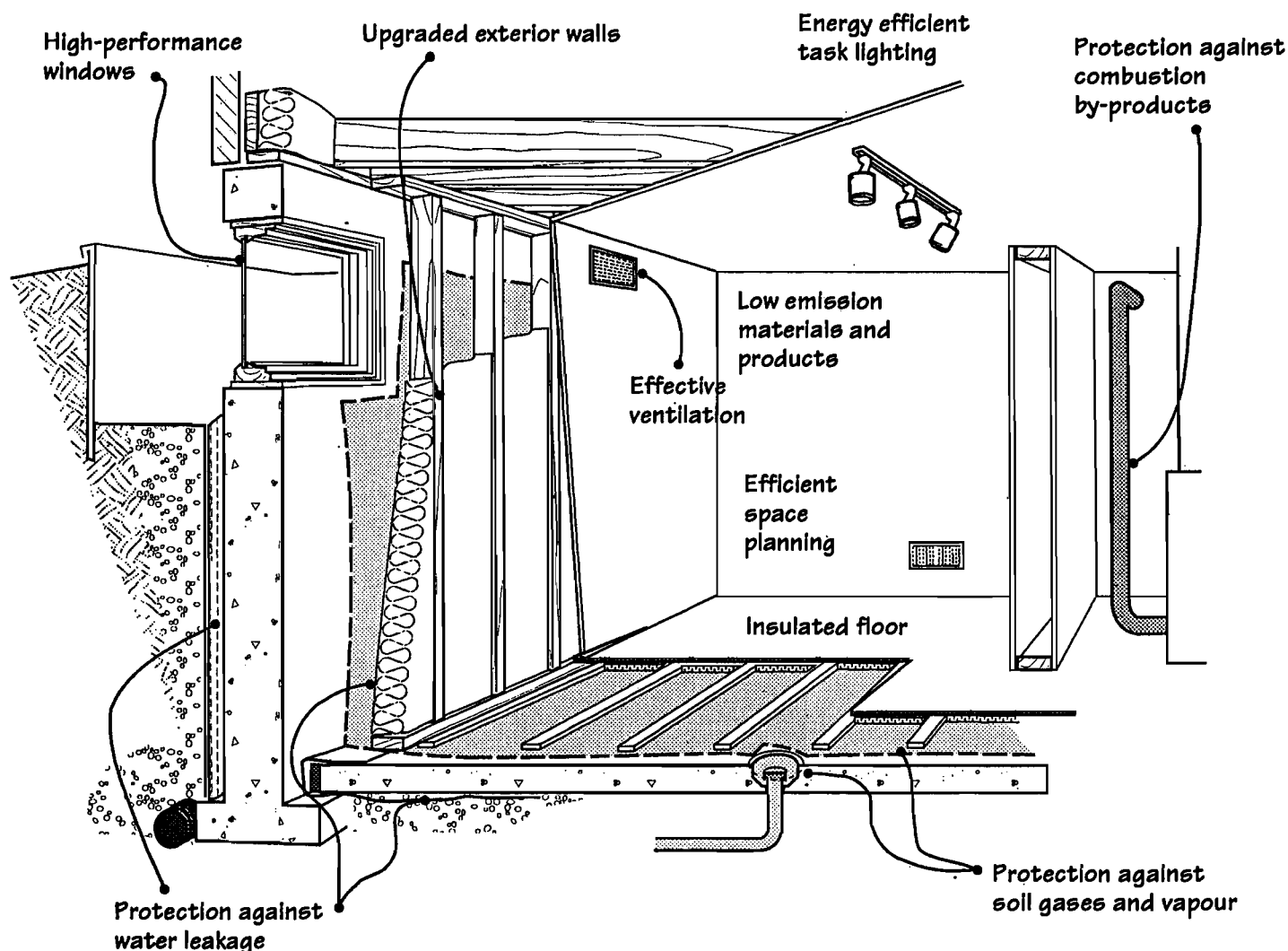
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Healthy Housing Basements

Healthy
Housing
Fact Sheet
6

Occupant Health • Energy Efficiency • Resource Efficiency • Environmental Responsibility • Affordability



- Materials with recycled content
- Managed construction waste

Healthy Housing Basements



Occupant Health

Protection against water leakage

- Water leakage will lead to the development of mold and mildew. Minor leaks can be repaired from the interior. Significant leakage may require excavation around the foundation to remedy the problem.

Protection against soil gases and vapour

- Provide an effective air barrier on the interior face of the wall to isolate the living area from soil gases. Seal around all openings and joints in the slab. In areas with high radon levels, install a sealed floor trap. Ensure an effective seal over sump pits.

Low emission materials and products

- When selecting materials for the interior of the converted basement, minimize the use of materials with high levels of volatile organic compounds (VOCs). Specify water-based paints and adhesives.

Effective ventilation

- When finishing your basement, ensure that your existing heating and ventilation system has adequate capacity to serve the new space, providing heat and fresh air while allowing for the exhaust of stale air. Provide direct exhaust venting from areas used for crafts or for storage of toxic materials such as solvents and paints.

Protection against combustion by-products

- Make certain that your furnace is properly vented and that there is an adequate supply of combustion air to prevent backdrafting and spillage of combustion gases.



Environmental Responsibility

Efficient space planning

- Careful attention to design can result in optimal use of purchased materials and reduced construction wastes. More durable materials (moisture-resistant) last longer, minimizing future burdening of landfill sites.

Construction waste

- In many markets, scrap wood, drywall and metal can be either reused or recycled.



Resource Efficiency

Materials with recycled content

- Glass fibre batt or cellulose insulation, drywall and a variety of flooring products are available with recycled content.



Energy Efficiency

Upgraded exterior walls

- Basements can account for as much as 30% of the heat loss from a home. Higher insulation levels and effective air sealing in the foundation and floor assemblies will improve energy performance. Install rigid insulation and polyethylene over concrete floor slabs before the new flooring to enhance comfort levels.

High-performance windows

- Energy rated, high-efficiency window units will enhance comfort and provide long-term energy savings.

Energy efficient task lighting

- Compact fluorescent fixtures are four times more efficient than standard incandescent bulbs. Task lighting will allow for extra light when and where it's needed.



Affordability

Life cycle analysis

- Improving the energy efficiency of your basement can significantly reduce the cost of operating your home. Converting unused basement space into efficient, usable space may improve the resale value of your home.

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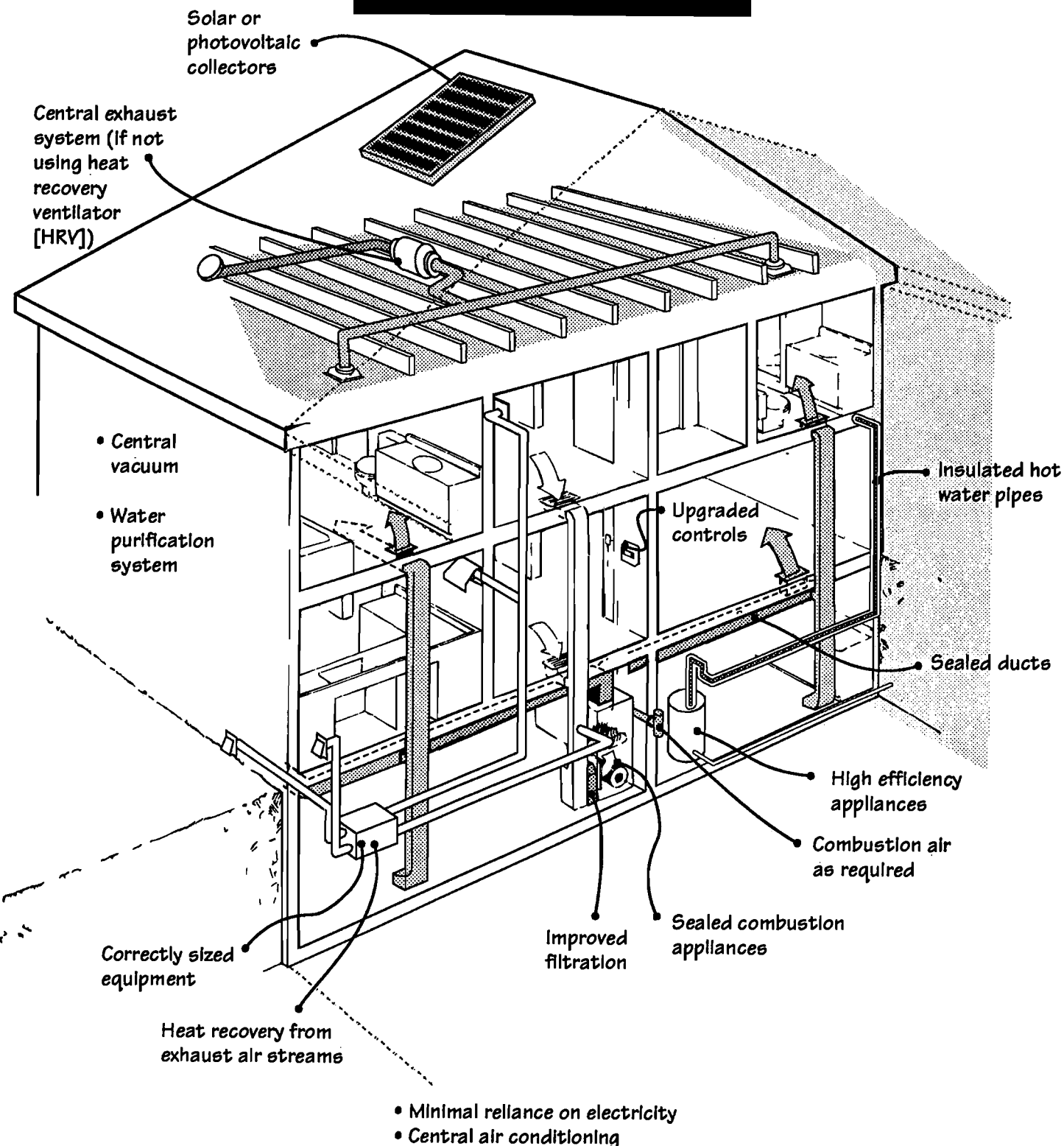


Healthy Housing Mechanicals

Healthy
Housing
Fact Sheet

7

Occupant Health • Energy Efficiency • Resource Efficiency • Environmental Responsibility • Affordability



Healthy Housing Mechanicals



Occupant Health

Central exhaust system

- A high quality central exhaust fan can operate continuously without bothersome noises and high electrical costs. Continuous ventilation will reduce the potential for build-up of contaminants throughout the home.

Combustion air as required

- Most combustion appliances such as gas or oil-fired hot water heaters, furnaces and space heaters, as well as wood stoves and fireplaces, need an adequate supply of combustion air to operate safely. This combustion air should be supplied via a dedicated duct from the exterior. Relying on indoor air for this purpose will result in poor performance and the potential for combustion gases to spill into the living space.

Sealed combustion appliances

- These appliances will reduce the possibility of combustion gases spilling into the home. To be on the safe side, install a carbon monoxide (CO) detector.

Improved filtration

- The purpose of most conventional furnace filters is to protect the fan motor from dust particles. Odours and particles, including mold, dust and pollen, should be removed from the indoor air. Various types of filters now available do the job far more effectively than conventional filters.



Environmental Responsibility

Minimal reliance on electricity

- Unless it is water-generated, electricity is an inefficient and environmentally intrusive way to heat a home. For non-hydraulic forms, only about 35% of the energy consumed becomes electricity. Oil and gas heating systems offer seasonal efficiencies between 78% and 97%.

Heat recovery from exhaust air streams

- A balanced mechanical ventilation system is best but can increase heating energy consumption (and environmental pollution). Including heat recovery by selecting an HRV saves money and reduces energy requirements.

Central air conditioning

- Where air conditioning is required, it is more efficient and less environmentally harmful to select a central system. Window units should only be used if one or two rooms need cooling.



Resource Efficiency

Correctly sized equipment

- A furnace is most efficient after it's been running for a while. While an oversized system will satisfy heating demands quicker, it will do so at the expense of operating efficiency due to shorter cycling times.

Upgraded controls

- Automatic controls such as set-back thermostats for the furnace and dehumidistats for the heat recovery ventilator (HRV) allow occupants to maintain optimal comfort levels in the home. A set-back thermostat alone can save about 12% on heating and cooling costs.



Energy Efficiency

High efficiency appliances

- For combustion space heating, select condensing (sealed combustion) units with an annual fuel utilization efficiency (AFUE) of greater than 89%. Consider an integrated space heating and domestic hot water (DHW) system combining the two functions in one unit.

Insulated hot water pipes

- Make sure the hot water lines leaving the hot water heater have pipe insulation installed to prevent heat loss and to save water.



Affordability

Life cycle analysis

- In many parts of the country, homes with electric resistance heating historically have lower resale values than gas-, oil- or propane-heated homes. Higher efficiency, better performing mechanical systems can provide long-term energy and dollar savings to the homeowner.

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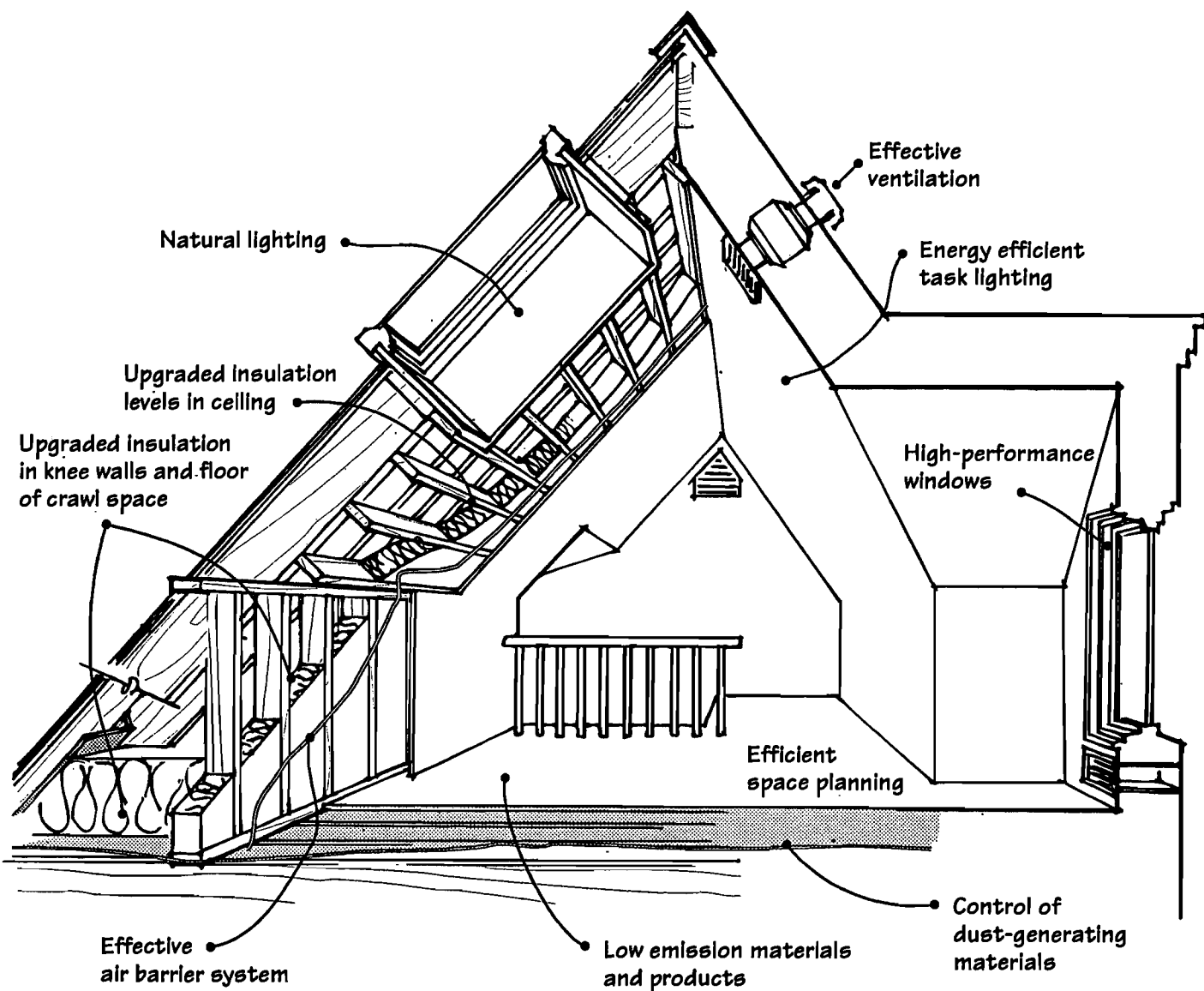


Healthy Housing Attics

Healthy
Housing
Fact Sheet

8

Occupant Health • Energy Efficiency • Resource Efficiency • Environmental Responsibility • Affordability



- Resource efficient products
- Materials with recycled content
- Managed construction waste

Healthy Housing Attics



Occupant Health

Control of dust-generating materials

- Loose-fill insulation materials or older fibrous batt materials can generate particles which will circulate in the air. Either isolate the materials from the new space using an interior air barrier, or remove the materials.

Low emission materials and products

- When selecting materials for the interior of the converted attic, minimize the use of materials with high levels of volatile organic compounds (VOCs). Specify water-based paints, sealants and adhesives.

Effective ventilation

- Ensure that your existing heating and ventilation system has adequate capacity to serve the new space, providing enough heat, fresh air and good air circulation.

Natural lighting

- Operable skylights or dormer windows can brighten up the new space and allow for natural ventilation when required.



Resource Efficiency

Resource efficient products

- Manufactured wood products and finger-jointed trim can reduce the burden on old growth forests.

Materials with recycled content

- Glass fibre batt or cellulose insulation, drywall and a variety of flooring products are available with recycled content.



Environmental Responsibility

Efficient space planning

- Careful attention to design can result in optimal use of purchased materials and reduce construction wastes. More durable materials last longer, minimizing future burdening of landfill sites.

Construction waste

- In many markets, scrap wood, drywall and metal can be either reused or recycled.



Energy Efficiency

Upgraded insulation levels in ceiling

- The size of the exposed rafters can limit insulation levels. To accommodate the required ventilation space and high levels of insulation, cavity spaces should be extended, ceilings should be cross-strapped, or a layer of rigid insulation should be installed on the interior of the rafters. In most parts of the country, RSI 5.6 (R-32) should be attained.

Upgraded insulation levels in knee walls and floor of crawl space

- Knee walls should be treated as exterior walls with equivalent levels of insulation. Insulation installed or left between the floor rafters in a crawl space should not block soffit ventilation.

Effective air barrier system

- Air leakage represents the main cause of heat loss in homes. When converting attic spaces, pay special attention to eliminating any potential sources of leakage.

High-performance windows

- If installing skylights or dormer windows, choose high-performance energy rated windows with gas fills, insulated spacers and insulated frames.

Energy efficient task lighting

- Compact fluorescent fixtures are four times more efficient than standard incandescent bulbs. Task lighting will allow for extra light when and where it's needed.



Affordability

Life cycle analysis

- Improving insulation and airtightness levels can reduce the cost of operating your home while increasing the amount of usable space. Converting unused attic space into efficient, usable space may improve the resale value of your home.

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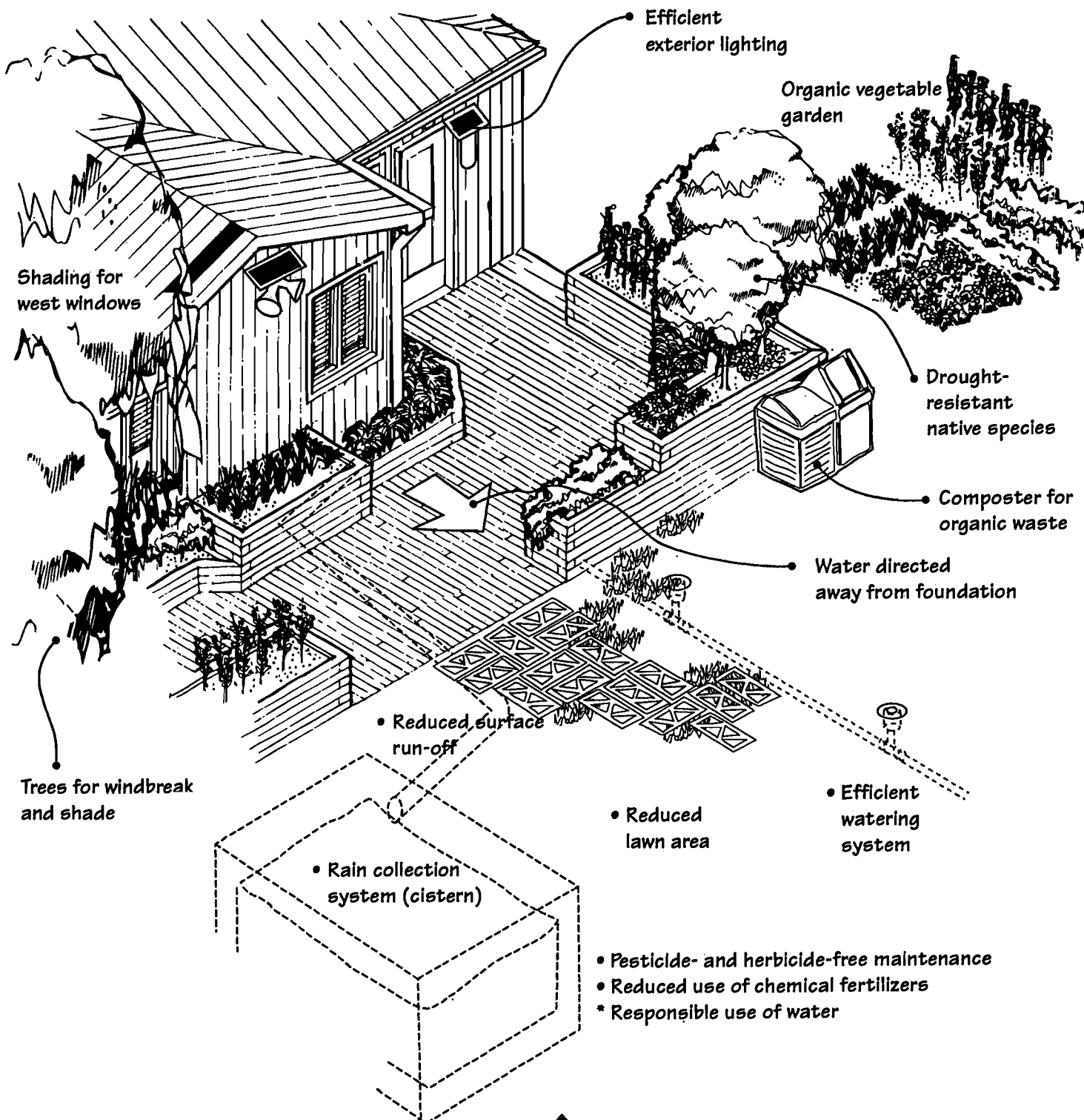


Healthy Housing Landscapes

Healthy Housing
Fact Sheet

9

Occupant Health • Energy Efficiency • Resource Efficiency • Environmental Responsibility • Affordability



Healthy Housing Landscapes



Occupant Health

Pesticide- and herbicide-free maintenance

- The best controls for insect pests are natural ones (birds and beneficial insects). Make sure the garden has a variety of small trees and shrubs to attract wildlife.
- In plant beds, apply a 4-cm layer of mulch to discourage weed growth.

Reduced use of chemical fertilizers

- With proper consideration for soil conditioning and organic content, you should be able to enjoy a lawn and garden free from chemical fertilizers.

Organic vegetable garden

- Vegetables grown with organic fertilizers are much healthier — for the consumer and for the environment.



Energy Efficiency

Reduced lawn area

- More than 90% of the plant area of most building lots is covered in grass. Smaller lawns mean less maintenance and reduced watering requirements.

Trees for windbreak and shade

- When re-landscaping, think about your home's energy needs. Plant a windbreak along the windward side of the house to reduce the energy impacts of harsh winter winds. Place deciduous trees along the south side to provide cooling shade in summer.

Efficient exterior lighting

- Consider exterior-rated compact fluorescent or sodium lighting, especially for security lighting, coupled to an infra-red or motion sensor activation system.

Shading for west windows

- West windows are a major source of heat gain in summer. For ground floor windows, consider trellises with broad-leaved vines or climbing perennials to provide cooling shade. On upper floors, consider decorative awnings to shade windows.



Resource Efficiency

Rain collection system (cistern)

- Rainwater is free. A cistern is a large tank that can be used to collect this water for use on lawns. Cistern water can also be used indoors for toilets and washing machines.

Efficient watering system

- Install a sub-surface drip irrigation system in all plant beds; consider in-ground sprinklers with automatic timers for lawn areas.



Environmental Responsibility

Responsible use of water

- Don't overwater. The lawn needs only 2.5 cm (1 in.) of water per week. Use a plastic container to measure if weekly rainfall is sufficient.

Reduced surface run-off

- Let rainwater stay in the ground where it will replenish ground water supplies and reduce the strain on storm sewers. Use interlocking paving stones instead of pavement or concrete.

Drought-resistant native species

- Native plants and grasses can often survive periods of low rainfall without the need for watering. They are also more resistant than non-native species to pest infestations.

Composter for organic wastes

- Keep organic household waste out of landfills — it's a great soil conditioner.



Affordability

Life cycle analysis

- A natural landscape will reduce the amount of time, energy and money you need to invest to keep things outdoors looking their best. Minimizing requirements for water and energy for exterior purposes will result in reduced utility bills and long-term savings.

CMHC offers a wide range of housing-related information.

For details, contact your local CMHC office, or the
Canadian Housing Information Centre
Canada Mortgage and Housing Corporation
700 Montreal Road
Ottawa, Ontario K1A 0P7
(613) 748-2367

Visit our World Wide Web site at www.cmhc-schl.gc.ca

CMHC'S HEALTHY HOUSE IN TORONTO
LA MAISON SAINTE DE LA SCHL À TORONTO

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**CMHC's HEALTHY HOUSE IN TORONTO PROJECT TEAM /
ÉQUIPE DE PROJET DE LA MAISON SAINE DE LA SCHL À TORONTO**

CMHC Project Leaders / Chefs de projet à la SCHL

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Developer / Promoteur
Mr. Rolf Paloheimo
Creative Communities Research Inc.
152 Sparkhall Avenue
Toronto ON M4K 1G8

Tel: (416) 466-5172
Fax: (416) 466-5173

MAJOR PARTNERS / PRINCIPAUX PARTENAIRES

consultation on water quality / consultation sur la qualité de l'eau
technical support on drinking water and waste water / soutien technique en matière d'eau
potable et d'eaux usées

microbiological sampling and analysis of water quality / analyse d'échantillonnage
microbiologiques et de la qualité de l'eau

Ms. Pamela Scharfe

Tel: (416) 392-0978

City of Toronto Public Health /

Fax: (416) 392-0715

Ville de Toronto, Service de santé publique

Western Health Area

2340 Dundas Street West

Toronto ON M6P 4A9

Ms. Heather Broomer

Tel: (416) 235-5824

Ontario Ministry of Environment and Energy /

Fax: (416) 235-6059

Ministère de l'Environnement et de l'Énergie de l'Ontario

125 Resources Road

Room E252

Toronto ON M9P 3V6

Mr. Michael Brodsky

Tel: (416) 235-5717

Ontario Ministry of Health /

Fax: (416) 235-5951

Ministère de la Santé de l'Ontario

Box 9000

Station A

Toronto ON M5W 1R5

consultation on active solar systems / consultation sur les systèmes solaires actifs financial
support for photovoltaic system / Soutien financier pour système à piles photovoltaïques

Mr. Per Drewes

Tel: (416) 207-6367

Environment and Sustainable

Fax: (416) 207-6565

Development Division

Ontario Hydro

800 Kipling Avenue KR 312

Toronto ON M8Z 5S4

DESIGN TEAM / ÉQUIPE DE CONCEPTION

solar heating and cooling systems, thermal design / systèmes de chauffage solaire et de refroidissement, conception thermique

Watershed Tech Inc.

Mr. Doug Hart
94 Yarmouth Road
Toronto ON M6G 1W9

Tel: (416) 533-8970
Fax: (416) 538-8032
doughart@interlog.com

structural frame / structure

Mr. Ken Fong
Read Jones Christoffersen Ltd.
144 Front Street West
Suite 510
Toronto ON M5J 2L7

Tel: (416) 977-5335
Fax: (416) 977-1427

electrical system / système électrique

Environment and Sustainable
Development Division
Ontario Hydro
800 Kipling Avenue KR 312
Toronto ON M8Z 5S4

Tel: (416) 207-6367
Fax: (416) 207-6565

potable water system / système électrique

Mr. Bob LeCraw
RAL Engineering Ltd.
482 Queen St.
Newmarket ON L3Y 2H4

Tel: (905) 853-0626
Fax: (905) 853-8807

Mr. Rolf Paloheimo
Creative Communities Research Inc.
152 Sparkhall Avenue
Toronto ON M4K 1G8

Tel: (416) 466-5172
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Dr. Don Waller
Technical University of Nova Scotia
P.O. Box 1000
1360 Barrington Street
Halifax NS B3J 2X4

Tel: (902) 420-7853
Fax: (902) 420-7551

waste water treatment systems / systèmes de traitement des eaux usées

Mr. Craig Jowett
Waterloo Biofilter Systems Inc.
Department of Earth Sciences
Waterloo ON N2L 3G1

Tel: (519) 836-3380
Fax: (519) 836-3381

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Mr. Bob LeCraw
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Newmarket ON L3Y 2H4

Tel: (905) 853-0626
Fax: (905) 853-8807

integration of all water systems / intégration de tous les systèmes d'eau

Mr. Al Townshend
Blue Heron Environmental Technology
R.R. #1
930 Seven Springs Lane
Athens ON K0E 1B0

Tel: (613) 924-9575
Fax: (613) 924-9901

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Mr. Martin Liefhebber
Martin Liefhebber Architects Incorporated
177 First Avenue
Toronto ON M4M 1X3

Tel: (416) 469-0018
Fax: (416) 469-0978

non-toxic termite barrier / écran anti-termite non toxique

Dr. Timothy Myles
University of Toronto
Faculty of Forestry
33 Willcocks Street
Toronto ON M5S 3B3

Tel: (416) 978-5755
Fax: (416) 978-3834

APPLIANCES / APPAREILS MÉNAGERS

clothes washer / lave-linge

The Miele W1918 clothes washer, with horizontal drum and high-speed spin cycle (1,500 rpm), cleans gently and efficiently, using two-thirds the electricity and less than half the water of a conventional washing machine.

Le lave-linge Miele W1918, avec sa cuve horizontale et son cycle d'essorage à haute vitesse (1 500 tours/mn), nettoie en douceur et avec efficacité tout en utilisant les deux tiers de l'électricité et moins de la moitié de l'eau d'un appareil classique.

sponsor / commanditaire :

Ms. Carolyn Cross
 Miele Limited
 55G East Beaver Creek Road
 Richmond Hill ON L4B 1E5

Tel: (905) 707-1171
 Fax: (905) 707-0177

dishwasher / lave-vaisselle

The Miele G595SCi dishwasher cleans efficiently, operates quietly and uses two-thirds the electricity and half the water of a conventional dishwasher.

Le lave-vaisselle Miele G595SCi nettoie avec efficacité, sans bruit, et utilise les deux tiers de l'électricité et la moitié de l'eau d'un appareil classique.

sponsor / commanditaire :

Ms. Carolyn Cross
 Miele Limited
 55G East Beaver Creek Road
 Richmond Hill ON L4B 1E5

Tel: (905) 707-1171
 Fax: (905) 707-0177

refrigerator / réfrigérateur

The compressors and condensers of this custom-built refrigerator are positioned outside the envelope of the house to improve efficiency in winter, reduce heat gain in summer and help decrease noise levels inside the house.

A 2.5 cm (1 in.) thick Aura^R Superinsulation panel insulates about five times better than urethane foam.

Le fait de placer à l'extérieur de l'enveloppe de la maison le compresseur et le condenseur de ce réfrigérateur hors série améliore son efficacité en hiver, réduit les gains calorifiques l'été et diminue le bruit à l'intérieur.

Le panneau superisolant Aura^R de 2,5 cm (1 po) d'épaisseur isole cinq fois mieux que la mousse d'uréthane.

sponsors / commanditaires :

Mr. John Tchitdjian
 Toronto Kitchen Equipment Ltd.
 1150 Barmac Dr.
 Toronto ON M9L 2S2

Tel: (416) 745-4944
 Fax: (416) 745-3217

Mr. Ralph McGrath
 Owens Corning
 Science and Technology Center
 2790 Columbus Rd., Route 16
 Granville OH 43034, 1200 USA

Tel: (740) 321-7707
 Fax: (740) 321-7575

CARPENTRY / MENUISERIE**bamboo plank flooring / parquet de bambou**

Bamboo is an elegant, light-grained substitute for hardwood. It is fire resistant, hard and sustainably harvested every three to five years.

Le bois de bambou est un produit de remplacement du bois dur élégant et légèrement veiné.

Résistant au feu, il est dur et est récolté de façon écologique tous les trois à cinq ans.

sponsors / commanditaires :

Mr. Ed Lowans

Tel: (416) 544-1629

Lowans and Stephen Environmental Consultants

Fax: (416) 544-1630

42 Donegall Drive

Toronto ON M4G 3G5

Mr. Keith Bow

Tel: (416) 297-5465

K &M Bamboo Products Inc.

Fax: (416) 299-7219

63 Silver Star Blvd

Unit E2

Toronto ON M1V 5E5

decking / platelage

TREX wood-polymer lumber made from reclaimed plastics and wood waste can be cut, drilled, sawed, and screwed like wood. It will not crack, split, warp or rot the way lumber does.

Les éléments de construction bois-polymère TREX, fabriqués de plastique recyclé et de déchets de bois, peuvent être taillés, sciés et vissés sauf que, contrairement au bois, ils présentent l'avantage de ne se fissurer, ni fendiller, ni gauchir ni pourrir.

sponsor / commanditaire :

Mr. Rick McQuin

Tel: (905) 335-3366

Nicholson and Cates Limited

Fax: (905) 335-2328

3060 Mainway Drive Suite 300

Box 219

Burlington ON L7M 1A3

drying closet / penderie de séchage

The drying closet, which replaces a mechanical clothes dryer, provides heat through tubing connected to the radiant floor heating system. Moist air is removed by the ventilation system. A drying closet is energy efficient, causes no wear and tear on fabrics, and does not create static electricity making fabric softeners unnecessary. The lint-free air can be exhausted through the heat recovery system.

La penderie de séchage, qui remplace la sècheuse mécanique, émet de la chaleur grâce à des canalisations raccordées à l'installation de chauffage par rayonnement à partir du sol. L'air humide évacué par l'installation de ventilation. Une penderie de séchage est éconergétique, ne favorise pas l'usure de tissus et ne produit pas d'électricité statique, rendant ainsi inutile l'achat d'un assouplisseur de tissu. L'air étant exempt de charpie, il peut être évacué par le ventilateur de chaleur.

engineered wood products / produits en bois préfabriqués

Engineered wood products reduce the need for lumber from old-growth forests. Wood fibres from small, young quickly regenerated trees are arranged to produce strong, straight, dimensionally stable engineered lumber.

SilentFloor[®] TJI[®] joists, Parallam[®], Timberstrand[®] and Microllam[®] beams and columns were used as structural framing components in the floors, walls and roof.

Les produits en bois préfabriqués réduisent la demande de bois de construction en provenance de forêts matures. Les fibres de bois provenant d'arbres petits, jeunes et à régénérescence rapide sont disposées de façon à produire du bois préfabriqué résistant, droit, de stabilité dimensionnelle.

Les poutres et poteaux SilentFloor[®] TJI[®] joists, Parallam[®], Timberstrand[®] et Microllam[®] tiennent lieu d'éléments structuraux des planchers, des murs et du toit.

sponsors / commanditaires :

Mr. Anthony Caravaggio
Trus Joist MacMillan Limited
86 Guided Ct
Suite 10
Toronto ON M9V 4K6

Tel: (416) 740-1427
Fax: (416) 740-0745

Mr. Brian Hornbostel
Weyerhaeuser Canada Inc.
633 Creditstone Rd.
Concord ON L4K 4N2

Tel: (905) 660-4084
Fax: (905) 660-4089

Mr. Paul Hill
Lansing Buildall
1170 Martingrove Rd.
Toronto ON M9W 4X1

Tel: (416) 241-8844 or (416) 241-8710
Fax: (416) 241-0407

kitchen cupboards / armoires de cuisine

Cupboards are built of Medite II, which is made from pre-consumer wood waste, contains no added formaldehyde and is moisture and flame resistant.

Les armoires en Medite II, produit dérivé de déchets de bois pré-consommation auquel aucune dose de formol n'est ajoutée, résistent à l'humidité et au feu.

sponsors / commanditaires :

Mr. Frank Pelcz
Cardinal Kitchens Limited
165 Exeter Rd.
London ON N6L 1A4

Tel: (519) 652-3295
Fax: (519) 652-9855

Mr. Chris Leffel
Medite Corporation
2151 Professional Drive Suite 200
Roseville CA 95661 USA

Tel: (800) 676-3339 or (541) 773-2522
Fax: (503) 779-9921

Mr. Jim Kunzli	Tel: (416) 674-3333
McFadden's Hardwood & Hardware Limited	(800) 268-0942
2164 Buckingham Rd.	Fax: (416) 674-8810
Oakville ON L6H 6M7	(800) 265-4278

stairs / escaliers

Stairs are built of birch, a durable, fast-growing domestic hardwood that emits few chemicals, and are finished with a water-based epoxy coating.

Les escaliers sont fabriqués en bouleau, essence de bois dur poussant rapidement au pays et dégageant peu de produits chimiques, puis revêtus d'une couche d'époxy à base d'eau.

sponsor / commanditaire :

Mr. Reinhold Klinger	Tel: (416) 291-1394
R. K. Woodworking Specialists Ltd.	Fax: (416) 291-1014
4160 Midland Ave.	
Toronto ON M1V 4S6	

CONCRETE / BÉTON

concrete floors / planchers de béton

The thermal mass provided by 45 metric tonnes (50 tons) of concrete poured into corrugated metal decking in the suspended floor / ceiling system, is critical to the passive solar system performance.

La masse thermique qu'assurent 45 tonnes métriques (50 tonnes) de béton coulé sur le platelage en métal ondulé du plancher / plafond suspendu est essentielle à la performance du système solaire passif.

sponsors / commanditaires :

Mr. Dennis Zuliani	Tel: (416) 423-1300
Canadian Building Materials Company	Fax: (416) 423-4211
55 Industrial St.	
Toronto ON M4G 3W9	

Mr. Dan Notari	Tel: (905) 761-7000
Dufferin - Custom Concrete Group	Fax: (905) 761-7300
3300 Highway # 7	
Suite 600	
Concord ON L4K 4M3	

Mr. Dave Lain	Tel: (416) 798-4755
Innocon Inc.	Fax: (416) 798-4925
50 Newkirk Road	
Richmond Hill ON L4C 3G3	

floor finish / revêtement de finition de plancher

The floor is finished with recycled glass mixed with cement mortar which is ground to a smooth surface to expose the aggregate (glass) and sand. The recycled glass provides depth, interest and light.

Le plancher est revêtu d'une couche de verre recyclé mélangé à un mortier de ciment qu'on a meulé pour lui donner une surface lisse et expose le granulat (le verre) et le sable. Le verre recyclé donne au revêtement de la profondeur, de l'intérêt et de la lumière.

sponsors / commanditaires :

Mr. Joe Paradiso

Tel: (416) 232-3000

Consumers Glass

Fax: (416) 232-3222

777 Kipling Avenue

Toronto ON M8Z 5Z4

Mr. Rick Bortolotti

Tel: (416) 235-0161

York Marble, Tile & Terrazzo Ltd.

Fax: (416) 235-1247

41 Colville Road

Toronto ON M6M 2Y2

imprinted concrete / béton façonné

Two poured concrete patios in the backyard have been coloured and stamped with a pattern to enhance their appearance. These patios provide a durable, environmentally friendly collection area for relatively clean surface water that will be directed to the cistern.

Les deux patios en béton coulé aménagés dans la cour arrière ont été colorés et façonnés pour en rehausser l'aspect. Durables et écologiques, ils acheminent l'eau relativement pure vers la citerne.

sponsor / commanditaire :

Mr. Geoff Kinney

Tel: (905) 670-1998

Duron Ontario Ltd.

Fax: (905) 670-4662

1860 Shawson Drive

Mississauga ON L4W 1R7

wall forms / coffrages muraux

Durisol[®], a wood-particle concrete consisting of 78 percent recycled materials, was used to construct poured-in-place, reinforced concrete walls. The wall forms can be sawn, nailed and shaped with ordinary carpenter's tools.

Durisol[®], béton de particules de bois contenant 78 % de matériaux recyclés, entre dans la fabrication des murs en béton armé, coulé sur place. Les coffrages muraux peuvent être sciés, cloués et façonnés à l'aide d'outils classique de charpentier.

sponsors / commanditaires :

Mr. Hans Rerup

Tel: (905) 521-0999

Durisol Materials Limited

Fax: (905) 521-8658

67 Frid Street

Hamilton ON L8P 4M3

CONSULTANT SERVICES / CONSULTANTS

technical information on concrete walls and floors; construction materials donated by member manufacturers / information technique sur les murs et planchers de béton; matériaux de construction offerts gracieusement par des fabricants membres de l'association

Mr. Ludwik Hajduk
Canadian Portland Cement Association /
Association canadienne du ciment Portland
1500 don Mills Road
Suite 703
Toronto ON M3B 3K4

Tel: (416) 449-3708
Fax: (416) 449-9755

recommendations on light-gauge galvanized non-load bearing steel studs and track used in wall assemblies to support interior finishes / recommandations quant aux poteaux non porteurs et rails en acier léger galvanisé utilisés dans les murs pour porter les revêtements intérieurs de finition

Mr. Steve Fox
Canadian Sheet Steel Building Institute /
Institut canadien de la tôle d'acier pour le bâtiment
652 Bishop St. North
Unit 2A
Cambridge ON N3H 4V6

Tel: (519) 650-1285
Fax: (519) 650-8081

field inspection and testing on concrete, footings, piles, and caissons; soil investigation; roofing and compaction testing; geo-environmental study and appraisal / inspection sur les lieux, mise à l'essai du béton, des semelles, des piliers et des caissons; reconnaissance du sol; tests de couverture et de compactage; étude géo-environnementale et évaluation

Mr. Rajinder Chahal
Chih S. Huang & Associates Inc.
2750 - 14th Avenue
Unit 11
Markham ON L3R 0B6

Tel: (905) 475-0784
Fax: (905) 475-5127

consulting services for the products, methods and design elements used in advanced, energy efficient and healthy residential and commercial buildings / services de consultation relatifs aux produits, méthodes et éléments de conception utilisés dans la réalisation de bâtiments sains, évolués et éconergétiques d'usage commercial et résidentiel

Mr. Ed Lowans Tel: (416) 544-1629
 Lowans and Stephen Environmental Consultants Fax: (416) 544-1630
 42 Donegall Drive
 Toronto ON M4G 3G5

in collaboration with Henry Gorenak of the University of Toronto – landscape plan that considers water collection, discharge functions, cost efficiency and durability / en collaboration avec Henry Gorenak de l'Université de Toronto, plan d'aménagement paysager tenant compte du captage de l'eau et de son rejet, de l'efficacité et de la durabilité

Mr. Ruedi Hofer Tel: (416) 239-9818
 PMA landscape Architects Ltd. Fax: (416) 239-1310
 2842 Bloor St. W.
 Suite 201
 Toronto ON M8X 1B1

concrete for foundations, floors and walls for noise reduction; fire safety and solar energy storage; concrete donated by member companies / béton pour les fondations, les planchers et les murs améliorant l'insonorisation, la sécurité incendie et le stockage de l'énergie solaire; béton offert gracieusement par des compagnies membres

Mr. Bob Hanycz Tel: (905) 507-1122
 Ready Mixed Concrete Association of Ontario Fax: (905) 890-8122
 365 Brunel Road
 Unit 3
 Mississauga ON L4Z 1Z5

development of WaterSave computer software used to model water recycling features / mise au point du logiciel WaterSave ayant servi à modéliser les fonctions de recyclage de l'eau

Mr. Peter Russell Tel: (613) 748-2306
 Technical Policy and Research Fax: (613) 748-2402
 CMHC / SCHL
 700 Montreal Road
 Ottawa ON K1A 0P7

Mr. Chris Gates Tel: (905) 841-5551
 REIC Consulting Ltd. Fax: (905) 841-6744
 15010 Young Street
 Aurora ON L4G 1M6

ensuring quality cast-in place reinforced concrete construction; reinforcing steel donated by member companies / garantie de la qualité de la construction en béton armé coulé sur place; acier d'armature offert gracieusement par des compagnies membres

Mr. Warren Webster

Tel: (416) 499-4000 ext. 28

Reinforcing Steel Institute of Canada /

Fax: (416) 499-8752

Institute d'acier d'armature du Canada

70 Leek Cres.

Richmond Hill ON L4B 1H1

DEVELOPMENT SERVICES / SERVICES DIVERS

construction financing / crédit à la construction

Ms. Brenda Browning

Tel: (905) 660-6936

Bank of Montreal / Banque de Montréal

Fax: (905) 660-6995

York Regional Office

7880 Keele Street

Concord ON L4K 4G7

legal services / services juridiques

Mr. Paul Huckins

Tel: (416) 229-6226

Koroloff & Huckins Barristers and Solicitors

Fax: (416) 229-6517

1110 Sheppard Avenue East

Suite 304

Toronto ON M2K 2W2

brokers for the Ontario Home Builder's Association / Maison de courtage de l'Ontario

Home Builder's Association

construction insurance / Assurance pendant la construction

Mr. George Pennie

Tel: (905) 521-3000

Mainway Insurance Brokers Limited

Fax: (905) 577-6955

154 Main Street East

Suite 202

Hamilton ON L8N 1G9

real estate consulting / consultants en immobilier

Mr. Tupper Foster

Tel: (416) 484-1250

Cruickshank Realty Inc.

Fax: (416) 484-1257

64 Merton Street

Suite B

Toronto ON M4S 1A1

DOORS, GLASS & WINDOWS / PORTES, VERRE ET FENÊTRES

doors / portes

Insulated steel doors are energy efficient, secure and low maintenance.

Les portes en acier isolées sont éconergétiques, sûres, et demandent peu d'entretien.

sponsor / commanditaire :

Mr. Michael Panno

Tel: (905) 791-4491

Stanley Doors Systems

Fax: (905) 564-7752

110 Walker Drive

Brampton ON L6T 4A6

door hardware / quincaillerie de porte

Durable and stylish, the SCHLAGE AL-Series lever design locksets feature cylindrical chassis and heavy-duty spring cages to prevent sagging.

De fabrication durable et d'allure distinctive, les serrures à bec-de-cane SCHLAGE AL-Series sont composées d'un coffre cylindrique et d'un cage à ressorts de fort calibre en prévenant l'affaissement.

sponsor / commanditaire :

Mr. Bill Watson

Tel: (905) 278-6128

Ingersoll Rand Architectural Hardware

Fax: (905) 278-3258

1076 Lakeshore Road East

Mississauga ON L5E 1E4

roof / lanterneau

The vented skylight allows fresh air in and lets hot or stale air out. Skylights can provide up to 30 percent more light than a wall-mounted window.

Le lanterneau ventilé admet de l'air frais à l'intérieur et permet d'évacuer l'air chaud ou confiné. Un lanterneau admet jusqu'à 30% plus de lumière du jour qu'une fenêtre murale.

sponsor / commanditaire :

Mr. Marc Lauzon

Tel: (514) 620-6180 or

Roto Frank of America Inc.

(800) 243-0893 Ext. 758

3525 Paul Sauvé

Vaudreuil QC J7V 8T5

skylight / lanterneau

SunScope is a 33 cm (13 in.) diameter tubular skylight that provides full spectrum light and blocks harmful ultraviolet rays. It is energy efficient with virtually no heat loss in winter and no heat gain in summer. SunScope lights up a 10.5 m² (200 sq. ft.) room.

Le lanterneau tubulaire Sunscope de 33 cm (13 po) de diamètre procure de l'éclairage en spectre continu tout en bloquant les rayons ultraviolets nocifs. Étant éconergétique, ce lanterneau ne subit pratiquement aucune perte de chaleur l'hiver ni de gain de chaleur l'été. Le lanterneau SunScope permet d'éclairer une pièce de 10,5 m² (200 pi²).

sponsor / commanditaire :

Mr. John Lupton
 Millwork Home Centre
 1279 Simcoe Street North
 Oshawa ON L1G 4X1

Tel: (905) 728-6291 or
 (800) 263-7884
 Fax: (905) 728-8589

windows / fenêtres

The triple-pane, Low-E (Low-Emissivity coatings block damaging ultraviolet sunlight and heat loss) glass with pultruded fiberglass frames, are energy efficient and dimensionally stable. The rigid warm-edge spacer, a reinforced thermoplastic material, reduces window heat loss and eliminates condensation. Argon gas between panes reduces convection heat losses.

Les fenêtres à triple vitrage à faible émissivité (le revêtement à faible émissivité fait obstacle aux rayons ultraviolets nuisibles de la lumière du jour et à la déperdition de chaleur) logées dans un dormant en fibre de verre pultrudée font preuve d'efficacité énergétique et de stabilité dimensionnelle. L'intercalaire rigide, constitué d'un matériau thermoplastique renforcé, réduit les déperditions de chaleur de la fenêtre et contre la formation de condensation. La lame d'air remplie d'argon réduit les pertes de chaleur par convection.

sponsors / commanditaires :

Mr. Boden Zubchinsky
 INEX Spacer
 631 McCaffrey Rd.
 St. Laurent, Montréal QC H4T 1N3

Tel: (514) 343-9132
 Fax: (514) 343-5379

Mr. Larry Bidner
 Inline Fiberless Ltd.
 30 Constellation Court.
 Toronto ON M9W 1K1

Tel: (416) 679-1171
 Fax: (416) 679-1150

Mr. Nick Limb
 Libby-Owens-Ford Co.
 811 Madison Avenue
 P.O. Box 0799
 Toledo Ohio USA

Tel: (419) 247-4884
 Fax: (419) 247-4517

Mr. Claude Levesque
 T.C Insulating Glass Inc
 71 Witmore Rd.
 Unit 1 & 2
 Woodbridge ON L4L 8G5

Tel: (905) 850-9820
 Fax: (905) 850-9823

ELECTRICAL / ÉLECTRICITÉ

conditioners / conditionneurs

non-demonstration house - on grid / maison qui n'est pas en démonstration - branchée au réseau

Two micro-power conditioners link the 200 V direct current produced by the photovoltaic panels with the conventional 115 V, 60 Hz alternating current used in the house. The power conditioners "track" the sunlight and temperature changes throughout the day to extract as much power from the solar system as possible. This electricity is synchronized with the public utility and any power not used in the house is fed back to Toronto Hydro. At night or during periods of low sunshine the utility feeds power back to the house.

The conditioners are a new design being tested in this house. They were developed by Per Drewes of Ontario Hydro Technologies and Richard Cheung of Ryerson Polytechnic University.

Deux micro-conditionneurs électriques ajoutent les 200 V de courant continu produits par les panneaux photovoltaïques aux 115 V (60 Hz) de courant alternatif traditionnel utilisés dans la maison. Les conditionneurs électriques «suivent» les changements d'ensoleillement et de température tout au long de la journée pour extraire le plus de courant possible de l'installation solaire. Cette électricité est synchronisée avec la compagnie d'électricité et toute quantité de courant qui n'est pas utilisée dans la maison est retournée à Toronto Hydro. La nuit ou durant les périodes de faible ensoleillement, la compagnie d'électricité alimente la maison à son tour.

Ces conditionneurs sont une nouveauté actuellement mise à l'essai dans cette maison. Ils ont été conçus par Per Drewes, d'Ontario Hydro Technologies, et par Richard Cheung, de la Ryerson Polytechnic University.

sponsor / commanditaire :

Mr. Per Drewes
Ontario Hydro
800 Kipling Avenue
KR 136
Toronto ON M8Z 5S4

Tel: (416) 207-6367
Fax: (416) 207-6565

halogen lighting / éclairage halogène

The halogen lights made by Orbit Lighting can be placed anywhere on the clothesline-style wiring. The lights run on 12 volts and the lamps only consume 20 watts, providing energy efficient, clear white light which dramatically accentuates colours and textures.

Les ampoules halogènes, fabriquées par Orbit Lighting, peuvent se fixer n'importe où sur le cordon d'éclairage. Les ampoules, exigeant une intensité de 12 V, ne consomment que 20 W et assurent un éclairage blanc clair éconergétique rehaussant à merveille les couleurs et les textures.

sponsor / commanditaire

Mr. Rick Campbell
Sesco Inc.
601 Ormont Drive
Toronto ON M9L 2W6

Tel: (416) 745-9292
Fax: (416) 745-7497

photovoltaic (PV) panels / panneaux photovoltaïques**demonstration house 150 Sparkhall - off grid / maison témoin du 150, Sparkhall, hors réseau**

The roof-mounted PV panels can generate up to 2.3 kW of power on sunny days. The electricity is stored in batteries in the basement utility room. A 4 kW inverter changes direct current from the 48 volt battery to household alternating current at 120 volts.

Les panneaux photovoltaïques disposés sur le toit assurent jusqu'à 2,3 kilowatts d'énergie électrique les journées ensoleillées. L'électricité est stockée dans des batteries se trouvant dans les local de service du sous-sol. Un invertisseur de 4 kilowatts transforme le courant direct à partir de la batterie de 48 volts en courant alternatif domestique de 120 volts.

non-demonstration house - on grid / maison reliée au réseau

Two power conditioners provide the link between the roof-mounted PV panels and the utility electrical system. They maximize the power coming from the solar source, convert it from direct to alternating current, and feed surplus power to the utility system. On sunny days, electricity for the house comes from the sun. At night, power is supplied by the utility.

Deux conditionneurs d'énergie assurent le lien entre les panneaux photovoltaïques du toit et le réseau électrique public. Ils maximisent l'énergie provenant de la source solaire, transforme le courant direct en courant alternatif, et canalisent le surplus d'énergie vers le réseau public. Par une journée ensoleillée, l'alimentation de la maison est assurée par le soleil, et la nuit, par le réseau public.

sponsors / commanditaires :

Ms. Evelyn Bennett
ASE Americas, Inc.
4 Suburban Park Drive
Billerica MA 01821

Tel: (978) 667-5900 ext.266
Fax: (978) 663-2868

Mr. Chris Ives
Technical Policy and Research
CMHC / SCHL
700 Montreal Road
Ottawa ON K1A 0P7

Tel: (613) 748-2312
Fax: (613) 748-2402

INTERIOR DECORATING / DÉCORATION INTÉRIEURE

closet shelving / tablettes de placard

Sturdy wire shelving allows air to circulate around clothing and makes it easy to see what is inside.

Les solides tablettes en treillis métallique permettent à l'air de circuler autour des vêtements et aident à bien voir ce qui trouve à l'intérieur du placard.

sponsor / commanditaire :

Ms. Barb LaRocques
Space Age Shelving
660 Eglinton Avenue East
Toronto ON M4G 2K2

Tel: (416) 322-5575
Fax: (416) 322-5202

cookware / batterie de cuisine

The LIFETIME[®] stainless steel cookware uses a minimum-moisture vapor seal to retain vitamins and minerals in food. The aluminum and carbon steel absorb the heat from the burner and transfer it evenly across the cooking surface.

La batterie de cuisine en acier inoxydable de LIFETIME[®] requiert un minimum de vapeur ou d'humidité pour conserver les vitamines et les minéraux que renferment les aliments. L'aluminium et l'acier ordinaire absorbent la chaleur de brûler et la transmettent de façon uniforme à toute la surface de cuisson.

sponsor / commanditaire :

Mr. Mike O'Neill
International Home Products Ltd.
4807 Kent Avenue
Niagara Falls ON L2H 1J5

Tel: (905) 356-4900
Fax: (905) 356-7244

interior design services / services d'aménagement intérieur

Organic cottons and wood furniture finished with natural paints have been used so that indoor pollutants are minimized

On a utilisé des cotons non traités et des meubles en bois peints avec la peinture naturelle de manière à réduire au minimum les émissions de polluants à l'intérieur.

sponsor / commanditaire :

Ms. Alexandra Leikermoser
Mr. William Potalivo
ética natural living
2279 Queen Street East
Toronto ON M4E 1G5

Tel: (416) 960-8223
Fax: (416) 694-3202

microwave oven / four à micro-ondes

The Panasonic Genius Dimension 4 microwave / convection oven bakes, broils, microwaves or combination-cooks while using less energy than a conventional oven.

Le four à micro-ondes et à convection Genius Dimension 4 de Panasonic permet la cuisson ordinaire, les grillades, la cuisson aux micro-ondes ou une cuisson mixte, mais utilise tout de même moins d'énergie qu'une cuisinière classique.

sponsor / commanditaire :

Mr. Steve Kitazama
 Matsushita Electric of Canada Limited /
 Matsushita Électrique du Canada Limitée
 5770 Ambler Drive
 Mississauga ON L4W 2T3

Tel: (905) 624-5010
 Fax: (905) 624-9880

mirrored closet doors / portes de placard à miroirs

Sliding doors allow easy access to closets without encroaching on the interior space. The mirrored finish makes the room seem larger.

Les portes coulissantes donnent un accès facile aux placards sans empiéter sur l'espace intérieur. Les miroirs appliqués sur les portes donnent l'impression que la pièce est plus grande qu'elle ne l'est en réalité.

sponsor / commanditaire :

Mr. Paul Chattarpaul
 McDoors & Closets Inc.
 150 Norfinch Drive # 3
 Toronto ON M3N 1X9

Tel: (416) 633-3667
 Fax: (416) 663-5912

MECHANICAL / INSTALLATIONS MÉCANIQUES**air cleaner / purificateur d'air**

A turbulent air stream in the Lifebreath[®] 2000 air cleaner carries particles into a dead air space where they remain. The unit works at a continuously high level of efficiency without affecting air flow, and needs to be cleaned only once a year.

Le courant d'air turbulent à l'intérieur du purificateur d'air Lifebreath[®] 2000 transporte les particules dans un vide d'air où elles demeurent. L'appareil fonctionne à un niveau d'efficacité constamment élevé sans modifier le débit d'air et n'a besoin d'être nettoyé qu'une fois l'an.

sponsors / commanditaires :

Mr. John Godden
 Alpha-Tec Consulting and Construction
 1420 Bayview Avenue
 Toronto ON M4G 3A7

Tel: (416) 486-5724
 Fax: (416) 486-5724

Mr. Roger Johnson
 Nutech Energy Systems Inc.
 511 McCormick Blvd.
 London ON N5W 4C8

Tel: (519) 457-1904
 Fax: (519) 457-1676

air tightness / étanchéité à l'air

The house envelope was tested for air tightness to ensure that energy goals were met.

L'enveloppe de la maison a fait l'objet d'une vérification de l'étanchéité à l'air pour garantir la poursuite des buts énergétiques.

sponsor / commanditaire :

Mr. John Godden
Alpha-tec Consulting and Construction
1420 Bayview Avenue
Toronto ON M4G 3A7

Tel: (416) 486-5724
Fax: (416) 486-5724

batteries and inverter / batteries et invertisseur

The Dynacel/DC lead acid batteries, consisting of eight 275 kg (600 lb) modules providing a total of 48 volts of electricity, can store enough energy for four days without sunshine. The high efficiency inverter, which converts direct current (DC) to normal household alternating current (AC), has high surge ability and low idle current draw.

Les batteries au plomb Dynacel / à courant direct, constituées de 8 modules de 275 kg (600 lb) assurant une alimentation électrique de 48 volts, peuvent stocker suffisamment d'énergie pour répondre à la demande pendant quatre journées sans soleil. L'invertisseur à haute efficacité, lequel transforme le courant direct en courant alternatif domestique, peut supporter une forte surtension et consomme peu de courant au ralenti.

sponsors / commanditaires :

Mr. Sam Vanderhoof
Trace Engineering
5916-195th N.E.
Arlington WA 98223 USA

Tel: (360) 435-8826
Fax: (360) 435-2229

Mr. Farhad Khursigara
Yuasa Exide (Canada) Inc.
392 Deerhust Drive
Brampton ON L6T 5H9

Tel: (905) 790-1212
Cell: (416) 918 7153
Fax: (905) 790-7070

floor drain / avaloir de sol

The XN-3 Dranjer™ floor drain has a water back-flow prevention valve that also serves as an alternative to a trap primer. A trap primer consists of a small-diameter tube that drips water into the trap to maintain a seal. This experimental floor drain does not require water to maintain a seal, thus eliminates wasted water, and prevents soil and sewer gases and odours from entering the house.

L'avaloir de sol XN-3 de Dranjer^{MC} comporte un clapet auto-retour évitant de recourir à un amorceur (tube de faible diamètre alimentant le siphon pour assurer la garde d'eau). Cet avaloir de sol expérimental n'a pas besoin d'alimentation pour maintenir la garde d'eau; il évite donc le gaspillage d'eau tout en empêchant les gaz souterrains, les gaz d'égout et les odeurs de s'infiltrer dans la maison.

sponsor / commanditaire :

Mr. Harold Westdal
Dranjer Corporation
10 McGillivray Place
Unit 9
Winnipeg MB R3T 1N4

Tel: (204) 474-0451 or
(204) 453-0691
Fax: (204) 453-0691

heat recovery ventilator (HRV) / ventilateur-récupérateur de chaleur (VRC)

The Lifebreath[®] HRV has an aluminum heat exchange core that recovers heat from exhaust air and transfers it to incoming air to conserve energy. The continuous exchange of fresh and stale air keeps indoor air quality high.

Le VRC Lifebreath[®] comporte un échangeur de chaleur en aluminium récupérant la chaleur de l'air évacué pour préchauffer l'air admis dans le but d'économiser l'énergie. L'échange continu d'air frais et d'air vicié assure une qualité de l'air exceptionnelle.

sponsors / commanditaires :

Mr. John Godden
Alpha-Tec Consulting and Construction
1420 Bayview Avenue
Toronto ON M4G 3A7

Tel: (416) 486-5724
Fax: (416) 486-5724

Mr. Roger Johnson
Nutech Energy Systems Inc.
511 McCormick Blvd.
London ON N5W 4C8

Tel: (519) 457-1904
Fax: (519) 457-1676

radiant floor heating / chauffage rayonnant par le sol

Kitec multipurpose pressure pipe is evenly distributed in the concrete floor to carry solar-heated water to all parts of the house. Concrete is poured into the steel decking that creates the ceiling for the space below. Both the floor and ceiling radiate heat to the interior of the house.

Les canalisations sous pression tout usage Kitec sont réparties uniformément dans le plancher de béton pour acheminer l'eau chauffée par le soleil vers tous les parties de la maison. Du béton est coulé dans le platelage d'acier qui constitue le plafond du niveau en dessous. Le plancher et le plafond rayonnent la chaleur à l'intérieur de la maison.

sponsors /commanditaires :

Mr. Lyle Jory
Alternative Combined Energy Systems
P.O. Box 546
Station P
Toronto ON M5S 2T1

Tel: (416) 463-5835
Fax: (416) 463-4067

Mr. Andrew Hoerner
Bert Hoerner & Son Plumbing & Heating
868 Broadview Avenue
Toronto ON M4K 2R1

Tel: (416) 463-2573
Fax: (416) 466-3711

Mr. Alan Verschoote
IPEX Inc.
6810 Invader Cres.
Mississauga ON L5T 2B6

Tel: (905) 670-7676 or
(416) 587-9970 (car)
Fax: (905) 670-5295

Mr. Warren Webster
Reinforcing Steel Institute of Canada
70 Leek Cres.
Richmond Hill ON L4B 1H1

Tel: (416) 499-4000 ext.28
Fax: (905) 707-0610

Mr. Jamie Robertson
Vicwest
1296 South Service Road West
Oakville ON L6L 5T7

Tel: (905) 825-2252
Fax: (905) 825 2272

solar hot water panels / panneaux solaires pour le chauffage de l'eau

Two Solcan 2100 solar panels heat the domestic hot water. Because the solar panels are located on the third level and the storage tank is in the fourth-floor bathroom, the system uses gravity rather than electric pumps to return cold water to the panels. On a sunny day, 180 l. (40 gal.) of hot water can be delivered for use.

Deux panneaux solaires Solcan 2100 assurent le chauffage domestique de l'eau. Puisqu'ils sont situés au troisième niveau et que le réservoir de stockage se trouve dans la salle de bains du quatrième niveau, le système renvoie l'eau froide aux panneaux par gravité plutôt qu'au moyen d'une pompe électrique. Par une journée ensoleillée, ils assurent 180 litres (40 gallons) d'eau chaude.

sponsor / commanditaire :

Mr. Bob Swartman
Solcan Inc.
126 Wychwood Park
London ON N6G 1R7

Tel: (519) 473-0501
Fax: (519) 473-0501

MOISTURE PROTECTION / PROTECTION CONTRE L'HUMIDITÉ

foundation drainage / drainage des fondations

Terradrain is a prefabricated drainage panel that allows water to flow freely down the foundation wall into the drainage pipe. It consists of a porous geotextile bonded to an embossed polystyrene core.

Le panneau de drainage préfabriqué Terradrain permet à l'eau de s'écouler librement vers le bas des fondations jusqu'au tuyau de drainage. Il est constitué d'un géotextile poreux lié à une âme de polystyrène en relief.

sponsor / commanditaire :

Mr. Doug Simmons
Terrafix Geosynthetics Inc.
425 Attwell Drive
Toronto ON M9W 5C4

Tel: (416) 674-0363
Fax: (416) 674-1159

foundation insulation / isolant pour fondations

10 cm (4 in.) of STYROFOAM* HI-40 and a vapour barrier layer were placed under the slab to prevent frost penetration, thereby improving thermal performance and reducing frost heave damage to the foundation and structure.

Les panneaux de STYROFOAM* HI-40 de 10 cm (4 po) et le pare-vapeur placés sous la dalle visent à prévenir la pénétration du gel, améliorant ainsi la performance thermique et réduisent les risques de soulèvement par le gel des fondations et du bâtiment.

sponsors / commanditaires :

Ms. Martha Webb

Tel: (416) 531-2813

Dow Chemical

(416) 573-5730

61 Burnside Dr.

Fax: (416) 531-2335

Toronto ON M6G 2M9

*Trademark of the Dow Chemical Company / *Marque de commerce de Dow Chemical Canada Inc.

Mr. Paul Hill

Tel: (416) 241-8844 or

Lansing Buildall

(416) 241-8710

1170 Martingrove Rd.

Fax: (416) 241-0407

Etobicoke ON M9W 4X1

housewrap / revêtement d'étanchéité

Tyvek[®] Housewrap is an external protective sheet that acts as an air barrier, keeping out moisture while letting the house breathe. It's wrapped over the exterior sheathing.

La membrane de protection Tyvek[®], qui tient lieu de pare-air enveloppant le revêtement d'ossature extérieur, garde l'humidité tout en étant perméable à la vapeur d'eau.

sponsor / commanditaire :

Mr. Peter Russell

Tel: (905) 821-3300

Du Pont Canada

Fax: (905) 821-5177

P.O. Box 2200

Streetsville

Mississauga ON L5M 2H3

interior insulation / isolation intérieure

Roxul[®] mineral wool insulation batts contain over 50 percent recycled content. The fibres are larger in diameter than in other fibrous insulation material and are therefore less likely to disperse particles into the air.

Les matelas isolants de laine minérale Roxul[®] contiennent plus de 50% de matière recyclée. Les fibres constituantes présentent un diamètre supérieur à celui des autres matériaux isolants fibreux et risquent donc de moins disperser de particules dans l'air.

sponsor / commanditaire :

Mr. Steve Koch

Tel: (905) 875-9307 or

Roxul Inc.

(905) 878-8474

551 Harrop Dr.

Fax: (905) 878-8077

Milton ON L9T 3H3

roofing / couverture

The thermoplastic Nelco roofing system looks like slate and is thermally stable, lightweight and flame resistant. It provides a relatively clean surface for water collection.

La couverture thermoplastique Nelco, simulant l'allure de l'ardoise, fait preuve de thermostabilité en plus d'être légère et ignifuge. Elle assure une surface relativement propre pour recueillir l'eau.

sponsor / commanditaire :

Mr. Paul McCormack
Stirling Building Products Limited
281 Alliance Rd.
Milton ON L9T 4N9

Tel: (800) 268-5094 or
(905) 878-5531
Fax: (905) 878-8334

siding / bardage

Hardiplank siding is a fibre-cement product that looks like wood. Hardiplank will not crack, rot, or de-laminate. It's non-combustible, moisture resistant and termite-proof.

Le bardage Hardiplank est un produit de fibro-ciment similibois qui présente les avantages de ne pas se fissurer, de ne pas pourrir et de ne pas se décoller. Il est de plus incombustible, à l'épreuve des termites et résiste à l'humidité.

sponsors / commanditaires :

Mr. Brian Hornbostel
Weyerhaeuser Canada Inc.
633 Creditsone Rd.
Concord ON L4K 4N2

Tel: (905) 660-4048
Fax: (905) 660-4089

Mr. Paul McCormack
Stirling Building Products Limited
281 Alliance Rd.
Milton ON L9T 4N9

Tel: (800) 268-5094 or
(905) 878-5531
Fax: (905) 878-8334

SITE WORK / TRAVAUX PRÉPARATOIRES**architectural decorative elements / éléments architecturaux décoratifs**

A variety of recycled-concrete columns are carefully situated to enhance the north retaining wall in the back yard and create places for plant tubs.

Différentes colonnes en béton recyclé sont disposées avec soin dans le but de rehausser l'aspect du mur de soutènement nord de la cour arrière et de ménager de l'espace pour les jardinières.

sponsors / commanditaires :

Mr. Joe Bernardi
Bernardi Precast Inc.
412 Elizabeth Street
Guelph ON N1E 2Y1

Tel: (519) 822-4820
Fax: (519) 822-4820

Mr. Art Lucs
Vilnis Design Works
153 Glasgow Street North
Guelph ON N0E 4W7

Tel: (519) 837-3154
Fax: (519) 837-3154

gunite retaining wall / mur de soutènement en gunite

The gunite (sprayed concrete) retaining wall stabilizes the sloping back yard and provides a rough surface for attractive climbing vines.

Le mur de soutènement en gunite (béton pulvérisé) stabilise la cour arrière et procure une surface rugueuse aux vignes grimpantes.

sponsor / commanditaire :

Mr. Mirek Samborski

Tel: (416) 259-6791

Beam Construction (1984) Co. Ltd.

Fax: (416) 259-6716

16 Heslop Dr.

Toronto ON M8W 4R1

landscaping / aménagement paysager

The low-maintenance landscaping is functional and esthetically pleasing. The front yard features flowering perennials and edible plants in the garden. The backyard, which has two patios designed to collect surface water and divert it into the cistern, is quite dry and shady. The ground cover and other plants for this area were chosen for their ability to thrive under these conditions.

L'aménagement paysager nécessitant peu d'entretien allie fonctionnalité et esthétique. Le jardin avant let en évidence des fleurs vivaces et un potager. La cour arrière, où sont aménagés deux patios ayant pour but de recueillir les eaux de ruissellement et de les acheminer à destination de la citerne, est plutôt sèche et combragée. Le choix s'est arrêté sur des couvre-sol et autres plantes qui peuvent croître dans de telles conditions.

sponsor / commanditaire :

Mr. Ruedi Hofer

Tel: (416) 239-9818

PMA Landscape Architects Ltd.

Fax: (416) 239-1310

2842 Bloor St. W.

Suite 201

Toronto ON M8X 1B1

nursery stock / produits de pépinière

Native material, fruit trees and shrubs were chosen to be esthetically pleasing, hardy and easy to maintain.

Les matières, les arbres fruitiers et les arbustes sont indigènes et on été choisis parce qu'ils sont agréables au regard, résistants et faciles d'entretien.

sponsors / commanditaires :

Mr. Jim McCracken

Tel: (416) 759-5650

Hugh McCracken Limited

Fax: (416) 759-5304

R.R. #1

1440 Colborne Street East

Brantford ON N3T 5L4

Mr. John Putzer

Tel: (905) 821-3450

M. Putzer Hornby Nursery Ltd.

Fax: (905) 878-8737

7314 Sixth Line

Hornby ON L0P 1E0

Ms. Marjorie Hancock
Woodland Nurseries
2151 Camilla Road
Mississauga ON L5A 2K1

Tel: (905) 277-2961
Fax: (905) 277-0650

site selection / choix de l'emplacement

Located in an established neighbourhood, the lot faces south for maximum solar exposure. Because municipal services were not required, it was possible to build on a lot that typically would be considered unusable.

Situé dans un quartier établi, le terrain orienté au sud bénéficie d'une exposition solaire maximale.

Puisque les services municipaux ne sont pas requis, il a été possible de construire la maison sur un terrain qui serait autrement considéré comme inutilisable.

sponsors / commanditaires :

Mr. Tupper Foster
Cruikshank Realty Inc.
64 Merton Street
Suite B
Toronto ON M4S 1A1

Tel: (416) 484-1250
Fax: (416) 484-1257

Mr. Randy Rabideau
Rabideau & Czerwinsky, Ontario Land Surveyors
777 The Queensway
Unit E
Toronto ON M8Z 1N4

Tel: (416) 252-2511
Fax: (416) 252-1501

termite barrier / écran anti-termites

Non-toxic granitic sand forms a highly effective barrier against termites.

Le sable granitique non toxique constitue un écran anti-termites très efficace.

sponsor / commanditaire :

Mr. Todd Knapton
Hutcheson Sand & Mixes
8 West St. South
Huntsville ON P1H 1PQ

Tel: (705) 789-4457
(800) 461-5521
Fax: (705) 789-1049

SKILLED TRADES / CORPS DE MÉTIER SPÉCIALISÉS

construction equipment rentals, sales and service / location, vente et réparation de matériel de construction

Ms. Jule Elias
A-1 Rent-a-Tool Ontario Ltd.
278 Bridgeland Ave.
Toronto ON M6A 1Z4

Tel: (416) 781-5244
Fax: (416) 781-8135

installation of water and filtration system piping / installation de tuyaux d'alimentation en eau et de système de filtration

Mr. Andrew Hoerner Tel: (416) 463-2573
 Bert Hoerner & Son Plumbing & Heating Fax: (416) 466-3711
 868 Broadview Avenue
 Toronto ON M4K 2R1

excavation services / services d'excavation

Mr. Manny Arcuri Tel: (905) 746-1277
 Crosstown Disposal Ltd.
 47 Humberview Drive
 Woodbridge ON L4H 1B5

fabrication of solar panels, custom metal support brackets / fabrication des panneaux solaires, des consoles métalliques sur mesure

Mr. Dennis Parolin Tel: (416) 535-1686
 Dufferin - Iron and Railings Fax: (416) 533-3615
 1423 Dufferin Street
 Toronto ON M6H 4C7

structural work, construction and project management / travaux de charpente, construction et gestion

Mr. Doug Webber Tel: (416) 767-0404
 Green City Construction and Design Fax: (416) 767-9383
 85 Lavinia Avenue
 Toronto ON M6S 3H9

sand and stone products / sable et pierre

Mr. Paul Franceschini Tel: (905) 277-1471
 Franceschini Bros. Aggregates Ltd. Fax: (905) 270-8183
 2531 Cawthra Rd.
 Mississauga ON L5A 2W7

finish carpentry / menuiserie de finition

Mr. Joe Macedo Tel: (905) 851-5276
 J. Macedo Carpentry & Millwork Ltd. Fax: (905) 851-7589
 129 Rowntree Dairy Road
 Unit 3
 Woodbridge ON L4L 6C9

electrical contractors / entrepreneurs-électriciens

Mr. Vince Monopoli Tel: (905) 738-5729
 Monopoli Electric Inc. (416) 347-3131
 164 Bourbon St. Fax: (905) 660-3238
 Woodbridge ON L4L 6Y9

SPECIALITIES / SPECIALITÉS

central vacuum / aspirateur central

The central vacuum exhausts dust outside for a cleaner indoor environment.

En évacuant la poussière à l'extérieur, l'aspirateur central contribue à assainir le milieu intérieur.

sponsor / commanditaire :

Mr. Scott Stevens

Tel: (905) 895-0985

Broan Limited

Fax: (905) 830-6925

28 Boothbay Cres.

Newmarket ON L3Y 1Y5

countertop / surfaces de travail

Made in Canada, KARADON solid-surface countertops are seamless, easy to clean and repairable. These countertops are made of polyester with a mineral filler.

Produits au Canada, les surfaces de travail KARADON fabriquées de polyester et de charges minérales ne présentent aucun joint, en plus d'être faciles à nettoyer et à réparer.

sponsors / commanditaires :

Mr. Tom Bernard

Tel: (416) 531-5051

Octopus Products Limited

Fax: (416) 531-3254

200 Geary Avenue

Toronto ON M6H 2B9

faucets / robinets

The Delta 462/550 "go anywhere" pull-out sprays with water conserving aerators direct water flow where needed. The Delta 520-WF washerless, single-lever basin faucets are accessible and easy to use.

Le robinet Delta 462/550 à arroseur rétractible et aérateur économiseur d'eau permet de diriger le jet à volonté. Le robinet de lavabo Delta 520-WF, sans rondelle, est doté d'une seule manette favorisant son accessibilité et simplifiant son emploi.

sponsor / commanditaire :

Ms. Micheline Billings

Tel: (905) 712-1422

Delta Faucet Canada

Fax: (905) 712-1456

405 Britannia Road East

Suite 210/212

Mississauga ON L4Z 3E6

finishes / revêtements de finition

Varathane Elite Diamond Finish^R, used on the kitchen cupboards and natural wood trim, is a durable, water based, interior clear finish. Varathane Diamond Colour Series^R used on the painted wood trim and doors, is a tintable, water based, multi-purpose enamel for interior and exterior use.

Le revêtement de finition Elite Diamond de Varathane^{md} appliqué sur les armoires de cuisine et les boiseries naturelles est transparent, durable, à base d'eau et destiné à un usage intérieur. Le revêtement Diamond Colour de Varathane^{md} appliqué sur les portes et boiseries peintes est in émail tout usage, à base d'eau, pouvant être teinté et se prête à un usage intérieur ou extérieur.

sponsor / commanditaire :

Ms. Karen Court

Tel: (905) 333-6545

Flecto Coatings Ltd. / Flecto Coatings Ltée

Fax: (905) 333-9241

Suite 203 South

1455 Lakeshore road

Burlington ON L7S 2J1

industrial coatings / revêtements de finition industriels

Solignum 100 percent polyurethane water-based finish was used on the wood stairs, bamboo plank flooring and concrete floors. This durable Canadian-made product is clear, easy to use and adheres to most solvent-based finishes.

Le revêtement à base d'eau Solignum en polyuréthane à 100 % a été utilisé sur les escaliers de bois, les parquets de bambou et les planchers de béton. Ce produit canadien durable est transparent et facile à utiliser. Il adhère à la plupart des revêtements de finition à base de solvant.

sponsor / commanditaire :

Mr. Brian Zinman

Tel: (416) 749-5542

Solignum Inc.

Fax: (416) 742-2985

200 Norelco Drive

Toronto ON M9L 1S4

plaster / plâtre de finition

A thin finish coat of veneer plaster, which has no additives, is applied over "blue board" (rigid interior sheeting material). Veneer plaster is faster to install than traditional plaster, and provides harder, abuse-resistant surfaces. Paint is not required.

Une mince couche de plâtre de finition, ne contenant aucun additif, est appliquée par-dessus les panneaux de revêtement rigides. Le plâtre de finition s'applique plus facilement que l'enduit au plâtre classique tout en offrant une surface plus résistante. Le plâtre de finition ne requiert pas d'application de peinture.

sponsors / commanditaires :

Mr. Doug Skrepnek

Tel: (905) 803-5666 or

Canadian Gypsum Company

(905) 803-5620

350 Burnamthorpe Rd.

(905) 803-5600

5th Floor

Fax: (905) 803-5682

Mississauga ON L5B 3J1

Mr. John Martelli
Florida Drywall
101 Toro Rd.
Unit 43
Toronto ON M3J 2Z1

Tel: (416) 633-7728 or
(416) 230-6734
Fax: (416) 633-7026

recycled glass countertop / comptoir fait de verre recyclé

The kitchen countertop consists of 60 percent recycled glass from the Ontario Blue Box program. Portland cement and marble chips bind the materials, provide strength and result in a distinctive appearance.

Ce comptoir de cuisine est constitué à 60 p. 100 de verre recyclé recueilli grâce au programme Boîte Blue de l'Ontario. Du ciment Portland et des éclats de marbre lient les matériaux, leur confèrent leur résistance et donnent à l'ensemble un aspect très particulier.

sponsor / commanditaire :

Mr. John Labalestra
Noug Art Inc.
41A Colville Road
Toronto ON M6M 2Y2

Tel: (416) 249-6581
Fax: (416) 235-1247

sealant and adhesive / scellant à la silicone

The flexibility and adhesion of silicone sealant allows it to stretch and compress with movement that occurs around windows, doors and siding. Latex silicone can be painted, lasts well and can be cleaned with water.

La flexibilité et l'adhésion de scellant à la silicone lui permet de s'étirer et de se comprimer selon le mouvement se produisant autour des fenêtres, des portes et du parement extérieur. Le scellant de silicone au latex se peint, dure longtemps et se nettoie à l'eau.

sponsor / commanditaire :

Mr. Ed Churney
CSL Silicones Inc.
144 Woodlawn Road West
Guelph ON N1H 1B5

Tel: (519) 836-9044
Fax: (519) 836-9069

shower head / pomme de douche

Delta's 1500 Monitor series shower head has a pressure balance system that prevents hot or cold water shock caused by pressure fluctuations. The memory maintains the same temperature setting once the selection is made.

Le régulateur de pression de la pomme de douche de la série 1500 Monitor de Delta évite les variations soudaines de la température de l'eau puisqu'il conserve en mémoire la température de consigne préétablie.

sponsor / commanditaire :

Ms. Micheline Billings
Delta Faucet Canada
405 Britannia Road East
Suite 210
Mississauga ON L4Z 3E6

Tel: (905) 712-1422
Fax: (905) 712-1456

shower stall / cabine de douche

The durable, low-maintenance Iris Model K-3434 space-saving shower kit features multiple shelves and a round door with double center-opening panels.

La cabine de douche modèle K-3434 d'Iris, durable et nécessitant peu d'entretien, comporte de multiples tablettes et une porte ronde et deux panneaux s'ouvrant au centre.

sponsor / commanditaire :

Ms. Carolle Nolin

Tel: (418) 387-4155

MAAX Inc.

Fax: (418) 387-3507

600 Cameron

Sainte-Marie

Beauce QC G6E 1B2

stainless steel sinks / évier en acier inoxydable

20-gauge stainless steel sinks are durable and easy to clean.

Les évier en acier inoxydable d'épaisseur 20 s'avèrent durable et faciles à nettoyer.

sponsor / commanditaire :

Mr. Richard Brown

Tel: (705) 526-5427

Kindred Industries

Fax: (705) 526-8055

1000 Kindred Road P.O Box 190

Midland ON L4R 4K9

toilets / toilettes

Ultra Low Flush (ULF) toilets feature a gravity-fed, siphon-like flushing action, which uses only 6 L (1.5 gal) of water compared to the 16 L (3.5 gal.) flush of a conventional toilet.

Les toilettes à très faible consommation d'eau comportent une chasse d'eau siphonique par action gravitaire qui ne consomme que 6 litres (1,5 gallon) d'eau comparativement aux 16 litres (3,5 gallons) que requiert un appareil classique.

sponsor / commanditaire :

Mr. Richard Brown

Tel: (416) 798-1890

Crane Canada Inc. - Plumbing Division

Fax: (416) 798-2163

75 International Dr.

Toronto ON M9W 6L9

STEEL / ACIER**steel studs / poteaux en acier**

Light-gauge, galvanized, non-loadbearing steel studs and track were used in the wall assemblies.

They support the interior finishes inside the vapour barrier, helping to maintain the integrity of the building envelope.

Les murs sont constitués d'ossatures non porteuses en poteaux et rails d'acier léger galvanisé servant d'appui aux revêtements intérieurs de finition disposés du côté intérieur du pare-vapeur et contribuant ainsi à préserver l'intégrité de l'enveloppe de bâtiment.

sponsor / commanditaire :

Steve Fox

Tel: (519) 650-1285

Canadian Sheet Steel Building Institute /

Fax: (519) 650-8081

Institut canadien de la tôle d'acier pour le bâtiment

652 Bishop St. North

Unit 2A

Cambridge ON N3H 4V6

WATER SYSTEMS / TRAITEMENT DE L'EAU**circulator / circulateur**

The Grundfos Series UP three-speed circulator allows individual temperature control through select hot water zoning loops in the radiant floor heating system. It is durable, corrosion resistant and quiet, and uses very little energy.

Le circulateur à trois vitesses Grundfos de la série UP-permet de commander la température des pièces grâce à des boucles de zone du système de chauffage par rayonnement par le sol. Le circulateur est durable, résistante à la corrosion, fonctionne sans bruit et consomme très peu d'énergie.

sponsor / commanditaire :

Mr. Victor Lukic

Tel: (905) 829-9533

Grundfos Canada Inc.

Fax: (905) 829-9512

2941 Brighton Rd.

Oakville ON L6H 6C9

concrete tanks / réservoirs en béton

Rain water is stored in a 20, 000 L (4,400 gal.) underground cistern (storage tank) in the back yard. This is an adequate supply for six months based on Toronto's average annual precipitation. The 3,600 L (800 gal.) septic tank is buried under the driveway, and the 2,000 L (440 gal.) waste water recirculation tank is located under the floor in the first level.

L'eau de pluie est stockée dans une cistern souterraine de 20 000 litres (4 400 gallons) aménagée dans la cour arrière. Elle suffit à assurer un approvisionnement de 6 mois, suivant la moyenne des précipitations annuelles à Toronto. La fosse septique d'une capacité de 3 600 litres (800 gallons) est enfouie sous la voie d'accès privée pour automobile, et le réservoir de recirculation des eaux usées d'une capacité de 2 000 litres (440 gallons) se trouve sous le plancher de premier niveau.

sponsor / commanditaire :

Mr. Jim Wilkinson

Tel: (905) 628-5611

Wilkinsons Heavy Precast Limited

Fax: (905) 628-9292

588 Highway 5 RR# 2

Dundas ON L6H 5E2

grey water heat exchanger / échangeur de chaleur pour eaux ménagères

The GFX grey water heat exchanger recovers up to 80 percent of the heat usually lost from hot water that flows down the drain. It's maintenance-free and requires no energy to operate.

L'échangeur de chaleur pour eaux ménagères GFX récupère jusqu'à 80% de la chaleur des eaux usées évacuées. L'appareil ne requiert pas d'entretien et fonctionne sans dépense d'énergie.

sponsors / commanditaires :

Mr. Carmine Vasile
Waterfilm Energy, Inc.
P.O. Box 48
Oakdale NY 11769 USA

Tel: (516) 758-6271
Fax: (516) 758-0438

Mr. James Vaughn
Vaughn Manufacturing Vorp.
26 Old Elm St.
P.O Box 5431
Salisbury MA 01952-0431 USA

Tel: (978) 462-6683
Fax: (978) 462-6497

pump / pompe

The JetpaQ "three-in-one" pumping system (pump, diaphragm tank and frequency control) maintains constant water pressure throughout the house. The drinkable and reclaimed water systems each have their own pump.

Le système de pompage JetpaQ (comporte pompe, vase d'expansion à membrane et contrôle de fréquence) maintient constante la pression d'eau dans tout la maison. Les systèmes d'alimentation en eau potable et de recyclage de l'eau disposent de leur propre pompe.

sponsor / commanditaire :

Mr. Victor Lukic
Grundfos Canada Inc.
2941 Brighton Rd.
Oakville ON L6H 6C9

Tel: (905) 829-9533
Fax: (905) 829-9512

slow sand filters / filtre à sable lent

The slow sand filter unit allows water to pass progressively through several layers of coarse to fine sand, and finally through an activated charcoal filter bed. Separate units are used for potable (drinkable) water and reclaimed water.

Le filtre à sable lent permet à l'eau de traverser plusieurs couches de sable grossier et fin pour enfin traverser un lit de filtration à charbon activé. Des appareils distincts sont utilisés pour l'eau potable et l'eau recyclée.

sponsor / commanditaire :

Mr. Gert Jungeblut
Alfa Plastics
2 Baker Rd.
Brampton ON L6T 4E3

Tel: (905) 792-8005
Fax: (905) 792-6667

Mr. Bob LeCraw
RAL Engineering Ltd.
482 Queen St. East
Newmarket ON L3Y 2H4

Tel: (905) 853-0626
Fax: (905) 853-8807

ultraviolet (UV) disinfection / désinfection par rayons ultraviolets

UV light damages bacteria and viruses so they cannot reproduce. This method helps to reduce micro-organisms in water to a very low level.

Filtered potable (drinkable) water passes through the UV disinfection unit on its way to the potable water storage tank and once again before it's consumed. Double UV exposure ensures complete disinfection, guarding against bacterial growth in the storage tank. The reclaimed water is also UV-treated.

Les rayons ultraviolets empêchent les bactéries et les virus de se reproduire. Ils contribuent à réduire à un très faible niveau les micro-organismes dans l'eau.

L'eau potable filtrée passe par un appareil de désinfection par rayons ultraviolets avant de parvenir à la citerne et subit un autre traitement avant consommation. La double exposition aux rayons ultraviolets assure une complète désinfection, prévenant toute prolifération bactérienne dans la citerne. L'eau recyclée subit également un traitement par rayons ultraviolets.

sponsor / commanditaire :

Mr. Dean Boode

Tel: (519) 457-3400

Trojan Technologies Inc.

Fax: (519) 457-3030

3020 Gore Rd.

London ON N5V 4T7

Waterloo Biofilter™ / Waterloo Biofilter™

Aerobic (oxygen-requiring) bacteria in the Waterloo Biofilter™ treat waste water through biodegradation -- the process by which living matter decomposes substances so they can be absorbed back into the environment. An alternative to a conventional septic system tile bed, it reduces contaminants to less than ten parts per million (ppm).

Les bactéries aérobies (ayant besoin d'oxygène) du filtre biologique Waterloo Biofilter™ traitent les eaux usées par biodégradation, processus suivant lequel la matière organique décompose les substances pour que l'environnement puisse les réabsorber. Solution de rechange au système septique classique, ce filtre réduit les contaminants à moins de dix parties par million (ppm).

sponsor / commanditaire :

Mr. Craig Jowett

Tel: (519) 836-3380

Waterloo Biofilter Systems Inc.

Fax: (519) 836-3381

Department of Earth Sciences

Waterloo ON N2L 3G1