

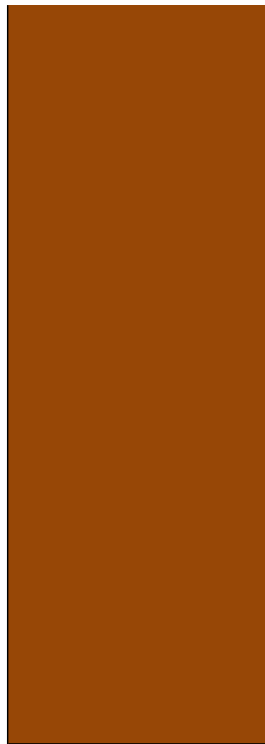
Harmony Habitat's Construction Impacts Review Chart Copyright 2013

Home Components	Conventional Products	Lifecycle Stage	Impact Type	Impact Details	Eco-Fact	References
Wood Frame	conventional lumber	raw materials acquisition	resource depletion	old growth forest, and otherwise unsustainable forestry		
		manufacturing	human health, water pollution	pesticides- Creosote and pentachlorophenol, worker and environmental exposures from pesticide workers exposed to pesticides and airborne		
		construction	human health			
		use	human health, air quality	pesticide emissions,		
Exterior	vinyl siding	raw materials acquisition	resource depletion	petroleum products Production of PVC powder involves the transport of dangerous explosive materials such as vinyl chloride monomer (VCM) and the creation of toxic waste, notably ethylene dichloride (EDC) tars. Tar		
		manufacturing	human health, air quality, air pollution, embodied energy, transportation, social justice	wastes in particular contain huge quantities of dioxins that are then incinerated or construction workers inhale PVC dust from cutting		http://archive.greenpeace.org/toxics/html/content/pvc1.html#life
		construction	human health	Plasticisers are not bound to the plastic and can leach out over time; The most common plasticiser, the phthalate DEHP, is a suspected carcinogen. Phthalate softeners are leaches chemicals into soil and water and biological		http://archive.greenpeace.org/toxics/html/content/pvc1.html
		use	fire, durability, human health	break down is extremely slow, fills landfill		
		disposal	groundwater/soil, landfill volume			

	Hardie board/Fiber cement siding - made of sand, cement and cellulose	Raw materials acquisition		Mining raw materials impacts include energy and resource use, soil erosion, pollutant runoff, and land and habitat loss; air and water quality degradation, combustion emissions, dust, CO2, and particulates from mineral processing	Pollution Prevention Environmental Impact Reduction - Checklists for NEPA/309 REVIEWERS, Prepared by Science Applications International Corporation, January 1995 INTOSAI - Working Group on Environmental Auditing
		Manufacturing	groundwater	see cement impacts	
		Transport	resource depletion, air pollution		
		Construction/installation			
		Use in building			
		Disposal	Waste/Landfill Volume	Fiber cement siding cannot be recycled, end of use results in bulky landfill	
	Cement	Raw materials acquisition	resource depletion, air pollution	Mining raw materials impacts include energy and resource use, soil erosion, pollutant runoff, and land Limestone calcining, cement kiln operation, and portland cement production affect air quality. High-Btu-content wastes, usually tires, are used in some cement kilns, some of which may be hazardous; heavy metals released in dust and gases	<div data-bbox="1627 930 1887 1203" style="border: 1px solid black; padding: 5px;"> www.sciencedirect.com/science/article/pii/B9780080442761501574 Berkes, Howard (2011-11-10). "EPA Regulations Give Kilns Permission To Pollute : NPR". NPR.org. </div>
		Manufacturing Transport	Air pollution/carbon footprint	As of 2011 US cement kilns are "legally allowed to pump more toxins into the air than are hazardous-waste incinerators.	
		Construction/installation		Toxic additives used in curing compounds; potentially hazardous airborne dust may	

					Offgassing of volatile compounds (aromatic and halogenated hydrocarbons) Concrete dust released by building demolition and	A study by the U.S. Environmental Protection Agency (EPA) reported various aromatic and halogenated hydrocarbon emissions from concrete masonry units that ranged from 0.06 to 0.39 µg/m ² per	U.S. Environmental Protection Agency (EPA)
	Use in building Disposal						
Sheathing	OSB and plywood - Boards made from glue bonded waste wood and/or unsustainably harvested timber	Raw materials acquisition	Resource depletion	Destructive and unsustainable logging practices, minimal standards for accountability	grind them up into sawdust and then compress them...with glues and nitrogen. And we get particleboard. What do we make out of the particleboard? Floor underlayment, cabinets, furniture, tables...If you are mold and you have a choice between hardboard and particleboard what are you going to choose?	Considerable waste inherent in the manufacturing process. "In most cases, only about 50-75% of the usable volume of wood in a tree is converted into plywood"	http://www.buildingscience.com/documents/insights/bsi-027-material-view-of-mold
		Manufacturing Transport	Resource depletion, Human health	Glues and resin binders contain phenol- and urea-formaldehyde			www.madehow.com/Volume-4/Plywood.html#ixzz2AR5y1qH1
		Construction/installation	Human health	Glues and resin binders contain phenol- and urea-formaldehyde, probable human carcinogens; Eyes, nose and throat irritant;			Material Safety Data Sheets
		Use in building Disposal	Human health, Air quality	Air quality and respiratory concerns from off-gassing Toxins leach into landfill soils			

Insulation	All insulation	Use in building	Human Health Air Quality, Durability	Moisture/mould problems associated with building insulation and open wall cavities	
	Fibreglass batting	Raw materials acquisition	Resource depletion	Boron is a raw material that is potentially in short supply Made from silica, sand, limestone, boron, phenol formaldehyde, cullet High embodied energy due to fibres being blown or spun from molten glass. Binding resins and oils are	www.commerce.wa.gov.au/worksafe/content/Safety_Topics/Hazardous_substances/Additional_resources/Working_with_fibreglass.html
		Manufacturing Transport	Air pollution, Carbon footprint		
		Construction/installation Use in building	Human health	Irritant, possible carcinogen	
		Disposal	Air quality, Human health, Landfill volume	Air quality and human health concerns during product removal; Cannot be recycled	
Spray insulation - polystyrene , isocyanate,	Raw materials acquisition	Resource depletion (petrochemical), Air pollution - Ozone depletion Global Warming - Carbon footprint Energy Use	Polystyrene is produced from ethylene, a natural gas component, and benzene, derived from petroleum. Styrene is a possible carcinogen, mutagen, chronic toxin, and environmental toxin. Polyisocyanurate and polyurethane, are made from petroleum products	http://www.buildinggreen.com/auth/article.cfm/1995/1/1/Insulation-Materials-Environmental-Comparisons/	



	Manufacturing Transport	Air pollution Carbon footprint	isocyanate uses chlorine-based chemicals as intermediates.	Insulation Materials: Environmental Comparisons From EBN Volume 4, No. 1 -- January/February 1995
	Construction/installation Use in building	Air pollution Carbon footprint	HCFC foamed installation are damaging to stratospheric ozone	http://www.buildinggreen.com/auth/article.cfm/2002/7/1/Revisiting-Rigid-Foam-Insulation-and-Ozone/
	Disposal	Landfill volume	Landfilled, does not break down	
Cellulose-	Raw materials acquisition Manufacturing Transport	Resource depletion	Boron is a raw material that is potentially in short supply Made with newspaper, borates, ammonium sulfate	http://www.buildinggreen.com/auth/article.cfm/1995/1/1/Insulation-Materials-Environmental-Comparisons/
	Construction/installation Use in building	Human health Air quality	Fibers and chemicals can be irritants	
	Disposal	Landfill volume	Cannot recycle	

**Air/Vapour Barrier:
Conventional hollow wall
envelope (various assembly
types)**

<p><u>Hollow wall components:</u> Polyethylene, plywood/OSB floor sheathing, polyolefin house/rim wrap, sealants, polyurethane foams, drywall, sealants, gaskets, expanding foam sealants, etc.</p>	<p>Use in building</p> <p>Disposal</p>	<p>Human Health Air Quality, Durability</p> <p>Landfill volume, groundwater/soil, pollution</p>	<p>Air space can create opportunity for moisture/mould build up and possible combustion Plastic, synthetic material can build up electrostatic and unhealthy ion balance Resulting mold causes respiratory, cognitive and mood problems Multiple component wall systems are difficult to separate for recycling, bulky landfill items susceptible to leaching</p>	
<p>Gypsum/drywall</p>	<p>Raw materials acquisition</p> <p>Manufacturing</p> <p>Transport</p> <p>Construction/installation</p>	<p>Resource depletion, groundwater/soil, pollution; habitat destruction</p>	<p>Gypsum crystal is usually found in conjunction with or near sulfur deposits. If the calcium sulfate in gypsum mixes with the sulfur, toxic chemicals can be produced Mining leads to soil erosion, causes sinkholes, landslides. uses additives, such as dispersants, accelerators, set retarders, flame retardants, biocides. The most Heavy sheets create high carbon footprint when product is shipped from far</p>	<p>http://www.ehow.com/info_8535057_dangers-gypsum-mining-processing-use.html</p> <p>Pharos project: www.pharosproject.net/product_category/show/id/4</p>

**Air Barrier - Exterior
Insulation Approach**

Rigid insulation: extruded polystyrene, polyethylene gaskets, one-part urethane or silicone sealant, foam sealants

Raw materials acquisition

Resource depletion

Petroleum based product

Use in building

Disposal

Landfill volume, groundwater/soil, pollution; human health, air pollution

Offgassing potential, susceptible to mold growth
 Not all drywall is recycled or properly disposed; drywall in landfills leaches heavy metals, biocides and other chemicals; wet gypsum dissolves into calcium and sulfate and may leach into the groundwater causing sulfate contamination.
 Incidence of high Total Dissolved Solids (TDS) concentrations at construction and demolition debris landfills.
 Foul-smelling hydrogen sulfide (H₂S) gas

The U.S. federal limit for sulfate in drinking water is 250 mg/L. Sometimes concentrations above this limit have been found in groundwater near unlined landfills.
 Humans are very sensitive to the odor of H₂S can smell it at concentrations as low as <0.1 ppm. Concentrations above 250 ppm are lethal and have been found in landfills. Several lawsuits or remedial action have occurred due to problems

www.natureswayresources.com/resource/infosheets/gypsum.html

Caulking and sealants - used in window and wall assemblies

	Manufacturing	Resource depletion (petrochemical), Air pollution - Ozone depletion Global Warming - Carbon footprint Energy Use Human health Air quality	Petroleum-based product; pollutes the air and creates large amounts of liquid and solid waste; Styrene has been linked to increased levels of chromosomal damage, abnormal pulmonary function and cancer in workers at polystyrene and styrene plants; Made with HCFCs blowing agents which have effects on ozone depletion and global warming. (their ozone depletion potential is greatly reduced relative to CFCs	Polystyrene manufacturing process named the 5th largest creator of hazardous waste in the U.S. (Via 1986 EPA report on solid waste) According to the California Integrated Waste Management Board, polystyrene's environmental impacts are second only to aluminium, when taking energy consumption, greenhouse gas effect, and total environmental effect into consideration	"Polystyrene Fact Sheet," Foundation for Advancements in Science and Education, Los Angeles, CA. www.greenbuildingadvisor.com/blogs/dept/musings/calculating-global-warming-impact-insulation
	Transport				
	Construction/installation	Human health Air quality	Contain benzene and styrene, suspected carcinogens and neurotoxins		Polystyrene Fact Sheet," Foundation for Advancements in Science
	Use in building	Human health Air quality	Contain benzene and styrene, suspected carcinogens and neurotoxins		www.way-to-go.org/doc/PolystyreneFactSheets.pdf
	Disposal	Landfill volume, groundwater/soil, pollution	persistent bulky landfill material, will not break down for 500 years; leaches styrene; principle component of urban litter		Polystyrene Fact Sheet," Foundation for Advancements in Science and Education, Los Angeles, CA.
	Latex-based caulking	Construction/installation	Air Quality, Human Health	Eye, skin, respiratory tract irritant; Inhalation of high vapor concentrations can cause CNS-depression and narcosis. Harmful if inhaled, may affect the brain or nervous system causing dizziness, headache	
	Butyl rubber sealant	Construction/installation	Air Quality, Human Health	Eye, skin, respiratory tract irritant; contains possible carcinogen Titanium dioxide and lung carcinogen	Material Safety Data Sheets (MSDS)

Nitrile rubber	Construction/installation	Air Quality, Human Health	Inhalation can lead to nose and throat irritation headache, nausea, loss of coordination, dizziness, unconsciousness, even asphyxiation. May cause skin irritation and/or dermatitis.	Material Safety Data Sheets (MSDS)
			Technical name for neoprene is Mixed dialkyl thioureas, chemical used in the processing of rubbers. The American Contact Dermatitis Society selected as mixed dialkyl thioureas as its Allergen of the Year for 2009	
			Adding diethylthiourea speeds up the vulcanization of neoprene rubber which makes the rubber more stable, tougher and more pliable so it can be shaped and formed into different products. Industrial uses of diethylthiourea are found in anticorrosive compounds, detergents, fungicides and insecticides, some polyvinyl chloride adhesives, and in	
Neoprene rubber - gaskets	Use in building	Air quality, Human Health	Produces volatile products over its lifetime from thermal degradation including hydrogen chloride and when comes in contact with water will form hydrochloric acid;	http://dermnetnz.org/dermatitis/diethylthiourea.html
			Some polysulfide sealants contain cyclohexane, epoxy resin, barium oxide. May be absorbed through skin; repeated/prolonged exposure increases risk of absorption. Can cause eye, skin or respiratory irritation.	American Contact Dermatitis Society
			From the late 1950s to early 1970s, elastic polysulphide sealants used in outdoor seams between concrete blocks in prefabricated buildings contained 5–30% polychlorinated biphenyls (PCBs).	PCB contamination from polysulphide sealants in residential areas-exposure and risk assessment. <i>Chemosphere</i>. 2005 Apr;59(4):537-43. www.ncbi.nlm.nih.gov/pubmed/15788176
Polysulfide sealant	Construction/installation	Air quality, Human Health		
Polyurethane sealant	Construction/installation	Air Quality, Human Health	Contains PVC, xylene, ethylbenzene; eye, skin, respiratory tract irritant Contains butyl benzyl phthalate and ethylene glycol.	Material Safety Data Sheets (MSDS)
Acoustical sealant	Construction/installation	Air quality, Human Health	Vapors can be harmful; may	Material Safety Data Sheets (MSDS)

Wall Treatments

Paint - oil, latex-based, vapour barrier paints

Raw materials acquisition

Can contain formaldehyde, aldehydes, and 4-PC; additives can include biocides; pigments can contain metal like cadmium and lead. Solvents contain

Recent estimates show architectural coatings contribute roughly 4% of total North American greenhouse gas emissions

Paint Quality Institute

Manufacturing
Transport

Offgassing of volatile organic compounds known to cause adverse health and respiratory effects such as eye, nose, and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system.

1999 data from the National Emission Inventory states surface coatings emitted 2.14 million tons, representing the largest stationary source category, second only to vehicles as the largest source of VOC emissions of all source categories in the inventory, accounting for 12% of the Paint emissions can continue for extended periods of time after application. Sparks et al. (1999) estimated that less than 50% of the VOC's in latex paint applied to a

National Emission Inventory
Material Safety Data Sheets (MSDS)

Construction/installation

Human health
Air quality

Offgassing of volatile organic compounds known to cause adverse health and respiratory effects
Requires proper disposal for recycling, sometimes which results in downcycling or disposal: Latex paint added to the manufacturing of different products, such as

surface are emitted in the first year. Compounds studied include ethylene glycol, propylene glycol,

Use in building

Human health
Air quality

Disposal

Landfill contaminant;
Chemical leaching

<http://earth911.com/recycling/hazardous/paint/how-paint-gets-recycled/>

Floor covering

Wallcoverings - vinyl, or fabric wallpaper treated with a vinyl coating	Raw materials acquisition	Resource sustainability; pollution; carbon footprint	Pulp and paper from unsustainable forestry; petrochemical	
	Manufacturing Transport	Carbon footprint; Resource sustainability; Water pollution, Air pollution; Waste;	Large quantities of toxic chemical pollutants produced, eg, hydrochloric acid, vinyl chloride, and neurotoxic dioxin; plasticizers used contain phthalates which are endocrine/ hormone disruptors Dioxin is a persistent Organic Pollutants (POPs), which	GreenBuilding\43106016.pdf - California Environmental Protection Agency, Office of Environmental Health Hazard Assessment World Health Organization: libdoc.who.int/ehc/WHO_EH_C_215.pdf
	Construction/installation		Some glues have VOCs that offgas during installation; even low VOC varieties Vinyl releases VOCs, particularly with heat.	
	Use in building		Susceptible to mold growth	
	Disposal	Waste/Landfill Volume	Cannot be recycled	
Carpet - Fiber and backing	Raw materials acquisition	Resource sustainability - petroleum-based products	Petroleum based products - virgin/recycled nylon, recycled polyethylene terephthalate (PET) Polypropylene, polyester, Styrene-butadiene latex,	
	Manufacturing	Resource sustainability - water pollution - Human Health - Air Quality - Waste	Dioxins produced in manufacturing process; some dyes toxic; plasticizers with phthalates contain endocrine/hormonal disruptors; wasteful manufacturing process, particularly water pollution	

Transport

Construction/installation

Air Quality, Human Health

Low-level exposures to petrochemicals found in carpet and other consumer products produced severe central nervous symptoms including difficulty

<http://www.holisticmed.com/carpet/tc4.txt>

Use in building

Air Quality, Human Health, Durability

Disposal

Landfill volume, groundwater/soil

Difficult to recycle, results in bulky landfill item that leaches chemicals
Nearly 5 billion pounds of discarded carpet in U.S. landfills each year

Vinyl - Resilient flooring

Raw materials acquisition
Manufacturing

Resource depletion
Air pollution
Waste
Carbon footprint
Social justice
Air quality
Human health

Petroleum based product

Large quantities of toxic chemical pollutants produced, including hydrochloric acid, vinyl chloride, and neurotoxic dioxin produced in manufacturing process; use of toxic dyes plasticizers used contain with phthalates which as endocrine/hormonal disruptors
Dioxin is a persistent Organic

Transport

Workers exposed to new offgassing vinyl materials at risk for adverse health reactions

Construction/installation

Air Quality, Human Health

Poses severe health risks to humans during life cycle. Plasticisers will evaporate into the room. Toxic chemicals can be present in final product and offgas during its life cycle which can

<http://www.lenntech.com/polyvinyl-chloride-pvc.htm>

Use in building

Air Quality, Human Health

	Disposal	Landfill volume, groundwater/soil	<p>Cannot be recycled; bulky landfill item; chemical leaching; does not breakdown;</p> <p>PVC Recycling is neither technically nor financially feasible.</p> <p>Currently less than 1% of PVC is materially 'recycled'. Post-consumer products or PVC waste products cannot be recycled into the same quality because PVC always needs virgin PVC to make a product of similar quality.</p> <p>The majority of this collected</p>	<p>http://archive.greenpeace.org/toxics/html/content/pvc1.html#life</p>
Laminate	Raw materials acquisition	Resource sustainability; Carbon footprint; Air Pollution	<p>Petroleum-based product; pollutes air</p> <p>Compressed and processed particle board and paper reinforced with melamine</p>	
	Manufacturing Transport	Carbon footprint		
	Construction/installation	Air Quality, Human Health	<p>At concentrations above 0.1 ppm in air, formaldehyde can irritate the eyes and mucous membranes, resulting in watery eyes.</p> <p>Once surface layer wears off, it cannot be refinished.</p> <p>Wood fibers far more susceptible to mold than solid wood.</p>	
	Use in building	Durability, Air Quality, Human Health,		
	Disposal	Landfill volume, groundwater/soil, Air Pollution	<p>Whole system needs replacing once worn, cannot be recycled; considered safe for incineration but chemical components release toxins</p>	

Windows

Carpet/laminate adhesives	Raw materials acquisition	Resource sustainability	Petroleum based product	http://www.holisticmed.com/carpet/tc4.txt
	Manufacturing Transport		Workers exposed to high VOC adhesives face adverse health reactions. Highly irritating to mucuous	
Construction/installation	Air Quality, Human Health		VOCs continue to offgas after installation, causing adverse health reactions to nose, throat, respiratory tract, and	
Use in building	Air Quality, Human Health		glues and sealants stay on carpet/laminate materials; can leach into	
Disposal		Landfill contaminant; Chemical leaching,	soil/groundwater;	
Vinyl windows	Raw materials acquisition	Human health, air quality, social justice	Petroleum based product	
	Manufacturing Transport	Human health, air quality, social justice, carbon footprint	Dioxins produced in manufacturing process; plasticizers with phthlates contain endocrine/hormonal disruptors	
	Construction/installation			
Use in building	Durability, Air Quality, Human Health,		Off-gassing hormonal disruptors ; Vinyl windows cannot be repaired, and warp with expansion over time	

	Disposal	Landfill volume, groundwater/soil	Cannot be recycled; bulky landfill item; chemical leaching		
Fibreglass windows	Raw materials acquisition		High embodied energy due to fibres being blown or spun from molten glass. Binding resins and oils are used to	www.sustainablebuildingresource.co.uk (non-natural / conventional insulations)	
	Manufacturing Transport				
	Construction/installation	Air Quality Human Health	Respiratory irritants, use of high volatile organic compounds in installation Inhalation of fibreglass fibres can cause moderate		The Center for Disease Control and Prevention names fiberglass dust as a danger especially when used
	Use in building	Air Quality Human Health	irritation to the eyes, ears and throat, breathing Cannot be recycled; bulky landfill item		
	Disposal	Landfill volume			
Aluminum extruded	Raw materials acquisition	Carbon footprint; Resource depletion; Water pollution, Air pollution; Waste; Social justice	Mining of bauxite can have local impacts on biodiversity through disturbed land and habitat, disruption of streams, surface and ground water use, discharge of wastewater and solid waste disposal, combustion emissions, dust, CO2, and particulates from mineral processing	Alcoa Management and policy case study	
	Manufacturing Transport	Carbon footprint	At production sites, biodiversity can also be affected by air emissions of fluorides, sulphur dioxide and particulates. Refineries generate solid	Aluminum Extruders Council www.aec.org	
	Construction/installation				

Interior millwork- doors and cabinets		Use in building		Aluminum is recyable, but component assemblies are not always dismantled for	
		Disposal	Landfill volume		
	Solid core doors w. MDF wood with veneer	Raw materials acquisition		MDF is produced using wood fibres pressed with chemical-	
		Manufacturing Transport		Cutting of wood releases wood dust and toxic chemicals like formaldehyde-based resins which can aggravate asthma and other lung conditions, irritate mucous membranes, and Wood fibre products susceptible to mold growth, finished MDF may offgas volatiles, as well as the Cannot be recycled; bulky landfill item; chemical leaching; burning would release dioxins and other	www.wisegeek.com/what-are-the-health-risks-of-mdf.htm
		Construction/installation	Air Quality, Human Health		
	Use in building	Air Quality, Human Health			
	Disposal	Landfill volume, groundwater/soil			
Roof	Asphalt shingles	Raw materials acquisition	Resource depletion; pollution; carbon footprint	Asphalt shingles are coated in bitumen, a non-renewable resource. Contain Polycyclic aromatic hydrocarbon (PAH), which are carcinogens; Surface granules often contain chemicals and metals such as copper to inhibit algae	www.epa.gov/hpv/pubs/summaries/asphlcat/c14901.pdf
		Manufacturing Transport	Air pollution Carbon footprint Human health		
		Construction/installation			

	Use in building	Air Quality, Human Health, Durability, Energy Use	short life span; runoff contaminates water with hydrocarbons and heavy metals; offgas when heated by the sun; Mold infestations can arise with undetected roof leaks.	
	Disposal	Landfill volume, groundwater/soil	Landfilled in some areas, leaching a concern; when recycled it is used as component in hot mix	It is estimated that around 30 billion pounds of asphalt roofing are taken to landfills every year.
Tar and gravel (on low-sloped roofs)	Raw materials acquisition	Resource depletion (petrochemical), Air pollution; Carbon footprint	Mining raw materials impacts include energy and resource use, soil erosion, pollutant runoff, and land and habitat loss; air and water quality degradation, combustion emissions, dust, CO2, and particulates from mineral processing	
	Manufacturing Transport	Air pollution Carbon footprint Human health	Carbonaceous semi-liquid or semi-solid material which is the end product in oil refining process. Also produced by heating certain types of bituminous coals,	
	Construction/installation	Human health Air quality	Workers inhale harmful fumes; PAHs have been identified as having the	
	Use in building	Human Health Air Quality, Durability	Emits volatile organic compounds, particularly when heated by the sun; vapors seep into home and degrade air quality; average tar and gravel roof is guaranteed only 2-5 years, may require replacement	
	Disposal	Landfill volume, groundwater/soil	Labor intensive to remove; contains harmful chemicals that can leach into soils and groundwater	

Single ply membranes - for low sloping roofs	Raw materials acquisition	Air pollution Carbon footprint	Mining raw materials impacts include energy and resource use, soil erosion, pollutant runoff, and land and habitat loss; air and water quality degradation, Asphaltic base contains toxic cyanides, phenols, asphalt, benzene, polycarbon aromatics, toluene, xylene, sulphur, and heavy metals. Thermoplastic (PVC)
	Manufacturing Transport	Air pollution Carbon footprint Human health	
	Construction/installation	Human health Air quality	Hot-mopped tar installation results in harmful toxic fumes; Epidemiological studies of roofers have demonstrated an excess of lung cancer (unclear to what extent these cancers may be attributable to asphalt exposures since in the past, roofers have been exposed to known human lung
	Use in building Disposal		Not biodegradable, though
Wood shingles	Raw materials acquisition	Resource depletion Carbon footprint	Destructive and unsustainable logging practices, minimal standards for accountability Toxic chemicals and heavy metals added as fire
	Manufacturing Transport		
	Construction/installation		
	Use in building	Water pollution	Cannot be used for rainwater harvesting due to chemical

Water Use	PVC pipes	Disposal	Landfill volume, groundwater/soil Air pollution	often cannot be recycled; chemicals prevent proper composting; chemical leaching in landfills; incineration releases toxic gases	
		Use in building	Human health; water pollution	PVC plastic piping has been shown to outgas diethyl phthalate, trimethylhexane, aliphatic hydrocarbons and	Prescriptions for a Healthy House p 221
		Conveyance to building	Human health; water pollution	Municipal water supply can be piped through piping such as PVC and asbestos cement	
		Use in building	Resource sustainability; waste; water pollution	Water waste worsens water security; Potable water quantity abuse through high volume water use in toilets, faucets, showers, clothing and dish washing machines, irrigation and household habits. Drain disposal of household chemicals contaminates water supply, adds stress to water purification infrastructure	Canadians use 340 L water/person/day; Canada concedes we are pushing our water cycle beyond its natural limits; a third of Canadians depend on groundwater to supply homes; Residential indoor water use in Canada: Toilet 30%, bathing 35% laundry 20%, kitchen & drinking 10%, cleaning 5%
Appliances	gas-fired appliances	Raw materials acquisition	Carbon footprint; Pollution; Social justice; Habitat destruction/species displacement	Emit nitrogen dioxide, nitrous oxide, sulfur oxides, hydrogen cyanide, carbon monoxide, CO2, formaldehyde, particulate	
		Use in building			Prescriptions for a Healthy House, p 6

Electrical		Raw materials acquisition	Carbon footprint; Pollution; Social justice; Habitat destruction/species displacement	Electricity generation produces a large share of Canadian nitrogen oxides and sulphur dioxide emissions, contributors of smog and acid rain, and the largest uncontrolled industrial source of mercury emissions in Canada. Fossil fuel-fired electric power	Environment Canada
Heating	Gas, oil, propane fuels	Raw materials acquisition	Carbon footprint; Pollution; Social justice; Habitat destruction/species displacement		
		Use in building	Air Quality, Human Health	Toxic fumes can leak into building envelope through supply lines, poorly ventilated or improperly sealed mechanical rooms and open combustion appliances; backdrafting Moving air is energy intensive; electric currents	Precriptions for a Healthy House p 222
Hot water	Forced air heating	Use in building	Air Quality, Human Health	can be conducted via metal ductwork; improper Households use 14% of their energy consumption on heating water. Hot water tank systems heat a large	Precriptions for a Healthy House NAHB www.toolbase.org/Technology-Inventory/Plumbing/tankless-
		Use in building	Carbon footprint, resource depletion	High energy process wastes a lot of water; chemical intensive, washes chemicals into bodies of water	
Sewage		Conveyance	Resource depletion; waste; pollution	In most cities, stormwater and sewage are conveyed together, creating a larger	