RDN Sustainable Development Guide

Section A: Location and Site Design

Location

1 Future Growth

Why do we care?

New developments in Village Centres or within Growth Containment Boundary (GCB) help curb rural sprawl and create compact complete communities that provide opportunities for people to live in close proximity to services, employment and amenities. This development pattern has the greatest potential to reduce automobile dependence, supports the provision of public transit and other forms of transportation, facilitates the use of more resource and energy efficient infrastructure and building types, and ultimately results in a significant reduction in greenhouse gas (GHG) emissions and improvement of residents' well-being.

Definition

Growth Containment Boundary (GCB) as defined in RDN Regional Growth Strategy is the boundary between what is considered 'urban' in the context of our electoral areas and that what is considered rural. Lands within the GCB are intended to accommodate some additional growth to facilitate the creation of compact, more complete communities which include places to live, work, learn, shop and access services.

Resource

Regional District of Nanaimo Regional Growth Strategy and/or RDN Map www.rdn.bc.ca

2 Infill

Why do we care?

Infill development is new construction on vacant or underused lots in the established neighbourhoods and business districts. These sites are typically located closer to the centre of the community and are more likely to be served by public infrastructure, such as roads, water and sewer lines. There are many benefits of infill development including making better use of urban land supplies while reducing consumption of forest and agricultural land, replacing abandoned areas with functioning assets, lowering costs of public services such as transit, sidewalks, water and sewer, school, and public safety (police, fire, ambulance), and avoiding or limiting site disturbance.

Definition

Infill refers to the use of land within a built-up area for further construction.

3 Neighbourhood Connectivity

Why do we care?

Projects that are located in close proximity to services, employment and amenities have great potential to reduce occupants' dependence on personal automobile and make other forms of travel more viable. Choosing such a project location encourages a more active and healthier lifestyle and could also result in reduction of greenhouse gas emissions related to personal travel.

1 Environment (Habitat, Ecology, Air and Water)

1.1 Fish Habitat and Watercourse Protection / Erosion and Sediment Control

Why do we care?

Land clearing removes the protective layer over soil. The unprotected soil is easily 'washed' off the land by the impact of sun, rain, wind and moving water. When soil sediments flow into nearby water bodies, they have severe negative impacts on fish and their habitats. They reduce the amount of sunlight reaching aquatic plants, clog or abrade fish gills and cause suffocation, smother aquatic feeding sites and spawning areas and interfere with fishes'' ability to navigate. Sediment and erosion control reduce the amount of sediment that gets washed into nearby streams. It is also important that we control sediment and erosion on construction sites in order to prevent polluting the air with dust and particulate matter.

Definition

A water feature includes any of the following:
a) any watercourse, whether it usually contains water or not;
b) any pond, lake, river, creek, or brook; and/or,
c) any ditch, culvert, spring, or wetland.

Resource

BC Ministry of Environment and Department of Fisheries and Oceans
Land Development Guidelines for the Protection of Aquatic Habitat September 1993 online file
http://www.dfo-mpo.gc.ca/Library/165353.pdf
BC Ministry of Environment Riparian Areas Regulation
http://www.env.gov.bc.ca/habitat/fish_protection_act/riparian/riparian_areas.html

Example actions

- plan the development to the existing terrain and site conditions;
- schedule development to minimize risk of potential erosion (i.e., in months with less rain);
- retain existing vegetation where possible;
- re-vegetate/protect bare areas;
- divert runoff away from bare areas;
- minimize the length and steepness of slopes where possible;
- minimize runoff velocities and erosive energy;
- design development for increased runoff;
- retain eroded sediments on-site with erosion and sediment control structures;
- plan, inspect, and maintain erosion and sediment control structures.

1.2 Environmentally Sensitive Areas

Why do we care?

Streams and their adjacent lands provide essential habitat and corridors for fish, birds, and other wildlife. Riparian areas need to remain in a largely undisturbed state in order to protect habitat, prevent flooding, control erosion and sedimentation, and recharge groundwater. In many areas, groundwater aquifers are the main source of drinking water for residents and need to be carefully protected in order to maintain human health. The nests of eagles, herons, peregrine falcons, osprey, gyrfalcon and burrowing owls, their eggs, and their young are also protected pursuant to section 34 of the Provincial Wildlife Act.

Definition

Environmentally sensitive features include coastal areas, nesting trees, rare and endangered species, aquifers, lakes, streams, riparian areas, and floodplain areas.

Riparian areas are the areas bordering on streams, lakes, and wetlands that link water to land. The blend of streambed, water, trees, shrubs and grasses directly influences and provides fish habitat.

Resource

Sensitive Ecosystem Inventory: East Vancouver Island and Gulf Islands 1993-1997
http://www.env.gov.bc.ca/sei/van_gulf/publications.html

1.3 Aquifer and Groundwater Protection: quality

Why do we care?

Many communities in the Regional District of Nanaimo rely on untreated groundwater for their drinking water supply. What we do on the land affects the quality of water that is in the ground. Some groundwater aquifers are particularly vulnerable to contamination and homeowners that live above highly vulnerable aquifers need to take great care on their properties in order to prevent bacteria from septic systems or chemicals such as fuel and pesticides from entering their community's water source.

Definition

A secondary treatment system has an additional treatment unit that greatly improves the quality of water that comes from a septic system

Resource

Well Protection and Groundwater Stewardship for Rural Areas
http://www.bcgwa.org/waterwell/2wellProtection.html
RDN Watershed Snapshot Report 2010
http://www.rdn.bc.ca/cms.asp?wpID=1748

Example actions

- locate septic tank and fields 100 feet away from wellhead;
- use secondary treatment in the area of high aquifer vulnerability;
- have proper fuel storage to avoid contamination of groundwater;
- locate wells on high ground to protect from flooding and away from any potential contaminant sources;
- avoid using fertilizers and pesticides;
- seal abandoned wells to prevent contamination.

1.4 Aquifer and Groundwater Protection: quantity

Why do we care?

There are several areas in the Region where aquifers are showing signs of stress. Some aquifers are naturally 'low producing' and naturally do not have a lot of water available in them for us to pump out. Especially in these areas, we need to be very careful that we do not use too much water, as it is very easy to 'run out'. Other aquifers are simply being over-used. If we take more

water from an aquifer than can be returned through rainwater recharge, it is like spending more money each month than we get paid. The groundwater 'bank' levels drop and wells begin to go dry. There are some areas in the RDN where this is already starting to happen.

Resource for Agricultural Irrigation

Environmental Farm Plan Program 'Irrigation System Assessment Guide'
http://www.agf.gov.bc.ca/resmgmt/EnviroFarmPlanning/EFP_Irrigation_Guide/Irrig_Guide_toc.htr

Example actions

- use little or no groundwater for landscaping irrigation;
- install no turf lawn.

1.5 Rainwater Management: rate, quantity and quality

Why do we care?

Under natural conditions, rainwater falls slowly to the ground through trees and vegetation, then filters through the soil, and recharges groundwater. However, impervious surfaces such as pavement cannot soak up rainwater. Instead, the rainwater falls on it and then quickly speeds to the closest drainage area and into the nearest river, lake, or stream. When the fast-moving rainwater rushes into nearby streams, it destabilizes stream banks, scours river channels, and damages fish habitat. As water moves across impervious surfaces such as pavement, it picks up sediment, bacteria, and toxins from vehicles (i.e., copper from brake pads, rubber from tires, motor oil, etc.), creating a toxic brew for fish. In dry summer months, when there is no rain, many streams rely on groundwater flowing into them to prevent them from going dry. This groundwater is called base flow. When pavement prevents rainwater from entering the ground, rivers that depend on base flow may go completely dry in the summer.

Definition

Impervious surfaces are hard surfaces such as pavements (roads, sidewalks, driveways and parking lots) that prevent rainwater from entering the ground. Rain gardens are attractive features that allow water from roofs and driveways to be directed into a vegetated pond. For most showers and rainstorms, the pond can hold the water and slowly release it into the ground. For heavy rainstorms, an overflow pipe directs water into the storm sewer.

Resource

Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia, March 2006
http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare2006/develop_with_care_intro.html
Metro Vancouver Stormwater Source Control Design Guidelines
http://www.metrovancouver.org/services/wastewater/sources/Pages/StormwaterManagement.aspx
Ministry of Water, Land and Air Protection - Standards and Best Practices for Instream Works
http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf
The Association of Professional Engineers and Geoscientists of British Columbia
http://www.apeg.bc.ca/index.html

Example actions

- minimize the amount of impervious surface by using pervious paving instead of asphalt or concrete;
- use vegetated swales, infiltration basins, and absorbent vegetation to maximize the infiltration of uncontaminated stormwater;

- create 'rain gardens' to reduce the rate of stormwater runoff;
- create detention ponds to reduce the amount of silt and pollutants that enter streams and groundwater.

1.6 Air Quality

Why do we care?

Outdoor burning is strongly discouraged because chemicals and tiny particles in wood smoke can make people quite sick. Smoke can also blot out the landscape so effectively that road and air travel are dangerously affected, and beautiful views are hidden.

Resource

BC Ministry of Environment
A Guide to the Open Burning Smoke Control Regulation
http://www.env.gov.bc.ca/epd/bcairquality/reports/agttobsc.html

Example actions

- pile branches densely in alternating layers with other clean wood debris to form a long narrow mound or berm;
- consider mill large trees you've had to cut down on site to use in your project;
- avoid burning wood with paints or adhesives on it;
- cut, split and store wood unsuitable for construction for at least one year before using as firewood.

2 Protection of Development

2.1 Hazard Lands

Why do we care?

The development of land or removal of vegetation in hazard lands may destabilize the area, cause environmental damage, and pose potential for loss of life and property. Development in floodplains could cause the inconvenience for occupants to be evacuated from time to time, and pose a greater risk of loss of life or property damage in a major flooding event.

Definition

Hazardous lands include steep slopes adjacent to watercourses and along the coastal shoreline and flood prone lands that are subject to terrain hazards (flooding, landslides, debris flows, avalanches, etc.) Floodplains are areas adjacent to water bodies that are subject to flooding.

Resource

BC Ministry of Environment
Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia March 2006
http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare2006/develop_with_care_intro.html

Example actions

- re-vegetation;
- slope enhancement works recommended by a geotechnical engineer or other qualified professional;
- mitigation and restoration measures recommended by a geotechnical engineer or other qualified professional;

- conduct the development at a time of year and use of construction methods that minimize the impact.

2.2 Fire Hazard

Why do we care?

Many residents in the Region live in or near forested lands and could be exposed to spreading wildfire. The best protection against loss, damage or injury due to wildfire is prevention.

Resource

RDN Fire Hazard Map or RDN Map
http://www.rdn.bc.ca/cms.asp?wpID=761
http://www.rdn.bc.ca/cms.asp?wpID=419
BC Forests and Range Wildfire Management Branch
http://bcwildfire.ca/Prevention/FireSmart.htm

Example actions

- create a cleared zone within the first 10 metres of space around the building;
- reduce fuels by thinning and pruning from 10 to 30 metres out from your building;
- thin or reduce shrubs and trees, retain fire resistant deciduous trees, space trees beginning 30 metres from any structure.

2.3 Contaminated Site

Why do we care?

Development of contaminated sites encourages site clean-up, reduces pressure on undeveloped land and allows for development that does not destroy wildlife habitats. It is important to ensure, however, that the site is properly cleaned up so that human and environmental health is maintained.

Definition

Contaminated site is an area of the land in which the soil or any groundwater lying beneath it, or the water or the underlying sediment, contains a hazardous waste, or another prescribed substance in quantities or concentrations exceeding risk based or numerical criteria or standards or conditions in the Contaminated Sites Regulation.

Resource

Ministry of Environment Contaminated Sites Regulation
http://www.env.gov.bc.ca/epd/remediation/leg_regs/csr.htm

3 Food Security

3.1 Productive Land Protection

Why do we care?

In areas where the competition between urban and agricultural uses is intense, productive agricultural land is sometimes converted into residential and other non-farm uses – a transformation that is largely irreversible. To achieve a high level of food self-sufficiency, we need to protect productive land base in our region and its farming capabilities. Therefore, conversion and removal of productive lands are discouraged.

3.2 Planning for Agriculture

Why do we care?

In areas where agriculture is a permitted use, the site design impacts the potential of both current and future farming.

Definition

A farm home plate including houses and the ancillary residential features such as lawns, swimming pools, tennis courts, garages for personal vehicles should be minimized so as to restrict the amount of productive land the development alienates. The house should be reasonably sized. The capital investment in a large house reduces the attractiveness of the lot for farming. A very large expensive home on farmland may limit the number of farmers who are able to purchase and farm the property. Keeping houses and residential features close together helps keep the remaining land intact and avoid fragmentation.

Resource

British Columbia Institute of Agrologists www.bcia.com

3.3 Compatibility

Why do we care?

The development of lands adjoining or reasonably adjacent to farm lands may compromise the agricultural use of the farm lands. Special efforts are often needed to avoid the conflicts between agricultural operations and non-farm uses and create greater compatibility between land uses.

Definition

Agricultural land includes land located within the Provincial Agricultural Land Reserve (ALR), and land with farm status under BC Assessment Act.

Resource

Ministry of Agriculture and Lands
A Guide to Edge Planning Promoting Compatibility Along Urban-Agricultural Edges 2009
http://www.al.gov.bc.ca/resmgmt/sf/publications/823100-2_Guide_to_Edge_Planning.pdf
BC Agricultural Land Commission
Landscape Buffer Specifications 1993 http://www.alc.gov.bc.ca/publications/buffer/intro.htm

Example actions

- buffer or separate the development from the farming operations, including screening, landscaping, fencing, siting of buildings or structures and diversion of surface water runoff by ditching, retention ponds, etc.;
- avoid road endings directed into farming operations;
- consider adequate drainage to avoid flood, erosion or siltation damage to adjacent farm lands or affect water retention on downstream farms.

3.4 Onsite Food Production

Why do we care?

Less than 10% of the food consumed on Vancouver Island and the Gulf Islands is grown locally.

Most food travels over 2500 miles to get to eater's table. This globalized food system our society depends on is increasingly vulnerable to fuel prices rise, food contamination, and climate change. Supporting local food production is critical in building community's resiliency.

Resource

Nanaimo Community Gardens
http://www.nanaimocommunitygardens.ca/about.php
Permaculture and Sustainable Food Production at O.U.R. EcoVillage
http://ourecovillage.org/courses-events/permaculture/

4 Pride of Place (culture, history, arts)

4.1 Archaeological Significance

Why do we care?

Archaeological sites are the only physical evidence for 98% of the rich history of British Columbia, extending back at least 12,000 years. This resource is of great value to First Nations, local communities and the general public. The Province controls damaging activities by protecting them by law and requiring a permit to develop within site boundaries. Damaging an archaeological site without a permit is unlawful.

Resource

BC Ministry of Natural Resource Operations Archaeology Branch
http://www.tca.gov.bc.ca/archaeology/index.htm
Telephone 250-953-3334
Find out if there is an archaeological site on the subject property by submitting a data request to the Archaeology Branch: http://www.archdatarequest.tsa.gov.bc.ca/
BC Association of Professional Archaeologists
http://www.bcapca.bc.ca/
Telephone 778-420-4450

Section B: Building Design and Construction

Home Size	All things being otherwise equal, a large home consumes more materials and energy than a small home over its lifecycle (including pre-construction, construction, use, and demolition or deconstruction). Source: Canada Green Building Council LEED for Homes www.cagbc.org				
Maximum home size (ft2) by number of bedrooms					Home Size Score
≤1 Bedroom	2 Bedrooms	3 Bedrooms	4 Bedrooms	5 Bedrooms	
714	1089	1497	2041	2245	10
742	1131	1556	2121	2333	9
772	1176	1617	2205	2425	8
802	1222	1680	2291	2520	7
833	1270	1746	2381	2619	6
866	1320	1815	2475	2722	5
900	1372	1886	2572	2829	4
935	1425	1960	2673	2940	3
972	1481	2037	2778	3055	2
1010	1540	2117	2887	3175	1
1050	1600	2200	3000	3300	0 (average)
1091	1663	2286	3118	3430	-1
1134	1728	2376	3240	3564	-2
1179	1796	2469	3367	3704	-3
1225	1866	2566	3500	3850	-4
1273	1940	2667	3637	4001	-5
1323	2016	2772	3780	4158	-6
1375	2095	2881	3928	4321	-7
1429	2177	2994	4082	4491	-8
1485	2263	3111	4243	4667	-9
1543	2352	3233	4409	4850	-10
For larger homes, or homes with more bedrooms, the formula in LEED Canada for Homes Exhibit 5 will apply.					

a. Shortcut

Third-Party Certification

LEED for Homes and **Built Green** are two widely recognized voluntary green building rating systems that are applicable to single family homes. They both cover a wide range of issues including energy, water, indoor environment quality, building materials, and waste management. Both systems are point based and have several levels of achievement based on the total score. LEED for Homes is developed and administered by the Canada Green Building Council. More information about this rating system can be found on the CaGBC website: www.cagbc.org. The Built Green Program is managed by Built Green Canada. Their website is www.builtgreencanada.ca.

LEED for New Construction and Major Renovation is suitable for multi-unit residential, commercial and institutional projects.

The **Green Globes** is another voluntary rating system ideal for small, low budget commercial and institutional projects. There are several assessment tools available for various types of project. Choose Green Globe Design for New Buildings and Retrofits assessment tool. Their website is: www.greenglobes.com

	Section B Overall Achievement Score
LEED Platinum LEED Gold LEED Silver	100 90 80 Note: Home size is already taken into account in LEED for Homes rating system.
Built Green Platinum Built Green Gold Built Green Silver	90 + Home Size score 80 + Home Size score 70 + Home Size score
Green Globe 5 Globes Green Globe 4 Globes Green Globe 3 Globes	100 90 80

b. Step-by-step

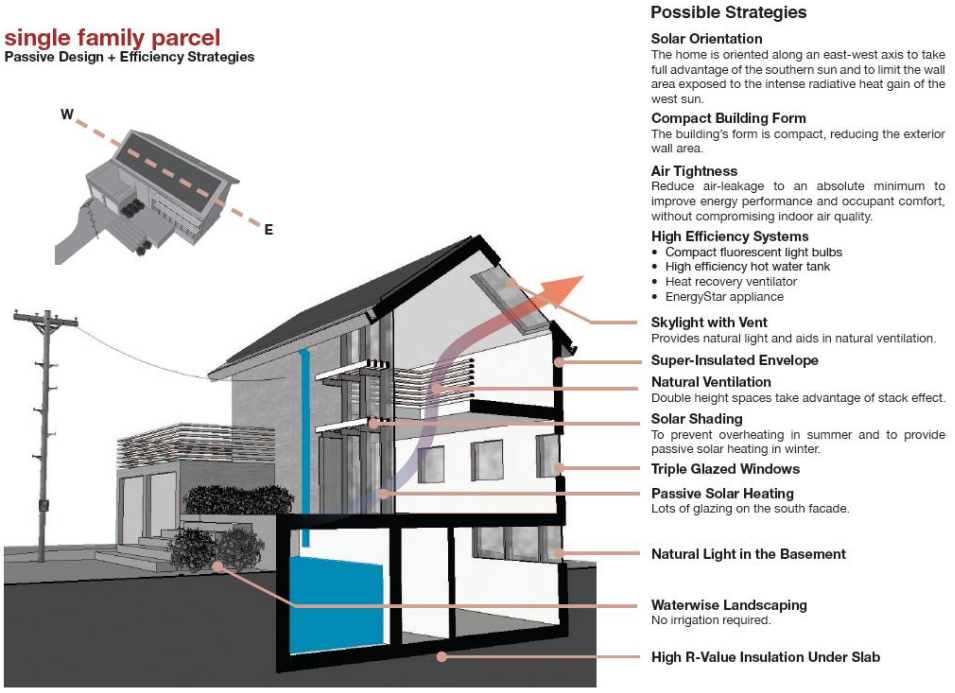
In the planning and design phase, different strategies should be considered sequentially, to maximize building performance in a most cost effective way. The following three 'tiers' of design strategies are specified:

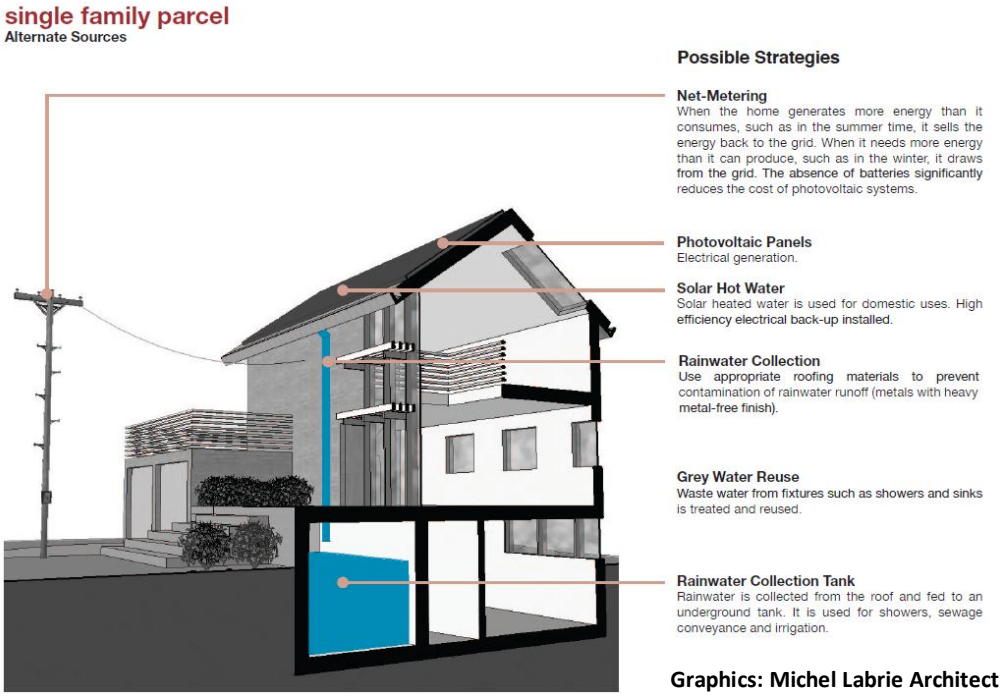
1. Passive design
   Reducing the need for energy and water supplied to a building.
2. Efficient systems
   Delivering the energy and water needed most efficiently.
3. Alternative sources
   Supplying the energy and water needed from on-site renewable sources.

The checklist is structured in a way that more emphasis is placed on reducing demand for energy and water through intelligent design than employing often expensive and ever evolving technologies. For new houses, City of Vancouver's ***Passive Design Toolkit for Homes*** is a particularly valuable resource. The toolkit illustrates and explains the fundamental design principles based on which low energy houses can be realized in a cost effective manner. For renovations and home improvement, the ***Green Home Renovation Series*** is recommended.

For commercial and institutional projects and multi-unit residential developments, refer to City of Vancouver's ***Passive Design Toolkit Best Practices***.

These documents are free and can be downloaded from the City of Vancouver's website here: http://vancouver.ca/sustainability/building_green.htm





Graphics: Michel Labrie Architect

1 Energy

Net-zero

'Net Zero' means that for a given resource, such as energy or water, no net input is required from external utilities on an annual basis. Buildings may be net-zero carbon, releasing no carbon dioxide from fossil fuels during operations.

1.1 Reduce Energy Demand/Passive Design

Passive design refers to an approach that discourages reliance on mechanical systems for heating, cooling and lighting and instead harnesses naturally occurring phenomenon such as the power of the sun, direction of wind and other climatic effects to maintain consistent indoor temperatures and occupant comfort. In consideration of the climate zone our region is in, the passive design strategies aim to maximize solar gains in winter and avoid unwanted solar gains in summer.

For a practical and easy-to-understand guide on how to apply passive design approach to your project, download a copy of the City of Vancouver Passive Design Toolkit for Homes or Passive Design Toolkit Best Practices from the following website:
http://vancouver.ca/sustainability/building_green.htm

Solar Orientation

Good building orientation in relation to the earth's axis and a site's geographical features can improve passive gains and thereby reduce the need for mechanical heating or cooling systems. This can also result in lower energy bills, and lower related GHG emissions.

Solar access describes the amount of useful sunshine reaching a building.

Vegetation

Landscaping can be an effective and pleasant option to aid passive design strategies. Place appropriate vegetation to block unwanted sun, filter harsh winds or mitigate heat island effect in the summer resulting from large paved areas.

Compact Form

A compact design maximizes living space within a minimum envelope area. The envelope or shell of the building is where heat loss occurs. Therefore minimizing exterior wall surface area can reduce associated heat gain/ loss potential.

Building Envelope

Building envelope refers to the roof, walls, windows, and floors of a building. Sound building envelope design can keep out wind, water and cold just like clothing protects us from these elements. Minimum insulation requirements are currently embedded in the BC Building Code. Beyond a certain thickness, there is minimal increase in performance and attention must be paid to the airtightness of the construction, thermal (heat) bridges and appropriate windows. The performance approach, which measures the overall energy performance of a construction, rather than a prescriptive approach of only specifying insulation values is a more accurate way to ensure that a building performs as intended.

Energy Modeling

HOT2000 software can be used to estimate how much energy a home or a residential building up to 21 units will use and to help fine tune the plans.
http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/eng/software_tools/hot2000.html

For commercial and institutional buildings, EE4 software available from Natural Resources Canada or other similar modeling software can predict the energy usage of a building and help optimize the design.

Thermal Mass

Thermal mass is a measure of a material's capacity to absorb heating or cooling energy. It can be used to store heat energy and then release the energy gradually, thereby moderating indoor temperature fluctuations. Materials such as concrete or bricks are highly dense and require a lot of energy to be heated or cooled. Mass situated on the south side of a building is most efficient for heating but should be shaded from the sun in the summer to avoid overheating. Generally thermal mass should be located on the ground floor, on the inside of a building, exposed to the indoor environment.

Interior Layout

Consider the locations of the most frequently used rooms, the lighting needs for each room and the external shading situation so that the interior layout responds to the building's orientation and takes full advantage of the natural conditions available on the site.

Solar Shading

Appropriate use of shading can prevent too much heat from entering a building by shading the glass from direct sunlight. Overhangs, louvres and sunshades can all regulate solar access effectively if designed properly. Interior blinds can reduce glare but are ineffective at blocking solar heat gain as the heat is already inside the building envelope.

Natural Light

Good daylighting eliminates the need for artificial lighting, reducing energy consumption for this purpose. Consider the primary function of each room and the type of light it requires, when each room will be occupied, and what is the most appropriate style and placement for windows.

Natural Ventilation

Natural ventilation strategies use naturally occurring air flow patterns around and in a building to introduce outdoor air into the space. Using passive strategies for ventilation can leverage natural climatic conditions to provide occupant control over thermal comfort for little or no extra cost.

Heat Recovery Ventilator

Passive design encourages a tight building envelope. An HRV ensures a continuous supply of fresh air to the interior and also provides filtration of the air. Ventilation which makes use of an HRV is more efficient, as the system reclaims waste heat from exhaust airflows.

Real-time Energy Display

Whole house energy monitors or in-home displays (IHDs) provide information about exactly how much electricity is being consumed in real time. The monitor enables occupants to take action before they are hit with a big electricity bill. Studies have shown that instantaneous feedback can reduce energy consumption by up to 20%.

Resource

Energy Monitoring Systems Canada www.energymonitoring.ca
Blue Line Innovations http://www.bluelineinnovations.com/
The Energy Detective http://www.theenergydetective.com/
The PowerTab In-Home Display http://www.energy-aware.com/our-products/ihd/

1.2 Efficient Systems

If the building is designed to naturally condition its internal space through passive design strategies, the building will have a smaller heating or cooling load thereby reducing its need for and the size of active heating or cooling systems to maintain occupant's thermal comfort. The next step is to ensure that the selected systems are highly efficient.

Efficient Space Heating or HVAC System /Efficient Water Heating System

An experienced professional engineer or other qualified professional can help make the appropriate choice on the type and size of the main space and water heating systems according to the building's calculated heating and/or cooling demand. Make sure to choose a high efficiency model of the selected systems when possible.

Resource[*]

Natural Resources Canada Office of Energy Efficiency Energy Star products
http://oee.nrcan.gc.ca/residential/business/manufacturers/qualified-products.cfm?attr=12
LiveSmart BC Energy Efficiency Grants for Homeowners
http://www.citygreen.ca/home-energy-efficiency-grants
BC Hydro Whole Home Efficiency
http://www.bchydro.com/buyersguide/Whole_Home_Efficiency.html

Heat Pump

A heat pump is an electrical device that extracts heat from one place (earth, outdoor air or water) and transfers it to another (indoor air or water). The heat pump cycle is fully reversible, meaning that it is capable of providing both heating and cooling. The coefficient of performance (COP) of heat pumps is generally greater than 2. This means that for every unit of energy needed to run the heat pump, it generates at least 2 units of energy.

Definition

The coefficient of performance (COP) is a measure of a heat pump's efficiency. It is determined by dividing the energy outputs of the heat pump by the electrical energy needed to run the heat pump, at a specific temperature. The higher the COP, the more efficient the heat pump.

Resource

Natural Resources Canada: *Heating and Cooling with a Heat Pump*
http://oee.nrcan.gc.ca/publications/infosource/pub/home/heating-heat-pump/booklet.pdf

[*] *The list of companies is for information only and is not intended as an endorsement by the RDN.*

Appliances

Products that display the ENERGY STAR symbol have been tested according to prescribed procedures and have been found to meet or exceed high energy efficiency levels without compromising performance. Choose Energy Star products can help reduce overall household energy consumption.

Resource

Natural Resources Canada Office of Energy Efficiency Energy Star products
http://oee.nrcan.gc.ca/residential/business/manufacturers/qualified-products.cfm?attr=12

Lighting

Energy Star qualified lighting fixtures and bulbs consume two thirds or less than conventional fixtures and bulbs. The 30 light fixtures in the average Canadian home consume close to $200 worth of electricity every year.

Resource

Natural Resources Canada Office of Energy Efficiency Energy Star Qualified Lighting Products
http://www.oee.nrcan.gc.ca/residential/personal/lighting/energystar-cfls.cfm?attr=4

1.3 Alternative Sources

Solar Hot Water

Solar hot water system harnesses solar thermal energy to heat water. Once installed, the system will take advantage of the 'free' solar energy to supplement up to 60% of the water heating energy needs for a typical family of four. Speak to a couple of SolarBC registered installers in your area for an initial assessment.

Resource

SolarBC http://www.solarbc.ca/install/households

Other renewable energy systems

Renewable energy systems tap into the clean and sustainable sources of energy, emit no or near zero greenhouse gases and provide long term energy independence and security. They are more likely to be feasible in places where renewable energy sources such as wind, solar, river or ocean are abundant on site or easily accessible. They are sometimes necessary in remote areas not serviced by energy utilities. Speak to qualified professionals to find out if any renewable energy system would be a suitable choice for your project.

Resource

BC Sustainable Energy Association www.bcsea.org
Canadian Solar Industries Association www.cansia.ca

1.4 EnerGuide Rating

An EnerGuide rating provides a standard measurement of a home's energy efficiency, on a scale from 0 to 100. EnerGuide ratings are calculated by a Certified Energy Advisor using information collected from the analysis of building plans and the results of a blower door test performed after the house has been built.

Resource

Natural Resources Canada
http://oee.nrcan.gc.ca/residential/personal/new-homes/upgrade-packages/rating.cfm?attr=4

2 Water

2.1 Water Uses

Water is a precious and vulnerable resource in our region. Only use water for essential needs. This will help ensure that there is enough water to replenish aquifer and for your neighbours and members in your community to meet their essential needs.

2.2 High Efficiency Water Fixtures

Installing high efficiency water fixtures is the easiest way to save water. Read the product literature carefully and choose the high efficiency models.

Water Factor is the number of gallons per cycle per cubic foot or litres per cycle per litre that the clothes washer uses. The lower the water factor, the more efficient the washer is. If a clothes washer uses 30 gallons per cycle and has a tub volume of 3.0 cubic feet, then the water factor is 10.0.

A waterless composting toilet is permitted but a septic system must still be installed to handle wastewater, grease and food debris from kitchen sinks, and to meet regulatory requirements.

Resource

The Canadian Water and Wastewater Association tests toilets yearly. For a condensed view of the report and other helpful information, visit the Regional District of Durham Ontario's website at: www.region.durham.on.ca/toilettest
Team WaterSmart
www.teamwatersmart.ca
Natural Resources Canada Office of Energy Efficiency
Energy Star products
http://oee.nrcan.gc.ca/residential/business/manufacturers/qualified-products.cfm?attr=12
BC Hydro Whole Home Efficiency
http://www.bchydro.com/buyersguide/Whole_Home_Efficiency.html

2.3 Landscaping

Xeriscape refers to landscaping in ways that reduce or eliminate the need for supplemental water from irrigation. This is usually done through the proper selection of native or drought tolerant plants. Watering is often needed to establish plants in the first one to two years. The provision of hose bib that enables hand watering is acceptable as its use of water is significantly less than a purpose-built irrigation system.

Resource

BC Landscape and Nursery Association www.bclna.com
Certified Horticultural Technicians are qualified to supervise landscape construction, and often offer landscape design-build services for single family homes.
BC Society of Landscape Architects www.bcsla.org

Landscape Architects are qualified in design and construction supervision of all landscape installations, but should also have qualifications as an IIABC Certified Irrigation Designer if their scope is irrigation design/supervision.

2.4 Irrigation Systems for Landscaping

Our average water consumption per household is about 540 litres per day in winter and rises to 1,346 litres per day in summer. Almost all of the increase is for outdoor watering of landscapes. It is estimated that as much as 50% of outdoor water use is over and above that necessary to meet the objective of an attractive household yard. Up to 65% of water used to irrigate our lawns and gardens is lost to inefficient watering practices which result in runoff, evaporation, or leaks.

Smart controllers use sensors and weather information to manage watering times and frequency. As environmental conditions vary, the controller increases or decreases irrigation.

Resource

To ensure that your irrigation system is designed and constructed properly, engage a qualified professional. Certified Irrigation Designer from the IIABC is a key qualification for irrigation design. They and other professionals accredited as Certified Irrigation Technician II are qualified to supervise irrigation construction.
Irrigation Industry Association of BC (IIABC) www.irrigationbc.com
Team WaterSmart www.teamwatersmart.ca

2.2 Alternative Sources

Seeking alternative sources to supplement potable water use, after doing everything you can to reduce demand, is taking one step further towards net-zero water use. Graywater and rainwater can be viable water sources, but depending on the use, may require appropriate collection and treatment measures.

Make sure to engage qualified professionals when investigating these options for your project. Inform your building inspector of your intention to use alternative sources to ensure that the proposed solution will meet regulatory requirements.

Graywater Reuse

Graywater refers to discharges from laundry facilities, showers, baths, and bathroom sinks. It does NOT include discharge from toilets or kitchen sinks.

Resource[*]

iDUS Home Conservpump http://www.iduscontrols.com/products/home-conservepump/
Brac Systems http://www.bracsystems.com/products.php

Rainwater Collection

Harvested or recovered rainwater refers to storm water collected from external surfaces of buildings or other hard-surfaces areas not exposed to vehicular or pedestrian traffic.

Resource[*]

The Rainwater Connection http://www.rainwaterconnection.com/
Ties with Nature Ponds and Gardens www.tieswithnature.ca
Water Tiger www.watertiger.net

* *The list of companies is for information only and is not intended as an endorsement by the RDN.*

3 Health

3.1 Interior Paints / 3.2 Interior Adhesives and Sealants

Exposure to Volatile Organic Compounds (VOC) can trigger asthma attacks, eye irritation and respiratory problems, nausea and dizziness among other symptoms.

Green Seal GS-11 Environmental Standard for Paints and Coatings www.greenseal.org
Look for paints that meet the following VOC limit (in g/L):

- Flat Topcoat 50
- Float Topcoat with colorant added at the point-of-sale 100
- Non-flat Topcoat 100
- Non-flat Topcoat with colorant added at the point-of-sale 150
- Primer or Undercoat 100

California South Coast Air Quality Management District Rule #1168 for Adhesive and Sealant Applications page 10 to 12 http://www.arb.ca.gov/DRDB/SC/CURHTML/R1168.PDF
In general, look for adhesives and sealants with VOC content of less than 150 g/L.

3.3 Carpet

Green Label and Green Label Plus Programs are established by the Carpet and Rug Institute to ensure that customers are purchasing low emitting products on the market.
http://www.carpet-rug.org/

3.4 Composite Wood or Agrifiber Products

Formaldehyde can cause watery eyes, burning sensations in the eyes and throat, nausea, fatigue, skin rash, wheezing and coughing, and difficulty in breathing. High concentrations may trigger asthma attacks.

4 Materials

4.1 Local Materials

Local materials here refer to materials harvested and processed on Vancouver Island, including site-cut timber. Use of local materials reduces the environmental impacts, especially the greenhouse gas emissions resulting from transportation.

4.2 Low Embodied Energy Materials

In this checklist, a material's embodied energy refers to the non-renewable energy consumed in the acquisition of raw materials, their processing, manufacturing, transportation to site and construction. Wood, clay, straw bale, stone are examples of low embodied energy materials.

All materials have energy consumption associated with their production. Those with low embodied energy consume significantly less non-renewable energy such as fossil fuel in their making, resulting in less greenhouse gas emission.

4.3 Materials with Recycled Content

Recycled content of a product is from materials that would otherwise have been discarded. There are two kinds of recycled content: post-consumer and pre-consumer. Post-consumer content is a material that has served its intended use and instead of being disposed of it is being reused in a different product. Pre-consumer content (which is sometimes referred to as post-industrial) is scrap that is generated during the manufacturing process and recycled back into products.

Drywall, concrete, metal components can often contain high recycled content. Look for recycled content information in product literature.

4.4 Reused Materials

Salvaged or reused materials can be sourced through demolition and salvage companies or outlets such as Demxx Deconstruction in Coombs and Habitat For Humanity Restores on the Island. Builders, contractors or building suppliers could also be helpful in sourcing salvaged materials.

4.5 Rapidly Renewable Materials

Rapidly renewable materials are natural, non-petroleum-based building materials that have harvest cycles under 10 years such as bamboo, cork, straw, natural linoleum products, wool, wheat board, strawboard, etc. Because of their shorter growing cycles, these materials often require significantly less land to produce the same amount of product. The use of rapidly renewable materials provides the opportunity to displace raw materials that have greater environmental impacts.

4.6 Forest Stewardship Certified (FSC) wood

Forest Stewardship Council (FSC) is an international, non-profit organization that supports environmentally appropriate, socially beneficial, and economically viable management of the world's forests. FSC certification is a forest certification and labeling system for paper and wood products that come from responsibly managed forests, and verified recycled sources.

4.7 Construction Waste Management

Diverting construction, demolition and land clearing debris from landfill disposal can help prolong the use of existing landfill. Gypsum drywall, wood waste, recyclable cardboard, papers, metal, are prohibited for disposal in the landfill. See Bylaw 1531.02 Schedule 'C' for a complete list of Prohibited Waste (go to www.rdn.bc.ca and then find Solid Waste section)

Resource

List of disposal alternatives in the RDN http://www.rdn.bc.ca/cms.asp?wpID=1505
RDN Solid Waste Recycling Directory http://www.rdn.bc.ca/cms.asp?wpID=412

5 Additional Merits

5.1 Fire Hazard

If the proposed project is located in an area rated with extreme or high risk of Wildland Urban Interface (WUI) fire on the FireSmart Hazard Rating, there are FireSmart building design and construction strategies that could reduce fire dangers.

Resource

BC Forests and Range Wildfire Management Branch
http://bcwildfire.ca/Prevention/FireSmart.htm

5.2 Vegetated roof

Vegetated roof (or green roof) technologies are systems engineered to provide multiple benefits such as protecting roof membrane, providing wildlife habitats, managing stormwater runoff, creating aesthetically pleasing rooftop. A green roof system is an extension of a functional roof.

Contact the authorized home warranty insurance companies listed on the Homeowner Protection Office's website (www.hpo.bc.ca) and ask if and what kind of vegetated roof system(s) they would

approve.

Resource

BCIT's Centre for Architectural Ecology website: http://commons.bcit.ca/greenroof/
Green Roofs for Healthy Cities www.greenroofs.org

5.3 **Social Significance**

Projects sometimes have real potential to make a social impact and to enhance the sense of place and community. These additional benefits can be realized through various means such as creating a community garden space, incorporating public art, or adding a feature where appropriate that could also benefit your neighbours or community,.

5.4 **Education Potential**

Sustainable development projects often present valuable opportunities to raise awareness among the public and demonstrate sound design and advanced technologies. There are many ways to realize education potential of a project: pictures and a project description can be used to showcase the project, a case study can be developed to share the success and lessons learned, a tour can be organized, signage can be put up to explain sustainability practices and features, etc. Consider the best way to demonstrate the 'green' aspect of the project.