



a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

RESIDENTIAL ENVIRONMENTAL ASSESSMENT PROGRAM (REAP)

Make UBC a living laboratory in environmental and social sustainability by integrating research, learning, operations, and industrial and community partners.

UBC Place and Promise - Goal

Create a vibrant and sustainable community of faculty, staff, students and residents.

UBC Place and Promise - Goal

As part of its responsibility as an educational and research institution and as a signatory to both the Halifax Declaration and the Talloires Declaration by the University Presidents for a Sustainable Future, UBC provides leadership by demonstrating the means to a sustainable community on campus.

UBC Policy #5 – Sustainable Development

UBC's goal is "to utilize its land resource to support academic activities and to build an endowment through the development of an integrated community in an environmentally sound fashion, consistent with regional objectives."

UBC Land Use Plan

This vision is about a university community, and adjacent park, that strives to balance ecological health, economic viability, and community. These components are all equally valued and, through careful planning, will lead to a community that will serve as a model for living, working and learning in harmony.

UBC Land Use Plan – Vision

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PART 1: LAND USE RULES

1.0 Preamble

The UBC Residential Environmental Assessment Program (REAP) is a framework for mandating and measuring sustainable building practices for market-based and staff/faculty/student residential developments located in Neighbourhood Housing Areas at UBC's Vancouver campus. Developed by UBC, REAP is integrated into the community planning and development approval process, and plays a key role in the build out of UBC's Neighbourhood Housing Areas. REAP is similar in structure to other green building rating systems such as LEED®, but is uniquely designed for application to multi-family residential buildings built in UBC's Neighbourhood Housing Areas.

In addition to the general objectives set out above, the objective for establishing REAP is to ensure that multi-family residential projects built in UBC's Neighbourhood Housing Areas are of higher quality and have lower environmental impacts than standard construction in BC's Lower Mainland region, with the goal to benefit both individual consumers and the UBC community as a whole.

1.1 Definitions

In this Land Use Rule:

- (a) **"Director of Planning"** means the person employed by Campus & Community Planning who is responsible for overall administration of the development and review process for development in UBC's Neighbourhood Development Lands (as at the adoption of this Land Use Rule, the Director of Planning and Development Services (Vancouver));
- (b) **"Director of Sustainability"** means the person employed by Campus & Community Planning who is responsible for overseeing sustainability initiatives and engineering planning functions for developments in UBC's Neighbourhood Development Lands (as at the adoption of this Land Use Rule, the Director of Sustainability and Engineering);
- (c) **"REAP Checklist"** means the checklist set out in Part 2 of this document;
- (d) **"Reference Guide"** means the details of the credits available pursuant to REAP, as set out in Part 3 of this document;
- (e) **"Campus & Community Planning"** means the department of UBC, as at the adoption of this Land Use Rule named Campus and Community Planning that is responsible for long-range planning, land use regulations, campus and landscape design, licensing and permits, and managing programs that cover sustainability initiatives to transportation and community-building activities; and
- (f) **"Campus Sustainability"** is the unit within Campus & Community Planning that coordinates the University's operational sustainability initiatives.

1.2 Regulations

- (a) The requirements set out herein are integrated with the permitting processes administered by Campus & Community Planning pursuant to the Development Handbook (which is another Land Use Rule). If there is a conflict between this Land Use Rule and the Development Handbook, the Development Handbook governs.
- (b) All persons developing multi-family residential projects in any of UBC's Neighbourhood Housing Areas must:
 - (i) participate in REAP by submitting the statements and checklists and other information described in Section 1.3 (Procedures), at the times and in the matter described therein; and
 - (ii) achieve at least a **REAP Gold Certification**, which means achieving all of the mandatory credits and earning at least the number of points set out in Part 2 of this document, the REAP Performance Levels and Checklist, and obtaining certification of same by Campus Sustainability.
- (c) The REAP Performance Levels and Checklist and the Reference Guide do not form a part of the REAP Land Use Rule. The Vice-President Finance, Resources and Operations may, in consultation with the Director of Planning, Director of Sustainability and UBC Properties Trust, amend (in whole or in part) the REAP Performance Levels and Checklist and the Reference Guide. Such amendments must be reported to the Land Use Committee at its next regular meeting.
- (d) Section 1.3 (Procedures) sets out the person or unit of the University to whom REAP submissions are to be made. That person or unit shall review each submission and may:
 - (i) seek additional information and clarifications from the project architect (or other responsible party); and
 - (ii) provide to the applicant interpretations of the requirements contained in any performance category.
- (e) The Director of Planning (or his/her designate), may:
 - (i) grant a waiver or variance, or accept an equivalency; and
 - (ii) publish on the Campus and Community Planning website, standardized interpretations of the requirements contained in any performance category.
- (f) The Director of Planning may permit a project to seek certification pursuant to an alternative green building rating system (e.g. LEED®), provided that:
 - (i) the Director of Planning must identify a minimum certification to be achieved by the project pursuant to that alternative rating system and once established, such minimum certification shall be binding upon the applicant; and
 - (ii) section 1.3 (Procedures) shall continue to apply, as adapted for the approved alternative rating system by the Director of Planning (or his/her designate).
- (g) If this Land Use Rule, the REAP Performance Levels and Checklist, and/or the Reference Guide including any interpretations published pursuant to section 1.2(e)(ii) are amended after an applicant has submitted a development permit in accordance with the Development Handbook and this Land Use Rule, the amendments do not apply to the project unless the applicant agrees that the amendments do apply.
- (h) If an applicant is not satisfied with a decision made pursuant to this Land Use Rule, the applicant may appeal the decision to the Associate Vice President, Campus & Community Planning, who will issue a final decision on the matter.

1.3 Procedures

Summary. As detailed below, during the course of planning and construction, and the permitting processes required throughout, the project architect (or other responsible party) will be responsible for reviewing and monitoring REAP application and reporting to Campus & Community Planning and to Campus Sustainability. REAP documentation submission requirements are integrated into the permitting process administered by Campus & Community Planning pursuant to the Development Handbook.

REAP submission requirements are as follows:

- (a) **REAP submission with parcel tender documents:** Developers are required to submit a "Sustainability Statement" with parcel tender documents that: describes their development; explaining how the development will be designed to achieve high environmental standards; and the ways in which they propose to apply REAP and earn credits in the six performance categories.

Submission: Sustainability Statement

Format: Electronic format

Submit to: Campus & Community Planning

- (b) **REAP Submission with Development Permit Application:** The project architect (or other responsible party) is required to submit: a REAP Checklist verifying their compliance with the program and identifying the REAP credits they will attempt in their development, at the time when a Development Permit application is made to Campus & Community Planning. The REAP Checklist must identify that the development will attempt to achieve at least REAP Gold. This checklist will be reviewed by Campus Sustainability for comment to Campus & Community Planning and will be included in the package submitted to the Development Permit Board.

Submission: REAP Checklist

Format: Electronic format (REAP Checklist-Excel spreadsheet)

Submit to: Campus & Community Planning

- (c) **REAP Submission with Building Permit Applications:** The project architect (or other responsible party) is required to submit an updated REAP Checklist and the required documentation as well as an updated Sustainability Statement at the time that a Building Permit application is made to Campus & Community Planning. These submissions will provide the documentation necessary for Campus Sustainability to verify compliance with the mandatory and optional credits that have been incorporated into the project, and to verify that, at minimum, REAP Gold will be achieved.

Submission: updated REAP Checklist, all documentation identified throughout this document as "Documentation: Submit at the Building Permit Phase", updated Sustainability Statement

Format: Electronic format (REAP Checklist-Excel spreadsheet; documentation with separate folders for each credit).

Submit to: Campus Sustainability

- (d) **REAP Submission with Occupancy Permit Applications:** The project architect (or other responsible party) is required to submit an updated REAP Checklist and the required documentation as well as an updated Sustainability Statement at the time of Occupancy Permit applications are made to Campus & Community Planning. These submissions will provide the documentation necessary for Campus Sustainability to verify compliance with the mandatory and optional credits that have been incorporated into the project, and to verify that, at minimum, REAP Gold will be achieved.

Submission: updated REAP Checklist, all documentation identified as "Documentation: Submit at the Occupancy Permit Phase", updated Sustainability Statement

Format: Electronic format (REAP Checklist-Excel spreadsheet; documentation with separate folders for each credit).

Submit to: Campus Sustainability

- (e) **REAP Certification:** Documentation submissions will be reviewed and verified by Campus Sustainability. Final certification will be awarded when the project is complete, all documentation is complete, and occupancy is granted.

PERFORMANCE LEVELS

REAP assesses the performance of building projects based on the number of points that are earned by meeting the requirements of credits distributed across seven performance categories. There are four levels of performance that can be achieved, with REAP Gold being the minimum standard.

Building projects need to achieve *all* of the mandatory credits and earn at least 35 points from the optional credits, including the required EA GOLD performance requirements, in order to achieve a REAP Gold certification.

Developers have the discretion to choose which optional credits to incorporate into their designs. Higher REAP ratings may help developers to be more attractive to prospective buyers by differentiating their product in the marketplace.

The REAP Performance Levels are:

Gold	45 points
Gold Plus	61 points
Platinum	76 points
Platinum Plus	101 points

UBC REAP 3.0 CHECKLIST SUMMARY

MANDATORY CREDITS	Max
Sustainable Sites (SS M)	M
Water Efficiency (WE M)	M
Energy & Atmosphere (EA M)	M
Indoor Environmental Quality (IEQ M)	M
Construction (CON M)	M
Innovation and Design Process (ID M)	M

OPTIONAL CREDITS	Max
Sustainable Sites (SS)	10
Water Efficiency (WE)	18
Energy & Atmosphere (EA)	52
Materials & Resources (MR)	18
Indoor Environmental Quality (IEQ)	8
Construction (CON)	4
Innovation and Design Process (ID)	24
TOTAL	134

REAP RATING:	
Gold	45 – 60 points
Gold Plus	61 – 75 points
Platinum	76 – 100 points
Platinum Plus	101 – 134 points

UBC REAP 3.0 CHECKLIST

Performance Category: Sustainable Sites (SS)			
The intention of the Sustainable Sites category is to reduce the negative impacts of development, maintain the natural landscape, vegetation and environmental attributes of the site and provide new landscaping that enhances the microclimate.			
<p>SS MANDATORY</p> <p>SS M1 – StormWater Management</p> <p>Develop a plan that integrates the on-site storm water management system with the neighbourhood-wide storm water management principles and strategies, including controlling of rate and/or quantity of run-off as required.</p> <p>SS M2 – Adapted and Ecologically Sound Planting</p> <p>Demonstrate that landscape design has minimized the need for pesticides and irrigation through the selection of adaptive and drought-tolerant plants and consideration of the principles of Integrated Pest Management and xeriscaping.</p> <p>SS M3 – Bicycle Parking</p> <p>Provide short term and long term covered storage facilities for securing bicycles in accordance with the <i>UBC Development Handbook</i>.</p> <p>SS M4 – Contribution to Community Car Sharing</p> <p>Contribute to the development of a community car-sharing network by funding the equivalent of one community vehicle per 100 residential units.</p> <p>SS M5 – Light Pollution Reduction</p> <p>Do not exceed Illuminating Engineering Society of North America (IESNA) illuminance requirements as stated in the <i>Recommended Practice Manual: Lighting for Exterior Environments</i>.</p> <p>SS M6 –Recycling Collection</p> <p>Provide for collection of domestic paper, plastic, glass and metal recyclables by contracting with a waste management company for the service. Recycling storage space shall be designed in accordance with Metro Vancouver's <i>Technical Specifications for Recycling Amenities</i>.</p> <p>SS M7 – Compost Collection</p> <p>Provide a space in the building for the collection compost and provide for the compost collection through a contract with UBC Waste Management or another waste management service provider. Design the space in the building in accordance with Metro Vancouver's <i>Technical Specifications for Recycling Amenities</i>.</p>			
		M	
		M	
		M	
		M	
		M	
		M	
		M	

SS 1 – RECYCLING AND COMPOSTING SS 1.1 – In-Suite Recycling and Compost Separation Provide a space <i>and</i> system for simplified separation and collection of recycling and compostables in each suite or unit.		
	2	
SS 2 – ALTERNATIVE TRANSPORTATION SS 2.1 – Additional Bicycle Facilities In addition to the requirements for bicycle parking in the <i>UBC Development Handbook</i> , provide an additional 0.25 Class I bicycle storage/bedroom and a bicycle repair station within the building.		
	2	
SS 2.2 – Electric Vehicle Charging – Visitor Provide one dedicated parking spot per 100 residential units for visitors of residents/owners, fully equipped with Level 2 charging station.		
	2	
SS 2.3 – Electric Vehicle Charging - Resident Install necessary conduit and transformer capacity to accommodate Level 2 Charging Stations for the following percentage of owners'/residents' parking (Max = 4 Points): <input type="checkbox"/> 10% of owners'/residents' parking – 2 Points <input type="checkbox"/> 20% of owners'/residents' parking – 2 Points		
	4	

Performance Category: Water Efficiency (WE)			
The intention of the Water Efficiency category is to encourage strategies that reduce the amount of potable water used for landscape irrigation and building operations.			
<p>WE MANDATORY</p> <p>WE M1 – Efficient Irrigation Technology</p> <p>Design and install a water-efficient irrigation system that includes an automated controller, rain or soil sensors and pressure regulator and for non-grass areas use a micro- or drip-feed irrigation system <i>or</i> install a temporary irrigation system.</p> <p>WE M2 – Low-Flush Toilets</p> <p>Specify and install high efficiency 4.8 L per flush (1.28 gal) single flush toilets or 3.4/6 L per flush (0.9gal/1.6gal) dual flush toilets for all water closets.</p> <p>WE M3 – Low-Flow Faucet Aerators</p> <p>Specify and install low-flow faucets with aerators in all bathroom sinks (max. 3.8 L per minute) <i>and</i> in all kitchen sinks (max. 6.8 L per minute).</p> <p>WE M4 – Low-Flow Showerheads</p> <p>Specify and install water-saving showerheads with a maximum flow rate of 8.5 L per minute in each shower.</p> <p>WE M5 – Energy Star Clothes Washers and Dishwashers</p> <p>Specify and install Energy Star-labelled clothes washers and dishwashers in each unit, or specify and offer only Energy Star models if these appliances are optional.</p> <p>WE 1 – WATER EFFICIENT LANDSCAPING</p> <p>WE 1.1 – Reduce Potable Water Use</p> <p>Reduce potable water use for site irrigation needs by 50% from the calculated mid-summer baseline.</p> <p>WE 1.2 – Eliminate Potable Water Use</p> <p>Eliminate potable water use for site irrigation needs.</p> <p>WE 2 – WATER USE REDUCTION</p> <p>WE 2.1 – Low-Flow Showerheads</p> <p>Specify and install water-saving showerheads (maximum of 5.7 L per minute) in each shower.</p> <p>WE 2.2 – Water Efficient Dishwashers</p> <p>Specify and install water-efficient dishwashers that use ≤ 11 L (2.91 gal) per normal wash cycle or if dishwashers are available only as an option, specify and offer only models complying with this credit.</p>			
			M
			M
			M
			M
			M
		3	
		3	
	2		
	1		

<p>WE 2.3 – Most Efficient Clothes Washers</p> <p>Specify and install Energy Star clothes washers listed as “Most Efficient” for current year, or if washers are available only as an option, specify and offer only models complying to this standard.</p>	2	
<p>WE 2.4 - Water Use Reduction Package</p> <p>Additional credit for achieving credits: WE 1.1, WE 2.1, WE 2.2 and WE 2.3.</p>	2	
<p>WE 3 – WATER METERING</p>		
<p>WE 3.1 – Domestic Hot Water Metering</p> <p>In units with central hot water, provide individual domestic hot water metering.</p>	3	
<p>WE 3.2 – Domestic Cold Water Metering</p> <p>Provide individual cold water meters for all units.</p>	2	

Performance Category: Energy & Atmosphere (EA)		
The intention of the Energy and Atmosphere category is to reduce depletion of non-renewable energy resources and to reduce environmental impacts of energy use, particularly emissions of local, regional and global air pollutants.		
EA MANDATORY		
EA M1 – Minimum Roof Insulation		M
Design the roof assembly with a minimum insulation value of R-40 h·ft ² ·°F/Btu (7.04 °K·m ² /W) for buildings with attic space and R-28 h·ft ² ·°F/Btu (4.93 °K·m ² /W) for cathedral ceilings/flat roofs.		
EA M2 – Minimum Exterior Wall Insulation		M
Design the exterior insulated wall area with a minimum thermal resistance of effective (overall) R-15.6 h·ft ² ·°F/Btu (2.75 °K·m ² /W) for above grade non-glazed wall areas, and R-7.5 h·ft ² ·°F/Btu (1.32 °K·m ² /W) " <i>continuous insulation</i> " for below grade walls.		
EA M3 – Minimum Floor Insulation		M
Design floors above non-heated parkade areas with a minimum insulation value of R-30 h·ft ² ·°F/Btu (5.28 °K·m ² /W) for framed floors and R-15.6 h·ft ² ·°F/Btu (2.75 °K·m ² /W) for slab floors.		
EA M4 – Energy Efficient Windows		M
Specify and install Energy Star-rated windows or windows with a maximum overall U-value of 0.35 Btu/hr·ft ² ·°F (2.0 W/m ² ·°K for non-metal framed windows <i>or</i> a maximum overall U-value of 0.45 Btu/hr·ft ² ·°F (2.55 W/m ² ·°K) for metal framed windows.		
EA M5– Minimum Boiler Efficiency		M
Specify and install boilers with a minimum thermal efficiency of 84% /AFUE of minimum 90% or heat using District Energy.		
EA M6 – Domestic Hot Water		M
Specify and install gas DHW boilers with a minimum efficiency of 84% (mid-efficiency boiler) or heat domestic hot water using District Energy.		
EA M7 – Energy Star Dishwashers and Refrigerators		M
Specify and install Energy Star-labelled dishwashers and refrigerators in each unit.		
EA M8 – Programmable Thermostats		M
Specify and install programmable thermostats for at least the largest heating zone in each unit.		

EA M9 –Common Area Lighting		M
Specify and install only non-incandescent lighting, such as fluorescent, compact fluorescent or LED in common areas.		
EA M10 –Parkade and Corridor Lighting Controls		M
Specify and install parkade and corridor lighting controls to automatically reduce the overall lighting level by at least 30% in a lighting zone when the zone is unoccupied.		
EA – ENERGY EFFICIENCY TARGETS		
EA GOLD-Mandatory	6	M
Design the building to meet a maximum EUI of 160 kwh/m2/yr, demonstrated using the UBC Energy Modeling Guidelines. This credit is mandatory and required for achievement of REAP Gold.		
EA Gold Plus	8	
Design the building to meet a maximum EUI of 140 kwh/m2/yr, demonstrated using the UBC Energy Modeling Guidelines. This credit is mandatory and required for achievement of REAP Gold Plus.		
EA Platinum	10	
Design the building to meet a maximum EUI of 120 kwh/m2/yr, demonstrated using the UBC Energy Modeling Guidelines. This credit is mandatory and required for achievement of REAP Platinum.		
EA Platinum Plus	10	
Design the building to meet a maximum EUI of 105 kwh/m2/yr, demonstrated using the UBC Energy Modeling Guidelines. This credit is mandatory and required for achievement of REAP Platinum Plus.		
EA 1-ENERGY METERING		
EA Credit 1.1: Thermal Energy Sub-Metering	1	
Provide separate metering in individual units for measuring thermal energy consumption used for space heating.		

EA 2 – RENEWABLE ENERGY		
EA 2.1 – Future Renewable Electricity	1	
Pre-wire buildings and provide installation space for future use of photovoltaic technologies or other renewable electricity generation.		
EA 2.2 – Renewable Electricity Utilization	3	
Utilize photovoltaic technologies or other renewable electricity generation for a portion of the building's electrical supply.		
EA 2.3 –Low-Carbon District Energy Utilization	5	
Utilize low carbon, renewable energy through connect to the District Energy System for the building's thermal energy supply (or be District Energy compatible).		
EA 3 – COMMISSIONING		
EA 3.1 –Commissioning	4	
Contract a third party Commissioning Authority to develop and implement a commissioning plan for all major building energy systems and verify they are installed, calibrated and perform according to design intent.		
EA 4 – AIRTIGHTNESS		
EA 4.1 –Building Envelope Airtightness	2	
The building envelope shall be constructed so that the air change rate is not greater than 3.5ACH50 when measured in accordance with CAN/CGSB-149.15-M86 (Determination of the airtightness of Building envelopes by the Fan Depressurization Method.)		
EA 5 – ENERGY MODELING		
EA 5 –Energy Modeling Workshop	2	
Model the energy performance of the building and hold a workshop with the design team, a representative from Campus sustainability and contractor to evaluate the results and optimize the design of the building.		

Performance Category: Materials & Resources (MR)		
The intention of the Materials and Resources category is to encourage design strategies that reduce and reuse material resources, reduce construction waste, and to select building materials that are environmentally preferable.		
MR 1 – RECYCLED CONTENT AND REUSED MATERIALS		
MR 1.1 – Reused Building Materials	2	
Use salvaged, refurbished, or reused materials for at least 5% of the total cost of building materials.		
MR 1.2 – Reused Building Materials	2	
Use salvaged, refurbished, or reused materials for at least 10% of the total cost of building materials.		
MR 1.3 – Recycled Content Materials	1 or 2	
Specify and use building materials with the following recycled content levels:		
1. Common area carpet with minimum 25% recycled content		
2. Drywall with minimum 15% recycled content		
3. Batt insulation with minimum 40% recycled content		
4. Doors contain minimum 15% recycled material		
5. Concrete with minimum 20% fly ash content, excluding suspended slabs		
6. Concrete with minimum 40% fly ash content, excluding suspended slabs		
7. Cabinetry with minimum 20% recycled content		
8. MDF products with minimum 50% recycled content		
<input type="checkbox"/> Minimum four recycled content items on list above		1 point
<input type="checkbox"/> All eight recycled content items on list above		2 points
MR 2 – REGIONAL MATERIALS		
MR 2.1 – Regionally Manufactured Building Materials	1	
Use a minimum of 20% (by value) of building materials and products that are assembled or manufactured within a radius of 800 km (500 miles).		
MR 2.2 – Regionally Sourced Building Materials	1	
Of the materials from Credit MR 2.1, use a minimum of 50% (by value) of building materials and products that are extracted, harvested or recovered (as well as assembled or manufactured) within a radius of 800 km (500 miles).		
MR 3 – CERTIFIED AND NON-ENDANGERED FOREST PRODUCTS		
MR 3.1 – Dimensional Lumber and Plywood	2 or 3	
Demonstrate that a minimum of 50% of the total value of dimensional lumber and plywood is certified in accordance with either:		
CSA Z809 – 2 Points		
Or Forest Stewardship Council (FSC) – 3 Points		

<p>MR 3.2 –Hardwood Floors Specify and install hardwood or bamboo flooring that is certified in accordance with the Forest Stewardship Council or CSA Z809. If floors are offered only as an option, specify and offer only bamboo or renewable products with third-party certification. CSA Z809 – 2 Points Or Forest Stewardship Council (FSC) – 3 Points</p>	2 or 3	
<p>MR4 BUILDING PRODUCT – INGREDIENTS MR 4.1 – Transparency of Ingredients Install ten different building products from three different manufacturers that demonstrate the chemical inventory of the product to and accuracy of 0.1% for each product. For each product selected provide either:</p> <ul style="list-style-type: none"> • Health Product Declaration (HPD) • Manufacturers Inventory of all ingredients by CAS number, or • Declare Label (Living Building Institute) 	2	
<p>MR 4.2 – Optimization of Ingredients Demonstrate that a minimum of 10% (by value) of building materials are optimized for ingredient content by demonstrating optimization in one of the following ways:</p> <ul style="list-style-type: none"> • GreenScreen v1.2 benchmark 4 minimum • Red List free • Free of ingredients listed on REACH Authorization and Candidate List 	2	

Performance Category: Indoor Environmental Quality (IEQ)	
The intention of the Indoor Environmental Quality category is to achieve enhanced indoor environmental quality through the thoughtful selection and application of materials and effective ventilation strategies.	
IEQ MANDATORY	
IEQ M1 – Adhesives and Sealants	M
Specify and use adhesives, sealants and sealant primers that do not exceed the VOC limits of the Canadian Environmental Choice/EcoLogo program <i>or</i> do not exceed the VOC limits specified in the State of California’s South Coast Air Management District Rule #1168.	
IEQ M2 – Paints and Coatings	M
Specify and use paints and coatings that carry an EcoLogo label or those rated at a minimum GPI-1 by the Master Painter’s Institute on the interior of the building.	
IEQ M3 – Carpet	M
Specify and install carpet and carpet cushion that carry the following certifications: Carpet and Rug Institute Green Label Plus <i>or</i> the Ecologo.	
IEQ M4 – Ventilation Effectiveness	M
Prepare and implement an effective air management strategy that meets the requirements of the current versions of CAN/CSA F326 or ASHRAE-62.1 or 62.2 as applicable to the building configuration.	
IEQ 1 – LOW-EMITTING MATERIALS	
IEQ 1.1 – Low VOC Paints and Coatings	2
Specify and use paints and coatings rated at a minimum GPS-2 by the Master Painter’s Institute on the interior of the building.	
IEQ 1.2 –Low-Emitting Composite Wood Products	2
Specify and install interior composite wood products, such as flooring, doors, trim, etc., that have no added urea formaldehyde. Cabinetry is excluded from this credit.	
IEQ 1.3 –Low-Emitting Insulation	2
Specify and install formaldehyde-free insulation on the interior of the building.	
IEQ 1.4 –Low-Emitting Cabinetry	2
Specify and install interior cabinetry (doors, boxes, counters and laminating adhesives) that contain no added urea formaldehyde.	

Performance Category: Innovation and Design Process (ID)			
The intent of the Innovation and Design Process category is to provide incentive and credit for general design and other innovative practices that improve the overall sustainability and environmental performance of the project.			
<p>ID MANDATORY</p> <p>ID M1 –Goal Setting Workshop</p> <p>Hold a green building workshop or Design Charrette including the developer, design consultants and contractor to review and develop the strategies for achieving the development's goals and priorities relevant to the <i>Residential Environmental Assessment Program</i>.</p> <p>ID M2 – Educate the Homeowner</p> <p>Develop a homeowner's manual that promotes sustainable behavior and describes all of the sustainable features of the project instructing the homeowner on their proper use. This manual should be included in record drawings or some form that will be accessible beyond the first generation of owner/resident.</p> <p>ID 1 – INNOVATION IN MATERIALS</p> <p>ID 1.1 – Life-Cycle Assessment</p> <p>Perform a Life-Cycle Assessment of the project's structure and enclosure and demonstrate a minimum of 5% improvement from a reasonable baseline building for three environmental categories.</p> <p>ID 2 –INTEGRATIVE AND UNIVERSAL DESIGN</p> <p>ID 2.1 – Green Building Specialist</p> <p>Engage an expert in green buildings and sustainable construction practices to provide advice on effective green building strategies to the design team.</p> <p>ID 2.2 – Design for Safety and Accessibility</p> <p>Demonstrate that at least 25% of the units in the building have been designed to meet the intent of SAFERhome standards which address issues of accessibility, children's safety, seniors and aging in place.</p> <p>ID 2.3 – Design for Security and Crime Prevention</p> <p>Demonstrate that the design has been reviewed by an accredited Crime Prevention Through Environmental Design (CPTED) practitioner</p>			
		M	
		M	
		4	
		1	
		1	
		2	

ID 3 – MARKET TRANSFORMATION		
ID 3.1 – Educate the Sales Staff Develop marketing materials based on the environmental performance of the project and ensure that the sales staff is knowledgeable about the green building features.	1	
ID 4 – ACADEMIC LINKS		
ID 4.1 – Enhance Research or Further Student Development Collaborate with UBC students and/or faculty on a research project or other opportunities to enhance the academic mission of the University and integrate it with the community. The research project should be concurrent with, and applicable to, the current project.	5	
ID 4.2 – Energy Data Sharing Incorporate a data sharing agreement into the sales contracts or strata constitution that allows building aggregate energy data to be collected for use by the UBC Campus Sustainability.	4	
ID 5 – INNOVATIVE DESIGN		
ID 5.1 – Innovative Design Strategy or Exemplary Achievement Demonstrate exceptional performance above the requirements set by one of the existing credits or the implementation of an innovative design strategy not specifically addressed by any of the existing credits.	2	
ID 5.2 – Innovative Design Strategy or Exemplary Achievement Demonstrate exceptional performance above the requirements set by one of the existing credits or the implementation of an innovative design strategy not specifically addressed by any of the existing credits.	2	
ID 5.3 – Innovative Design Strategy or Exemplary Achievement Demonstrate exceptional performance above the requirements set by one of the existing credits or the implementation of an innovative design strategy not specifically addressed by any of the existing credits.	2	

Sustainable Sites (SS)

SS MANDATORY**SS Credit M1: Stormwater Management****Mandatory****Requirement**

Develop a plan that integrates the on-site storm water management system with the neighbourhood-wide storm water management principles and strategies, including controlling of rate and/or quantity of run-off as required using green infrastructure wherever possible.

Intent

To provide safe conveyance of stormwater to protect people and property, minimize the need for stormwater infrastructure, and maintain the ecological integrity and health of landscapes and river systems.

Rationale

Development can significantly decrease the rate of natural water infiltration. Incorporating on-site stormwater management design features mitigates water flow into the storm sewer system, and promotes the health of nearby ecosystems and estuaries.

Definitions

- *Detention facility:* is a storage facility that is normally dry but is designed to hold surface water temporarily after a runoff event slowing runoff eg. natural swales, surface depressions, tanks, infiltration basins.
- *Retention facility:* collects stormwater and allows the water to soak into the soil. This infiltration process helps recharge groundwater.
- *Infiltration:* Water movement from land surfaces into the soil and water table.
- *Permeability:* Ability of a substance (i.e. soil) to transmit fluids through porous spaces.

Strategies

- Design a storm water detention system to handle storm events and reduce loading on storm sewers.
- Provide a subsurface infiltration trench below permeable paving to enhance water infiltration into soils.
- Optimize infiltration and plant health with a soil layer that is high in organic content.
- Consider green roofs, which both delay and reduce the runoff peak flows that occur with conventional roof systems.

Resources

- Stormwater management at UBC in general:
Site: <http://sustain.ubc.ca/campus-initiatives/water/stormwater-management>
- *Stormwater Planning: A Guidebook for British Columbia:* Prepared by the BC Ministry of Environment.
Site: <http://www.env.gov.bc.ca/epd/mun-waste/waste-liquid/stormwater/index.htm>
- *LEED Canada Reference Guide for Design and Construction 2009:* Information and resources provided for Sustainable Sites Credits 6.1 and 6.2.

Documentation: *Submit at the Building Permit phase*

- Letter signed by Civil Engineer or responsible party declaring requirements will be met.

SS MANDATORY

SS Credit M2: Adapted and Ecologically Sound Planting

Mandatory

Requirement

Demonstrate that landscape design has minimized the need for pesticides and irrigation through the selection of adaptive and drought-tolerant plants and consideration of the principles of Integrated Pest Management and xeriscaping.

Intent

To promote low maintenance, resource-efficient landscapes that do not require use of pesticides.

Rationale

Landscaping can place considerable demands on water resources and require high levels of maintenance. Ecologically sound landscaping is drought tolerant, low maintenance, and provides habitat for wildlife.

Definitions

- *Xeriscaping*: Landscaping that conserves water and requires minimal maintenance by using a variety of indigenous and drought-tolerant plants in combination with highly efficient irrigation methods.
- *Integrated Pest Management*: A process of planning and managing ecosystems to prevent organisms from becoming pests.

Strategies

- Use native drought-tolerant species (such as *sala*) for groundcover and consider limiting non-drought-tolerant grasses to 50% of landscaped area.
- Provide adequate volumes of high quality soil for all landscaped areas.
- Install efficient, low volume irrigation systems that deliver water directly to the root zone.
- Use mulching to reduce water lost to evaporation and runoff by 75-90% as compared to unmulched planting areas.
- Implement Integrated Pest Management strategies in order to reduce costs and liabilities associated with pesticide use.

Resources

- *Native Plant Society of British Columbia*: The NPSB provides listings of retail and wholesale nurseries and seed suppliers in the province.
Site: <http://www.npsbc.ca/>
- *Integrated Pest Management Program, BC Ministry of Environment*: The provincial Environmental Protection Division provides information and support for Integrated Pest Management.
Site: <http://www.env.gov.bc.ca/epd/ipmp/>
- *Evergreen Native Plant Database*: The non-profit's database provides information about native tree, shrub, wildflower, grasses and vine species across Canada.
Site: <http://nativeplants.evergreen.ca/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Landscape Architect declaring that the requirements will be met including a statement of principles to be applied to site design.

SS MANDATORY

SS Credit M3: Bicycle Parking

Mandatory

Requirement

Provide short term and long term covered storage facilities for securing bicycles in accordance with the *UBC Development Handbook*.

Intent

To encourage bicycle use, which contributes to reducing land development impacts and pollution associated with private automobile use.

Rationale

Bicycling is a healthy and sustainable alternative to the car for short commuter distances. Providing accessible and secure bicycle facilities promotes the use of bicycles as an alternative mobility option.

Definitions

- *UBC Class I Bicycle Parking*: Intended for long-term use of residents, and may consist of facilities under surveillance, indoor bicycle lockers, or restricted access parking.
- *UBC Class II Bicycle Parking*: Intended for short-term use of residents or visitors, and may consist of bicycle racks located in an accessible outdoor location.

Strategies

- Consider constructing storage rooms with solid walls. Motion-activated, tamper-proof security lighting is ideal.
- Provide adequate indoor space for proper storage: ideally, rooms should provide at least 1.8 m of headroom and stalls should be at least 1.8 m long for horizontal bicycles, 0.9 m wide if placed vertically.
- Provide bicycle racks with two points of contact, to allow convenient locking for a variety of sizes and styles.

Resources

- *The UBC Development Handbook*: The Handbook describes the development approval process for UBC neighbourhoods. See section 7.6 'Parking Requirements for Bicycles'.
Site: <http://planning.ubc.ca/sites/planning.ubc.ca/files/documents/UBC%20Development%20Handbook.pdf>
- *Transportation Demand Management Encyclopaedia*: The City of Victoria BC's TDM Encyclopaedia is a comprehensive source of information about innovative management solutions to transport issues, including bicycle parking and storage facilities.
Site: <http://www.vtpi.org/tdm/tdm85.htm>
- *Bicycle Friendly Berkeley Coalition (BFBC)*: BFBC provides comprehensive resources for addressing issues related to cycling, including detailed guidelines with criteria for determining good quality short-term bicycle parking facilities.
Site: <http://www.bfbc.org/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring requirements will be met.
- Number and location of bicycle storage facilities.

SS MANDATORY

SS Credit M4: Contribution to Community Car Sharing

Mandatory

Requirement

Contribute to the development of a community car-sharing network by funding the equivalent of one community vehicle per 100 residential units.

Intent

To reduce environmental impacts associated with private automobile use.

Rationale

Car sharing makes public transportation a viable option by providing a cost-effective alternative for special trips. The World Car-Share Online Inventory reports that in 2006, there are more than 1,000 cities in the world with active car-sharing networks.

Definitions

- *Community car-sharing network*: An organization that provides access to shared automobiles for its members as an alternative to private ownership.

Strategies

- Consult with UBC Properties Trust to make arrangements for the required contribution.
- Provide information to homebuyers on the community car-sharing program

Resources

- *Victoria Transport Policy Institute (VTPI)*: The VTPI is an excellent resource for information on a variety of sustainable mobility resources.
Site: <http://www.vtpi.org/>
- *Wikipedia*: See the Wikipedia online encyclopaedia entry on Car Sharing for a comprehensive overview of car sharing networks worldwide.
Site: <http://en.wikipedia.org/wiki/Carsharing>
- *Modo, the Car Co-op* is a Vancouver-based not-for-profit co-operative venture incorporated to foster car sharing as an alternative to the privately owned automobiles.
Site: <http://www.modo.coop/> ;
- *CarSharing.net* is a non-profit educational and promotional site, supporting the car sharing industry in North America.
Site: <http://www.carsharing.net/index.html>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Developer declaring that the requirements have been met.
- Number of residential units and documentation confirming the amount contributed to car-sharing network.

SS MANDATORY

SS Credit M5: Light Pollution Reduction

Mandatory

Requirement

Do not exceed Illuminating Engineering Society of North America (IESNA) illuminance requirements as stated in the *Recommended Practice Manual: Lighting for Exterior Environments*.

Intent

To eliminate light trespass from the building site, improve night sky access, and reduce development impacts on nocturnal environments and wildlife.

Rationale

Light pollution and light trespass compromise astronomical research, cause adverse human health effects, disrupt ecosystems, and needlessly consume excess energy.

Definitions

- *Light Trespass*: Unwanted or nuisance light emanating from a neighbouring property.
- *Light Pollution*: Waste light from buildings sites that interferes with astronomical research, produces glare, and adversely affects the environment.
- *Illuminance*: Amount of light falling on a surface, measured in units of footcandles (fc) or lux (lx).

Strategies

- Use full cut-off luminaires to direct light downward where it is needed, e.g. on pedestrian pathways, sidewalks and landscaped areas. Do not provide additional illumination for roadways.
- Design for an illuminance uniformity ratio of 4:1 for pathway lighting.
- Minimize outdoor lighting levels (e.g. limit exterior lighting on decks, balconies). Carefully match outdoor lighting levels with the application and use no more than absolutely necessary.
- Keep lighting poles low and closely spaced. For more uniform area lighting, such as parking lots, use a larger number of lower, pole-mounted luminaires instead of fewer, taller fixtures.
- Avoid reflective surfaces beneath downlit signs. Whenever possible, design the surfaces beneath downlit signs to be light absorptive rather than reflective.

Resources

- *Illuminating Engineering Society of North America*: IESNA is the recognized technical authority on illumination. The society publishes a variety of technical documents on illumination, as well as other lighting-related publications that encourage good lighting design.
Site: <http://www.iesna.org/index.cfm>
- *International Dark-Sky Association*: IDA provides extensive resources, guidelines and recommendations for minimizing light pollution.
Site: <http://www.darksky.org/>
- *Print Media: LEED Canada for New Construction and Major Renovations 2009*: Information and resources for Sustainable Sites Credit 8, 'Light Pollution Reduction'.

Documentation: *Submit at the Building Permit phase*

- Letter signed by Electrical Engineer declaring that the requirements will be met, including a description of the lighting strategy employed to achieve the credit.

SS MANDATORY

SS Credit M6: Recycling Collection

Mandatory

Requirement

Provide for collection of domestic paper, plastic, glass and metal recyclables by contracting with a waste management company for the service. Recycling storage space shall be designed in accordance with Metro Vancouver's Technical Specifications for Recycling Amenities.

Intent

To facilitate recycling and reduce the amount of waste sent to landfills.

Rationale

Recycling diverts valuable materials from the waste stream and allows them to be reclaimed for use as feedstock for new products, or to be reused as reconditioned or remanufactured products. Recyclable materials should include, at minimum, containers made from glass, metal or plastics labeled 1, 2, 4 or 5, as well as recyclable papers and cardboard.

Strategies

- Garbage removal contractors can often be contracted to remove recyclables as well. Phone around to compare costs and services.
- Consult with recycling contractors about the number, type and size of recycling bins that will be needed, as the bins may need to be purchased from them.
- Early contact with a recycling contractor could aid in coordinating in-suite collection systems with the collection system for the whole building (see SS Credit 1.1).

Resources

- *Metro Vancouver: Metro Vancouver's Technical Specifications for Recycling Amenities* offers space specifications for recycling storage in new developments.
Site: <http://www.metrovancouver.org/services/solidwaste/planning/Engagement/Pages/MFC.aspx>
- *BC Waste Management, Department of Plant Operations*: The UBC Waste Management Office orchestrates campus recycling and composting activities and provides education and information on waste reduction to the campus community.
Site: <http://www.recycle.ubc.ca/>
- *Recycling Council of British Columbia*: RCBC provides information on waste reduction, recycling, disposal and pollution prevention throughout the province.
Site: <http://www.rcbc.bc.ca/>

Documentation: *Submit at the Building Permit phase*

- Location and size of recycling storage area in the building. This area will serve as space for both materials recycling and organics.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by the Developer or Building Owner declaring that the requirements have been met, including a description of the waste management contract in place.

SS MANDATORY

SS Credit M7: Compost Collection

Mandatory

Requirement

Provide a space in the building for the collection compost and provide for the compost collection through a contract with UBC Waste Management or another waste management service provider. Design space in the building in accordance with Metro Vancouver's *Technical Specifications for Recycling Amenities*.

Intent

To facilitate composting to reduce the amount of organic waste that is disposed of in landfills.

Rationale

Composting organic waste reduces the volume of materials sent to municipal landfills, which helps to reduce demand for landfill infrastructure and to reclaim organic material for use as mulch and fertilizer. Metro Vancouver is also considering a 2015 ban on organics from the waste stream. This credit prepares new buildings for this potential reality.

Definitions

- *Compost*: Organic waste from food or plant sources that has been naturally decomposed.

Strategies

- Contact the UBC Waste Management Office or a private hauler in the lower mainland and surrounding areas who will transport compostables from UBC neighbourhoods to the facilities.
- To streamline waste management, consider contracting with haulers that will handle and remove compost and recycling in addition to regular garbage pickup.

Resources

- *Composting Council of Canada*: The Council is a national non-profit which serves as the central resource and network for the composting industry in Canada.
Site: <http://www.compost.org/>
- *City of Vancouver*: The City of Vancouver maintains a source list of commercial organic waste haulers.
Site: <http://vancouver.ca/green-vancouver/food-scraps-haulers.aspx>
- *Metro Vancouver*: Metro Vancouver's *Technical Specifications for Recycling Amenities* offers space specifications for recycling storage in new developments.
Site: <http://www.metrovancouver.org/services/solidwaste/planning/Engagement/Pages/MFC.aspx>

Documentation: *Submit at the Building Permit phase*

- Location and size of recycling storage area in the building. This area will serve as space for both materials recycling and organics.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by the Developer or Building Owner declaring that the requirements have been met, including a description of the waste management contract in place.

SS 1 – RECYCLING AND COMPOSTING

SS Credit 1.1: In-Suite Recycling and Compost Separation

2 points

Requirements

Specify and install a system for simplified separation and collection of recycling and compostables in each suite or unit.

Intent

To facilitate recycling and composting in order to reduce the amount of waste sent to landfills.

Rationale

Decisions to relegate many materials to the waste stream occur at the household level. By making it easier to recycle or compost materials than to throw them away, thoughtful design can help to make waste diversion standard household practice. In-suite containers provide a visual reminder to residents to participate in waste diversion, and facilitate the transporting of materials to the main collection area.

Definitions

- *Compostables*: Organic waste from food or plant sources that can be naturally decomposed. May include cooked food and meats, depending on the composting method used on the site or at the collection facility.

Strategies

- Complete built-in, under-counter compost/recycling bins are available. Review examples of in-suite separation systems in the *Southeast False Creek Solid Waste Management Plan*.
- Select a location in the suite that is accessible and easy to keep clean.
- Provide container labels that list compostable and recyclable items.
- Coordinate labelling of in-suite separation containers with containers in the main collection area to simplify transfer.

Resources

- *UBC Waste Management, Department of Plant Operations*: The UBC Waste Management Office orchestrates campus recycling and composting activities and provides education and information on waste reduction to the campus community.

Site: <http://www.buildingoperations.ubc.ca/municipal/waste-management/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements will be met.
- Description of the system implemented.

SS 2 – ALTERNATIVE TRANSPORTATION

SS Credit 2.1: Additional Cycling Amenities

2 points

Requirement

In addition to the requirements for bicycle parking in the UBC Development Handbook, provide an additional 0.25 Class I bicycle parking per bedroom and an in-building bicycle repair station complete with a 120V electrical outlet.

Intent

To encourage bicycle use, reduce land development impacts and reduce pollution associated with private automobile use.

Rationale

Bicycling is a healthy and sustainable alternative to the car for short commuter distances. Providing accessible and secure bicycle facilities promotes the use of bicycles as an alternative mobility option. Additionally, end of trip facilities help to promote continued bicycle use for residents, including a 120V electrical outlet for electric bicycle charging.

Definitions

- *UBC Class I Bicycle Parking:* Intended for long-term use of residents, and may consist of facilities under surveillance, indoor bicycle lockers, or restricted access parking.
- *UBC Class II Bicycle Parking:* Intended for short-term use of residents or visitors, and may consist of bicycle racks located in an accessible outdoor location.
- *Bicycle Repair Station:* A station to include tools for repair and a tire pump.

Example

Type of Unit	Number of Units	SS Credit M3	SS Credit 2.1 (add)	Total Bicycle Parking
Studio	8	$8 \times 1.5 = 12$	$8 \times 1 \times 0.25 = 2$	14
1 Bedroom	25	$25 \times 1.5 = 37.5$	$25 \times 1 \times 0.25 = 6.25$	44
2 Bedroom	42	$42 \times 1.5 = 63$	$42 \times 2 \times 0.25 = 21$	84
3 Bedroom	32	$32 \times 1.5 = 48$	$32 \times 3 \times 0.25 = 24$	72
TOTALS	107	161	53	214

Resources

- *HUB:* HUB is a Metro Vancouver charitable organization that promotes cycling in the Lower Mainland.
Site: <https://bikehub.ca/>
- *Commercial "Packaged" Repair Stations:*
Site: <http://urbanracks.rtrk.ca/>
Site: <http://www.dero.com/products/fixit/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements will be met, including:
 - Number and location of bicycle parking facilities.
 - Description of the bicycle repair station.

SS 2 – ALTERNATIVE TRANSPORTATION

SS Credit 2.2: Electric Vehicle Charging - Visitor

2 point

Requirement

Provide one dedicated parking spot per 100 residential units for visitors of residents/owners, fully equipped with Level 2 charging station.

Intent

To reduce the number of greenhouse gas emitting vehicles and encourage the use of alternative fuel vehicles.

Rationale

Alternative fuel vehicles can reduce greenhouse gas emissions from vehicle operation by approximately 28% as compared to conventional petroleum-powered vehicles.

Definitions

- *Plug-in Electric Vehicle:* A vehicle that uses electrically charged batteries to provide all or partial energy to power an engine, while requiring connection to a power outlet for charging.
- *Level 2 Charging Station:* A complete charging station comprised of the necessary wiring, circuitry, and outlets for a 220V, 40A connection.

Strategies

- In underground visitor parking, designate space(s) for electric vehicle charging.

Resources

- *LiveSmart BC:* LiveSmart BC has developed a Toolkit that includes guidelines for developers or other parties interested in installing electric vehicle charging stations in MURBS.

Site: <http://www.livesmartbc.ca/incentives/transportation/EV-toolkit.html>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements will be met.
- Plan showing location of parking spots equipped with charging stations for electric vehicles.

SS 2 – ALTERNATIVE TRANSPORTATION

SS Credit 2.3: Electric Vehicle Charging- Resident

4 points

Requirement

Install necessary conduit and transformer capacity to accommodate Level 2 charging stations for the following percentage of owners'/residents' parking.

10% of owners'/residents' parking

(2 Points)

20% of owners'/residents' parking

(2 Points)

Intent

To reduce the number of greenhouse gas emitting vehicles and encourage the use of alternative fuel vehicles.

Rationale

Alternative fuel vehicles can reduce greenhouse gas emissions from vehicle operation by approximately 28% as compared to conventional petroleum-powered vehicles.

Definitions

- *Plug-in Electric Vehicle:* A vehicle that uses electrically charged batteries to provide all or partial energy to power an engine, while requiring connection to a power outlet for charging.
- *Level 2 Charging Station:* A complete charging station, comprised of the necessary wiring, circuitry, and outlets for a 220V, 40A connection.

Strategies

- Install conduit, transformer capacity and necessary space in the electrical room to accommodate Level 2 Charging for the following percentage of owners'/residents' parking.
 - 10% of owners'/residents' parking – 2 Points
 - 20% of owners'/residents' parking – 2 Points

Resources

- *LiveSmart BC:* LiveSmart BC has developed a Toolkit that includes guidelines for developers or other parties interested in installing electric vehicle charging stations in MURBS.

Site: <http://www.livesmartbc.ca/incentives/transportation/EV-toolkit.html>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements will be met.
- Plan showing location of space designated for electric vehicle charging-ready stalls.

Water Efficiency (WE)

WE MANDATORY

WE Credit M1: Efficient Irrigation Technology

Mandatory

Requirement

Design and install a water-efficient irrigation system that includes an automated controller, rain or soil sensors and pressure regulator and for non-grass areas use a micro- or drip-feed irrigation system *or* install a temporary irrigation system.

Intent

To reduce the use of potable water for landscape irrigation.

Rationale

While water seems plentiful in BC's Lower Mainland, the issues of supply and quality are becoming increasingly important. Landscaping that uses water more efficiently assists in reducing impacts on water infrastructure. Efficient irrigation systems can reduce water consumption by 50-70% in planted areas, and overall per capita water consumption by 20-25%.

Definitions

- *Potable water:* Water that meets drinking water quality standards and is approved for human consumption by the authority having jurisdiction.

Strategies

- Use subsurface drip irrigation for trees to eliminate moisture losses due to evaporation.
- Specify a variety of drought tolerant plants in landscaping.
- Mulch planting beds to 50 mm depth to reduce loss of water by evaporation.
- Place plant communities with similar water regimes in common zones and match irrigation equipment and regimens with plant community requirements.

Resources

- *Waterbucket.ca:* The Waterbucket.ca website is the vehicle for communicating a water sustainability action plan for British Columbia, and includes a range of resources promoting water efficient planning and irrigation technologies.
Site: www.waterbucket.ca
- *Irrigation Industry Association of British Columbia:* The IIABC fosters and promotes information exchange on a range of issues related to irrigation in BC.
Site: <http://www.irrigationbc.com/>
- *Print Media:* BC Trickle Irrigation Manual. BC Ministry of Agriculture and Food. April 1999 Edition.
- *Print Media:* *LEED Canada-NC Version 1.0:* Information and resources for Water Efficiency Credit 1, 'Water Efficient Landscaping'.

Documentation: *Submit at the Building Permit phase*

- Letter signed by Landscape Architect indicating the requirements will be met, including a description of the irrigation system.

WE MANDATORY

WE Credit M2: Low-Flush Toilets

Mandatory

Requirement

Specify and install high efficiency 4.8 L per flush (1.28 gal) single flush toilets or 3.4/6 L per flush (0.9gal/1.6gal) dual flush toilets for all water closets.

Intent

To reduce potable water use associated with toilet flushing.

Rationale

Toilets that use less water reduce sewage treatment costs and help to defer the costs of building additional infrastructure.

Definitions

- *High efficiency toilets:* High efficiency toilets use 4.8 L of water per flush or lower
- *Dual flush toilets:* Dual flush toilets include two flush options, one for lighter needs (approximately 3.4 L or less) and another for heavier needs (approx. 6 L or less).

Strategies

- Consult with suppliers and builders to identify models that perform well. CSA and Warnock Hersey labels ensure the toilet model has passed performance and maintenance tests.
- Consider pressure assisted and vacuum assisted models as they generally improve the flushing performance of low-flush toilets.
- Ensure water pressure at the toilet will be adequate for the specified toilet type: pressure-assisted tanks require higher water pressure than gravity-fed tank toilets.
- Ensure the flush mechanism is properly adjusted and commissioned to deliver the appropriate amount of water per flush.
- Slope drain lines adequately to ensure there is no sludging.

Resources

- *Advanced Buildings Technologies and Practices:* Advanced Buildings provides an overview of technologies and practices that improve the energy and resource efficiency of commercial and multi-unit residential buildings.
Site: <http://www.advancedbuildings.org/low-flow-toilet.html>
- *Metro Vancouver Residential Water Conservation:* Metro Vancouver's Water Conservation program provides guidance to residential, commercial and industrial water users on water conservation.
Site: <http://www.metrovancouver.org/services/water/conservation/Pages/residential.aspx>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Mechanical Engineer declaring that the requirements will be met, including identification of specific fixtures used and flow rate.
- Cut sheet from the manufacturer indicating flow rate.

WE MANDATORY

WE Credit M3: Low-Flow Faucet Aerators

Mandatory

Requirement

Specify and install low-flow faucets with aerators in all bathroom sinks (max. 3.8 L per minute) *and* in all kitchen sinks (max. 6.8 L per minute).

Intent

To reduce potable water use associated with faucet use.

Rationale

According to the GVRD, approximately 14% of water used in residential buildings is from bathroom and kitchen faucets. Faucets that use less water reduce demand, which helps to reduce treatment costs and defer future costs of building additional infrastructure.

Definitions

- *Low-flow faucet*: A faucet that is designed to use less water than conventional faucets.
- *Aerator*: Aerators restrict water flow at the outlet without reducing water pressure by mixing air into the water stream.
- *Potable water*: Water that meets drinking water quality standards and is approved for human consumption by the authority having jurisdiction.

Strategies

- Consult with local suppliers to identify appropriate low-flow faucets with the required performance ratings for all bathroom and kitchen sinks.

Resources

- *Metro Vancouver Residential Water Conservation*: Metro Vancouver's Water Conservation program provides guidance to residential, commercial and industrial water users on water conservation.

Site: <http://www.metrovancouver.org/services/water/conservation/Pages/default.aspx>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Mechanical Engineer or responsible party declaring that the requirements will be met, including identification of specific fixtures used and flow rate.
- Cut sheet from the faucet manufacturer indicating flow rate.

WE MANDATORY

WE Credit M4: Low-Flow Showerheads

Mandatory

Requirement

Specify and install water-saving showerheads with a maximum flow rate of 8.5 L per minute in each shower.

Intent

To reduce energy use associated with hot water heating for showers.

Rationale

According to Natural Resources Canada, domestic hot water heating accounts for approximately 26% of residential energy demand in BC. Low-flow showerheads use less than 9 L of water per minute, a 50% reduction in water use as compared to conventional showerheads.

Definitions

- *Low-flow showerheads:* Low-flow showerheads use 8-9L of water or less per minute, approximately half the water of a traditional showerhead, while maintaining the same water pressure.

Strategies

- Consult with suppliers and builders to identify features or specific models of water-saving showerhead that meet the performance criteria.
- Not all low-flow showerheads perform equally well. Select manufacturers and models that have performed well in residential applications in the past.

Resources

- *BC Hydro:* With its *Power Smart at Home* program, BC Hydro provides resources on a wide range of energy saving strategies, including installing low-flow showerheads.
Site: http://www.bchydro.com/powersmart/residential/guides_tips/green-your-home/water_guide/low_flow_shower.html
- *Metro Vancouver Residential Water Conservation:* Metro Vancouver's Water Conservation program provides guidance to residential, commercial and industrial water users on water conservation.
Site: <http://www.metrovancouver.org/services/water/conservation/Pages/residential.aspx>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Mechanical Engineer or responsible party declaring that the requirements will be met, including identification of specific faucets used and flow rate.
- Cut sheet from the manufacturer indicating flow rate.

WE MANDATORY

WE Credit M5: Energy Star Dishwashers and Clothes washers

Mandatory

Requirement

Specify and install Energy Star-labelled dishwashers *and* clothes washers in each unit or specify and offer only Energy Star models if these appliances are optional.

Intent

To reduce water and use associated with the use of dishwashers and clothes washers.

Rationale

Appliance use represents one of the largest single end-uses in residential buildings. Energy Star qualified dishwashers and clothes washers reduce residential water and energy demand, operating costs, and environmental impacts.

Definitions

- *Energy Star*: The Energy Star symbol designates appliances that are among the most efficient in the marketplace. Requirements vary from one category to another, but typically an Energy Star model must be at least 20 percent more efficient than a conventional model.

Strategies

- Refer to NRCAN's Energy Star appliance directory to identify qualifying dishwasher and refrigerator makes and models.

Resources

- *Energy Star*: Natural Resources Canada and the Office of Energy Efficiency provide information on the program. The Energy Star appliance directory includes a comprehensive listing of the most energy efficient appliances in the market. See links below to Energy Star qualified model lists for dishwashers and clothes washers.

Site: <http://oee.nrcan.gc.ca/residential/10759>

Dishwashers: <http://oee.nrcan.gc.ca/pml-lmp/index.cfm?action=app.search-recherche&appliance=DISHWASHERS>

Clothes Washers: <http://oee.nrcan.gc.ca/pml-lmp/index.cfm?action=app.search-recherche&appliance=CLOTHESWASHERS>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect or responsible party declaring that the requirements will be met.
- Cut sheet from the manufacturer of the Energy Star appliances that will be installed.

WE 1 – WATER EFFICIENT LANDSCAPING

WE Credit 1.1: Reduce Potable Water Use

3 points

Requirement

Reduce potable water use for site irrigation needs by 50% from the calculated midsummer baseline consumption.

WE Credit 1.2: Eliminate Potable Water Use

3 points

Requirement

Eliminate potable water use for site irrigation needs.

Intent

To reduce or eliminate the use of potable water for landscape irrigation.

Rationale

While water seems plentiful in BC's Lower Mainland, the issue of water supply and water quality is becoming increasingly critical. Capturing rainwater and designing landscapes to use water more efficiently assists in reducing demand and the impact on existing infrastructure.

Definitions

- *Potable water:* Water that meets drinking water quality standards and is approved for human consumption by the authority having jurisdiction.
- *Rainwater cisterns:* Cisterns are water collectors commonly used in homes in locations with less access to public water systems like on the BC Gulf Islands, where water scarcity is a frequent issue.

Strategies

- Provide collection systems to collect rainwater run-off from roofs, to be used in a landscape irrigation system with cisterns and pumps.
- Use captured rainwater to feed any on-site water features.

Resources

- *Advanced Buildings Technologies and Practices:* Advanced Buildings provides an overview of cisterns and rainwater harvesting systems.
Site: <http://www.advancedbuildings.org/cisterns.html>
- *Waterbucket.ca:* The Waterbucket.ca website includes a range of resources promoting water efficient planning and irrigation technologies.
Site: www.waterbucket.ca
- *Irrigation Industry Association of British Columbia:* The IIABC fosters and promotes information exchange on a range of issues related to irrigation in BC. See "Standards for Landscape Irrigation Systems."
Site: <http://www.irrigationbc.com/page/standards>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Landscape Architect declaring that the requirements will be met, including a description of system and calculations to verify the claim of 50% or more reduction in potable water for irrigation.

WE 2 – WATER USE REDUCTION

WE Credit 2.1: Low-Flow Showerheads

2 points

Requirement

Specify and install low-flow showerheads (max. 5.7 L per minute) in each unit.

Intent

To reduce water and energy use associated with residential showers.

Rationale

According to Natural Resources Canada, domestic hot water heating accounts for approximately 26% of residential energy demand in BC.

Definitions

- *Low-flow showerheads:* Low-flow showerheads use 5-9L of water or less per minute, approximately half the water of a traditional showerhead, while maintaining the same water pressure.

Strategies

- Consult with suppliers and builders to identify features or specific models of water-saving showerhead that meet the performance criteria.
- Not all low-flow showerheads perform equally well. Select manufacturers and models that have performed well in residential applications in the past.

Resources

- *BC Hydro:* With its *Power Smart at Home* program, BC Hydro provides resources on a wide range of energy saving strategies, including installing low-flow showerheads.
Site: http://www.bchydro.com/powersmart/residential/guides_tips/green-your-home/water_guide/low_flow_shower.html
- *Metro Vancouver Residential Water Conservation:* Metro Vancouver's Water Conservation program provides guidance to residential, commercial and industrial water users on water conservation.
Site: <http://www.metrovancouver.org/services/water/conservation/Pages/residential.aspx>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Mechanical Engineer or responsible party declaring that the requirements will be met, including identification of specific showerheads used and flow rate.
- Cut sheet from the manufacturer indicating flow rate.

WE 2 – WATER USE REDUCTION

WE Credit 2.2: Water Efficient Dishwashers

1 point

Requirement

Specify and install water-efficient dishwashers that use ≤ 11 L (2.91 gal) per normal wash cycle or if dishwashers are available only as an option, specify and offer only models complying to this standard.

Intent

To reduce potable water use associated with dishwashers.

Rationale

According to the GVRD, approximately 2% of water used in residential buildings is used in dishwashers. 80% of the energy required to operate a dishwasher is used to heat water, so dishwashers that use the least water are also the most energy efficient. Dishwashers that use 15L or less represent approximately the top 50% of Energy Star rated dishwashers on the market.

Definitions

- *Water efficient dishwasher:* dishwashers that use less water (and energy) than conventional dishwashers.
- *Potable water:* water that meets drinking water quality standards and is approved for human consumption by the authority having jurisdiction.

Strategies

- Use Natural Resource Canada's on-line EnerGuide appliance directory to identify models that meet the performance requirement.
- Specify water efficient dishwashers in all tender documents, and consult with local suppliers and installers on which models work best.

Resources

- *Energy Star:* Natural Resources Canada and the Office of Energy Efficiency provide a searchable database of dishwashers.
Site: <http://oee.nrcan.gc.ca/pml-imp/index.cfm?action=app.search-recherche&appliance=DISHWASHERS>
- *Energy Star:* Natural Resources Canada and the Office of Energy Efficiency provide information on the program. The Energy Star appliance directory includes a comprehensive listing of the most energy efficient appliances in the market.
Site: <http://oee.nrcan.gc.ca/energystar/english/consumers/index.cfm?attr=0>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect or responsible party declaring that the requirements have been met.
- Cut sheet from the manufacturer of the dishwasher indicating water use per cycle.

WE 2 – WATER USE REDUCTION

WE Credit 2.3: Most Efficient Clothes Washers

2 points

Requirement

Specify and install Energy Star clothes washers listed as "Most Efficient 2013" or if washers are available only as an option, specify and offer only models complying to this standard

Intent

To reduce potable water use associated with clothes washers.

Rationale

According to the GVRD, approximately 23% of water used in residential buildings is used in clothes washers. Clothes washers that use less water reduce demand, which helps to reduce water treatment costs and future costs of supplying additional infrastructure.

Definitions

- *Most Efficient clothes washers:* clothes washers that use less water (and energy) than conventional clothes washers and have been rated as Most Efficient by Energy Star.
- *Potable water:* water that meets drinking water quality standards and is approved for human consumption by the authority having jurisdiction.

Strategies

- Use Natural Resource Canada's on-line EnerGuide appliance directory to identify models that meet the performance requirement.
- Consider front-loading clothes washers, which generally use much less water, soap, and energy than top-loading units.

Resources

- *Energy Star:* Natural Resources Canada and the Office of Energy Efficiency provide information on the program. The Energy Star appliance directory includes a comprehensive listing of the Most Efficient appliances in the market. The lists are separated into small washers (2.5 cu.ft. and smaller) and large washers (more than 2.5 cu.ft.) as seen in the links below.

Small Washer: http://www.energystar.gov/index.cfm?c=most_efficient.me_clothes_washers_sm

Large Washer: http://www.energystar.gov/index.cfm?c=most_efficient.me_clothes_washers

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect or responsible party declaring that the requirements have been met.
- Cut sheet from the manufacturer of the clothes washer indicating Energy Star rating and water use per cycle.

WE 2 – WATER USE REDUCTION

WE Credit 2.4: Water Use Reduction Package

2 points

Requirement

Additional credit for achieving credits: WE 1.1, WE 2.2, WE 2.2 and WE 2.3.

Intent

To reduce potable water use associated with irrigation, showers, dishwashers and clothes washers.

Rationale

Approximately 53% of water used in residential buildings is used for toilet flushing, dishwashers and clothes washers combined. Fixtures and appliances that use less water reduce demand, which helps to reduce water treatment costs and future costs of supplying additional infrastructure.

Definitions

- *Potable water*: water that meets drinking water quality standards and is approved for human consumption by the authority having jurisdiction.

Strategies

- Specify the fixtures and appliances required for WE 2.1, WE 2.2 and WE 2.3.

Documentation: Submit at the Occupancy Permit phase

Letter signed by Mechanical Engineer declaring that the credits requirements have been achieved.

WE 3 – WATER METERING

WE Credit 3.1 Domestic Hot Water Metering

3 points

Requirement

In units with central hot water, provide individual domestic hot water metering.

Intent

To encourage energy and water conservation by providing effective feedback to residents on hot water use.

Rationale

If suites are not individually metered, homeowners will not have clear idea of the amount of heated water they are using. Metering enables occupants to better understand their hot water usage patterns and to see the effectiveness of water saving strategies.

Strategies

- Consult with local suppliers to determine types of water meters commonly used in multi-unit residential applications.
- Consult with plumbing professionals for advice on locating the meters for easy access by meter readers or service personnel, which will depend on the type of meter that is selected.
- Consider installing meters with remote reading capability to reduce future operating costs, and facilitate the integration of future electronic billing systems.

Resources

- *Alliance for Water Efficiency*: The Alliance for Water Efficiency includes a resource study, "National Multifamily Submetering and Allocation Billing Program Study" which investigates submetering water utilities in various U.S. cities.

Site: <http://www.allianceforwaterefficiency.org/submetering.aspx>

- *National Environmental Services Centre*: NESC is located at West Virginia University and provides comprehensive information on water issues.

Site: http://www.nesc.wvu.edu/futurewater/water_efficiency/resources.cfm

Documentation: *Submit at the Building Permit phase*

- Letter signed by Mechanical Engineer declaring that requirements will be met
- Location and description of the metering system.

WE 3 – WATER METERING

WE 3.2: Cold Water Metering

2 points

Requirement

Provide individual cold water meters for all units.

Intent

To encourage water conservation by providing effective feedback to residents on water use.

Rationale

If suites are not individually metered, homeowners will not have clear idea of the amount of water they are using. Metering enables occupants to better understand their water usage patterns and to see the effectiveness of water saving strategies. Over 50% of Canadian municipalities are metered.

Strategies

- Consult with local suppliers to determine types of water meters commonly used in multi-unit residential applications.
- Consult with plumbing professionals for advice on locating the meters for easy access by meter readers or service personnel, which will depend on the type of meter that is selected.
- Consider installing meters with remote reading capability to reduce future operating costs, and facilitate the integration of future electronic billing systems.

Resources

- *Alliance for Water Efficiency*: The Alliance for Water Efficiency includes a resource study, "National Multifamily Submetering and Allocation Billing Program Study" which investigates submetering water utilities in various U.S. cities.
Site: <http://www.allianceforwaterefficiency.org/submetering.aspx>
- *National Environmental Services Centre*: NESC is located at West Virginia University and provides comprehensive information on water issues.
Site: http://www.nesc.wvu.edu/futurewater/water_efficiency/resources.cfm

Documentation: *Submit at the Building Permit phase*

- Letter signed by Mechanical Engineer declaring that requirements will be met.
- Location and description of the metering system.

Energy & Atmosphere (EA)

EA MANDATORY

EA Credit M1: Minimum Roof Insulation

Mandatory

Requirement

Design the roof assembly with a minimum insulation value of R-40 h·ft²·°F/Btu (7.04 °K·m²/W); for buildings with attic space and R-28 h·ft²·°F/Btu (4.93 °K·m²/W) for cathedral ceilings/flat roofs.

Intent

To control unwanted heat losses and gains by installing roof assemblies with improved thermal performance.

Rationale

Roof assemblies with higher R-values reduce unwanted energy gains and losses, promoting energy conservation and more comfortable indoor environments. Insulating with loose-fill fiberglass and cellulose or fiberglass batt insulation is relatively inexpensive; combined with a quality air barrier it reduces energy losses and minimizes condensation.

Definitions

- *R-value*: A measure of how well a material resists the passage of heat. The higher the R-value, the more effective the material is at keeping indoor environments warm in winter and cool in summer.
- *Air Barrier*: Air barriers prevent the passage of air through envelope assemblies. Airtight roof decks or roofing membrane serve as air barriers in roof assemblies.

Strategies

- Consult with a building envelope specialist to determine a combination of individual components that will deliver the required R-value. Consider installing full insulation thickness (using raised heel trusses), and wind barrier at eaves.
- Ensure the integrity of the air barrier by accommodating penetrations in the ceiling such as plumbing vent stacks, pot lights, partition walls, and electrical fixtures.

Resources

- *Manitoba R-2000 Home Program*: The R2000 program provides details illustrating best practice strategies for high performance building envelope design. The "Technical corner: Attics and Roofs" page provides basic information on insulation and air barriers.

Site: <http://www.r2000manitoba.com/technical.shtml>

- *Passiv House* : Provides standards for extremely well insulated buildings for high performance buildings.

Site : <http://www.passivhaustagung.de/PassiveHouseE/Passive house insulation.html>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements will be met.
- Description and overall R-value of the roof assembly used.

EA MANDATORY

EA Credit M2: Minimum Exterior Wall Requirements

Mandatory

Requirement

Design the exterior insulated wall area with a minimum thermal resistance of **effective (overall)** R-15.6 h·ft²·°F/Btu (2.75 °K·m²/W) for above grade non-glazed wall areas, and R-7.5 h·ft²·°F/Btu (1.32 °K·m²/W) “continuous insulation” for below grade walls.

Intent

To control unwanted heat losses and gains by installing wall assemblies with improved thermal performance.

Rationale

Wall assemblies with higher R-values reduce unwanted heat gains and losses, promoting energy conservation and more comfortable indoor environments.

Definitions

- *Building envelope*: The assembly of exterior partitions of a building that enclose conditioned spaces, through which thermal energy may be transferred to or from the exterior unconditioned spaces.
- *R-value (nominal)*: R-value is the measure of thermal resistance, or how well a material resists the passage of heat. In construction terms.
- *Effective R-value*: Effective R-value is a measure of overall wall performance, accounting for the full wall assembly.

Strategies

- Consult with a building envelope specialist to determine a combination of individual components that will deliver the required effective R-value. Components and strategies may include optimizing depth and spacing of studs in the wall cavity for maximum thermal performance.
- Design wall assemblies that reduce unnecessary thermal bridging through framing or wall detailing.

Resources

- *Homeowner Protection Office*: The HPO is a provincial Crown corporation that was formed as a response to widespread problems with condominium construction in the coastal BC climate. The office provides information and support to residential consumers, as well as technical information on high quality envelope construction and a range of educational opportunities for builders.
Site: <http://www.hpo.bc.ca/>
- *American Society of Heating Refrigerating and Air Conditioning Engineers*: ASHRAE develops energy standards for worldwide use, including the 90.1-2010 standard, which specifies similar R-values for insulated walls. The standard is available through ASHRAE's website.
Site: <https://www.ashrae.org/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements will be met.
- Description and overall R-value of the roof assembly used.

EA MANDATORY

EA Credit M3: Minimum Floor Insulation

Mandatory

Requirement

Design floors above non-heated parkade areas with a minimum insulation value of R-30 h·ft²·°F/Btu (5.28 °K·m²/W) for framed floors and R-15.6 h·ft²·°F/Btu (2.75 °K·m²/W) for slab floors.

Intent

To control unwanted heat losses by installing floor assemblies with improved thermal performance above non-heated parkades.

Rationale

A lot of heat can be lost through the floors when livable space is built over an unheated parkade and is not adequately insulated. Floor assemblies with higher R-values reduce unwanted heat loss, promoting energy conservation and more comfortable indoor environments.

Definitions

- *R-value*: A measure of how well a material resists the passage of heat. The higher the R-value, the more effective the material is at keeping indoor environments warm in winter and cool in summer.

Strategies

- Consult with a building envelope specialist to determine a combination of individual floor components and strategies that will deliver the required R-value.
- Ensure that appropriate measures are taken to prevent air leakage between the headers and the foundation wall.
- Pay careful attention to ensure that all penetrations in the wall are properly sealed and insulated.
- Ensure that the vapor barrier is installed at the most appropriate point in the wall assembly relative to the dew point.

Resources

- *American Society of Heating Refrigerating and Air Conditioning Engineers*: ASHRAE develops energy standards for worldwide use, including the 90.1-2010 standard, which specifies similar R-values for floor insulation. The standard is available through ASHRAE's website.

Site: <https://www.ashrae.org/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements will be met.
- Description and overall R-value of the roof assembly used.

EA MANDATORY

EA Credit M4: Energy Efficient Windows

Mandatory

Requirement

Specify and install Energy Star-rated windows *or* windows with a maximum overall U-value of 0.35 Btu/hr-ft²-°F (2.0 W/m²-°K) for vinyl frames or 0.45 Btu/hr-ft²-°F (2.55 W/m²-°K) or less for aluminum frames.

Intent

To minimize uncontrolled heat loss and heat gain through the building's windows.

Rationale

Windows with higher thermal performance reduce uncontrolled heat loss and heat gain, which helps to reduce energy consumption and make indoor environments more comfortable. Energy Star qualified windows are distinguished from other windows by their superior insulating performance.

Definitions

- *U-value:* A measure of heat flow through any combination of materials, air layers and air spaces. Lower U-values indicate products that insulate better and slow the transfer of heat into and out of buildings.
- *Energy Star:* The Energy Star symbol designates products that are among the most energy efficient in the marketplace. Energy Star windows are qualified for their energy efficiency for each of four zones in Canada with specified U-values.

Strategies

- Use Natural Resource Canada's on-line Energy Star for windows program to identify models that qualify for use in the lower mainland.
- Check the BC Hydro Power Smart at Home Windows Rebate Program for availability of financial incentives to install Energy Star windows in new residential construction.

Resources

- *Office of Energy Efficiency (OEE):* Natural Resources Canada and the Office of Energy Efficiency provide comprehensive information on the Energy Star program for windows including qualifying criteria and lists of models, manufacturers and suppliers.
Site: <http://www.nrcan.gc.ca/energy/products/categories/fenestration/13739>
- *BC Hydro Power Smart:* With its Power Smart at Home Windows Rebate Program, BC Hydro offers rebates for Energy Star labelled windows installed in single-family homes and multi-unit residential developments.
Site: <http://www.bchydro.com/>
- *American Society of Heating Refrigerating and Air Conditioning Engineers:* ASHRAE develops energy standards for worldwide use, including the 90.1-2010 standard, which is available through ASHRAE's website.
Site: <https://www.ashrae.org/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements will be met.
- Shop drawing from manufacturer showing glazing system U-value or that windows are Energy Star-rated.

EA MANDATORY

EA Credit M5: Minimum Boiler Efficiency

Mandatory

Requirement

Specify and install hot water boilers with a minimum thermal efficiency of 84%/ AFUE of minimum 90% or heat using District Energy.

Intent

To reduce energy use associated with space heating. The boilers installed should be designed to supply 100% of the building's thermal energy needs in a fashion that is District Energy Ready (see EA Credit M11).

Rational

According to Natural Resources Canada, space conditioning accounts for approximately 52% of residential energy demand in BC. Newer furnaces are available with combustion efficiencies ranging from 80% up to 97%, promoting energy conservation and reduced operating costs.

Definitions

- *Thermal Efficiency:* Thermal Efficiency is the most widely used measure of a commercial boiler and make-up air efficiency. It is based on the ratio of the amount of heat produced by the heating appliance, to the amount of fuel supplied to the appliance.
- *Annual Fuel Utilization Efficiency (AFUE):* AFUE is the most widely used measure of a furnace's heating efficiency. It is based on the ratio of the amount of heat actually delivered to your home, to the amount of fuel supplied to the furnace.

Strategies

- If residential sized appliances (boilers or furnaces) are used, specify and install units with minimum an AFUE of 90%
- Ensure that the heating appliance is properly sized for the application, as over-sizing (>25% over peak demand) is a major cause of short cycling and inefficiency.
- Ensure that chimney and flue vents are properly sized using locally approved vent pipe materials.

Resources

- *American Society of Heating, Refrigerating and Air-Conditioning Engineers:* In addition to developing and maintaining industry standards for HVAC&R systems (heating, ventilation, air conditioning and refrigeration) ASHRAE provides a wide range of educational materials for researchers and practitioners.

Site: www.ashrae.org

Documentation: *Submit at the Building Permit phase*

- Letter signed by Mechanical Engineer declaring that the requirements will be met.
- Manufacturer's spec sheet showing minimum efficiency of installed equipment.

EA MANDATORY

EA Credit M6: Domestic Hot Water

Mandatory

Requirement

Specify and install gas DHW boilers with a minimum efficiency of 84% (mid-efficiency boiler) or heat domestic hot water using District Energy.

Intent

To reduce energy use associated with domestic hot water heating.

Rationale

According to Natural Resources Canada, domestic hot water heating accounts for approximately 26% of residential energy demand in BC. DHW boilers that operate with higher efficiency promote energy conservation and reduced operating costs.

Definitions

- *Energy Factor*: The energy factor (EF) indicates a water heater's overall energy efficiency based on the amount of hot water produced per unit of fuel consumed over a typical day.
- *First Hour Rating (FHR)*: The first hour rating is the amount of hot water in US gallons the heater can supply per hour (starting with a tank full of hot water)

Strategies

- Ensure that minimum efficiency or energy factor requirement is met.
- Ensure proper sizing for DHW units in gallons per occupant, and only consider domestic hot water heaters with a first hour rating that matches peak hour demand.
- To reduce venting-related energy losses with gas-fired boilers, consider installing sealed-combustion units.
- For gas-fired DHW boilers, only consider units with electronic ignition and power draft systems.

Resources

- *American Council for an Energy-Efficient Economy (ACE3)*: ACE3 offers a number of water heating efficiency measures.

Site: <http://www.aceee.org/consumer/water-heating>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Mechanical Engineer declaring that the requirements will be met.
- Manufacturer's spec sheet showing minimum efficiency of installed equipment.

EA MANDATORY

EA Credit M7: Energy Star Dishwashers and Refrigerators

Mandatory

Requirement

Specify and install Energy Star-labelled dishwashers *and* refrigerators in each unit.

Intent

To reduce energy consumption associated with the use of dishwashers and refrigerators.

Rationale

Appliance use represents one of the largest single end-uses in residential buildings. Energy Star qualified refrigerators reduce residential energy demand, operating costs, and environmental impacts.

Definitions

- *Energy Star*: The Energy Star symbol designates appliances that are among the most energy efficient in the marketplace. Requirements vary from one category to another, but typically an Energy Star model must be from 10 to 50 percent more efficient than a conventional model.

Strategies

- Refer to NRCAN's Energy Star appliance directory to identify qualifying dishwasher and refrigerator makes and models.

Resources

- *Energy Star*: Natural Resources Canada and the Office of Energy Efficiency provide information on the program. The Energy Star appliance directory includes a comprehensive listing of the most energy efficient appliances in the market.
Site: <http://oee.nrcan.gc.ca/pml-imp/index.cfm?action=app.search-recherche&appliance=REFRIGERATORS>
- *EnerGuide*: Natural Resources Canada and the Office of Energy Efficiency provide information on the program as well as energy and water consumption ratings of major appliances. See "Appliance Model Listings".
Site: <http://oee.nrcan.gc.ca/energuide/home.cfm>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect or responsible party declaring that the requirements have been met.
- Cut sheet from the manufacturer indicating appliances are Energy Star labelled.

EA MANDATORY

EA Credit M8: Programmable Thermostats

Mandatory

Requirement

Specify and install programmable thermostats for at least the largest heating zone in each unit.

Intent

To reduce energy consumption associated with space heating.

Rationale

Programmable thermostats maintain a desired comfort level when a home is occupied, then enter an economizing mode at night and when the home is unoccupied. As peak heating or cooling only occurs when the home is occupied, programmable thermostats save energy and heating costs.

Definitions

- *Programmable thermostat:* A thermostat that senses room temperature and controls the HVAC system according to a pre-programmed schedule set by the homeowner. Some models are capable of accommodating different settings for every day of the week.

Strategies

- Programmable thermostats must have at least two different programming periods and at least four possible temperature settings to qualify.
- Consult with suppliers to identify models that are easy to use, and provide the homeowner with an operation manual.

Resources

- *BC Hydro:* With its *Power Smart at Home* program, BC Hydro provides resources on a wide range of energy saving strategies, including installing programmable thermostats.

Site: http://www.bchydro.com/powersmart/residential/guides_tips/green-your-home/heating_guide/manage_thermostat.html

Documentation: *Submit at the Building Permit phase*

- Letter signed by Electrical engineer or responsible party declaring that the requirements will be met.
- Cut sheet from the manufacturer of the thermostat supplied and description of thermostat locations.

EA MANDATORY

EA Credit M9: Common Area Lighting

Mandatory

Requirement

Specify and install only non-incandescent lighting, such as fluorescent, compact fluorescent or LED, in common areas.

Intent

To reduce energy use associated with lighting in common areas.

Rationale

Approximately 95% of the energy used by incandescent bulbs produces heat rather than light. Compared with incandescent lighting, fluorescent and LED lighting produce significantly more light per watt of energy consumed. Non-incandescent bulbs also last a lot longer than incandescents: fluorescent bulbs last approximately 10 times longer, and LEDs approximately 25 times longer.

Definitions

- *Fluorescent and compact fluorescent lighting:* Fluorescent lighting produces light by fluorescing phosphors instead of heating a filament. Compact fluorescent lamps can be installed in most standard incandescent fixtures.
- *Light Emitting Diode (LED) lighting:* A display and lighting technology that produces visible light when an electrical current is applied to a semiconductor diode.

Strategies

- Specify safety signage that uses LED lighting.
- Look for LED fixtures that replace more common compact fluorescent fixtures, feature and exterior lights.
- Check with a local lighting supplier to determine the appropriate fixture and bulb type for common areas.
- Where compact fluorescent bulbs will be used, ensure that fixtures are either specially designed for or are compatible with compact fluorescent bulbs.

Resources

- *BC Hydro:* With its *Power Smart at Home* program, BC Hydro provides resources on a wide range of energy saving strategies and incentives.

Site: http://www.bchydro.com/powersmart/residential/guides_tips/green-your-home/lighting_guide/energy_efficient_lighting.html

Documentation: *Submit at the Building Permit phase*

- Letter signed by the Electrical Engineer declaring that the requirements will be met including a description of the common area lighting.

EA MANDATORY

EA Credit M10: Parkade and Corridor Lighting Controls

Mandatory

Requirement

Specify and install parkade and corridor lighting controls to automatically reduce the overall lighting level by at least 30% in a lighting zone when the zone is unoccupied.

Intent

To reduce energy use associated with lighting in parking areas and corridors.

Rationale

Occupancy sensors and dimming controls can reduce demand for lighting energy by 30 to 60% (depending on usage) over spaces that are continuously lit, due to the intermittent occupancy.

Definitions

- *Parkade Lighting*: Lighting designed to illuminate the underground parking areas and drives.
- *Corridor Lighting*: Lighting that illuminates the corridors of the building.
- *Occupancy Sensors*: Electrical sensors that detect occupancy and control lighting according to pre-set commands. The three types of occupancy sensors are passive infrared (PIR), ultrasonic, and hybrid or dual-technology sensors. The most common combination of sensor types is PIR and ultrasonic sensors.
- *Dimming Controls*: Electrical controllers that allow lighting output to vary depending on control sequences.

Strategies

- Install occupancy sensors to each lighting zone that turn off the zone when no occupancy is detected.
- Install dimming controls to lower all lamps to 70% or lower when the zone is unoccupied.
- Take caution to ensure that all lighting fixtures, ballasts, or lamps are suited for dimming, as some may not include these features.
- Consult with suppliers to determine the most appropriate type of occupancy sensor for a given parkade configuration, as well as the best location(s) for installation.
- **Effectively coordinate lighting design to ensure safety is not compromised.**

Resources

- *BC Hydro*: With its *Power Smart* program, BC Hydro provides resources on a wide range of energy saving strategies and incentives for lighting systems.

Site: http://www.bchydro.com/powersmart/business/power_smart_tips/lighting_systems.html

- *Lighting Controls Association*: The Lighting Controls Association published a two-part series on the lighting standards in ASHRAE 90.1-2010.

Part 1: <http://lightingcontrolsassociation.org/ashrae-releases-90-1-2010-part-1-design-scope-administrative-requirements/>

Part 2: <http://lightingcontrolsassociation.org/ashrae-releases-90-1-2010-part-2-lighting-controls/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by the Electrical Engineer declaring that the requirements will be met.
- Identification of controlled and un-controlled parkade lighting wattage.

EA TARGETS – BUILDING ENERGY EFFICIENCY

EA GOLD

6 points

Requirement

Design the building to meet a maximum energy use intensity (EUI) of 160 kWh/m²/yr, demonstrated using the UBC Energy Modeling Guidelines. This credit is mandatory and required for achievement of REAP Gold.

Intent

To reduce building energy usage by ensuring that the designed energy performance meets a high standard.

Rationale

Traditionally, energy codes and standards have used energy/utility costs as a proxy for energy performance. This system is designed for a wide variety of building types that are located in various climates. For construction at UBC, we are aiming for high performance energy performance, in order to fulfill the objectives of the UTown@UBC Community Energy & Emissions Plan. In an effort to affect the building performance more specifically, energy use intensity targets have been introduced into REAP.

Definitions

- *Energy Use Intensity (EUI)*: Energy use intensity is the measure of the buildings annual energy use per unit of floor area. For the purposes of REAP, this is considered the modeled energy performance, normalized for weather, and reported in kWh/m²/year

Strategies

In general, passive design strategies should be considered first, as they are often the best combination of performance and cost.

- Reduce the amount of exterior glazing, keeping the ratio of glazing to 40-50% of the wall area.
- Install double pane windows with argon fill and warm edge spacers.
- Install passive heat recovery on the wastewater system.
- Perform air leakage tests and reduce the leakage rate to less than 0.4 cfm/m² of building enclosure area.

Resources

- *City of Vancouver*: The City of Vancouver published a Passive Design Toolkit.
Site:
<http://vancouver.ca/home-property-development/energy-and-water-efficient-building-design.aspx>
- *UBC Energy Modeling Guidelines*: UBC developed an Energy Modeling Guideline document that includes best practice procedures for energy modelers.

Documentation: *Submit at the relevant Permit phase*

- **Development Permit**: Preliminary energy use that is targeted for the development. This performance level is required for the development to be certified REAP Gold.
- **Building Permit**: Preliminary Energy Modeling Checklist.
- **Occupancy Permit**: Final Energy Modeling Checklist, summary output from the energy model, and a letter signed by the Architect or Engineer declaring that the requirements have been met.

EA TARGETS – BUILDING ENERGY EFFICIENCY

EA GOLD PLUS

8 points

Requirement

Design the building to meet a maximum energy use intensity (EUI) of 140 kWh/m²/yr, demonstrated using the UBC Energy Modeling Guidelines. This credit is required for achievement of REAP Gold PLUS, but may also be used toward achieving a lower certification.

Intent

To reduce building energy usage by ensuring that the designed energy performance meets a high standard.

Rationale

Traditionally, energy codes and standards have used energy/utility costs as a proxy for energy performance. This system is designed for a wide variety of building types that are located in various climates. For construction at UBC, we are aiming for high performance energy performance, in order to fulfill the objectives of the UTown@UBC Community Energy & Emissions Plan. In an effort to affect the building performance more specifically, energy use intensity targets have been introduced into REAP.

Definitions

- *Energy Use Intensity (EUI)*: Energy use intensity is the measure of the buildings annual energy use per unit of floor area. For the purposes of REAP, this is considered the modeled energy performance, normalized for weather, and reported in kWh/m²/year

Strategies

Many strategies can be employed in order to meet this target. Below are a few strategies that may be considered during design and construction in addition to those mentioned for REAP Gold energy performance.

- Ensure that thermal breaks in the envelope are minimized or eliminated (e.g. balconies, windows, etc.)
- Install hot and cold water metering in each suite.
- Consider LED lighting with dimming controls throughout the building.
- Perform air leakage tests and reduce the leakage rate to less than 0.30 cfm/m² of building enclosure area.

Resources

- *Canada Mortgage and Housing Corporation*: The CMHC's website includes a number of resources for reducing energy in multi-unit residential buildings.
Site: <http://www.cmhc-schl.gc.ca/en/inpr/bude/himu/waensati/index.cfm>
- *UBC Energy Modeling Guidelines*: UBC developed an Energy Modeling Guideline document that includes best practice procedures for energy modelers.

Documentation: *Submit at the relevant Permit phase*

- *Building Permit*: Preliminary Energy Modeling Checklist.
- *Occupancy Permit*: Final Energy Modeling Checklist, summary output from the energy model, and a letter signed by the Architect or Engineer declaring that the requirements have been met

EA TARGETS – BUILDING ENERGY EFFICIENCY

EA PLATINUM

10 points

Requirement

Design the building to meet a maximum energy use intensity (EUI) of 120 kWh/m²/yr, demonstrated using the UBC Energy Modeling Guidelines. This credit is required for achievement of REAP Platinum, but may also be used toward achieving a lower certification.

Intent

To reduce building energy usage by ensuring that the designed energy performance meets a high standard.

Rationale

Traditionally, energy codes and standards have used energy/utility costs as a proxy for energy performance. This system is designed for a wide variety of building types that are located in various climates. For construction at UBC, we are aiming for high performance energy performance, in order to fulfill the objectives of the UTown@UBC Community Energy & Emissions Plan. In an effort to affect the building performance more specifically, energy use intensity targets have been introduced into REAP.

Definitions

- *Energy Use Intensity (EUI)*: Energy use intensity is the measure of the buildings annual energy use per unit of floor area. For the purposes of REAP, this is considered the modeled energy performance, normalized for weather, and reported in kWh/m²/year

Strategies

Many strategies can be employed in order to meet this target. Below are a few strategies that may be considered during design and construction in addition to those mentioned for lower energy performance credits.

- Install high performance triple pane windows with thermally non-conductive frames.
- Perform air leakage tests and reduce the leakage rate to less than 0.25 cfm/m² of building enclosure area.

Resources

- *Canada Mortgage and Housing Corporation*: The CMHC's website includes a number of resources for reducing energy in multi-unit residential buildings.
Site: <http://www.cmhc-schl.gc.ca/en/inpr/bude/himu/waensati/index.cfm>
- *UBC Energy Modeling Guidelines*: UBC developed an Energy Modeling Guideline document that includes best practice procedures for energy modelers.

Documentation: *Submit at the relevant Permit phase*

- *Building Permit*: Preliminary Energy Modeling Checklist.
- *Occupancy Permit*: Final Energy Modeling Checklist, summary output from the energy model, and a letter signed by the Architect or Engineer declaring that the requirements have been met.

EA TARGETS – BUILDING ENERGY EFFICIENCY

EA PLATINUM PLUS

10 points

Requirement

Design the building to meet a maximum energy use intensity (EUI) of 105 kWh/m²/yr, demonstrated using the UBC Energy Modeling Guidelines. This credit is required for achievement of REAP Platinum Plus, but may also be used toward achieving a lower certification.

Intent

To reduce building energy usage by ensuring that the designed energy performance meets a high standard.

Rationale

Traditionally, energy codes and standards have used energy/utility costs as a proxy for energy performance. This system is designed for a wide variety of building types that are located in various climates. For construction at UBC, we are aiming for high performance energy performance, in order to fulfill the objectives of the UTown@UBC Community Energy & Emissions Plan. In an effort to affect the building performance more specifically, energy use intensity targets have been introduced into REAP.

Definitions

- *Energy Use Intensity (EUI)*: Energy use intensity is the measure of the buildings annual energy use per unit of floor area. For the purposes of REAP, this is considered the modeled energy performance, normalized for weather, and reported in kWh/m²/year

Strategies

Many strategies can be employed in order to meet this target. Below are a few strategies that may be considered during design and construction in addition to those mentioned for lower energy performance credits.

- Install high performance triple pane windows with thermally non-conductive frames.
- Perform air leakage tests and reduce the leakage rate to less than 0.2 cfm/m² of building enclosure area.
- Install heat recovery on the ventilation system, whether central or decentralized.

Resources

- *Canada Mortgage and Housing Corporation*: The CMHC's website includes a number of resources for reducing energy in multi-unit residential buildings.
Site: <http://www.cmhc-schl.gc.ca/en/inpr/bude/himu/waensati/index.cfm>
- *UBC Energy Modeling Guidelines*: UBC developed an Energy Modeling Guideline document that includes best practice procedures for energy modelers.

Documentation: *Submit at the relevant Permit phase*

- *Building Permit*: Preliminary Energy Modeling Checklist.
- *Occupancy Permit*: Final Energy Modeling Checklist, summary output from the energy model, and a letter signed by the Architect or Engineer declaring that the requirements have been met.

EA 1 – ENERGY METERING

EA Credit 1.1: Thermal Energy Sub-Metering

1 point

Requirement

Provide separate metering in individual units for measuring thermal energy consumption used for space heating.

Intent

To encourage efficient use of thermal energy for space heating, by providing effective feedback to residents.

Rationale

Individual metering will give homeowners a clear idea of the amount of thermal energy they are using throughout the year. Sub-metering offers an important means to educate users on the energy and cost implications of different activities and use patterns.

Definitions

Strategies

- Install thermal energy (BTU) meters to measure space heating in individual units.
- Consider ultrasonic meters, which are smaller and have improved performance over standard displacement meters. The "first in Canada" installation of ultrasonic meters in a vertical subdivision was at Polygon's Quilchena Park development in Vancouver.

Resources

- *Advanced Buildings Technologies and Practices* provides an overview of technologies and practices that improve the energy and resource efficiency of commercial and multi-unit residential buildings. The 'Load Management' section contains information on utility sub-metering.

Site: http://www.sustainablebuilding.com/Advanced%20Buildings/Utility%20Sub-metering_files/main_t_load_utility_sub_metering.htm

Documentation: *Submit at the Building Permit phase*

Letter signed by Mechanical Engineer declaring that the requirements will be met.

EA 2 – RENEWABLE ENERGY SYSTEMS

EA Credit 2.1: Future Renewable Electricity

1 point

Requirement

Pre-wire buildings and provide installation space for future use of photovoltaic technologies or other renewable electricity generation.

Intent

To encourage and recognize increasing levels of self-supply with renewable technologies, to reduce environmental impacts associated with fossil fuel energy use.

Rationale

Renewable energy systems can help to transform buildings from energy consumers to energy producers. As the technology and economics of renewable systems continues to improve, forward thinking developers are increasingly considering future adoption as a key part of building design.

Strategies

- Analyze the approximate exposed surface areas that could be used for future photovoltaic arrays in order to calculate their potential energy contribution.
- Consider roughing in conduit and pipe chases for potential PV collection areas during building construction in order to reduce future installation costs and disruption to the building.
- Consider discussing with BC Hydro the trade-offs between installing a net metering system as compared to amount of battery storage capacity required to operate the system.
- Consider using Natural Resource Canada's RETScreen renewable energy evaluation tool in order to assess the feasibility of PV installations in any region of Canada.
- Consider the use of fuel cells and provide a location and electrical connection suitable for an installation.

Resources

- *Solar Energy Society of Canada, Inc. (SESCI):* SESCO is a volunteer based, non-profit solar organisation, and carries breaking Canadian solar news, workshops and conferences.
Site: <http://www.sesci.ca/>
- *BC Hydro:* Contact BC Hydro for information on setting up a net metering interconnection agreement.
Site: http://www.bchydro.com/energy-in-bc/acquiring_power/current_offerings/net_metering.html
- *RETScreen:* The RETScreen International Clean Energy Decision Support Centre assists public and private decision makers to effectively analyze and implement renewable energy projects.
Site: <http://www.etscreen.net/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Electrical Engineer declaring that the requirements will be met.
- Drawings showing wiring schematics.

EA 2 – RENEWABLE ENERGY SYSTEMS

EA Credit 2.2: Renewable Electrical Utilization

3 points

Requirement

Utilize renewable electricity for a portion of the building's electric supply.

Intent

To encourage and recognize increasing levels of onsite renewable technologies to reduce environmental impacts associated with fossil fuel energy use

Rationale

Renewable energy systems can help to transform buildings from energy consumers to energy producers.

Strategies

- Specify the use of PV-powered lighting where applicable such exterior landscapes and pathway lighting.
- Consider solar access when designing roofs, walls, windows and external shading devices intended for solar collection. A system that is well integrated building design generally offers the best economics and aesthetics.

Resources

- *The Canadian Solar Industries Association's (CanSIA)*: CanSIA's mission is to develop a strong, efficient, and professional Canadian solar industry, and offers current technical and product information.
Site: <http://www.cansia.ca/>
- *Solar Energy Society of Canada, Inc. (SESCI)*: SESCO is a volunteer based, non-profit solar organisation, and carries breaking Canadian solar news, workshops and conferences.
Site: <http://www.sesci.ca/>
- *RETSscreen*: The RETScreen International Clean Energy Decision Support Centre assists public and private decision to effectively analyze and implement renewable energy projects.
Site: <http://www.retscreen.net/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Electrical Engineer declaring that the requirements will be met.
- Specification sheet for technologies being installed.

EA 2 – RENEWABLE ENERGY SYSTEMS

EA Credit 2.3: Low Carbon District Energy Utilization

5 points

Requirement

Utilize low carbon, renewable energy through connection to the District Energy System for the building's thermal energy supply (or be District Energy compatible).

Intent

To encourage and recognize increasing levels of community scale (District Energy) renewable technologies supply to reduce environmental impacts associated with fossil fuel energy use.

Rationale

Use of renewable energy as opposed to fossil fuel based energy reduces GHG emissions and pollution of air and water.

Strategies

- Connect to a district energy system that utilizes renewable energy for its energy generation.

Resources

- *BC Climate Action Toolkit*: The BC Climate Action Toolkit includes resources and training on district energy systems.
Site: <http://www.toolkit.bc.ca/tool/district-energy-systems>
- *RETScreen*: The RETScreen International Clean Energy Decision Support Centre assists public and private decision to effectively analyze and implement renewable energy projects.
Site: <http://www.retscreen.net/>

Documentation: *Submit at the Building Permit phase*

Letter signed by the Developer declaring requirements will be met.

EA 3 – COMMISSIONING

EA Credit 3.1: Commissioning

4 points

Requirement

Contract a third party Commissioning Authority to develop and implement a commissioning plan for all major building energy systems and verify they are installed, calibrated and perform according to design intent.

Intent

To ensure that best practices in design are combined with best practices in construction.

Rationale

As a new homeowner takes occupancy of a building, they want to ensure that the green building in which they have invested their money has been constructed as designed. The Commissioning Authority, hired as a third party directly by the developer, helps to offer an unbiased quality control step in this development process. Additionally, commissioning has been found to significantly increase energy efficiency of the building.

Definitions

- *Commissioning Authority*: Professional hired by the developer to report that the construction and construction decisions meet the intent of the original design.
- *Building Energy Systems*: Any building system, including mechanical, electrical and controls, that impact the energy consumption of the building.

Strategies

- Engage a Commissioning Authority early in the project to develop a Commissioning Plan and ensure the commissioning requirements are properly covered.
- Mechanical and/or electrical Commissioning Agents will oversee their respective work and schedule. The Commissioning Authority will oversee the Commissioning Agents.
- Have the Authority review design drawings at each milestone (e.g. 30%, 50%, issued for construction), prior to the developer's approval.
- Employ the Authority to do multiple site reviews to catch any potential errors or oversights before correcting the mistake is costly.
- Have the Authority produce a final commissioning report prior to occupancy confirming that the Building's Energy Systems are installed and operating according to design.

Resources

- *Canada Standards Agency*: CSA Standard Z320 is a national standard for building commissioning.
Site: <http://www.csa.ca>
- *Print Media*: *LEED Canada for New Construction and Major Renovations 2009*: Information and resources for EA Credit 3.

Documentation:

Submit at Building Permit phase

- Commissioning Plan

Submit at the Occupancy Permit phase

- Final commissioning report, detailing the final approvals and the project commissioning process.

EA 4 – AIRTIGHTNESS

EA Credit 4.1: Building Envelope Airtightness

2 points

Requirement

The building envelope shall be constructed so that the air change rate is not greater than 3.5 ACH50 when measured in accordance with CAN/CGSB-149.15-M86 (Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method).

Intent

To encourage increased airtightness to save energy and to enhance building envelope durability.

Rationale

Historically 25% - 40% of the heat loss from a typical building occurs because of air leakage, this percentage can undermine other energy efficiency strategies if not controlled. In addition, excessive air leakage across a building assembly can cause moisture to condense inside assemblies resulting in a reduced durability and the possibility of mould development.

Air barrier systems control air flow from conditioned to unconditioned spaces and must be installed in a continuous manner over the entire building enclosure to avoid any gaps..

No exterior assembly can be totally airtight, a small amount of leakage will always occur, this credit specifies a maximum allowable air infiltration.

Definitions

An air barrier is any element that reduces the movement of air through a building enclosure.

The air barrier system is a combination of interconnected materials, flexible sealed joints and components of the building envelope that provide the airtightness of the building enclosure.

Strategies

- Specify air barrier system to be continuous throughout the building paying attention to sealing transition between the walls and roof as well as the foundation and walls.
- Provide flexible seal at all moving joints.
- Design air barrier to withstand pressures that will be present in the building.

Resources

- Information on R-2000 program requiring airtightness:
Site: <http://oee.nrcan.gc.ca/residential/builders-renovators-trades/4350>
- Information about building air barrier systems.
Site: <http://www.wbdg.org/resources/>

Documentation:

Submit at the Building Permit phase

- Letter signed by the Developer stating that the requirements will be met.

Submit at Occupancy Permit phase

- Provide documentation showing test results.

EA 5 – ENERGY MODELING

EA Credit 5.1: Energy Modeling Workshop

2 points

Requirement

Model the energy performance of the building and hold a workshop with the design team, a representative from Campus Sustainability and the contractor to evaluate the results and optimize the design of the project.

Intent

To reduce energy use associated with overall building operation and use.

Rationale

According to Natural Resources Canada, space conditioning and domestic hot water heating combined account for approximately 78% of residential energy demand in BC. Designing buildings to optimize energy usage promotes conservation and reduces operating costs.

Strategies

- Use commercial building energy analysis software or similar to model the building's design for code compliance and EUI.
- Consider applying to BC Hydro Power Smart New Construction for potential rebates associated with energy modeling.
- Use a building simulation that is able to measure the impact of various design scenarios on capital and operating costs and provide rapid feedback to the design team and workshop participants.
- Consider creating bundles that combine various energy performance options in order to identify and analyse the implication of various combinations for the final proposed design.

Resources

- *Natural Resources Canada Office of Energy Efficiency (OEE):* The OEE offers assistance for the design and construction of new buildings that are more energy efficient than standard buildings built in Canada.
Site: <http://www.nrcan.gc.ca/energy/efficiency/buildings/eenb/model/4055>
Energy modeling software: <http://www.nrcan.gc.ca/energy/software-tools/7417>

Documentation: *Submit at the Building Permit phase*

- Minutes and results of the energy modeling workshop.

Materials & Resources (MR)

MR 1 – RECYCLED CONTENT AND REUSED MATERIALS

MR Credit 1.1: Reused Building Materials

2 points

Requirement

Use salvaged, refurbished, or reused materials for at least 5% of the total cost of building materials.

MR Credit 1.2: Reused Building Materials

2 points

Requirement

Use salvaged, refurbished, or reused materials for at least 10% of the total cost of building materials.

Intent

To reduce the environmental impacts associated with manufacturing new building materials by reusing salvaged building materials.

Rationale

Reuse of salvaged materials reduces demolition waste and avoids the environmental impact of extracting raw materials to manufacture new building materials.

Strategies

- Establish communication between building stakeholders to identify opportunities to incorporate reused materials into the building design.
- Identify local sources for salvaged and refurbished materials and other materials available for reuse.
- Consider salvage materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick, and decorative items.

Resources

- *Building Materials Reuse Association*: BMRA is a non-profit organization that facilitates building deconstruction and reuse/recycling of recovered building materials.
Site: <http://www.bmra.org/>
- *Print Media: LEED Canada for New Construction and Major Renovations 2009*: Information and resources for Materials and Resources Credit 3.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Total value of construction materials and total value of re-used building materials.

MR 1 – RECYCLED CONTENT AND REUSED MATERIALS

MR Credit 1.3: Recycled Content Materials

1 or 2 points

Requirement

Specify and use building materials with recycled content levels :

1. Common area carpet with minimum 25% recycled content
2. Drywall with minimum 15% recycled content
3. Batt insulation with minimum 40% recycled content
4. Doors contain minimum 15% recycled material
5. Concrete with minimum 20% fly ash content, excluding suspended slabs
6. Concrete with minimum 40% fly ash content, excluding suspended slabs
7. Cabinetry with minimum 20% recycled content
8. MDF products with minimum 50% recycled content

- Four out of eight recycled content items on list above - 1 point
- All eight recycled content items on list above - 2 Points

Intent

To reduce the environmental impacts associated with manufacturing new building materials by using products with recycled content.

Rationale

Use of materials with recycled content reduces the environmental impacts associated with extracting raw materials for use in the manufacture of new building materials.

Definitions

Recycled content: includes pre-consumer recycled content and post-consumer recycled content.

Strategies

- Begin to consider incorporating recycled content materials into the project in the early stages of design.
- Identify local sources for materials with recycled content, and support regionally produced recycled content products to reduce costs of transportation.
- Evaluate recycled content materials for durability and performance in order to ensure that recycled content materials perform well in terms of strength, maintenance, and lifetime.

Resources

- *Print Media: LEED Canada for New Construction and Major Renovations 2009:* Information and resources for Material & Resources Credit 4.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Manufacturer's cut sheet for each material selected indicating recycled content.

MR 2 – REGIONAL MATERIALS

MR Credit 2.1: Regionally Manufactured Building Materials

1 point

Requirement

Use a minimum of 20% (by value) of building materials and products that are assembled or manufactured within a radius of 800 km (500 miles).

Intent

To foster sustainable regional economic development by increasing demand for building materials that are manufactured locally, and to reduce the environmental impacts associated with transporting materials over long distances.

Rationale

Motor vehicles are major energy consumers and sources of air, noise and water pollution. Transportation represents approximately 27% of total North American energy consumption and 70% of total petroleum consumption. Using materials that are extracted and processed locally reduce their embodied energy.

Definitions

- *Regionally Manufactured Building Materials:* Building materials and products that are assembled or manufactured within a radius of 800 km (500 miles).
- *Embodied Energy:* Embodied energy is the energy used in all of the processes associated with the construction of a building, from the extraction of raw materials, to product delivery. Embodied energy is a significant component of a building's lifecycle impact.

Strategies

- Establish a project goal for locally sourced materials and identify materials and suppliers that can achieve this goal.
- During construction, ensure that the specified local materials are installed and quantify the total percentage of regional materials installed.
- Set up a reporting and documentation system with sub-contractors and materials suppliers to collect and track required information.

Resources

- *Print Media: LEED Canada for New Construction and Major Renovations 2009:* Information and resources for Material & Resources Credit 5.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Total value of building materials and total value of regionally manufactured materials.

MR 2 – REGIONAL MATERIALS

MR Credit 2.2: Regionally Sourced Building Materials

1 point

Requirements

Of the materials from Credit MR 2.1, use a minimum of 50% (by value) of building materials and products that are extracted, harvested or recovered (as well as assembled or manufactured) within a radius of 800 km (500 miles).

Intent

To foster sustainable regional economic development by increasing demand for building materials that are extracted and manufactured locally, and to reduce the environmental impacts associated with transporting materials over long distances.

Rationale

Motor vehicles are major energy consumers and sources of air, noise and water pollution. Transportation represents approximately 27% of total North American energy consumption and 70% of total petroleum consumption. Using materials that are extracted and processed locally reduce their embodied energy.

Definitions

- *Regionally Sourced Building Materials:* Building materials and products that are extracted, harvested, recovered, assembled or manufactured within a radius of 800 km (500 miles).
- *Embodied Energy:* Embodied energy is the energy used in all of the processes associated with the construction of a building, from the extraction of raw materials, to product delivery. Embodied energy is a significant component of a building's lifecycle impact.

Strategies

- Establish a project goal for locally sourced materials and identify materials and material suppliers that can achieve this goal.
- During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed.
- Set up a reporting and documentation system with sub-contractors and materials suppliers to collect and track required information.

Resources

- *Print Media: LEED Canada for New Construction and Major Renovations 2009:* Information and resources for Material & Resources Credit 5.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Total value of regionally manufactured materials and total value of those materials that are also regionally extracted, harvested, or recovered.

MR 3 – CERTIFIED AND NON-ENDANGERED FOREST PRODUCTS

MR Credit 3.1: Dimensional Lumber and Plywood

2 or 3 points

Requirement

Demonstrate that a minimum of 50% of the total value of dimensional lumber and plywood is certified in accordance with either:

- | | |
|-------------------------------------|----------|
| CSA Z809 | 2 points |
| Or Forest Stewardship Council (FSC) | 3 points |

Intent

To support environmentally responsible, socially beneficial, and financially viable forest stewardship.

Rationale

Environmental impacts associated with much of conventional forest practices include soil erosion, stream sedimentation, habitat destruction, water and air pollution and waste generation. Wood certification is an important measure for demonstrating that sustainable forestry practices have been employed.

Definitions

- *Sustainable Forestry*: Forest management intended to meet long-term forest product needs while maintaining forest biodiversity.
- *Chain of Custody Certification*: A document used to verify compliance with FSC guidelines that tracks the movement of wood products from the forest to a vendor.
- *Independent Certifier*: An accredited third-party certifier that conducts independent audits on forest management and the chain of custody.

Strategies

- Research the availability of wood products that are available from FSC or CSA-certified sources.
- Develop a list of local vendors, suppliers and manufacturers that are FSC or CSA certified and establish product availability as early as possible.

Resources

- *Forest Stewardship Council (FSC)*: Certified products bear the FSC logo indicating that the FSC has verified that the wood has been harvested from forests that it deems as sustainably managed.
Site: <http://www.fsccanada.org/>
- *CSA Sustainable Forest Management Standards*: CSA SFM Z809 standards require forest companies to set in place a comprehensive management system.
Site:
http://shop.csa.ca/en/canada/invt/27017442008?utm_source=bing&utm_medium=cpc&utm_term=CSA%20Z809&utm_content=Sustainable+Forest+Management&utm_campaign=ENV+General
- *Print Media: LEED Canada for New Construction and Major Renovations 2009*: Information and resources for Material & Resources Credit 7.

Documentation: **Submit at the Occupancy Permit phase**

- Letter signed by Architect declaring that the requirements have been met.
- Total value of lumber and plywood
- Total value of certified lumber and plywood used in the project and for FSC provide CoC documentation for each product.

MR 3 – CERTIFIED AND NON-ENDANGERED FOREST PRODUCTS

MR Credit 3.2: Hardwood or Bamboo Flooring

2 or 3 points

Requirement

Specify and install hardwood or bamboo flooring that is certified in accordance with either:

CSA Z809	2 points
Or Forest Stewardship Council (FSC)	3 points

Intent

To support environmentally responsible, socially beneficial, and financially viable forest stewardship as well as the use of rapidly renewable flooring materials.

Rationale

Using products made from rapidly renewable materials like bamboo or from certified hardwood encourages sustainable forest management practices.

Definitions

- *Sustainable Forestry*: Forest management intended to meet long-term forest product needs while maintaining forest biodiversity.
- *Chain of Custody Certification*: A document used to verify compliance with FSC guidelines that tracks the movement of wood products from the forest to a vendor.
- *Independent Certifier*: An accredited third-party certifier that conducts independent audits on forest management and the chain of custody.

Strategies

- Research the availability of bamboo flooring or hardwood flooring that is available from FSC or CSA-certified sources.
- Explore engineered hardwood flooring
- Contact vendors as early as possible to establish product availability.

Resources

- *Forest Stewardship Council (FSC)*: Certified products bear the FSC logo indicating that the FSC has verified that the wood has been harvested from forests that it deems as sustainably managed.
Site: <http://www.fsccanada.org/>
- *CSA Sustainable Forest Management Standards*: CSA SFM Z809 standards require forest companies to set in place a comprehensive management system.
Site:
http://shop.csa.ca/en/canada/invt/27017442008?utm_source=bing&utm_medium=cpc&utm_term=CSA%20Z809&utm_content=Sustainable+Forest+Management&utm_campaign=ENV+General
Print Media: *LEED Canada for New Construction and Major Renovations 2009*: Information and resources for Material & Resources Credits 6 & 7.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Manufacturer's cut sheet for each material selected indicating certification standard and for FSC provide CoC documentation for each product.

MR 4 – BUILDING PRODUCTS INGREDIENTS

MR Credit 4.1: Transparency of Ingredients

2 points

Requirement

Install ten different building products from three different manufacturers that demonstrate the chemical inventory of the product to an accuracy of 0.1%. For each product selected provide either :

- Health Product Declaration (HPD)
- Manufacturers Inventory of all ingredients by CAS number, or
- Declare Label (Living Building Institute)

Intent

To encourage transparency in the market place by requesting ingredients for building products. By encouraging early adopters the intent is to start moving towards building products that contain less potentially harmful chemicals

Rationale

Many building products contain ingredients that are detrimental to human health, some are regulated, but many are not. The intent is that by providing transparency of ingredients manufacturers will be encouraged to optimize their products and more avoid more hazardous chemicals.

Definitions

- Health Product Declaration (HPD): is a building product “nutrition label” which reports health-related information. The EPD can be developed using an open standard which is available manufacturers for disclosure of product contents, emissions and health information. The standard is available at www.ppdcollaborative.org

Strategies

- Contact manufacturers as early as possible to ask for documentation.

Resources

Suggestions for alternate products arranged by MasterFormat section.

Site: *Perkins + Will Precautionary List* www.transparency.perkinswill.com

Information about healthy building materials including HPD's.

Site: *Healthy Building Network* www.healthybuilding.net

Building product library providing in depth information about product ingredients:

Site: *The Pharos Project* www.pharosproject.net

Article: *Avoiding Toxic Chemicals in Commercial Building Projects: A Handbook of Common Hazards and How to Keep Them Out.* www.buildinggreen.com

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met, including a list of the chosen products.
- Documentation for each product.

MR 4 – BUILDING PRODUCTS INGREDIENTS

MR Credit 4.2: Optimization of Ingredients

2 points

Requirement

Demonstrate that a minimum of 10% (by value) of building materials are optimized for ingredient content by demonstrating optimization in one of the following ways:

- GreenScreen v1.2 benchmark 4 minimum
- Red List free
- Free of ingredients listed on REACH Authorization or Candidate List

Intent

Encourage the selection of building products that minimize the use or generation of harmful substances.

Rationale

Definitions

- *GreenScreen* is from the not profit Clean Production Action which divides chemicals into four benchmarks, the most hazardous being Benchmark 1.
- *Red List* :a list of chemicals developed by the Living Building Institute to be avoided in building products for use in Living Building Certification.
- *REACH Authorization*: used in legislation developed by the European Union in a broad mandate to evaluate all chemicals and impose restrictions based on their hazard profile.

Resources

Red List, Living Building Challenge, the Red List provides a list of materials and chemicals that are detrimental to human health.

Site: <http://living-future.org/living-building-challenge/certification/documentation-requirements>

GreenScreen provides list of hazardous materials.

Site: <http://www.cleanproduction.org/Green.Greenscreen.php>

REACH authorization list.

Site: <http://echa.europa.eu/web/guest/addressing-chemicals-of-concern/authorisation/recommendation-for-inclusion-in-the-authorisation-list/authorisation-list>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Documentation of optimized ingredient content for each product chosen.
- Total value of building materials and the total value of building materials optimized for ingredient content.

Indoor Environmental Quality (IEQ)

IEQ MANDATORY

IEQ Credit M1: Adhesives and Sealants

Mandatory

Requirement

Specify and use adhesives, sealants and sealant primers that do not exceed the VOC limits of the Canadian Environmental Choice/EcoLogo program *or* do not exceed the VOC limits specified in the State of California's South Coast Air Management District Rule #1168.

Intent

To reduce the quantity of indoor air contaminants that are odorous or potentially irritating or harmful to the comfort and health of installers and occupants.

Rationale

Volatile organic compounds (VOCs) emitted from adhesives, sealants and paints based on polymers, solvents or plasticizers can compromise human health and the earth's atmosphere. VOCs contribute to both smog and poor indoor air quality.

Definitions

- *Volatile Organic Compounds (VOC)*: carbon-containing compounds that evaporate readily at room temperature.

Strategies

- Specify low-VOC adhesives, sealants, and sealant primers in construction documents, and ensure VOC limits are clearly stated in each section where these materials are addressed.
- Schedule field monitoring to ensure that only materials meeting the criteria are used.
- Review manufacturer's cut sheets for all adhesives, sealants and sealant primers to ensure they meet the criteria.

Resources

- *Environmental Choice Program/EcoLogo*: The EcoLogo is a registered trademark of Environment Canada and is part of the Environmental Choice Program. EcoLogo designates products that have met specific environmental performance criteria.

Site: <http://www.ecologo.org/en/index.asp>

- *California South Coast Air Quality Management District*: The District's Rule #1168 contains VOC limits for adhesives, primers and sealers in architectural applications.

Site: <http://www.aqmd.gov/rules/rulesreg.html>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Manufacturer's cut sheet indicating VOC content of all adhesives, sealants and sealant primers used in the project.

IEQ MANDATORY

IEQ Credit M2: Paints and Coatings

Mandatory

Requirement

Specify and use paints and coatings that carry an EcoLogo label or are rated at a minimum GPS-1 by the Master Painter's Institute on the interior of the building.

Intent

To reduce the quantity of indoor air contaminants that are odorous or potentially irritating or harmful to the comfort and health of installers and occupants.

Rationale

Paints and coatings contain organic and inorganic compounds or materials that may adversely impact human health and the atmosphere by releasing solvents or other toxic materials at various stages of the product life cycle.

Definitions

- *Low-Emitting Materials*: Materials containing compounds that do not evaporate at room temperature.
- *Volatile Organic Compounds (VOC)*: Carbon-containing compounds that evaporate readily at room temperature.

Strategies

- Specify low VOC paints and coatings in construction documents, and ensure specifications are clearly stated in each section where these materials are addressed.
- Schedule field monitoring to ensure that only paints and coatings meeting the criteria are used.

Resources

- *Master Painter's Institute*: The Institute provides information on the practical and technical aspects of paints and coatings and their professional application. The 'Specify Green' section contains the MPI rating system for identifying low-emitting paints.
Site: <http://www.paintinfo.com/>
- *Environmental Choice Program/Ecologo*: The EcoLogo is a registered trademark of Environment Canada and is part of the Environmental Choice Program. EcoLogo designates products that have met specific environmental performance criteria.
Site: <http://www.ecologo.org/en/index.asp>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Manufacturer's cut sheet indicating VOC content of all paints and coatings used on the interior of the building.

IEQ MANDATORY

IEQ Credit M3: Carpet

Mandatory

Requirement

Specify and install carpet and carpet cushion that carry the following certifications: Carpet and Rug Institute Green Label Plus *or* Ecologo certification.

Intent

To reduce the quantity of indoor air contaminants that are odorous or potentially irritating or harmful to the comfort and health of installers and occupants.

Rationale

Carpets are sources of volatile organic compounds (VOCs), dust, and fibre release.

Definitions

- *Volatile Organic Compounds (VOC)*: carbon-containing compounds that evaporate readily at room temperature.

Strategies

- Specify low-VOC carpets in construction documents.
- Ensure that VOC limits are clearly stated in each specification section where carpets are addressed.
- Tack in-suite carpets instead of gluing. Carpet in public/common areas should be adhered using low-VOC adhesives.

Resources

- *Carpet and Rug Institute Green Label Indoor Air Quality Test Program*: The program designates products that have been tested by an independent laboratory and have met criteria for very low emissions. The program covers: carpet, cushion and adhesives.
Site: <http://www.carpet-rug.com/>
- *Environmental Choice Program/Ecologo*: The EcoLogo label is a registered trademark of Environment Canada and is part of the Environmental Choice Program. EcoLogo designates products that have met specific environmental performance criteria.
Site: <http://www.ecologo.org/en/certifiedgreenproducts/>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Certification documentation for products selected.

IEQ MANDATORY

IEQ Credit M4: Ventilation Effectiveness

Mandatory

Requirement

Prepare and implement an effective air management strategy that meets the requirements of the current versions of CAN/CSA F326 or ASHRAE-62.1 or 62.2 as applicable to the building configuration.

Intent

To remove indoor air contaminants such as moisture and odours from kitchens and bathrooms, and to ensure adequate levels of outdoor airflow.

Rationale

New construction techniques and materials have led to buildings that are more tightly built, making adequate ventilation all the more critical. Inadequate ventilation can lead to high humidity levels, and can cause combustion gases from unsealed heating equipment to be released into the building.

Strategies

- Consult ASHRAE 62.1, 62.1 or and CSA F326 for detailed design strategies that support ventilation system planning to promote healthy indoor air quality levels. The systems clearly define adequate levels of air changes per hour.
- Proper equipment sizing including air handlers, coils, ducting, and fans are key elements in the overall system design, and should supply the outdoor airflow requirements for each zone in the building.
- During the design phase, pay particular attention to system and equipment components that curb indoor air contaminants at their source such as HEPA filters.
- During the design phase, ensure that system components such as ducts, plenums, and coils are readily accessible for regular cleaning and maintenance.
- Avoid locating outdoor-air intakes near point sources of contaminants such as vehicle emissions, cooling tower drift, or flue vents.
- Ensure that indoor air contaminated by building functions such as copiers, chemical storage, or combustion processes is exhausted locally, and is not allowed to mix with indoor return air.

Resources

- *Canadian Standards Agency (CSA)*: The CSA standard details ventilation standards for buildings and can be found on their website.
Site: <http://www.csa.ca/cm/ca/en/home>
- *American Society of Heating Refrigerating and Air Conditioning Engineers*: ASHRAE develops ventilation standards for worldwide use, including the ASHRAE 62 standard, which specifies ventilation standards for multi-unit residential buildings. The standard is available through ASHRAE's website.
Site: <https://www.ashrae.org/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Mechanical Engineer declaring that the requirements will be met.
- Description of ventilation system and fresh air management strategies employed.

IEQ 1 – LOW-EMITTING MATERIALS

IEQ Credit 1.1: Low VOC Paints and Coatings

2 points

Requirement

Specify and use paints and coatings rated a minimum GPS-2 by the Master Painter's Institute on the interior of the building.

Intent

To reduce the quantity of indoor air contaminants that are odorous or potentially irritating or harmful to the comfort and health of installers and occupants.

Rationale

Paints and coatings contain organic and inorganic compounds or materials that may adversely impact human health and the atmosphere by releasing solvents or other toxic materials at various stages of the product life cycle.

Definitions

- *Low-Emitting Materials*: Materials containing compounds that do not evaporate at room temperature.
- *Volatile Organic Compounds (VOC)*: Carbon-containing compounds that evaporate readily at room temperature

Strategies

- Specify GPS-2 paints in construction documents, and ensure specifications are clearly stated in each section where paints are addressed.
- Schedule field monitoring to ensure that only paints and coatings meeting the criteria are used.

Resources

- *Master Painter's Institute*: The Institute provides information on the practical and technical aspects of paints and coatings and their professional application. The 'Specify Green' section contains the MPI rating system for identifying low-emitting paints.

Site: <http://www.paintinfo.com/>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Manufacturer's cut sheet indicating VOC content of all paints and coatings used on the interior of the building.

IEQ 1 – LOW-EMITTING MATERIALS

IEQ Credit 1.2: Low-Emitting Composite Wood Products

2 points

Requirements

Specify and install interior composite wood products, such as flooring, doors, trim, etc., that have no added urea formaldehyde. Cabinetry is excluded from this credit.

Intent

To reduce the quantity of indoor air contaminants that are odorous or potentially irritating or harmful to the comfort and health of installers and occupants.

Rationale

Urea formaldehyde is a volatile organic compound (VOC) that a product can off-gas over its lifetime. The International Agency for Research on Cancer (IARC) considers formaldehyde a human carcinogen, a key factor in the material's implications for human health over the long-term. VOC's have short-term health implications as well, such as eye, nose and throat irritation, and headaches and nausea.

Definitions

- *Volatile Organic Compounds (VOC)*: Carbon-containing compounds that evaporate readily at room temperature.

Strategies

- Contact local suppliers early to determine availability of interior composite wood products that are urea-formaldehyde free.

Resources

- *Composite Panel Association and Composite Wood Council*: Provides comprehensive information on composite panel and wood.
Site: <http://www.pbmdf.com/>
- *International Agency for Research on Cancer (IARC)*: The objective of the IARC is to promote international collaboration in cancer research.
Site: <http://www.iarc.fr/>
- *Print Media: LEED Canada for New Construction and Major Renovations 2009*: Information and resources for Indoor Environment Quality Credit 4.4.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Manufacturer's cut sheet indicating each interior composite wood product contains no added urea formaldehyde.

IEQ 1 – LOW-EMITTING MATERIALS

IEQ Credit 1.3: Low-emitting Insulation

2 points

Requirements

Specify and install formaldehyde free insulation on the interior of the building.

Intent

To reduce the quantity of indoor air contaminants that are odorous or potentially irritating or harmful to the comfort and health of installers and occupants.

Rationale

Formaldehyde is a volatile organic compound (VOC) that a product can off-gas over its lifetime. The International Agency for Research on Cancer (IARC) considers formaldehyde a human carcinogen, a key factor in the material's implications for human health over the long-term. VOC's have short-term health implications as well, such as eye, nose and throat irritation, and headaches and nausea.

Definitions

- *Volatile Organic Compounds (VOC)*: Carbon-containing compounds that evaporate readily at room temperature.

Strategies

- Contact local suppliers early to determine availability of insulations and drywall that are formaldehyde free.

Resources

- *International Agency for Research on Cancer (IARC)*: The objective of the IARC is to promote international collaboration in cancer research.

Site: <http://www.iarc.fr/>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Manufacturer's cut sheet indicating each product selected is urea-formaldehyde free.

IEQ 1 – LOW-EMITTING MATERIALS

IEQ Credit 1.4: Low-Emitting Cabinetry

2 points

Requirement

Specify and install interior cabinetry (doors, boxes, counters and laminating adhesives) that contain no added urea formaldehyde.

Intent

To reduce the quantity of indoor air contaminants that are odorous or potentially irritating or harmful to the comfort and health of installers and occupants.

Rationale

Urea formaldehyde is a volatile organic compound (VOC) that a product can off-gas over its lifetime. The International Agency for Research on Cancer (IARC) considers formaldehyde a human carcinogen, a key factor in the material's implications for human health over the long-term. VOC's have short-term health implications as well, such as eye, nose and throat irritation, and headaches and nausea.

Definitions

- *Volatile Organic Compounds (VOC)*: Carbon-containing compounds that evaporate readily at room temperature.
- *Carcinogen*: A substance that is an agent in directly causing cancer.

Strategies

- Contact local suppliers early to determine availability of cabinetry that is urea-formaldehyde free.
- Consider using low-VOC finishes for all cabinetry sealants, finishing materials, and millwork.

Resources

- *Composite Panel Association and Composite Wood Council*: Provides comprehensive information on composite panel and wood.
Site: <http://www.pbmdf.com/>
- *International Agency for Research on Cancer (IARC)*: The objective of the IARC is to promote international collaboration in cancer research.
Site: <http://www.iarc.fr/>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Architect declaring that the requirements have been met.
- Manufacturer's cut sheet indicating each product selected contains no added urea formaldehyde.

Construction (CON)

CON MANDATORY

CON Credit M1: Staging and Construction

Mandatory

Requirements

Prepare and implement a Staging and Construction Plan, including alternate detour information and signage for pedestrians and cyclists.

Intent

To protect the ecology and natural features of the site such as topography, watercourses, flora and fauna from damage during the construction process.

Rationale

The construction process can be highly damaging to natural systems on the site. Although these effects cannot be completely avoided, protecting adjacent areas and vegetation from construction activity and debris can help to minimize the overall impact.

Definitions

- *Staging and Construction Plan*: A plan that establishes where and how construction materials and equipment will be temporarily stored on or near the construction site.

Strategies

- Identify staging and equipment storage areas in designated areas that are away from trees and vegetation, and that will cause minimal compaction of soils to be landscaped.
- Establish clearly marked construction and disturbance boundaries; delineate lay-down, recycling and disposal areas; and use areas to be paved as staging areas.
- Reduce the development footprint as much as possible, including building(s), access roads and parking.
- Limit site disturbance by using protective fencing.
- Designate washout area for concrete trucks in a non-disruptive area.
- Do not nail signs, utility boxes or fencing to trees.

Resources

- *UBC Strategic Transportation Plan*: The Strategic Transportation Plan describes UBC's policies for managing all automobile traffic on campus, including requirements and strategies for managing truck traffic during construction.
Site: http://transportation.ubc.ca/transportation-planning/files/2010/08/STP2005_14_July05_Approved.pdf

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Developer declaring that the requirements have been met.
- Copy of staging and construction plan.

CON MANDATORY

CON Credit M2: Vegetation Safeguards and Land-Clearing Debris

Mandatory

Requirements

Prepare a site plan showing the sizes and locations of vegetation to be removed, retained and salvaged, including plants located on adjacent public rights-of-way *and* develop a plan to effectively handle debris from land clearing and divert it from landfill disposal.

Intent

To protect the ecology and natural features of the site such as topography, watercourses, flora and fauna from damage during the construction process.

Rationale

The construction process can be highly damaging to natural systems on the site. Although these effects cannot be completely avoided, protecting adjacent areas and vegetation from construction activity and debris can help to minimize the overall impact.

Strategies

- Carefully survey the site prior to building and map existing site vegetation. Where possible, retain all significant trees and natural features and preserve natural slopes and the existing direction of water flow across the site.
- Prepare a site plan showing the sizes and locations of vegetation to be removed, retained and salvaged, including plants located on adjacent public rights-of-way.
- Protect the root zones of saved trees. Protection of existing significant trees should be substantial, visible and extend to at least the full perimeter of the tree canopy (the "drip line").
- Remove and stockpile topsoil, and where suitable, strip groundcover and shrubs for reuse after construction.
- Develop a plan to effectively handle debris from land clearing and divert from landfill disposal.
- Eliminate the use of pesticides in the preparation of the site to the greatest extent possible.

Resources

- *UBC Strategic Transportation Plan*: The Strategic Transportation Plan describes UBC's policies for managing all automobile traffic on campus, including requirements and strategies for managing truck traffic during construction.
Site: http://transportation.ubc.ca/transportation-planning/files/2010/08/STP2005_14_July05_Approved.pdf

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Developer declaring that the requirements have been met.
- Copy of vegetation site plan.
- Copy of debris and land clearing management plan.

CON MANDATORY

CON Credit M3: Truck Management Plan

Mandatory

Requirement

Prepare and implement a comprehensive truck management plan for the project that conforms to the *UBC Strategic Transportation Plan* and the *Neighbourhood Plan Development Guidelines*.

Intent

To manage truck traffic through residential neighbourhoods and control the frequency with which designated routes are used to reach the project site.

Rationale

Heavy truck traffic contributes to noise and air pollution in residential neighbourhoods. Truck traffic routing is necessary to minimize impacts on neighbourhoods surrounding the development site.

Definitions

- *Truck Management Plan*: A plan that identifies how truck traffic will be managed to disperse and minimize adverse impacts during project construction.

Strategies

- Contact UBC Properties Trust to develop a truck management plan for construction projects.
- Minimize truck trips by using pup or transfer trailers and by reusing materials on site where possible.
- Disperse truck traffic among the designated truck routes that connect to UBC.

Resources

- *UBC Strategic Transportation Plan*: The Strategic Transportation Plan describes UBC's policies for managing all automobile traffic on campus, including requirements and strategies for managing truck traffic during construction.
Site: http://transportation.ubc.ca/transportation-planning/files/2010/08/STP2005_14_July05_Approved.pdf
- *UBC Neighbourhood Plans*: Each UBC neighbourhood has its own development plan. Where specified, truck management plan requirements must be adhered to during construction.
Site: http://www.planning.ubc.ca/vancouver_home/plans_and_policies/land_use_planning/ubc_neighbourhood_plans.php

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Developer declaring that the requirements have been met.
- Copy of truck management plan.

CON MANDATORY

CON Credit M4: Wheel Wash

Mandatory

Requirement

Provide a wheel wash for vehicles leaving the site *or* a street cleaning program and catch basin protection.

Intent

To reduce the amount of soil and other solids leaving the site during excavation and entering into the storm water system.

Rationale

Construction vehicles can transport significant amounts of water contaminants off the site, including sediments, concrete, lubricants, fuels, solvents, fertilisers and pesticides. If allowed to enter storm drains, these contaminants may pollute water systems with silt, change the chemical balance, or remove dissolved oxygen.

Definitions

- *Wheel Wash*: A temporary or permanent installation that uses an immersion bath or water spray to remove mud, soil, rock, debris and other materials from the tires and undercarriages of vehicles.
- *Street Cleaning Program*: Cleaning programs establish schedules for sweeping based on the rate of debris accumulation and the anticipated frequency of rain events.
- *Catch Basin Protection*: Stormwater systems can be protected from sediment and pollutant loads with filtering materials installed in the catch basin system. A catch basin is an inlet from the street to the storm drain system that typically includes a grate and a sump to capture sediment.

Strategies

- Consult with UBC Properties Trust to determine whether truck traffic will be heavy enough to require a wheel wash.
- For street cleaning, identify and focus on priority areas where debris will most likely accumulate and produce the highest contaminant loads. Determine sweeping frequency based on the rate of debris accumulation and the frequency of rain events.
- Protect catch basins with filtering products that will prevent pollutants from entering storm drains.

Resources

- *Best Management Practices Guide for Stormwater*: This BMP guide, developed by Metro Vancouver, provides comprehensive information on stormwater management practices including wheel wash, street cleaning and catch basin protection.

Site: <http://www.metrovancouver.org/services/wastewater/sources/Pages/StormwaterManagement.aspx>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Developer declaring that the requirements have been met.

CON MANDATORY

CON Credit M5: Erosion and Sedimentation Control

Mandatory

Requirement

Prepare and implement a Sediment and Erosion Control Plan that conforms to *Best Management Practices Guide for Stormwater: Appendix H – Construction Site Erosion and Sediment Control Guide* (GVS&DD, October 1999).

Intent

To control on-site erosion to reduce negative impacts on water and air quality.

Rationale

Prevent loss of soil during construction by stormwater runoff and/or wind erosion by taking measures to protect topsoil by stockpiling for reuse. Prevent sedimentation of storm sewer or receiving streams and/or air pollution with dust and particulate matter.

Definitions

- *Soil erosion*: The removal and loss of soil by the action of water, ice, gravity or wind.
- *Sedimentation*: The settling out of soil particles transported by water.
- *Sediment and Erosion Control Plan*: A plan that encompasses all applicable stabilisation strategies required to limit sediment and erosion during construction, including:
 - A statement of erosion control and stormwater control objectives;
 - A comparison of post-development stormwater runoff conditions with predevelopment conditions;
 - A description of all temporary and permanent erosion control and stormwater control measures implemented on the project site; and
 - A description of the type and frequency of maintenance activities required for erosion control

Strategies

- Consult UBC and the Metro Vancouver for recommended measures to mitigate erosion and promote sedimentation control.

Resources

- *BC Ministry of Environment*: The Ministry provides a wide range of publications that support ecologically sensitive site development, including *Stormwater Planning: A Guidebook for British Columbia, Chapter 7: Site Design Solutions for Achieving Performance Targets*

Site: <http://www.env.gov.bc.ca/epd/mun-waste/waste-liquid/stormwater/>

- *Best Management Practices Guide for Stormwater: Appendix H – Construction Site Erosion and Sediment Control Guide*: Greater Vancouver Sewerage and Drainage District, October 1999.

Site: <http://www.metrovancouver.org/services/wastewater/sources/Pages/StormwaterManagement.aspx>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by the Civil Engineer or responsible party declaring that the requirements have been met
- Copy of the Erosion and Sedimentation Control Plan.

CON MANDATORY

CON Credit M6: Waste Management Plan

Mandatory

Requirement

Prepare and implement a Waste Management Plan that diverts 75% (by weight) of construction and demolition waste from landfill.

Intent

To divert construction and demolition from landfill disposal, to redirect recyclable material back to the manufacturing process, and to reclaim reusable construction materials for future use.

Rationale

Although actual waste reduction quantities and techniques will vary by site (based on materials used, local recycling markets and other conditions), builders can manage wastes safely and effectively while diverting the maximum possible amount of construction waste from disposal.

Definitions

- *Waste Management Plan:* A document prepared in advance of construction that details how construction waste will be managed throughout the project. Plans include specific instructions to crews and subcontractors on material separation and handling procedures.

Strategies

- Consider on-site separation and recycling of cardboard, metals, brick, concrete, plastic, clean wood, glass, gypsum wallboard, carpet, and insulation.
- Designate a specific area on the construction site for recycling, and track recycling efforts throughout the construction process.
- Identify construction haulers and recyclers to handle the designated material.

Resources

- Metro Vancouver's Demolition, Land Clearing and Waste Management Toolkits.
Site: <http://vancouver.ca/home-property-development/green-demolition-practices.aspx>
- *Print Media:* *LEED Canada for New Construction and Major Renovations 2009:* Information and resources for Materials & Resource Credit 2.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Contractor declaring that the requirements have been met.
- Copy of construction Waste Management Plan and hauling summary demonstrating 75% diversion.

CON 1 – CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT PLAN

CON Credit 1.1: Indoor Air Quality Management Plan

2 points

Requirement

Prepare and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building.

Intent

To prevent indoor air contamination resulting from the construction process that is odorous or potentially irritating or harmful to the comfort and health of installers and occupants.

Rationale

Building construction inherently includes activities that can contaminate buildings and subsequently impact indoor air quality well after the building is occupied. Construction management strategies and procedures can be instituted during construction that can reduce levels of indoor air contamination.

Definitions

- *Indoor Air Quality Management Plan*: A document specific to a building project that outlines measures to minimize contamination in the building during construction.
- *Absorptive Construction Materials*: Porous construction and finishing materials that can collect air pollutants and later release them into occupied spaces.

Strategies

- Protect the ventilation system ducting during construction, control pollutant sources, and interrupt pathways for contamination.
- Protect stored on-site or installed absorptive construction materials from moisture damage, and sequence installation to avoid contamination of absorptive materials such as carpets.
- Require a cessation of indoor smoking site policy as soon as drywall is delivered.
- Clean interiors, building cavities, ventilation systems and components, and replace filtration media prior to occupancy.

Resources

- *Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction 2nd Edition 2007*: Provides an overview of air pollutants associated with construction and a range of control measures.

Site: www.smacna.org

- *Print Media: LEED Canada for New Construction and Major Renovations 2009*: Information and resources for Indoor Environment Quality Credit 3.1.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Contractor declaring that the requirements have been met.
- Copy of Indoor Air Quality Management Plan.

CON 1 – CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT PLAN

CON Credit 1.2: Flushout / IAQ Test

2 points

Requirement

After construction ends and prior to occupancy conduct a minimum two-week continuous building flushout with new filtration media at 100% outside air *or* conduct a Baseline Indoor Air Quality Test.

Intent

To reduce the concentration of indoor air contaminants produced during construction prior to occupancy.

Rationale

Building construction inherently includes activities that produce air contaminants, which can subsequently impact indoor air quality into occupancy. Flushout procedures undertaken before occupancy expel contaminants that may have accumulated in the building during construction.

Definitions

- *Flushout*: Sustained ventilation of the building after the end of construction and prior to occupancy with new filtration media and outdoor air.
- *Baseline IAQ test*: An indoor air quality testing procedure that randomly selects sampling points to measure the maximum concentration levels for the following contaminants:
 - *Formaldehyde*: 27 ppb
 - *Particulates*: 50 mg per cubic meter
 - *TVOC*: 500 mg per cubic meter
 - *4-PCH*: 6.5 mg per cubic meter

Strategies

- Decide on a flushout plan or an IAQ testing prior to construction start.
- Develop the construction schedule to accommodate flushout or IAQ testing prior to occupancy.
- Include flushout or IAQ testing requirements in tender documents.
- Prior to IAQ testing reduce indoor air contaminant in order to achieve baseline. Retest non-compliant areas.

Resources

- *EPA*: Protocols for environmental requirements for air quality.
Site: <http://www.epa.gov/indoorairplus/index.html>
- *Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 1995*: Provides an overview of air pollutants associated with construction and a range of control measures.
Site: www.smacna.org
- *Print Media: LEED Canada for New Construction and Major Renovations 2009*: Information and resources for Indoor Environment Quality Credit 3.2.

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Contractor declaring that the requirements have been met, including:
- Copy of specifications showing requirement for flushout or results of IAQ testing.

Innovation and Design Process (ID)

ID MANDATORY

ID Credit M1: Goal-Setting Workshop

Mandatory

Requirement

Hold a green building workshop or Design Charrette including the developer, design consultants and contractor to review and develop the strategies for achieving the development's goals and priorities relevant to the Residential Environmental Assessment Program.

Intent

To create, through consensus, a set of comprehensive environmental design goals and strategies for a project and enhance communication and interaction throughout the design process.

Rationale

Goal-setting workshops promote a collaborative vision of specific goals and priorities in the early planning stages of the project. Early consensus on environmental goals amongst key consultants and trades acts as a strong driver in achieving green building goals over the duration of the project.

Definitions

- *Integrated Design Process (IDP)*: IDP involves the full design team and key stakeholders from the beginning of a building project. The group works together in a comprehensive, team-based approach with the goal of producing a successful integration of environmental systems and strategies.
- *Design Charrette*: An intensely focused workshop in which participants with a wide range of backgrounds and expertise are brought together to collaborate on a design problem.
- *Consensus*: The outcome of collaborative problem-solving where the solution is generally accepted rather than considered a grudging compromise, and that agreement is deep-rooted enough that it can stand for some time without need to revisit the issue.

Strategies

- Establish the key deliverables of the goal-setting workshop.
- Define performance goals at the outset and refer to them throughout the project.
- Examine functional requirements.
- Examine site development issues.
- Commence teamwork in the early stages of the project.

Resources

- *U.S. National Renewable Energy Laboratory (NREL)*: The NREL offers a comprehensive "Handbook for Planning and Conducting Charrettes for High-Performance Projects" as well as powerpoint presentation templates and sample charrette reports.

Documentation: *Submit at the Building Permit phase*

Copy of the minutes or report from the Goal Setting Workshop clearly outlining the REAP related priorities and goals.

ID MANDATORY

ID Credit M2: Educate the Homeowner

Mandatory

Requirement

Develop a homeowner's manual that promotes sustainable behaviour and describes all of the sustainable features of the project instructing the homeowner on their proper use. This manual should be incorporated into record drawings or some form that will be accessible beyond the first generation of owner/resident.

Intent

To promote awareness and ensure proper operation and maintenance of various systems in the suite and building.

Rationale

Proper operation and maintenance is required for optimal performance of energy and water efficient technologies. A manual that explains all of the features included in a home provides building occupants with access to the information they need to ensure the technologies perform as intended.

Strategies

- Ensure all of the green features of the home are well documented and described in the homeowner's manual. Provide resources for additional information where possible.
- Proper lifetime operation and maintenance ensures installed features will meet design goals. Provide written operational instructions for all appliances and equipment, maintenance schedules, maintenance instructions, manuals, warranties, and product descriptions.
- Promote sustainable behaviour by providing information on how to minimize energy and resource use throughout the home.

Resources

- *NAHB Model Green Home Building Guidelines; National Association of Homebuilders:* In the 'Operation, Maintenance and Homeowner Education' section, the Guidelines highlight information to include in a homeowner's manual. This also constitutes material the sales staff should have mastery of.

Site: <http://www.nahbgreen.org/Guidelines/nahbguidelines.aspx>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Developer certifying the requirements have been met.
- Copy of homeowner's manual highlighting sustainable features of the project.

ID 1 – INNOVATION IN MATERIALS

ID Credit 1.1: Life-Cycle Assessment

4 points

Requirement

Perform a Life-Cycle Assessment of the project's structure and enclosure and demonstrate a minimum of 5% improvement from a reasonable baseline building for three Environmental Categories.

Intent

To introduce a more holistic assessment of building environmental performance.

Rationale

Life cycle assessment (LCA) is a tool that can inform the design and construction team on how to build a more sustainable building. By performing a LCA during the design phase of the building, the team can look at the costs and benefits of using different materials in the building.

Definitions

Life-Cycle Assessment (LCA): is a technique to assess environmental impacts associated with all the stages of a product's life from-cradle-to-grave (i.e., from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling).

Environmental Categories: global warming potential in CO₂e, depletion of stratospheric ozone, acidification of land and water sources in kg SO₂, eutrophication in kg, formation of tropospheric ozone in kg and depletion on non-renewable energy resources in MJ

Strategies

- Consult with local LCA firms, who can provide the most up-to-date tools and resources on LCA integration into a project.
- Include LCA in the project's major consulting contracts. As the LCA inputs are based on the materials, some price economy may be gained by using the consultant's in-house expertise.
- Incorporate LCA into the contract with the Green Building Specialist. Many green building specialist also have expertise in LCA.
- Train staff on the use of LCA software, such as [Athena's Impact Estimator](#).
- Look for academic links with LCA, which may help in gaining credit for ID Credit 4.1.

Resources

- *LCA Alliance @ UBC:* UBC has developed an alliance of graduate students doing work in Life-Cycle Assessment. Their website offers resources and contacts for more information.
Site: <http://lcaalliance.com/>
- *Wikipedia:* Life-cycle assessment information.
Site: http://en.wikipedia.org/wiki/Life_cycle_assessment

Documentation: *Submit at the Occupancy Permit phase*

- Life-cycle assessment report, showing the results of the life-cycle assessment and confirmation that the credit criteria have been met.

ID 2 – INTEGRATIVE AND UNIVERSAL DESIGN

ID Credit 2.1: Green Building Specialist

1 point

Requirement

Engage an expert in green buildings and sustainable construction practices to provide advice on effective green building strategies to the design team.

Intent

To support, encourage, and streamline the process of implementing green strategies into building projects.

Rationale

The green building specialist can guide the design process and maintain a focus on environmental goals throughout the project. An experienced specialist familiar with the local construction industry can greatly reduce the effort required to achieve the goals associated with sustainable building practices.

Definitions

- *LEED AP*: A Leadership in Energy and Environmental Design Accredited Professional is a individual who has been accredited in the LEED rating system and capable of providing a framework for assessing building performance and meeting sustainability goals.
- *Integrated Design Process (IDP)*: IDP involves the full design team and key stakeholders from the beginning of a building project. The group works together in a comprehensive, team-based approach with the goal of producing a successful integration of environmental systems and strategies.

Strategies

- Utilize an Integrated Design Process to maximize the benefits for the whole project.
- Bring the green building specialist 'on board' early on in the project. From the project's outset, work with the green building specialist to:
 - Establish a reference against which alternative strategies can be evaluated;
 - Set green design goals that are both challenging and reasonably attainable;
 - Promote whole-building design strategies and raise awareness of green building benefits.

Resources

- *Better Bricks*: Provides further insight into the rationale for, and steps for achieving a meaningful integrated design process.
Site: <http://www.betterbricks.com/default.aspx?pid=energyeffectivedesign>
- *Print Media: LEED Canada for New Construction and Major Renovations 2009*: Information and resources for Innovation in Design Credit 2.

Documentation: *Submit at the Building Permit phase*

- Letter signed by Developer identifying an expert in green buildings and construction practices has been engaged for the project.
- Explanation of expert's combination of experience and education that demonstrate ability to provide advice.

ID 2 – INTEGRATIVE AND UNIVERSAL DESIGN

ID Credit 2.2: Design for Safety and Accessibility

1 point

Requirement

Demonstrate that at least 25% of the units in the building have been designed to meet the intent of SAFERhome standards which address issues of accessibility, children's safety, seniors and aging in place.

Intent

To design units with consideration of occupants with special accessibility and safety issues.

Rationale

Statistics Canada reports that 90% of accidents occur in the home. The SAFERhome Standards Society provides a Canadian certification program that simultaneously addresses issues of sustainability and universal design, promoting the health and safety of building occupants and the larger community.

Definitions

- *SAFER*: The acronym for the five tenets of the SAFERhome housing credo: Sustainable, Automated, Friendly, Environmental and Recycling.

Strategies

- Consult with the SAFERhome Society early on to ensure the 19-point criteria required for the certification program will be met in the building design, including:
 - Wider doors and hallways to improve circulation and accessibility.
 - More accessible placement of electrical outlets and plumbing features.
 - Wider stairways with narrower nosings to reduce tripping and falling hazards.

Resources

- *SAFERhome Standards Society*: The non-profit society promotes the adoption and use of housing standards and practices that are safe, healthy and sustainable for occupants and members of the community.

Site: <http://www.saferhomesociety.com/>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements have been met including an explanation of how the criteria have been addressed in the design.

ID 2 – INTEGRATIVE AND UNIVERSAL DESIGN

ID Credit 2.3: Design for Security and Crime Prevention

2 points

Requirement

Demonstrate that the design has been reviewed by an accredited Crime Prevention Through Environmental Design (CPTED) practitioner .

Intent

To alter or enhance the built environment through design that reduces opportunities for crime and nuisance activity.

Rationale

Careful environmental design can discourage and prevent crime, improving quality of life for homeowners and the larger community.

Definitions

Design informed by environmental criminology is based on a number of concepts, including:

- *Access control:* Controlling the access to a building or portion of a building, such as underground parking.
- *Defensibility:* Markers that discourage opportunities for crime such as fencing, locks on doors and bars on windows.
- *Surveillance:* Surveillance can be "natural" where residents observe the public areas of their neighbourhood, and "formal" where a person such as a security guard is employed to watch an area.
- *Target hardening:* Hardening or increasing security of a potential target, including surveillance, lighting, locks and fencing.
- *Territoriality:* Claiming an area as one's own and exerting influence over the area through maintenance of physical markers.

Strategies

- Undertake a review of the design by a certified CPTED practitioner and implement the recommendations to create a safer and more secure building for the occupants and visitors.

Resources

- *Crime Prevention Through Environmental Design Vancouver:* CPTED Vancouver is a non-profit organization which works to increase awareness and provide education and services for design approaches based on environmental criminology.

Site: <http://www.designcentreforcpted.org/Pages/Principles.html>

Documentation: *Submit at the Building Permit phase*

- Letter signed by Architect declaring that the requirements have been met.

ID 3 – MARKET TRANSFORMATION

ID Credit 3.1: Educate the Sales Staff

1 point

Requirement

Develop marketing materials based on the environmental performance of the project and ensure the sales staff is knowledgeable about the green building features.

Intent

To transform the residential housing market by highlighting the wide range of benefits associated with green building features, as compared to conventional construction.

Rationale

Well-designed marketing materials and knowledgeable staff ensure that the benefits of green building ownership are effectively communicated in a competitive housing market. Consumer demand for green building can be increased if more consumers are made aware of the long-term benefits of owning and occupying green homes.

Strategies

- Contract with a housing marketing firm that has a sound understanding of green building principles and effective leverage points within the current housing market.
- Conduct on-site training sessions with sales staff to ensure working knowledge of green building features and systems specific to the building. Use sample products and energy bills as teaching aids.
- Walk-throughs and model suites can be invaluable educational tools for buyers and for sales staff. For example, model suites with display cutaways and wall sections can help to demonstrate energy-efficient construction practices.

Resources

- *Selling Green Homes*: Alameda County's New Home Construction Green Building Guidelines are designed for the residential building industry. See "Chapter 5: Selling Green Homes" for advice on educating sales staff and market differentiation for green homes.
Site: <http://www.stopwaste.org/home/index.asp?page=487>
- *NAHB Model Green Home Building Guidelines*; National Association of Homebuilders: In the 'Operation, Maintenance and Homeowner Education' section, the Guidelines highlight information to include in a homeowner's manual. This also constitutes material the sales staff should have mastery of.
Site: <http://www.nahbgreen.org/Guidelines/nahbguidelines.aspx>
- *The Insider's Guide to Marketing Green Buildings*: This 2005 guide written by Jerry Yudelson provides comprehensive strategies, data, tools and techniques for marketing green buildings.
Site: <http://greenbuildconsult.com/>

Documentation: *Submit at the Occupancy Permit phase*

- Letter signed by Developer declaring that the requirements have been met.
- Copy of marketing material highlighting sustainable features of the project.

ID 4 – ACADEMIC LINKS

ID Credit 4.1: Enhance Research or Further Student Development

5 points

Requirement

Collaborate with UBC students and/or faculty on a research project or other opportunities that are applicable to the current building project, and will enhance the academic mission of the University and integrate it with the community.

Intent

To promote relationships amongst the development and academic communities and research on residential development projects, to aid UBC in achieving its goal of providing leadership in demonstrating the means to a sustainable community on campus.

Rationale

Residential development at UBC constitutes a unique and mutually beneficial opportunity to conduct research, to expand knowledge about green building practice and performance, and to build skills amongst developers, students, faculty, and the community.

Strategies

- Contact the SEEDS Program coordinator to discuss potential research projects that involve students, faculty and university staff. The SEEDS website contains a wide array of projects that have already been completed.
- Consult with project architects and other professionals involved in the building project to identify potential research subjects or issues of interest to the building industry.

Resources

- *SEEDS Program*: SEEDS (Social, Ecological, Economic Development Studies) projects bring together students, faculty and staff in projects that address sustainability issues. SEEDS projects aid the Sustainability Office in achieving its goal of developing an environmentally responsible campus that is socially and economically viable.
Site: <http://sustain.ubc.ca/courses-teaching/seeds/seeds-library>

Documentation:

Submit at the Building Permit phase

- Letter signed by Developer declaring that the requirements will be met.

Submit at the Building Permit phase

- Copy of research project or description of project opportunity.

ID 4 – ACADEMIC LINKS

ID Credit 4.2: Energy Data Sharing

4 points

Requirement

Incorporate a data sharing agreement into the sales contracts or strata constitution that allows building aggregate energy data to be collected for use by UBC Campus Sustainability.

Intent

To better understand actual building energy performance and aid the future development of student/academic research and UBC policy.

Rationale

While modeled energy performance for multi-unit residential buildings has become increasingly more common, actual building performance is much more difficult to obtain. This data, particularly within a defined community, is very valuable for researching best practice, understanding modeled vs. actual performance, and tracking performance trends over time.

Strategies

- Contact the Manager, Green Buildings in the UBC Campus Sustainability to coordinate this effort.
- Coordinate with utility providers to work out an agreement to allow data access to the UBC Campus Sustainability.
- Install a single meter on the electric, water, natural gas, and any other utility and allow for the possibility of access to that data to the UBC Campus Sustainability.
- Write language into the contracts for sales/leases or into the Strata constitution that makes this agreement available.
- Set up an innovative way to provide data back to the building occupants for potential Innovation and Design points.

Documentation: *Submit at the Building Permit phase*

- Letter signed by Developer declaring that the requirements will be met
- Highlighted copies of the sales, lease, and/or Strata documents that detail this agreement.

ID 5 – INNOVATIVE DESIGN

ID Credits 5.1 – 5.3: Innovative Design Strategy or Exemplary Achievement

2 – 6 points

Requirement

Demonstrate exceptional performance above the requirements set by one of the existing credits *or* the implementation of an innovative design strategy not specifically addressed by any of the existing credits.

Intent

To provide design teams and projects the opportunity to be awarded points for exceptional performance achieving the next performance threshold above the requirements set by the UBC Residential Environmental Assessment Program criteria and/or innovative performance not specifically addressed by the program.

Rationale

Although the performance measures covered in the UBC Residential Environmental Assessment Program address a wide range of issues, it is important to continually foster innovation and provide opportunities for developers, designers and contractors to explore other possible advances.

Definitions

- *Integrated Design Process (IDP)*: IDP involves the full design team and key stakeholders from the beginning of a building project. The group works together in a comprehensive, team-based approach with the goal of producing a successful integration of environmental systems and strategies.
- *Design Charrette*: An intensely focused workshop in which participants with a wide range of backgrounds and expertise are brought together to collaborate on a design problem.

Strategies

- Conduct research to identify applicable global best practices for building design, construction, commissioning, and post-occupancy evaluation.
- Consult with the design team and a green building specialist to determine where it is possible to substantially exceed a performance credit.
- Use the goal setting workshop to establish support for individual team members to take new initiatives and propose ideas for innovative strategies throughout the project, where achievable.
- Consider using the Integrated Design Process and design charrettes to identify high performance sustainable design measures that are not covered within the REAP assessment system.

Resources

- *Better Bricks*: Provides further insight into the rationale for, and steps for achieving a meaningful integrated design process.
Site: <http://www.betterbricks.com/default.aspx?pid=energyeffectivedesign>
- *Print Media: LEED Canada for New Construction and Major Renovations 2009*: Information and resources for Innovation in Design Credit 1.

Documentation: *Submit at the Occupancy Permit phase*

- Submit a description of the exceptional performance or the innovative design strategy. The submission should include: a description of the requirement, the intent, a rationale, strategies used and documentation that will be submitted to support the credit achievement.