SUSTAINABILITY CASE STUDY

Fulmer Family Centre for Childhood Studies

for: **Capilano University**

2025-04-23

Prepared by:

Village Consulting

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1. Background

Village Consulting was engaged to support achievement of project sustainability objectives, including Leadership in Energy and Environmental Design (LEED) v4.1 Gold certification. The Fulmer Family Centre for Childhood Studies at Capilano University is a 2-storey new childcare centre that functions as an academic laboratory. It supports practice-based classroom learning and curriculum development across a broad range of programs including the Early Childhood Care and Educational (ECCE) program.

Figure 1: Photos of the project building, provided by Capilano University

LEED (Leadership in Energy and Environmental Design) is a rating system and third-party evaluation tool that is recognized in over 160 countries as the international mark of excellence in green buildings. LEED was developed by the United States Green Building Council (USGBC). Founded in 1992, the USGBC is a non-profit community of leaders working to make green buildings available to everyone within a generation. The USGBC has more than 15,000 member organizations from every sector of the building industry and works to promote buildings that are environmentally responsible, profitable, and healthy places to live and work. Canadian projects are administered and supported by the Canada Green Building Council (CAGBC). Project certification levels range from Certified, Silver, Gold to Platinum.

LEED-certified buildings provide healthier indoor environments for students, staff, and visitors. This is due, in part, to the natural daylight, better ventilation, and less-toxic building materials that improve indoor air quality. Occupant comfort is increased through high performance building systems, occupant thermal and lighting controls, and biophilic design.

The physical learning environment plays an important role in supporting student success. By meeting the requirements of LEED certification, Fulmer Family Centre for Childhood Studies provides both a healthier learning environment and improved environmental sustainability outcomes.

2. Sustainability Fact Sheet

Sustainability Fact Sheet

For Fulmer Family Centre for Childhood Studies

Address: Capilano University, 2055 Purcell Way, North Vancouver, BC, V7J 3H5
# of Storeys: 2-storey
Gross Floor Area: 1,985 m^2
Site Area: 4,032 m^2

Environmental Impact Reduction

Energy Cost Compared to NECB 2011 Baseline +Based on energy modelling report issued on 2022-07-06	41 %*
Embodied Carbon Compared to Baseline Building (Steel Frame) +Based on LCA report issued on 2022-07-06 ++The project building uses structural mass timber	27 %*
Indoor Water Compared to LEED Baseline Building	30 %*
Irrigation Water Calculated per EPA Water Budget Tool	91 %*
Construction Waste Diversion Rate Waste Diversion Rate (by kg)	84 %**
Light Pollution Reduction All exterior lights +Complies with LEED back light, glare, and up-light reduction requirements	100 %**
Parking Reduction Per Institute of Transportation Engineers (ITE) Parking Generation Manual, 5th Edition	73 %*
Rainwater Management 90th Percentile Rainfall Retained	☑
Erosion and Sedimentation Control Planning and Monitoring	☑

Healthful Space

Open Space % Site Area with Open Space	38 %**
Protected & Restored Habitat % Preserved Greenfield Area	93 %**
Quality Views from Indoors % Regularly Occupied Area with Quality Views	79 %**
Low Emitting Materials % Compliance for All Finishes (by Surface Area)	89 %**
Thermal Comfort Controllability % Occupied Area with Occupant Controls	100 %**
Lighting Controllability % Occupied Area with Occupant Controls	100 %**
Construction Indoor Air Quality Management Planning and Monitoring	☑
Building Material Ingredients Declaration	30 products
Healthy Building Material Certification	5 products
Environmental Product Declaration	44 products

* Percent Reduction per LEED v4 BD+C New Construction
** Percent Compliance per LEED v4 BD+C New Construction

3. Sustainability Initiatives

3.1. Operating GHG Reductions

Limiting our energy use is important because almost all the ways we generate useful energy produce greenhouse gas (GHG) emissions at some point in their product chain and contribute to climate change. Fuel choices matter: the use of gasoline, diesel and natural gas are very GHG-intensive, while in most of Canada electricity generation is relatively clean. Unfortunately, electricity production in Alberta is still very GHG-intensive (this is slowly changing as old-style power plants are replaced with renewables like hydro turbines, wind turbines and solar panels.

This building features a high-performance envelope with optimized airtightness, energy efficient ventilation systems and advanced lighting solutions. Compared to a standardized baseline building, this building is expected to use 30% less energy each year.

Actionable Take-aways:
Understand where and from what fuels the energy you use comes from. Many new buildings are fully electric, and don't use any natural gas. You may be able to install solar panels at home or purchase green power from your electricity provider.

3.2. Embodied Carbon Reduction

Greenhouse gas emissions are created not only when our buildings consume energy, but also when the materials our buildings are made of are extracted from the ground, processed, manufactured into useful components, delivered to site, installed, maintained, and disposed of at end of life. This is called embodied carbon: the greenhouse gas impact embodied within the materials themselves. Embodied carbon impacts of a project can be reduced by restoring an existing building instead of constructing a new one. If this is not possible, choosing building materials like wood or steel (not concrete) with lower embodied carbon is preferable.

During the design of this building, an analysis of the whole lifecycle embodied carbon impacts of the structural and enclosure components was completed. The analysis covered embodied carbon (global warming potential) as well as other metrics, including: depletion of stratospheric ozone layer, acidification of land & water sources, eutrophication of waterways, formation of tropospheric ozone, and depletion of nonrenewable energy resources.

Actionable Take-aways:
You can help minimize embodied carbon by choosing to reuse existing items rather than buying new. This could include homes, automobiles, furniture, etc.

3.3. LED Lighting

Humans illuminate almost all of the indoor and outdoor spaces that we use, and lighting can make up a large portion of the energy use of our buildings. Lighting technology has improved drastically over the last 150 years. As late as the 1990s people were still lighting their homes with incandescent lightbulbs. Since then, compact fluorescent (CFL) and now light-emitting diode (LED) lamps have become common place and offer improved lighting quality and colour rendering while only using 10% of the energy of an incandescent lightbulb.

This building exclusively uses LED lighting, which consumes significantly less energy than traditional fluorescent and incandescent lights, offers a much longer lifespan, and is mercury-free for safer and more sustainable choice.

Actionable Take-aways:
Make sure to turn off lights that you aren't using. Only buy LED lights, do not purchase new incandescent lights. If you have any incandescent lights at home, they should be replaced with LED lights as soon as possible. Any CFL lights can be replaced at the end of their useful life.

3.4. Drive Less

Our transportation choices greatly impact carbon emissions and human health. Transportation accounts for ~25% of Canada's total greenhouse gas emissions (in 2019)[1], and about half of that comes from use of light-duty vehicles[2] like the family car. Spending too much time in automobiles and less time being active can contribute to an inactive and unhealthy lifestyle.

This facility is conveniently located next to a bus bay served by two routes, offering a total of approximately 130 weekday trips and 75 weekend trips. To plan your journey to this location using public transit, visit TransLink's website.

Actionable Take-aways:
Whenever you can, choose active transportation (walking, running, bicycling, etc.). When you can't do this, consider shared transportation options like public transit, or carpooling (riding with a friend). Active transportation does not emit any carbon emissions, while shared transportation can somewhat reduce emissions by moving more people with fewer vehicles.

3.5. Choose Electric Vehicles

Vehicles with internal combustion engines (burning liquid fuel like gasoline or diesel) create smog, particulate matter, and other airborne pollutants that can make people sick. Alternatively, electric vehicles produce no direct greenhouse gas emissions or air pollution when operating. Even when powered by carbon-intensive electricity, electric vehicles still result in reduced greenhouse gas emissions.

Actionable Take-aways:
Capilano University has many level 2 electric vehicle charging stations on campus. To find the locations of these charging stations, please refer to the campus site map available on the University's website.

[1] Government of Canada, Energy Profiles: https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/cda-eng.html)
[2] Government of Canada, Greenhouse Gas Inventory: https://data.ec.gc.ca/data/substances/monitor/canada-s-official-greenhouse-gas-inventory/B-Economic-Sector/EN_GHG_Econ_Canada.xlsx

3.6. Water Efficient Irrigation Systems

Fresh water is a limited resource. Though it can replenish naturally over time via the water cycle, people sometimes consume fresh water too quickly.

This facility uses over 50% less water for irrigation compared to a similar baseline facility by incorporating drought tolerant and/or native plants that require less water, as well as water efficient irrigation systems such as drip irrigation.

Actionable Take-aways:
You can reduce potable water use for irrigation by not watering your lawn (with spray irrigation or otherwise), planting only native or drought-tolerant plants, and covering your garden beds with mulch to retain moisture. If you must use irrigation, consider using drip-irrigation (water drips slowly from holes in a hose instead of spraying into the air) or installing a rain-barrel to capture and use rainwater (so that potable water can be preserved for human consumption).

3.7. Water Efficient Equipment

This building uses approximately 30% less water for non-process plumbing fixtures than a similar baseline facility. This includes water efficient plumbing fixtures and appliances.

Figure 2: Indoor Water Use at ECCE

Fixture Type	Water Consumption
Water Sense Labeled Toilets	4.8 Liter per Flush 3.8 Liter per Flush
Restroom Faucets	1.3 Liter per Minute
Kitchen Sinks	1.9 Liter per Minute

Actionable Take-aways:
At home, you can install low-flow plumbing fixtures like those described above. Look for fixtures and appliances with WaterSense or ENERGY STAR labels.

3.8. Fresh Air Volume

People produce or track dust, carbon dioxide, and other pollutants as they go about their daily lives that can accumulate in buildings. Additionally, some naturally occurring pollutants, such as radon, can accumulate in building without proper air circulation. As people spend at least 90% of their time indoors, it is important to manage these pollutants to keep our indoor spaces clean and provide better indoor air quality.

This facility is designed to provide fresh outdoor air in alignment with the requirements of ASHRAE 62.1, and industry standard. The amount of fresh air required for each space can vary depending on the size of the room and the expected number of people using the room (people breath out carbon dioxide). Airflow monitoring devices were installed in the mechanical ventilation systems to notify the building automation system and operators if the supply rate of door air falls lower than desired.

Actionable Take-aways:
Poorly ventilated indoor environments can lead to a buildup of pollutants such as carbon dioxide (CO2), carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter. This has the

potential to contribute to a range of adverse health effects, including: headaches, shortness of breath, decreased cognitive function, and more. A simple way to improve indoor air quality is to open windows regularly, especially after activities like cooking or sleeping. Strategic use of fans can enhance natural ventilation by promoting cross-breezes and improving overall air circulation within the space. Additionally, portable recirculating air filters can reduce space pollutant levels. Inexpensive recirculating filters can be made at home (see Corsi-Rosenthal box).

3.9. Carbon Dioxide Monitoring

Exposure to high concentrations of carbon dioxide (CO_2) can make people uncomfortable: causing headache, tiredness, sore throat, dizziness, stuffy nose, and difficulty concentrating[1]. Usually, the primary source of carbon dioxide in buildings is when it is exhaled by people. In Canada, the allowable long-term (24-hour average) exposure limit for carbon dioxide is 1,000 parts per million (ppm)[3].

Carbon dioxide sensors were installed in all densely occupied spaces of this facility including classrooms, labs, meeting rooms , etc. They were installed in the breathing zone (at a height between 0.9 and 1.8 meters) to most accurately measure the CO_2 occupants are exposed to. The sensors are connected to the buildings automation system and notify the building operator when the detected CO_2 concentration is higher than 750 ppm.

Actionable Take-aways:
You can reduce indoor CO_2 level by increasing air circulation. This can be accomplished by opening a window, making sure your furnace fan is set to always run. You can also consider using a portable fan or ceiling fan. Note that most homes are unlikely to have high CO_2 concentrations due to their leakiness and low occupancy.

3.10. Cross-Contamination Control

Buildings often contain sources of pollutants and particulate that can negatively impact human health. In particular: cleaning supplies, high-capacity printers, and other hazardous liquids or gases. These pollutants can travel through the air circulation of the building. To prevent cross contamination (from a storage room to a classroom for example) it is a good idea to isolate the rooms where hazardous pollutants are located. The rooms can be negatively pressurized with high exhaust rates and be provided with physical barriers, so that air cannot flow from them to protected rooms.

This facility's janitorial rooms, laundry rooms and waste room where pollutant sources may exist are mechanically and architecturally isolated. They are negatively pressured with sufficient exhaust and are provided with deck-to-deck (floor-to-floor) partitions and self-closing doors.

Actionable Take-aways:
Do not use hazardous chemicals and gases without supervision by responsible adults. All hazardous products should have a safety data sheets (SDS) nearby (or they can be found on the manufacturer's website). Always read the safety data sheet thoroughly before using any hazardous materials to understand the risks and any necessary treatment after exposure.

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[3] Government of Canada, Carbon Dioxide in Your Home (2021): https://www.canada.ca/en/health-canada/services/publications/healthy-living/carbon-dioxide-home.html

3.11. MERV 13 Filtration

People produce or track dust, carbon dioxide, and other pollutants as they go about their daily lives that can accumulate in buildings. As people spend at least 90% of their time indoors, it is important to manage these pollutants to keep our indoor spaces clean and provide better indoor air quality. Air filtration in ventilation systems is required to provide cleaner air. One way to measure filter performance is with a MERV rating. A higher MERV rating means the air filters remove a large range of particle sizes, as determined when operating at the least effective point in its life[4]. MERV 13 filters are considered high performing, with MERV 8 filters being standard.

This facility includes MERV 13 filters in the ventilation system. These are replaced by the facility operator as needed. MERV 13 filters can filter not only dust and mold spores, but also bacteria and viruses.

Actionable Take-aways:
Ask what kind of air filtration is used in your home. MERV rated filters can be purchased for home use. Consider at least MERV 8, and MERV 13 if possible. However, it is important to note that more energy is required for fans to push air through higher performance filters.

3.12. Thermal Comfort

Thermal comfort greatly impacts human mood, motivation, and productivity. It also plays a significant role in our health including integumentary, endocrine and respiratory systems[5]. Well-designed building mechanical and envelope systems support improved occupant thermal comfort. As thermal preferences can vary from person to person it is important to provide individual control such as thermostats, operable windows / dampers, fans, etc.

The facility's cooling and heating demand was reduced by designing a high-performance building envelope. Then, ASHRAE Standard 55 – 2010 calculation were completed to verify the building's conditioning systems would provide acceptable thermal comfort (temperature and humidity) for the majority of building occupants. In addition, each occupied space is provided with a thermostat such that it can be separately controlled if required.

Actionable Take-aways:
Wear comfortable and appropriate clothes for the weather and your activity (e.g. shorts in the summer, sweaters in the winter). This will help you stay comfortable passively before you need to turn to adding more mechanical heating or cooling.

3.13. Prevent Light Pollution

Artificial light has allowed people to extend their hours of activity beyond sunset with added safety and comfort. However, excess artificial light (light pollution) can also be disruptive to people and wildlife. Nocturnal species that hunt or forage at night, as well as some plant species, cannot adjust to seasonal variations when exposed to light that should not exist in their natural environment. Too much light in

[4] IWBI, WELL Glossary (2022): https://v2.wellcertified.com/en/wellv2/glossary
[5] IWBI, WELL v2 Reference Guide, Thermal Comfort Overview (2022): https://v2.wellcertified.com/en/wellv2/thermal%20comfort

the late evening (particularly white light) can disrupt human circadian rhythms (our bodies' sleep cycles) and contribute to improper sleep.

This building features outdoor light fixtures that are directly downward and strategically positioned away from the property boundaries to eliminate upward-oriented lighting and reduce glare. BUG ratings (backlight, up light, and glare) are a light fixture classification system used to identify outdoor lighting fixtures that minimize light pollution.

Actionable Take-aways:
Turn off TV's, phones, or other displays one to two hours before going to bed. If this is not practical, consider dimming and colour-shifting them red (called "night light" on most computers and phones). You can also select room lighting with the ability to be dimmed and colour shifted.

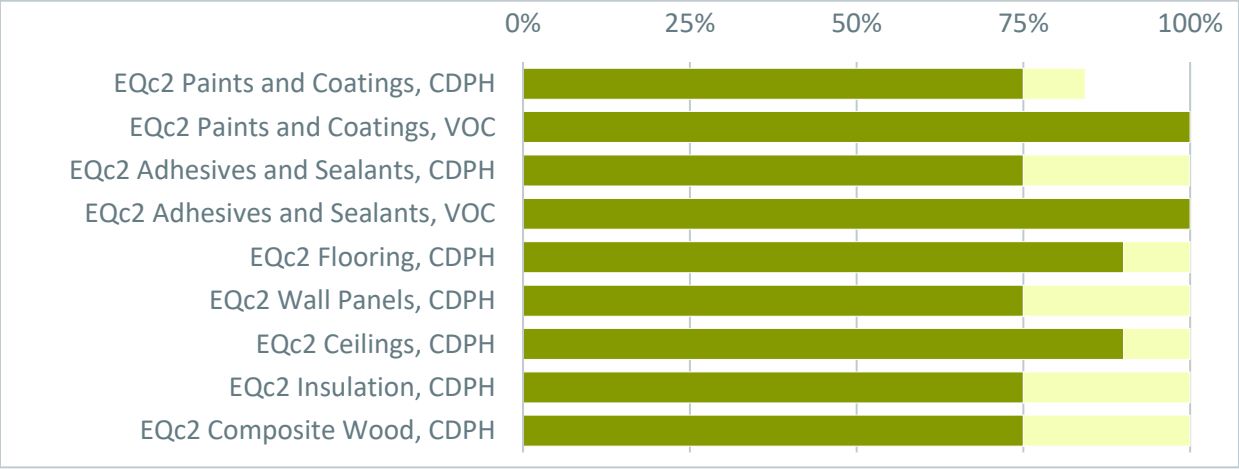
3.14. Healthy Building Materials

Humans have often included new materials in our lives before learning of their harmful effects on our health. Lead, asbestos, and mercury are examples of materials once common and now known to be dangerous, thus we regulate their use. Volatile organic compounds (VOCs) and formaldehyde are harmful emissions commonly found in interior finishes today (such as paints, sealants, and adhesives) that can cause respiratory health issues and increased cancer risks[6]. Many manufacturers now publish reports disclosing potential health impacts of ingredients of their products (called Health Product Declarations).

Legend
For Target: **Compliant Products Selected**

Beyond Target: **Compliant Products Selected**

Figure 3: Low Emitting Materials Compliance at Fulmer Family Centre for Childhood Studies



Low emitting interior finishes were used throughout this facility as shown above. The flooring, ceilings and insulation meet California Department of Public Health testing standard. All paints, coatings,

[6] *U.S. EPA., Volatile Organic Compounds' Impact on Indoor Air Quality (2017): https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality*

adhesives and sealants applied on site are low- or no-VOC. Composite wood used is classified as ultra-low- or no-formaldehyde.

Actionable Take-aways:
When buying paints, coatings, sealants, or adhesives for home, choose ones that have CDPH testing certificates, including: GreenGuard Gold, SCS Indoor Advantage Gold, MAS Certified Green, and Certified Clean Air.

3.15. Preferable Building Materials

Environmentally preferred materials are those that are sustainably sourced, manufactured, and shipped. These may include materials with high recycled content, sustainably harvested wood products with Forest Stewardship Council (FSC) certification, locally extracted & manufactured materials, and rapidly renewable materials like cork. Many manufacturers now publish life cycle assessments of their products to disclose the environmental impacts of manufacturing their products (called Environmental Product Declarations).

Legend
For Target: **Compliant Products Selected**

Beyond Target: **Compliant Products Selected**

Figure 4: Percentage Compliance Rate by Cost at Fulmer Family Centre for Childhood Studies

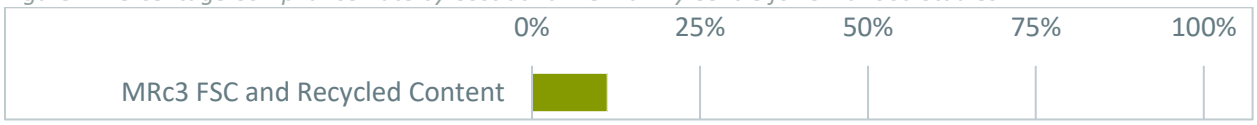
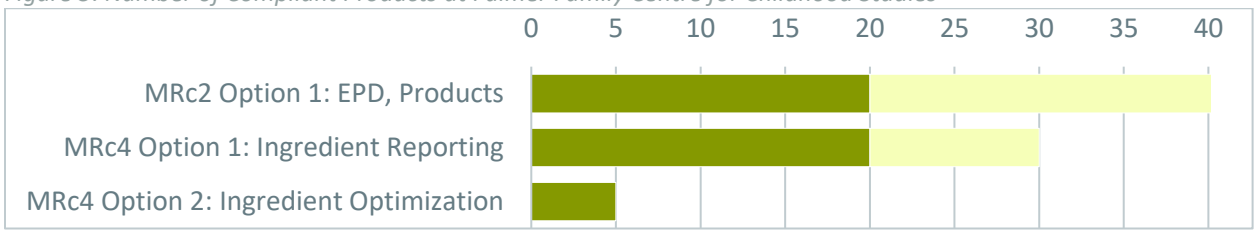


Figure 5: Number of Compliant Products at Fulmer Family Centre for Childhood Studies



The designers and builders of this facility put extensive effort into selecting as many environmentally preferred building materials as possible. Strict material requirements were set for the suppliers and the team tracked all materials brought to site during construction to ensure we achieved our objectives.

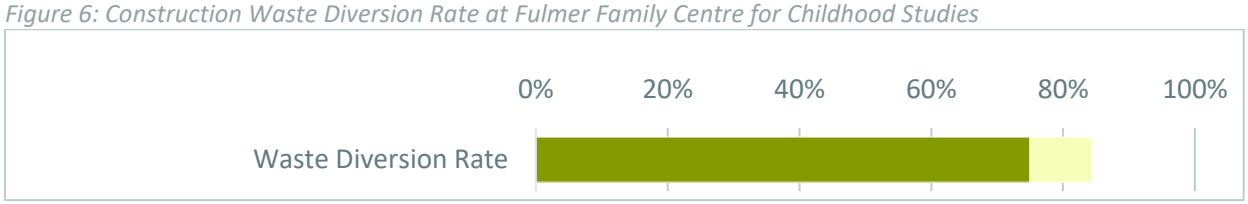
Actionable Take-aways:
You can choose products with high recycled content or Forestry Stewardship Council (FSC) content (some paper products for example). Also, you can choose products that are made in your city, or your province.

3.16. Waste Reduction

The environmental burden from material waste continues to grow as land is consumed for landfills, oceans accumulate garbage, and microplastics enter the human food chain[7]. The average Canadian creates 402 kg of waste residential waste each year (in 2018)[8] and collectively Canadians produced 35.6 million tonnes of waste in 2018[9]. Recycling can help us clean up our waste, though plastics can be impractical or impossible to recycle. Consuming less and choosing biodegradable materials can help us produce less waste to begin with.

In alignment with LEED BD+C v4 credit *Storage & Collection of Recyclables*, Capilano University has a comprehensive recycling program for paper, carboards, glass, plastics, metals, refundable containers, and organic waste. Electronic waste and batteries are collected at this facility to be appropriately disposed of.

Figure 6: Construction Waste Diversion Rate at Fulmer Family Centre for Childhood Studies



In addition, a construction waste management plan was implemented to minimize the amount of waste sent to landfill during construction. The project's goal was to achieve a 75% waste diversion rate and successfully exceeded this target by diverting 80% of all construction and demolition waste from landfill.

Actionable Take-aways:
Recycle everything you can. Beyond this, work to reduce non-biodegradable waste: use a reusable bottle (avoid bottled water), use reusable food containers / utensils (avoid single-use food containers / utensils). Avoid using plastic wherever possible and choose plain paper, cardboard, or other biodegradable materials instead. The less disposable material you use, the less must be produced.

[7] *Government of Canada, Plastic pollution information sheet: https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/chemicals-glance/plastic-pollution.html*
[8] *Government of Canada, Solid Waste Diversion and Disposal (2022): https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/solid-waste-diversion-disposal.html*