



SUSTAINABLE APPROACH & GREEN FEATURES

...green infrastructure, low energy design and practical sustainability features like preserving trees, building gardens and orchards, and using roofs to create pleasant micro-climates...



Sustainability Approach

- The Bannerman Green Housing Co-op has ambitious sustainability targets, and is committed to very high levels of energy and carbon performance for all projects. Third party certifications outline ambitious targets for these metrics. To achieve these goals, it is key to ensure that all parties (designers, consultants, owners, funding authorities) are on the same page. **From inception to completion, the team needs to work together in an integrated fashion.**
- Using a third-party certification is paramount to ensuring sustainability targets are both designed and constructed. 64 Bannerman is pursuing both Living Building Challenge Energy Petal and Passive House Low Energy Building accreditation, both of which will confirm that the performance of the building matches the designed intent.

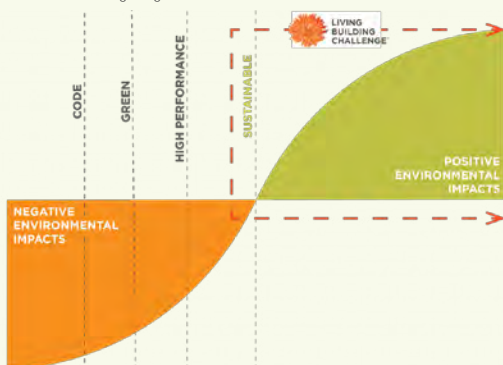


The Living Building Challenge (LBC) is a sustainability certification program and design framework developed by the International Living Future Institute (ILFI). It sets a rigorous standard for environmentally friendly and socially responsible building design and construction. The program is focused on creating buildings that operate as self-sufficient, regenerative systems and contribute positively to their surroundings. Achieving LBC certification is a rigorous process that involves documentation, performance verification, and often several years of monitoring and assessment to ensure a building meets all required standards.

The Living Building Challenge aims to encourage a new paradigm in sustainable building design and construction, pushing the boundaries of what is possible in terms of environmental performance, health and well-being, and community engagement. It challenges designers and builders to think holistically and innovate in order to create buildings that have a positive impact on both people and the planet.

Seven petals form the core framework of the Living Building Challenge, guiding the design and construction of buildings that are not only sustainable but also regenerative, healthy, and beautiful:

- Place:** Focusing on responsible land use and development, emphasizing the preservation and regeneration of the natural environment.
- Water:** Encouraging the collection, treatment, and responsible management of all water on-site, striving for net-zero water consumption.
- Energy:** Requiring buildings to generate all of their energy from renewable sources, achieving net-zero energy use over a 12-month period.
- Health and Happiness:** Emphasizing indoor air quality, access to natural light, and the use of non-toxic materials to promote occupant health and well-being.
- Materials:** Encouraging the use of locally sourced, responsibly harvested, and transparently documented materials to reduce environmental impact.
- Equity:** Promoting equitable access to building benefits and addressing social and community aspects.
- Beauty:** Fostering aesthetics, cultural significance, and a connection to nature in building design.



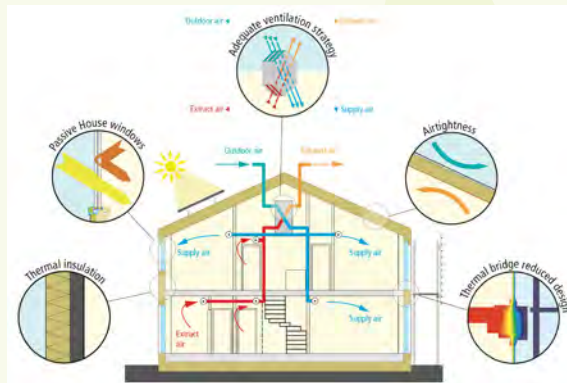
▲ Diagram of environmental impact of buildings, taken from ILFI resources.



Passive House Design is a highly energy-efficient building approach that focuses on minimizing energy consumption while maximizing occupant comfort and indoor air quality. It achieves this through a combination of rigorous principles, including super insulation, airtight construction, high-performance windows, heat recovery ventilation, and the elimination of thermal bridges. By significantly reducing the need for conventional heating and cooling systems, Passive House buildings can cut energy usage by up to 90% compared to traditional structures, resulting in substantial cost savings for occupants and a notable decrease in greenhouse gas emissions.

Importantly, Passive House Design provides occupants with consistent indoor temperatures, excellent air quality, and reduced noise pollution, creating healthier and more comfortable living environments. Its sustainability benefits extend to resource conservation, longevity, and adaptability, making it a crucial element in the transition towards more environmentally friendly and resilient building practices. As we continue to address the challenges of climate change and strive for energy efficiency, Passive House Design stands as a pivotal solution for achieving sustainable, low-energy, and comfortable living spaces. Passive House Design principles include:

- Super Insulation:** Passive House buildings are heavily insulated to minimize heat loss in cold weather and heat gain in hot weather.
- Airtight Construction:** The building envelope is carefully sealed to prevent uncontrolled air leakage, which can lead to energy waste and discomfort.
- High-Performance Windows and Doors:** Passive House buildings incorporate triple-glazed windows and highly insulated doors to reduce heat transfer through these openings.
- Ventilation with Heat Recovery (HRV/ERV):** Passive House buildings are equipped with mechanical ventilation systems that include heat recovery. These systems provide a continuous supply of fresh air while recovering heat from the outgoing stale air, maintaining indoor air quality and minimizing energy loss.
- Elimination of Thermal Bridges:** Thermal bridges are areas in the building envelope where heat can easily escape or enter. Passive House design aims to eliminate or minimize these bridges through careful detailing and insulation.
- Optimal Solar Gain:** Passive House buildings are designed to maximize passive solar gain during the winter months, using the sun's energy to help heat the interior. This is achieved through strategic window placement and sizing.
- Shading and Solar Protection:** To prevent overheating during the summer, Passive House design includes shading strategies that block excessive solar radiation while allowing for natural ventilation.
- Efficient Mechanical Systems:** Although Passive House design reduces the need for mechanical heating and cooling, when necessary, highly efficient, often renewable-based systems are used to meet the remaining demand.
- Energy Modeling and Verification:** Passive House projects undergo energy modeling to predict and optimize energy performance. Post-construction testing verifies that the building meets the stringent criteria set by the Passive House Institute.
- Comfort and Indoor Air Quality:** Passive House prioritizes occupant comfort and health through consistent indoor temperatures, excellent indoor air quality, and noise reduction.



▲ Passive House design strategy diagram, taken from Passive House Institute.



Site Design

A project's orientation on a site needs to be carefully assessed to offer the greatest potential for solar exposure. BGHC projects are designed to capture solar gain on the south facing facades during winter months to provide passive heating. In summer months, shading is provided through overhangs and balconies to prevent overheating and increased energy costs associated with air conditioning. Vegetation, including green roofs and yard treatment is integrated to complement the surrounding neighbourhood, increase biodiversity and support project biophilic design principles.



Water

BGHC's target of LBC core certification requires potable water to be treated like a precious resource by minimizing waste and use, and avoiding downstream impacts of water consumption. The project is targeting a potable water use reduction of 50% compared to a typical new building; aiming to use no potable water for irrigation, and managing/detaining all stormwater on site to reduce combined sewer overflow.



Energy Efficiency

Passive House and LBC both require careful consideration of energy use and embodied carbon. To meet Passive House Low Energy Building, criteria include meeting aggressive space heating and cooling targets of 30kWh/m² per year, an air tightness of 1.0 air changes per hour, and a total primary energy demand of less than 120 kWh/m² per year. These are all substantial improvements on standard building practices. In addition, the LBC Energy petal requires reduction of energy use by 70% compared to an equivalent baseline building and the production of 105% of annual energy needs through on-site renewable sources. No combustion on site is permitted. All embodied carbon must be offset through a carbon offset purchase. Each suite, and end-use of energy will be metered so that occupants can understand and work to reduce their energy consumption once the building is inhabited.



Sustainable Materials

BGHC is targeting a number of different metrics regarding sustainable materials through the Living Building Challenge. This includes specifying several projects that adhere to rigorous sustainability standards, sourcing wood products that are either salvaged or FSC certified, and sourcing at least 20% of construction materials by cost within 500km of the site. In order to meet these requirements, the project team is engaged in advocacy with manufacturers and suppliers, and must carefully document decisions at each stage of the design process.



Recycling & Waste Diversion

LBC requires a minimum of 80% of construction waste material be diverted from landfill. This requires the project team to examine alternate construction methods that can reduce product waste, especially where no recycling infrastructure exists. Construction waste includes any materials that are on site, purchase, or used in the project but not permanently installed, including demolition and packaging waste. Dedicated infrastructure is provided for collection of recyclables and compostable food scraps during occupancy.



Healthy Indoor Environments

One of the key drivers of a healthy indoor environment is the ventilation system, which will be designed to ASHRAE 62 standards, with bathrooms, kitchens and janitorial areas requiring direct exhaust. BGHC is also requiring that 75% of all regularly occupied spaces within the building have outside views and daylight; this applies to each space within the building, as well as the building as a whole. Smoking of any sort is prohibited in all buildings and enclosed spaces, and within 25' of any building opening. Design elements and material choices will be carefully considered in order to maintain very good air quality, including walk-off mats at entrances, and low-VOC material choices.



Commissioning

Both Living Building Challenge and Passive House are performance based certification. This means that once built, the projects are measured to ensure compliance. Commissioning Agents are an important part of this process: they offer a third-party validation of mechanical and electrical systems to ensure that what is being designed and installed meets project goals, and that the equipment is functioning as per the design.