CASE STUDY/
GREEN BUILDING

UBC Campus Sustainability Office

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

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Abstract/

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UBC MADE SIGNIFICANT CONTRIBUTIONS TO THE FLEDGLING GREEN BUILDING INDUSTRY WITH THE C.K. CHOI BUILDING IN 1996 AND THE LIU CENTRE IN 2000.

GREEN BUILDINGS WILL PLAY A MAJOR ROLE IN UBC'S IMPLEMENTATION OF THE UBC CLIMATE ACTION PLAN. UBC IS LEVERAGING THE NECESSITY FOR CLIMATE ACTION TO IMPROVE ITS EXISTING AND NEW BUILDINGS.

UBC DEMONSTRATES BOTH INSTITUTIONAL AND RESIDENTIAL GREEN BUILDING PRACTICES, MAKING UBC UNIQUE AMONG UNIVERSITIES AND A MODEL FOR OTHER MUNICIPALITIES.

Introduction

PHOTO BUNTING COADY ARCHITECTS

LIFE SCIENCES CENTRE IS THE LARGEST BUILDING IN CANADA TO EARN LEADERSHIP IN ENERGY AND DESIGN (LEED) GOLD CERTIFICATION

UBC's journey toward creating green buildings and a sustainable campus began with signing both the Talloires Declaration and the Halifax Declaration in the early 1990s, pledging to make sustainability the foundation for campus operations, research and teaching. These declarations served as touchstones for early green building champions at UBC.

The C.K. Choi Building for the Institute of Asian Research, UBC's first green building, was also one of the world's first green buildings. This revolutionary building resulted from the efforts of a few visionary champions at the university, who were determined to change the traditional construction process and build a ground-breaking example of high-performance, low-impact architecture.

Following the C.K. Choi, UBC built other notable green buildings such as the Liu Centre (2000) and the Life Sciences Centre (2004), the largest building in Canada to earn Leadership in Energy and Design (LEED) Gold certification from the US Green Building Council.

To guide construction of all campus buildings, UBC enshrined sustainable building practices into the Technical Guidelines. This occurred at the start of a renewed construction boom on campus and has produced a number of high-performance buildings, each featuring innovative sustainable building practices, including the Fred Kaiser Building, the Institute for Computing, Information and Cognitive Systems, the Michael Smith Laboratories and the Irving K. Barber Learning Centre. Green building at UBC continues to evolve in the context of provincial and institutional greenhouse gas (GHG) reduction and sustainable development initiatives.

Context /

SINCE THE SIGNING OF THE TALLOIRES AND HALIFAX DECLARATIONS IN THE 1990s, THE POLICY AND LEGISLATION FRAMEWORK FOR GREEN BUILDINGS AT UBC HAS DEVELOPED SIGNIFICANTLY: PROVINCIAL REQUIREMENTS HAVE EMERGED IN THE FORM OF A HIGH-PERFORMANCE BUILDING POLICY, A 'CARBON NEUTRAL BY 2010' MANDATE AND A 'GREEN' BC BUILDING CODE.

 PHOTO BY VERONICA STARK

Since the signing of the Talloires and Halifax Declarations in the 1990s, the policy and legislation framework for green buildings at UBC has developed significantly: building projects at UBC have been informed by a Sustainable Development policy since 1997; projects must implement Technical Guidelines that incorporated sustainable building practices and have been enhanced to incorporate LEED requirements; and provincial requirements have emerged in the form of a High-Performance Building Policy, a **'Carbon Neutral by 2010'** mandate and a 'Green' BC Building Code.

EVOLVING INSTITUTIONAL CONTEXT

UBC Policy 5, Sustainable Development

UBC Policy 5 was approved in May 1997. While the policy does not explicitly refer to green buildings, the policy's broader objectives to minimize pollution of air, water and soil and to conserve resources and reduce waste provide the context and rationale for implementing green buildings at the University.

UBC Technical Guidelines

The UBC Technical Guidelines function as an add-on to the BC Building Code to ensure that new construction and renovation of all university-owned institutional buildings meet UBC's expectations for performance and quality. In 2002, the Technical Guidelines underwent a significant revision from prescriptive to performance requirements and, as part of this process, many of the requirements were updated to be nominally equivalent to LEED Silver performance. As of June 2008, the guidelines incorporate the requirements for all seven LEED prerequisites in LEED Canada-NC (New Construction & Major Renovations).

Climate Action

Green buildings will play a major role in implementing the UBC Climate Action Plan (CAP). The CAP ensures UBC will meet its commitments under the University and College Presidents' Climate Change Statement of Action for Canada, as well as regulatory requirements from the Province of British Columbia for a carbon neutral public sector. Demand-side measures for buildings in the CAP include specific energy performance requirements covering all building project types on campus, plus absolute performance targets in terms of energy density (kwh/m2).

PROVINCIAL CONTEXT

High-Performance Building Policy (HPBP)

As of November 2007, all publicly owned new construction and major renovation projects over 600 m2 must achieve LEED Gold certification. UBC policies and initiatives play a key role in ensuring that green building features and practices are included in all construction.

Provincial Mandate: Carbon Neutral by 2010

In 2007, the Province announced that each public sector organization in BC must be carbon neutral by 2010 and in each subsequent year. Actions must include: a GHG emissions inventory, emissions reductions and offsets to net remaining emissions to zero.

'Greening' the BC Building Code

New BC Building Code requirements for energy and water efficiency took effect in September 2008. The requirements include: increased insulation levels for residential buildings, enhanced water efficiency requirements and compliance with the ASHRAE 90.1-2004 standard for institutional and commercial buildings. These requirements create a new 'floor' for construction in the province; even with the enhanced requirements, green building practices continue to go over and above code requirements.

Story

PHOTO BY MARTIN DEE

GREEN BUILDING AT UBC IS NOTABLE FOR ITS EARLY START AND FOR ITS SCOPE: THE FIRST GREEN PROJECT, THE C.K. CHOI BUILDING, WAS COMPLETED IN 1996 AND WAS ONE OF THE FIRST GREEN BUILDINGS IN THE WORLD; THE SCOPE OF GREEN BUILDING AT UBC IS WIDER THAN THE SCOPE OF MOST OTHER UNIVERSITIES, IN THAT IT ENCOMPASSES BOTH INSTITUTIONAL AND MARKET RESIDENTIAL CONSTRUCTION.

INSTITUTIONAL BUILDINGS

UBC's signature green buildings receive a high profile and are frequently visited by sustainability tour groups, led by Sustainability Office student employees. The tours have grown to over 50 per year, ranging in size from 5 to 30 guests, and draw interest from the UBC community; regional primary and secondary schools; international guests; and architecture and engineering firms.

1996: **The C.K. Choi Building for the Institute of Asian Research**

UBC's first green building, featuring approaches to reducing energy, water and resource use that were unprecedented at the time maintains its presence as a high-performance, innovative building and continues to draw a great deal of interest from green building professionals and the public.

Highlights include:

– Composting toilets that save more than 1,000 litres of water per day
– A plant-based greywater recycling system that processes compost tea from the toilets and waste water from kitchen and bathroom sinks
– 50 percent reused or recycled materials
– 100 percent natural ventilation
– Overall energy use 23 percent below a comparable building built to the ASHRAE 90.1 standard
– 2000: Named one of the Top Ten Green Buildings by the American Institute of Architects

2000: **The Liu Centre for Global Issues**

Highlights include:

– Commitment to retain significant trees on the site
– Careful deconstruction of the existing building
– 93 percent of the demolition materials were diverted from landfill; salvaged materials were used to construct the Liu Centre and the remaining materials were sold or recycled
– 100 percent natural ventilation
– High-volume fly ash concrete, where 50 percent of the energy intensive cement was replaced with fly ash, a waste product from burning coal
– Energy use 34 percent below MNECB
– 2002: Received Earth Award for outstanding energy performance and environmental initiatives in the new building category from the Building Owners and Managers Association

2004: **Life Sciences Centre (LSC)**

2004: The largest post-secondary research facility in BC, opened in September

2005: 52,167 m2 LSC received LEED Gold certification and was the largest building in Canada to achieve LEED Gold

One of the first laboratory facilities in North America to be designed and constructed using principles of sustainability:

– To meet an extremely tight construction schedule, the design team used a modular approach for the laboratories
– Labs and office spaces capitalize on daylighting and views wherever possible, as do the two enclosed atria that house large study spaces

The building achieved:

– Water use reduction of 50 percent as compared to conventional construction
– 80 percent of construction waste was recycled or salvaged
– Energy use reduction of 30 percent below ASHRAE 90.1

Other High-Performance Building Features

Green building features and practices extend beyond the signature buildings to include:

enhanced performance requirements in the Technical Guidelines which are mandatory for all construction and renovation at UBC (see Context).

A few of the buildings that feature high-performance building systems are:

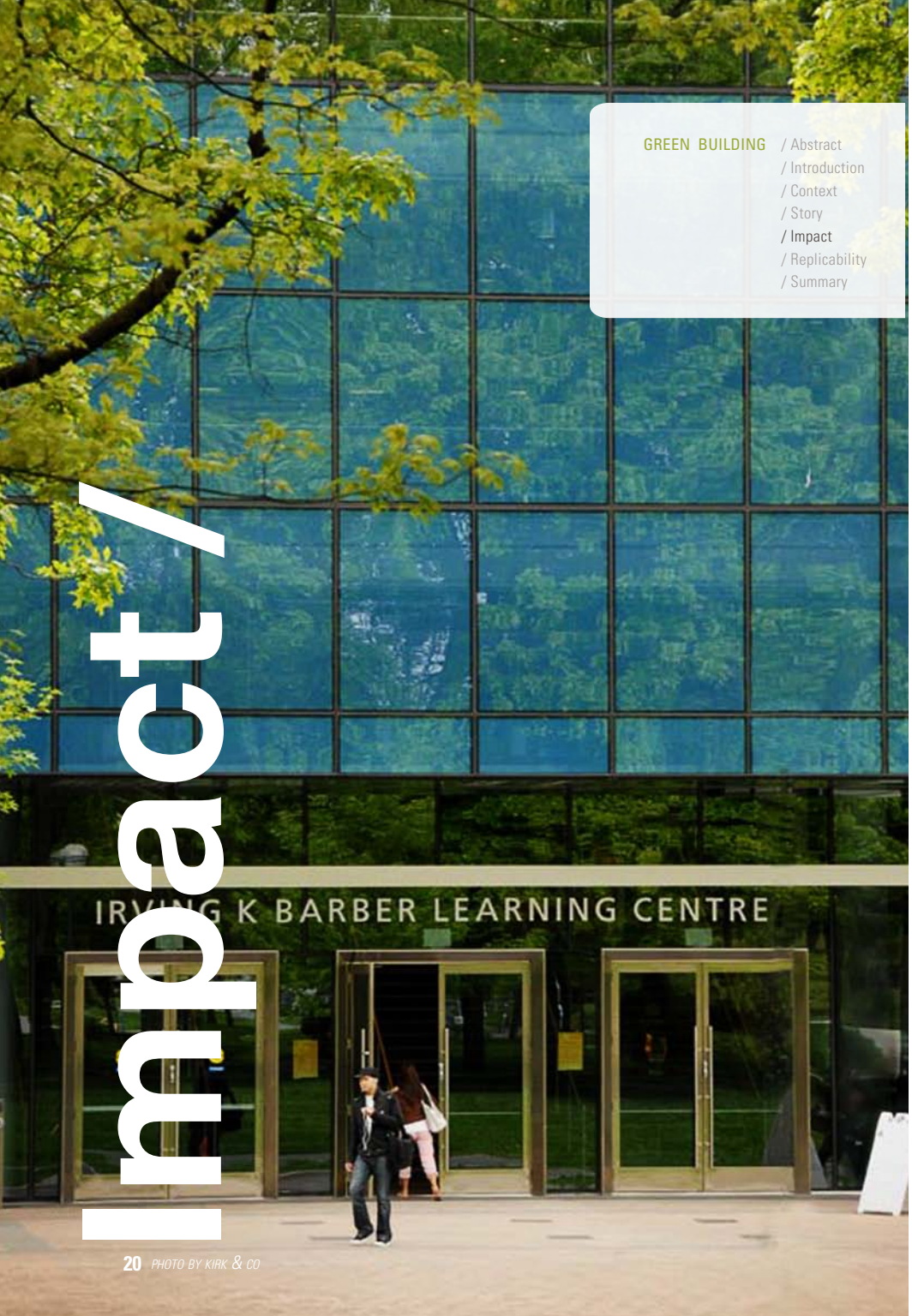
Fred Kaiser Building
Institute for Computing Information and Cognitive Systems
Michael Smith Laboratories
Aquatic Ecosystem Research Laboratory
Irving K. Barber Learning Centre

RESIDENTIAL BUILDINGS

UBC has a large land endowment that it is developing into a complete campus community. Plans for University Town feature a mix of neighbourhood services and both market and non-market (i.e. student, staff and faculty) housing. UBC retains ownership of the land parcels and is therefore empowered to impose green building requirements on all residential construction.

UBC REAP (Residential Environmental Assessment Program)

UBC REAP is a made-at-UBC green building rating system that is based on LEED. REAP was developed to provide a residential rating system for application in UBC's University Town, at a time when no other rating system could be used for all residential building types, especially the four-storey wood frame construction prevalent in the local market. REAP is a prescriptive assessment system that takes the much of the guesswork out of sustainable building practices for residential developers, which are typically not as familiar with green buildings. The full REAP system (Version 2.0) was released in 2006, after a one-year pilot. REAP was developed in partnership between UBC Properties Trust, UBC Architecture faculty member Dr. Raymond Cole, and the Sustainability Office. REAP is mandatory for all residential construction in University Town neighbourhoods.



Impact /

20 PHOTO BY KIRK & CO

UBC FUNCTIONED AS A CATALYST FOR BUILDING LOCAL CAPACITY IN GREEN BUILDING EXPERTISE.

UBC and the broader community have accrued a wide range of benefits due to green building:

– Early on, UBC functioned as a catalyst for building local capacity in green building expertise. The C.K. Choi building served a major learning exercise for local engineers and architects, creating multiple spin-off benefits for the region.

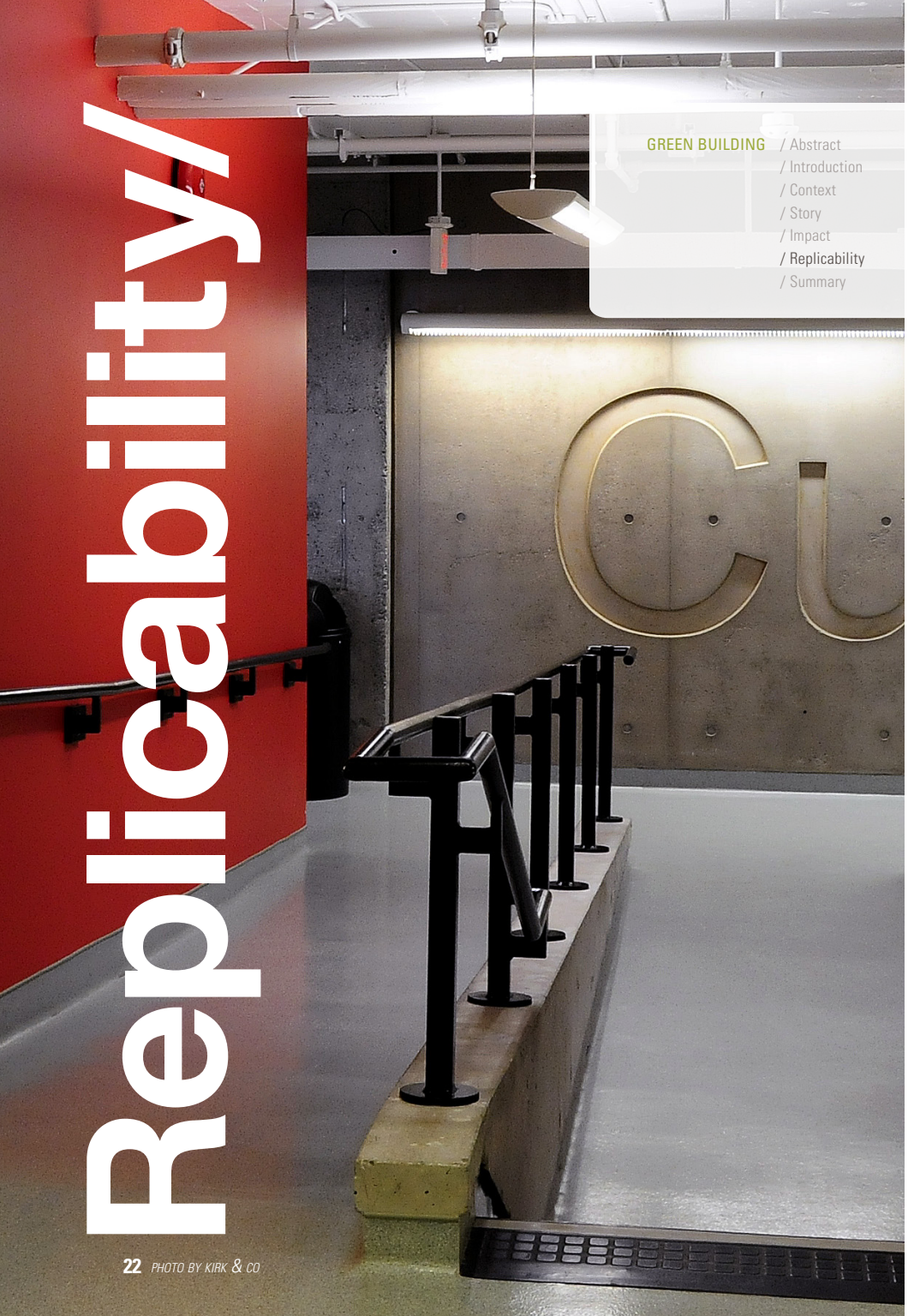
– Green buildings garner a great deal of positive public attention for the University. In addition to their contribution to numerous campus sustainability and green architecture awards, the green buildings draw approximately 50 tours per year.

– Green buildings reduce operating costs at UBC due to energy, resource and water efficiency that outperforms conventional construction.

– Sustainable building practices have spread to buildings on campus that UBC does not actually own—the Technology Enterprise Facility III building was built independently and achieved LEED Silver certification and the new NRC Institute for Fuel Cell Research was certified LEED Gold by the US Green Building Council.

– Residential construction in all University Town neighbour-hoods is built to UBC green standards (REAP) and some residential developers have taken the green building practices they were exposed to at UBC off campus to their other projects in the region.

– UBC serves as an example to municipalities that are interested in implementing a green building rating system for residential buildings.



Replicability/

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BUILDINGS ARE AN INVESTMENT IN THE FUTURE OF AN ORGANIZATION. THEY SHOULD BE TREATED AS AN INVESTMENT TO BE MAXIMIZED RATHER THAN A COST TO BE REDUCED.

– An overarching sustainability policy creates a frame and context for green building.

– While a dedicated green building policy is ideal, there are other means for implementation, i.e. Technical Guidelines.

– Sustainable buildings do not have to cost more. Integrated design is about making tradeoffs in building systems. The earlier the decisions are made, the lower the final cost impact and the higher the final effect on performance.

– When green building projects do cost more than standard construction, advocates need to be able to effectively communicate the business case for green building (i.e. the savings in operations as well as the value of a higher quality, higher performance and more durable building).

– Clear, explicit goal statements, introduced as early as possible in a green building project, are a key to success: many consultants have the expertise and desire to build a sustainable project, but just need the permission to do so.

– A design charrette or goal-setting workshop to kick-start the process ensures that designers, occupants and operating staff are all on board and contribute to the shared vision.

– In terms of technical support, an in-house green building resource can provide invaluable assistance as a liaison between the design team and the university's staff and departments.

Summary/

FUTURE

UBC recognized the potential of green building and put the concepts into practice early on, becoming an originator of the green building movement in North America. The next phase in the evolution of green building at UBC continues UBC's leadership position in the North American green building movement. UBC is creating a 'living laboratory' on the campus, demonstrating and showcasing innovative practices from Europe, such as the Passivhaus low-energy building standard, and building the Centre for Interactive Research on Sustainability (CIRS), an extremely low-impact building that will foster research and collaboration on sustainability solutions. The CIRS building is designed to go beyond merely minimizing negative impacts, aiming to contribute to the regeneration of natural systems. A highly integrated approach to building design will result in 'net positive in energy and water' performance for the building, demonstrating the potential for reducing UBC's reliance on the utilities grid. Learning from the challenges and successes of the CIRS project, UBC has the opportunity to standardize the integrated design process to achieve high performance in all future building projects.

CONCLUSION

Buildings are not only one of the largest contributors to resource depletion and climate change, they are also the most visible and enduring elements of an organization's commitment to sustainability. The value of green buildings goes far beyond the value of avoided energy and water costs, to improved productivity and enhanced marketing and promotional value for the organization.