CENTRE FOR INTERACTIVE RESEARCH ON SUSTAINABILITY

Building Overview

"It's a wonderful idea: that nature and building are working together."

- Peter Busby, Managing Director, Perkins + Will Architects

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

CIRS
CENTRE FOR INTERACTIVE RESEARCH ON SUSTAINABILITY

BUILDING BACKGROUND

The CIRS building is the flagship project of UBC's Campus as a Living Laboratory initiative, which combines building and operational infrastructure, construction and retrofits with research and teaching opportunities to advance sustainability on and off campus. It is used as a test-bed to study sustainable technologies, systems, processes, practices and behaviours.

The building was designed to push the envelope of sustainable performance in both environmental and human terms by providing net positive benefits to both its surroundings and its inhabitants. The design approach included the integration of building systems and passive strategies to achieve high standards of performance while remaining adaptive to changing needs and uses over time.

FACILITIES

Lobby/Atrium As the core of CIRS, it welcomes visitors and visually connects them to key sustainability features. Electronic signage displays information on building performance, research projects, and campus-wide activities.

Modern Green Auditorium This 423 seat lecture hall, one of the largest on campus, draws many students to CIRS. It is day-lit and ventilated through an underfloor air system.

The Loop Cafe This popular lunch spot serves fresh and organic choices sourced locally whenever possible. Products use minimal packaging that is mostly recyclable or compostable.

Offices and Labs As a space for multidisciplinary education and research, CIRS provides dedicated lab and office space for UBC researchers and partners.

BC Hydro Theatre A flexible and adaptive facility for high-quality, data-intensive visualizations, modeling and scenario generation. This space allows a variety of configurations to maximize user experience and facilitate unanticipated uses.

FEATURES

Wood Structure demonstrates the use of both pine beetle-damaged and certified wood products as viable materials for institutional applications that store carbon and reduce the building's greenhouse gas emissions from construction.

Living Roof recreates a meadow environment for birds, insects and native or adaptive plants, and contributes to reducing heat island effects by providing evapotranspiration cooling.

Living Façade provides shading during the summer and allows warmth from the sun to be absorbed by the building in winter. The vegetated wall of vines uses reclaimed water for irrigation.

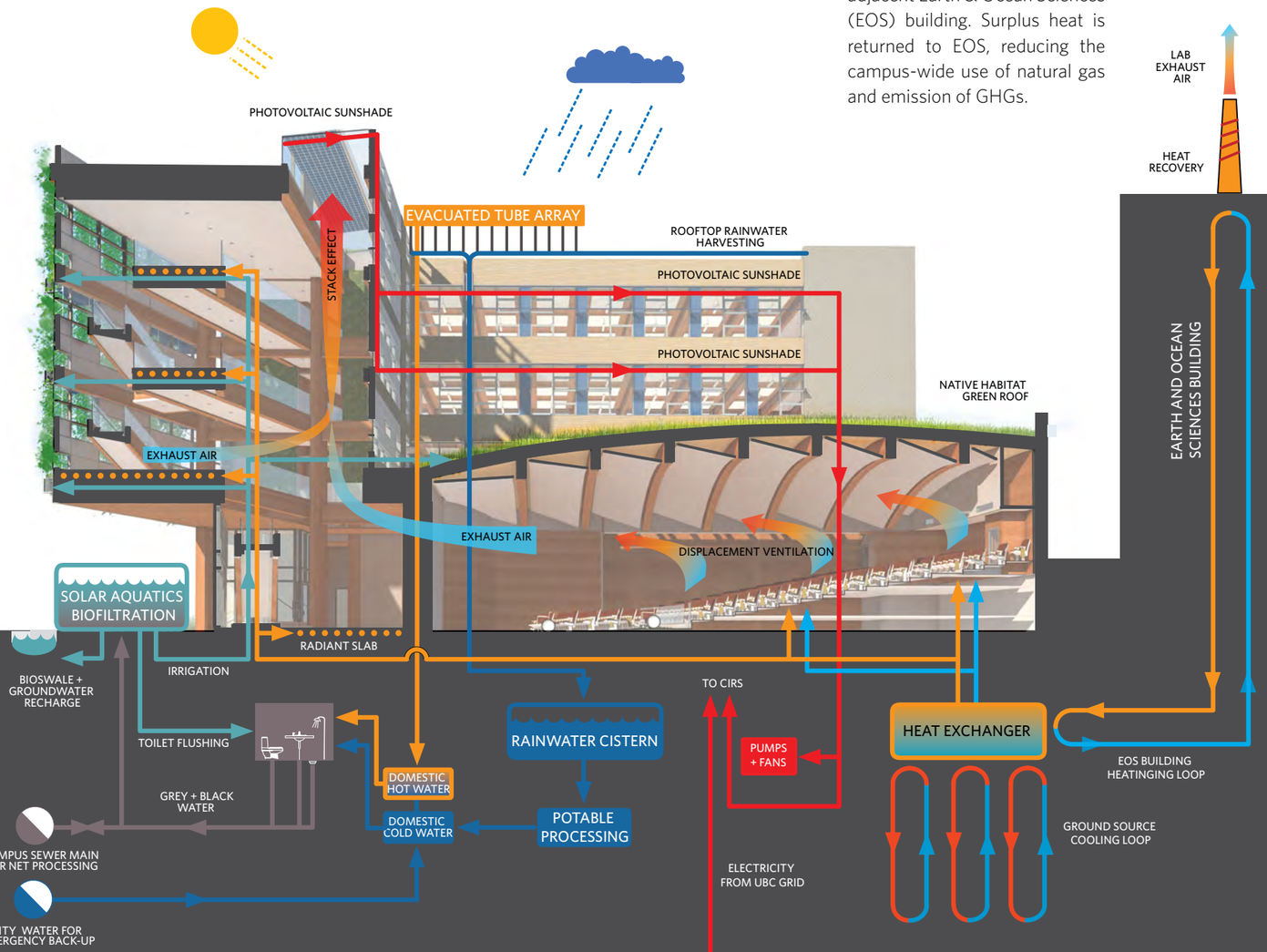
Reclaimed Water System treats campus waste water using solar aquatics and constructed wetland technologies. The reclaimed water is used to flush toilets and for irrigation.

Solar Energy is harvested through collectors that provide hot water for the building and through photovoltaic panels that convert it to electricity used to power the building systems.

Rainwater System harvests rain water from the roof, purifies it using filtration and disinfection and stores it for use in the building. Stormwater runoff is redirected through bioswales to the local aquifer.

Geoexchange System transfers thermal energy between the building and the ground, providing heating in the winter and cooling in the summer.

Heat Exchange System collects waste heat from within CIRS building systems and from the adjacent Earth & Ocean Sciences (EOS) building. Surplus heat is returned to EOS, reducing the campus-wide use of natural gas and emission of GHGs.



CIRS
CENTRE FOR INTERACTIVE RESEARCH ON SUSTAINABILITY

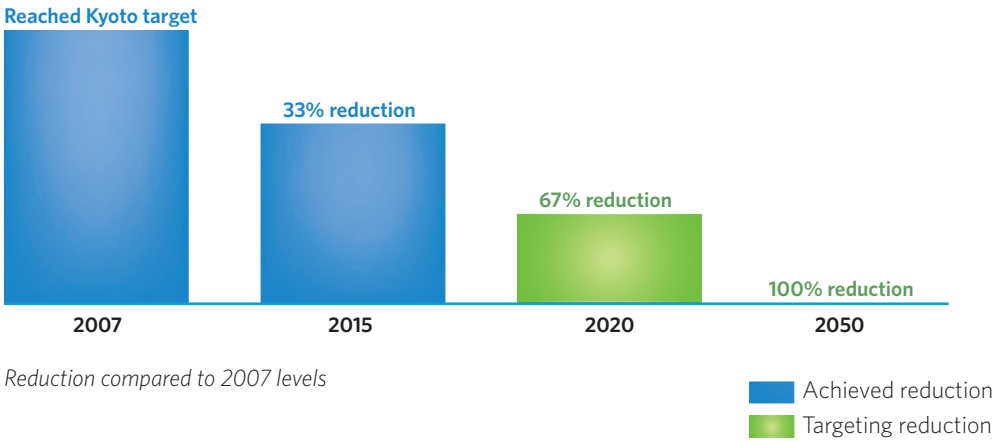
CIRS CONTEXT

INTRODUCTION

The global challenges associated with climate change, rapid urbanization, and degradation of the biosphere and natural systems that sustain life, as well as the mammoth task of providing food and drinking water for a rapidly expanding population, require that society accelerate dramatically the adoption of more sustainable practices. The Centre for Interactive Research on Sustainability at the University of British Columbia campus in Vancouver, Canada was created in response to these challenges.

The University of British Columbia is Canada's second largest university and a research leader in science, engineering, social sciences and humanities. It is a global leader among post-secondary institutions that are using their campuses as living laboratories: test-beds and demonstration sites for sustainability in education, research, infrastructure and operations, individual behavior and community building. UBC actively engages with non-academic partners — industry, government, NGOs and community groups — to develop policies, set ambitious performance targets, patent new technologies, create commercially successful spin-off companies, and, of course, educate and train the next generation in sustainability related knowledge and skills. Through these highly qualified graduates and collaborative partnerships, the lessons learned at UBC influence sustainability practices around the world.

UBC's commitment to reduce its GHG emissions:



Reduction compared to 2007 levels

Vancouver campus at a glance:

- academic centre, mixed-use residential neighbourhoods and agricultural land
- 400+ hectares (988 acres) of land
- over 1.4 million square meters (15 million square feet) of institutional floor space divided into nearly 400 buildings
- 40,000+ registered students
- 13,000+ staff and faculty employees
- 10,000+ students living on campus
- 10,000+ non-student residents
- 39 active campus as a living lab projects

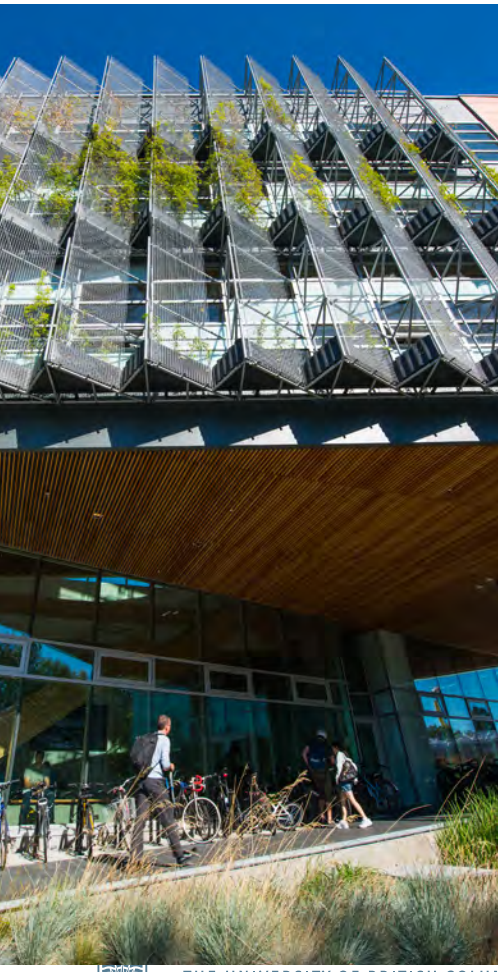
- Data from 2013/2014 Annual Sustainability Report

Photo credit: Don Erhardt

"Our vision for UBC is to create campus environments that nurture the wellbeing of UBC's community, visitors and ecology."

- Gerry McGeough, Director of Campus Planning and Design

The Centre for Interactive Research on Sustainability (CIRS) was one of the first demonstration projects of UBC's campus as a living lab initiative. The CIRS building was designed using regenerative sustainability principles, targeting net-positive performance in terms of both environment and human wellbeing. As the home of an interdisciplinary research centre, the building functions as a real-world research and education project, as well as a means of engaging its inhabitants and community. The ultimate goal is the introduction of innovative solutions for urban areas that begin to address the global challenges facing humanity.



WHAT'S NEXT?

Buildings like CIRS — that adhere to and operationalize the principles of regenerative sustainability, seek to improve their communities and provide opportunities for learning — are deeply transformative and have a catalytic effect toward the establishment of higher sustainability targets in their constituent organizations.

UBC is beginning to apply the principles and lessons learned from CIRS to projects at both the building and neighbourhood scale, as well as longer term planning initiatives.

REGENERATIVE SUSTAINABILITY

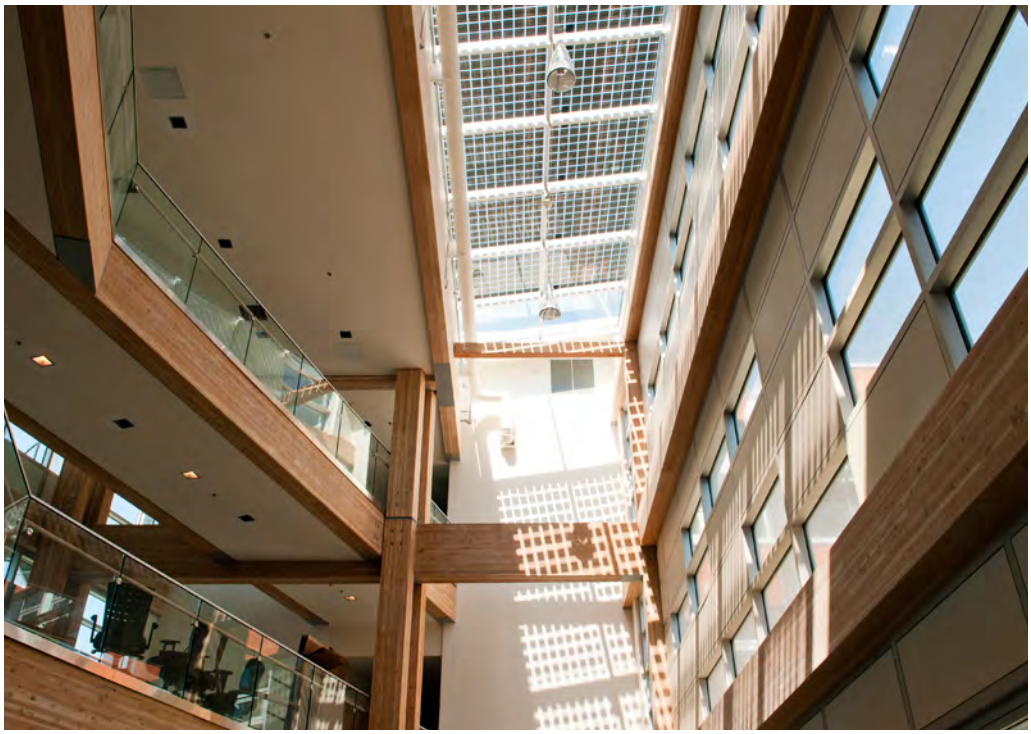
"At UBC's Vancouver campus, sustainability means simultaneous improvements in human and environmental wellbeing, not just reductions in damage or harm. By 2035, such regenerative sustainability is embedded across the University throughout teaching, learning, research, partnerships, operations and infrastructure, and the UBC community."

- 20 year Sustainability Strategy for UBC

NET POSITIVE IMPACTS

Contemporary environmentalism has shown itself to be ill-equipped to address the immense global sustainability challenges facing humanity. We can no longer afford the current practice of pursuing goals that simply reduce our environmental impacts — it's simply insufficient as a driving force for the magnitude of required changes.

To address this crisis we need to think of every aspect of modern life, including constructing buildings and developing land, as acts of restoration and regeneration. We need to inspire people to repair and restore the biosphere, sequester carbon dioxide and seek out significantly more effective use of resources, especially non-renewables. This shift in perspective has the potential to motivate us to move beyond a practice of trying to create buildings and developments that are simply "less bad" into a new paradigm that strives to achieve the creation of "good" development. It helps us shift our mindset from measuring impacts into providing benefits, from sacrifice to contribution and finally, from net zero to net positive. This is the foundation of regenerative sustainability.



REGENERATIVE SUSTAINABILITY IN PRACTICE

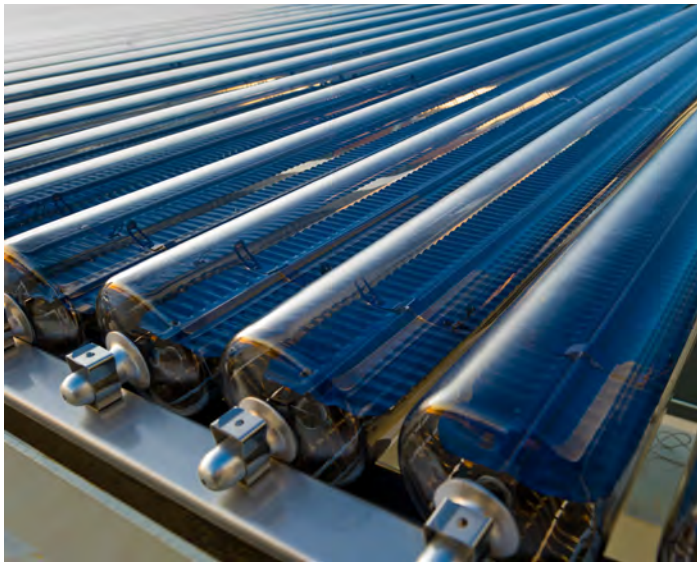
How do we apply, in a practical sense, these regenerative sustainability principles to the urban context (buildings, communities, cities, etc.)?

UBC built CIRS to try to better understand this challenge.

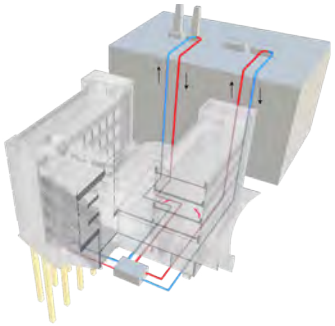
The CIRS building was the first project at the University to adhere to and operationalize the two dimensions of regenerative sustainability as outlined by Dr. John Robinson: the active restoration and regeneration of the environment; and the active pursuit of improvement in the wellbeing of the human community. The design, construction and operation of the CIRS building at UBC provides insights and practical experience on what is technically, economically and institutionally feasible and what barriers and challenges must be overcome in order to realize regenerative sustainability principles at the building and neighbourhood scales. The opportunity for learning is huge.

The CIRS experience indicates that is possible for buildings and neighbourhoods to:

- capture and exchange more energy than is obtained from current utility networks;
- become self-sufficient in water use by harvesting rainwater, treating and recycling wastewater, and recharging groundwater reservoirs with storm-water runoff;
- capture and store more carbon dioxide in building materials and structural components than the amount emitted during construction activities;
- and improve the conditions that impact the health, happiness and productivity of building inhabitants. This can be achieved through a high quality indoor environment with natural light and natural ventilation, and through the active participation of the inhabitants in operational decisions that impact both their comfort and wellbeing, in effect, creating a mutually beneficial symbiotic relationship between people and buildings.

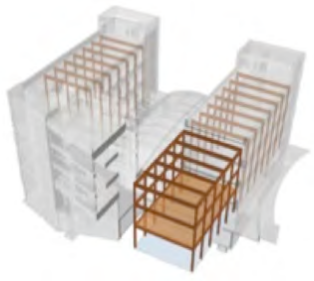


ENABLERS



Energy Exchange

Heat exchangers capture waste heat from the Earth and Ocean Sciences (EOS) building. Excess heat is returned to EOS which results in natural gas savings and fewer GHG emissions.



Wooden Structure

Using wood as the main structural material, CIRS sequesters more carbon than was produced during its construction, making it a net carbon negative project.

CIRS REGENERATIVE SUSTAINABILITY ENABLERS

The regenerative sustainability principles embodied by CIRS — the net-positive improvement of environmental and human well-being through the act of building — are enabled by a set of interconnected design and operational strategies.

› **Systems thinking and integration**

Optimizing at the whole system level, rather than sub-optimizing at the component level, changes the scope and outlook of the design effort. It leads the planning and design team to look for opportunities for systems to interact with the building surroundings and for potential contributions of net benefits into the encompassing community.

› **Application of industrial ecology principles**

The basic notion that the by-products of some processes can become inputs for others can be successfully adapted from product manufacturing to the planning and design of sustainable buildings. This approach reconsiders "wastes" as useful resources and, through connection with other buildings and infrastructure, can create larger networks of resource exchange with community scale benefits.

› **Building engines of carbon sequestration**

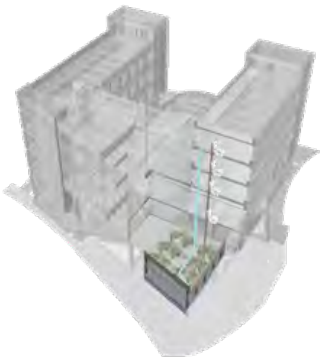
The exploitation of wood structures and building materials to sequester the carbon that was absorb by the trees while they were alive. This goes beyond simply limiting the CO_2 generated during building construction — through the extraction, manufacturing, transportation and installation of materials and components — to begin to offset those emissions.

› Rational use of natural resources

Not all equipment and systems require the highest quality of resources for operation. Within buildings, specific applications can be strategically matched with the appropriate grade and quality of resources, eg. using grey water rather than potable water to flush toilets. This application limits waste and emissions, and optimizes the use of secondary resources, equipment and infrastructure required to limit overall waste and emissions, and clean, heat or otherwise upgrade primary resources.

› Empower occupants to become inhabitants

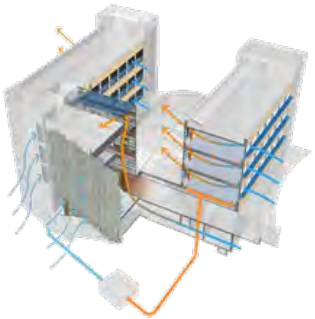
Building *occupants* are generally passive recipients of building systems and infrastructure, are not normally in control of their indoor environment and do not usually get involved in the operation and optimization of their buildings. In contrast, building *inhabitants* are considered part of the building ecosystem. They have control over the conditions that impact their comfort, are encouraged to get involved in the operations of the building and are motivated to contribute to the long-term sustainability of the building. Without active inhabitant engagement and participation sustainable buildings cannot meet their performance targets.



Reclaimed Water

Black water (from toilets and urinals) and grey water (from showers and sinks) is collected from fixtures in the building.

The Solar Aquatics bio-filtration system treats the waste water which is pumped back into CIRS and used to flush toilets and for landscape irrigation.



Ventilation

CIRS takes advantage of natural ventilation. Manually operable windows allow for inhabitant control over airflow and temperature.

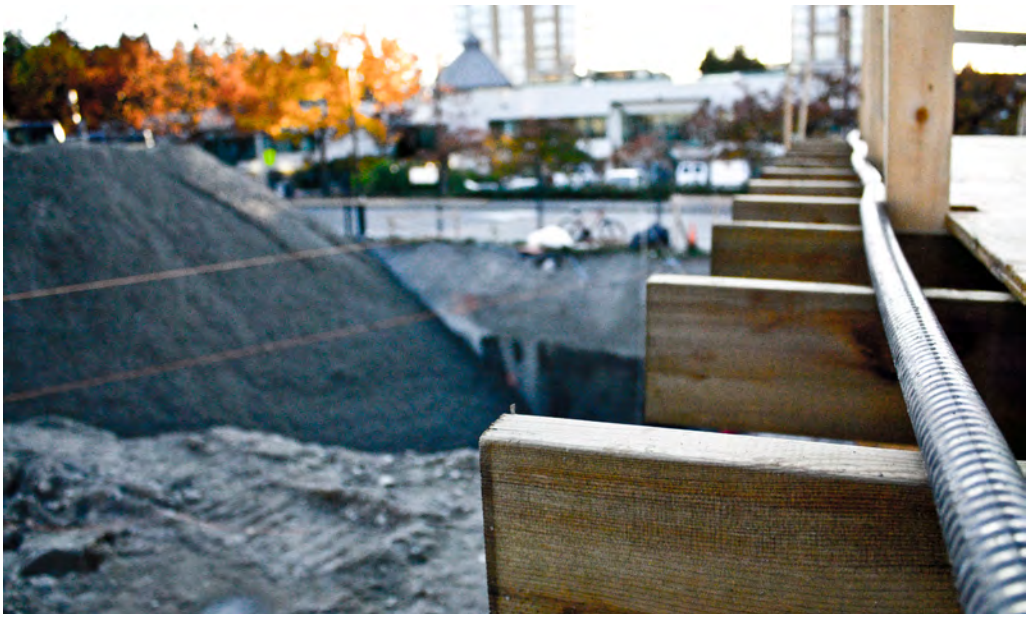
CIRS CONSTRUCTION

CONSTRUCTION AND RESEARCH INFRASTRUCTURE

CIRS was first conceived in 1999 by UBC professor Dr. John Robinson as an opportunity to create a sustainability showcase in the province of British Columbia: a building in which to push the envelope of sustainable design by integrating passive design strategies with the most advanced sustainable technologies of the time to achieve an off-the-chart level of performance. Completed in 2011, the CIRS building has become UBC's sustainability flagship and is the home of dozens of UBC sustainability researchers, planners, operators and partners.

The building's systems and infrastructure, as well as the processes of planning, designing, building and operating the facility are part of the research agenda of CIRS. It is equipped with a robust network of sensors and controls that are part of a sophisticated building automation and monitoring system with more than 3,000 points. This capability facilitates performance tracking and reporting, and enables the collection of real-time data for research projects. Every system and component in the building will be studied over the course of its useful life, and improved through the application of design innovations, new operational practices and advancements in technology.

Principles of flexibility, modularity and adaptability were emphasized in the design of the CIRS building to ensure that it can easily and cost-effectively respond to future requirements. This resiliency allows spaces to change to fit inhabitant needs and support research projects, and ultimately enables the complete disassembly of the building and the repurpose of its constituent components at the end of its useful life.



Project Goals

- Design CIRS to be as passive and as simple as possible.
- Produce a building that exemplifies replicable, economical solutions.
- Neutralize ecological impacts on site.
- Regenerate ecosystems to attract local fauna.
- Conduct a life cycle assessment of all building components for environmental impact.
- Provide inhabitants control over their environment and comfort conditions.
- Ensure that water leaving the site is as good or better quality than when it arrived.
- Collect and treat all wastewater on-site or within the precinct.
- Control, dispose of, reuse and discharge 100% of stormwater on-site.
- Become a living lab for researchers and companies to test innovative products and technology.
- Advance knowledge of sustainable design strategies.

DEVELOPMENT OF THE CIRS BUILDING started in 1999. In the following years, the project went through three different iterations, at different sites and with different proposed inhabitants. During that time, there have been significant advancements in public awareness, policy and market developments, and technological capabilities related to sustainable buildings. The dedicated leadership team maintained a strong project vision through all of these changes and ensured that the ambitious project goals would be achieved.

Idea is born
Design iteration
People join the team
Partnership forged
Feasibility study
$$$ Funding
Construction

Dr. Martha Piper, president of UBC at the time, asks all the research units on campus to develop a strategic plan for future development.

Dr. John Robinson, then at the Sustainable Development Research Initiative, proposes an idea to create a "BC Showcase", a building that would demonstrate sustainable principles and practices holistically.

Dr. John Robinson meets with Peter Busby, the architect, to discuss the creation of the "greenest building in North America". Multiple key concepts including the "living laboratory" and "accelerating sustainability" are developed during this meeting.

Busby & Associates Architects (now Perkins+Will Architects Canada) prepares a feasibility study for the first iteration of the CIRS building, located on UBC's Vancouver Campus.

A decision is made to move the CIRS building to a site on the Great Northern Way Campus.

The CIRS Steering Committee is created to provide expert advice and guidance on the project. It included representatives from local academic institutions, government agencies, academic researchers and industry.

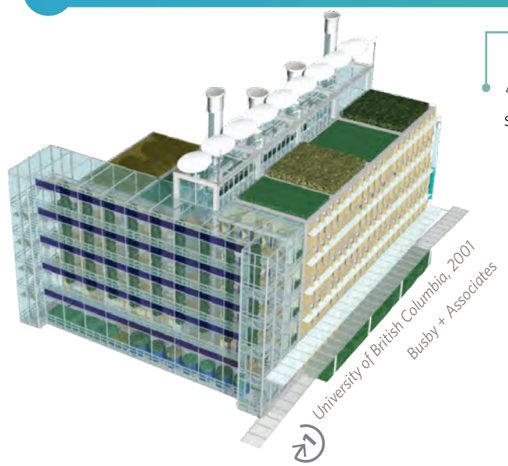
Alberto Cayuela, a consultant at Stantec at the time, joins the team as program manager.

The other academic institutions of the Great Northern Way campus (GNWC) become partners in the project: Emily Carr University of Art and Design, British Columbia Institute of Technology, Simon Fraser University.

A feasibility study is undertaken for the Great Northern Way campus context with a new program accommodating all four academic institutions.

$$$ The team applies for a Canada Foundation for Innovation (CFI) grant.

The team applies for a British Columbia Knowledge Development Fund (BCKDF) grant.



BC Hydro becomes a strategic partner.

$$$ A Sustainable Development Technology Canada grant is secured for Innovative building envelope and renewable energy components.

The feasibility study is completed.

$$$ The CFI and BCKDF grants are approved.

The CIRS building project returns to the UBC Campus, with UBC as the sole owner and under the management of UBC Properties Trust.

A site is selected on West Mall adjacent to Sustainability Street, a public commons area and the first planned green corridor on campus.

Over the winter, the design teams respond to new requests for proposals (RFPs) for the new project program and context.

Four interdisciplinary design charettes are held between March and July.

Schematic design begins in May and transitions to design development in September.

$$$ A Western Economic Diversification Canada grant is secured.

Construction documents for the tender set are completed in September.

Site service work, utility relocation and demolition of the previous building occurs over the summer.

Construction begins in October.

Construction is completed and building occupancy is granted in August.

Building inhabitation begins in September.

"Celebrating CIRS" conference and official opening of the CIRS building happen in November.

Building performance and occupancy starts to be monitored and analyzed by operators and researches.

A series of optimization projects starts to be implemented towards addressing building system performance shortcomings, increasing energy and water efficiency, and creating a better place for CIRS inhabitants to work.

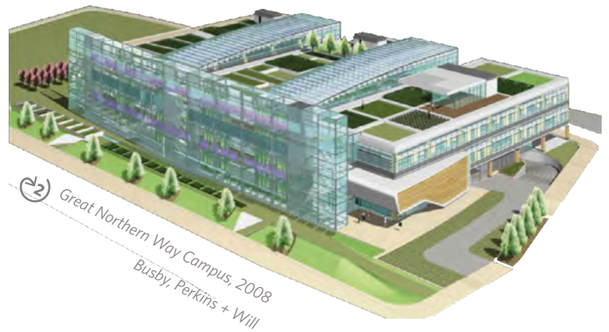
Dr. Ray Cole is appointed as academic director of CIRS in July.

The CIRS building becomes UBC's first LEED Platinum certified project.

2007 2008 2009 2010 2011 2012 2013 2014

Honeywell and Haworth become strategic partners.

Modern Green Development becomes a strategic partner.



CIRS is officially established as a UBC research centre.

CIRS begins to recognize designated faculty researchers from multiple disciplines.

An Advisory Board is created with representatives from academic institutions, NGOs and industry partners.

a place of mind UBC

CIRS CENTRE FOR INTERACTIVE RESEARCH ON SUSTAINABILITY

"It's crucial not to be guided too much by what it is possible. If it is possible it's boring, and we don't want to be boring. Let's figure out what is impossible and get as close as we can to that."

Dr. John Robinson, CIRS Project Sponsor and Founder

A PLACE FOR BIG IDEAS THAT MAKE BIG IMPACTS

AWARDS + CERTIFICATIONS

INTERNATIONAL SUSTAINABLE CAMPUS NETWORK EXCELLENCE AWARD
International Sustainable Campus Network | *2015*

2015 ROYAL ARCHITECTURAL INSTITUTE OF CANADA GREEN BUILDING AWARD
Royal Architectural Institute of Canada | *2015*

CANADIAN GREEN BUILDING AWARD
SAB Magazine | *2014*

SUSTAINABLE BUILDING OF THE YEAR
World Architecture News | *2013*

LEED PLATINUM CERTIFICATION
Canada Green Building Council | *2013*

SUSTAINABLE DEVELOPMENT AWARD
Golder Associates | 2013

BC GREEN BUILDING AWARD
WoodWorks! | 2013

ARCHITECTURAL INNOVATION AWARD
Architectural Institute of British Columbia | *2012*

AWARD FOR ENGINEERING EXCELLENCE
Association of Consulting Engineering Companies-BC | *2012*

EXCELLENCE IN STRUCTURAL ENGINEERING AWARD
National Council of Structural Engineers Associations | *2012*

WOOD DESIGN AWARD
Wood Design & Building | 2012

BEST OFFICE OR COMMERCIAL DESIGN & READER'S CHOICE WINNER
Treehugger Best of Green | *2011 & 2012*

PROJECT TEAM:

Architect	**Perkins + Will Architects**
Structural Engineers	**Fast+Epp**
M/E/P	**Stantec Consulting**
Landscape Architect	**PWL Partnership**
Solar Aquatic Biofilter	**Eco-Tek Ecological Technologies**
Environmental consultant	**Nova Tec Consultants**
Construction Manager	**Heatherbrae Builders**

CENTRE FOR INTERACTIVE RESEARCH ON SUSTAINABILITY

GENERAL INQUIRIES:

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