# 4.0

# GOAL & TARGETS

*"We set goals that were spectacular and beyond challenging for that time."*
*-Blair McCarry, Mechanical Engineer, Stantec/Perkins + Will*

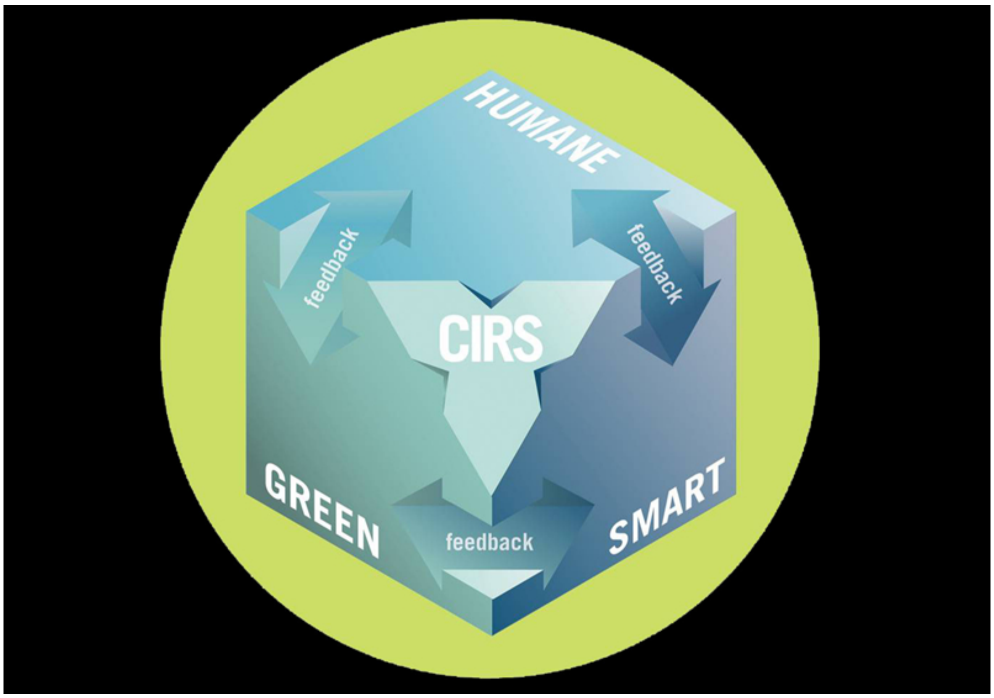


Image 4.1 CIRS Goals Diagram

## 4.1 Overview

The goals and objectives of the CIRS project were created to uphold the project vision and accelerate the adoption of sustainable building and development practices. The project goals were functional tools that helped move the design agenda forward. The goals became the benchmark against which the team measured progress and project performance.

Over the course of the design process, the team concluded that in the context of CIRS, the goals must focus on building design with a healthy social and biophysical interior environment for its inhabitants. It must also positively impact the local and global environment. Emphasis was placed on resource use, life cycle impacts, and the interaction between the building and inhabitants. Broadly, the project goals fell into three categories: green, humane and smart.

### LESSONS LEARNED

Tie funding to goals

Prioritize goals

Make distinctions between goals and strategies

Develop simple but compelling goals

Look for planning synergies

AGENTS

*Core leadership team*

*Design team*

*Charette participants – advisors, professionals, researchers, industry partners, experts, stakeholders*

PROCESS

*The initial conceptual level of CIRS goals were developed extremely early in the design process in meetings with the core leadership team and the design team. These goals were expanded and more fully developed through a series of design charettes that included advisors from the steering committee, design professionals, academic researchers, industry partners, outside experts and other stakeholders.*

***Green:***

CIRS will have a net positive impact on the ecosystem health, at both a local and global scale, while living within and contributing to the biophysical flows available within the project site.

***Humane:***

CIRS will provide a socially and biophysically healthy environment for human inhabitation, with the capability to adapt to changing needs over time and continuously improve the health, productivity and happiness of the inhabitants.

***Smart:***

CIRS will integrate the performance of the building with the human inhabitants, through building and system monitoring and information feedback, with the intention of continually testing and improving the green and humane features of the project over time.

## 4.2 Description

Over the course of the project timeline, the CIRS project goals underwent a number of drafts and iterations to inform, direct and benchmark the design process. While the project site was still being designed for the Great Northern Way Campus in 2004-2006, 22 goals were drafted as part of more comprehensive "Sustainable Design Goals and Strategies Matrix". This document divided the goals into clear focus areas and listed between two and 20 strategies for each goal to support achievement.

When the CIRS project moved back to the UBC Vancouver campus in 2008, it was an opportunity to revisit the goals in a new context, taking into consideration advances in technology, process and priorities that had occurred since the project was originally conceived. The goals were re-evaluated and refined during the Revised Design Principles Charette in March 2008, by interdisciplinary groups of stakeholders, including representatives from UBC research and administration, the design team and industry partners. At this time the goals were compiled into a list of 10 guiding principles.

The principles, closely related to the project vision, illustrated the intentions and ideals of the overall project. They provided a clear conceptual direction that was easily communicated to a wide range of audiences. The more detailed list of goals and targets, however, became a working tool for the design team in developing the integrated systems and passive strategies that form a high-performing sustainable building. A key imperative for both the guiding principles and the final goals was to consider the pace of change over the lifetime of the building. The principles and goals were conceived with the flexibility to inspire a building that could adapt to new technologies and practices and support continuous improvement of its impact on ecological and human health.

### Summary of Guiding Principles:

(from the Revised Design Principles Charette on March 28, 2008, Charette Proceedings Appendix 3.7)*

1. Design with time in mind— anticipate climate change, design for a 100-year life cycle, build to last but allow for change.
2. Materials should be selected based on zero waste criteria—design for modification and disassembly, do not use toxic materials. Convert ongoing 'waste' streams to useful flows.
3. Energy use should have a net positive impact on ecological health—minimize onsite consumption, use renewable energy sources, or harness waste heat from adjacent buildings, or displace energy that was being used by adjacent buildings.
4. Water use should have a net positive impact on ecological health; achieve self-sufficiency on the water flows available to the site.
5. Site design should produce a net positive impact on ecological health—create additional habitats compared to existing site value.
6. Provide instrumentation and controls to allow feedback and learning.
7. Produce a core building that exemplifies best practice, economical solutions.
8. Provide a comfortable, healthy environment for inhabitants, including 100 percent natural daylit spaces, and temperature and ventilation under local or individual control.
9. On an ongoing basis, assess the interaction between the environment provided by the building and the health, productivity, and happiness of those who work and visit it.
10. Provide opportunities for inhabitants to connect with each other and the world with a facility that is both functional and beautiful.

The principles and goals were used as tools in a number of ways during the creation of CIRS. The leadership team used them to promote the project to gain financial support, to engage specific groups of stakeholders to build involvement in the project and to communicate the intentions of the project to the public. The design team used them as inspiration, to guide decisions regarding design strategies and to develop creative solutions to challenging problems. While many of the principles and goals for CIRS are simple in concept, they are complex in implementation. Living on water flows available onsite, for example, was a simple clear goal that involved multiple design strategies and required input from several disciplines, as well as health and environmental regulators. The simplicity of the goal, however, made it more effective as a communication tool and allowed for flexibility in developing the strategies to meet it.

## COSTS

*Costs will be added in a future update*

## RATINGS SYSTEMS

*The CIRS goals were established independently of any rating systems; however, many of the issues addressed in both LEED and the Living Building Challenge were encompassed in the goals. Each new iteration of goals incorporated revision and addition to the ratings systems.*

*For more information on the rating systems and CIRS refer to Section 19.0 Rating Systems.*

RELATED SECTIONS

*3.0 Vision & Leadership*

*5.0 Partnerships*

*6.0 Research*

*7.0 Building Design*

*8.0 Design Process*

*19.0 Monitoring & Measurement*

*21.0 Commissioning &Performance Testing*

*22.0 Occupants vs. Inhabitants*

*24.0 Operations & Maintenance*

*25.0 Continual Evaluations*

## 4.3 Campus Context

### UBC Vancouver Campus Plan

The most recent and comprehensive Campus Plan and Design Guidelines for the development of UBC's Vancouver campus were adopted in June 2010. The Campus Plan was developed as CIRS was being designed and with many of the same stakeholders. There are significant synergies and influences between the CIRS project and the Campus Plan.

### UBC as a Living Lab

Through the Living Lab Initiative, the University is expanding its efforts to incorporate sustainability in teaching, research and operations on campus. As part of this initiative, sustainability principles and practices inform future decisions in campus planning, land-use and development. Lessons learned and components tested in individual pilot projects are evaluated for application to other project or at the larger campus scale.

UBC Campus Plan

### UBC Sustainability Goals

The University has developed its own sustainability related goals, outlined in the Vancouver Campus Plan and Design Guidelines. All building project are to be designed and constructed sustainably "to reduce emissions, energy and water consumption and maintenance requirements; and improve livability". (Campus Plan Synopsis pg 7)

Buildings, landscapes and Infrastructure projects are to be coordinated to work together to address resource consumption and management, especially in terms of stormwater management in combination with environmental and human amenities. As a standard, UBC has adopted LEED Gold certification or the equivalent as the minimum for all new buildings. Additionally, new buildings must include performance monitoring for water, electrical and thermal systems that is capable of interfacing with the University wide on-line energy management information system (EMIS).

At a building scale, the Design Guidelines emphasize provisions for improving energy performance and building comfort:

- prioritizing on passive design strategies in building design
- using orientation, shape and massing to provide comfortable low energy buildings
- matching programming with appropriate space planning to take advantage of building scale passive strategies designing building envelopes and choosing materials to minimize energy use and maximize human comfort
- increase project durability and efficient use of resources while reducing waste management
- ensuring that project do not negatively impact the environmental quality of campus

UBC Vancouver Campus Plan and Design Guidelines Section 2.1 Campus Wide Sustainability pg 9-10 and 2.3.10 Sustainability Best Practice In Building Design, pg 18-20

## 4.4 Goals & Targets

The project goals and targets supported the 22 guiding principles listed above. It provided a working tool for the design team during the development of CIRS and its systems.

The matrix in Table 4.1 on pages 8-27 contains the complete set of goals and targets used on the CIRS project

## 4.5 Benefits

The goals and targets benefitted the CIRS project in the following ways:

**Attracted Attention**

- Audacious goals attract and excite people. Goals helped stakeholders and the general public understand project intentions and visualize the end result.

**Guided Better Decision Making**

- Goals helped to direct the project over long periods and multiple iterations. They also guided decisions made by the design team and stakeholders throughout the development of the project. Despite the fact that the strategies for CIRS were refined over time, the goals were a consistent narrative was available to remind the design team and stakeholders of the project priorities.

**Translated Vision to Reality**

- The goals translate the vision of the project into reality and provided concrete meaning to conceptual ideas. The CIRS vision is to accelerate sustainability. The goals provided specific objectives that clarified what 'accelerating sustainability' meant to different aspects of the project while providing the design team with clear targets to achieve.

**Changed the Conversation**

- Positive goals can help re-frame the conversation about sustainability. The general dialogue about sustainability is often about sacrifice and lifestyle change. Discussing sustainability as having positive impacts on both the environment and humans resonated with many people who were presented with the CIRS vision.

**Aligned Goals to Funding Sources**

- Setting challenging goals attracted unusual sources of funding to the project. Support from the funding agencies brought credibility to the project. Strategies and goals that were externally funded were less likely to be removed from the project by either the owner or the design team.

### RESOURCES

*CIRS Integrated Design Process Case Study Report, 2008*

*CIRS 2004-2006 Sustainability Goals and Strategies Document*

*CIRS Charette Proceedings Document, 2008*

*CIRS Goals in Outline Form, Charette Proceedings Appendix 3.7, 2008*

*CIRS Goals in Numbered Form, Charette Proceedings Appendix 3.7, 2008*

*Presentations from the Goals Charette*

## 4.6 Challenges

The goals and targets of the CIRS project were challenging to implement in the following ways:

### Resolving Conflicting Goals

- One of the original goals of the CIRS project was to have an experimental building with the capability of continually changing components and systems to test different technologies and configurations. . Another goal was for CIRS to be a high-performing building in certain key metrics (including energy use and water consumption). There is some conflict between these goals as an experimental building does not always represent the best performing building, due to the uncertain success of some experiments. In the final design, the core of the project became a high-performance building with certain systems and components maintaining significant testing capabilities.

### Preventing Design Compromises

- Not all goals established at the outset of the design process could be met as the design and construction of the building progressed. For example, the offices blocks were designed to accommodate a mix of open and closed office spaces, in amounts that would allow for 100 per cent daylighting and natural cross-ventilation. The tenant fit-outs resulted in significantly more closed offices than was originally intended, which limited the effectiveness of the passive strategies and necessitating more supplementary artificial lighting and mechanical ventilation.

## 4.7 Lessons Learned

The experience gained through the using the goals and targets for CIRS provided valuable lessons to apply to future projects. Some of the key lessons are:

### Tie Funding to Goals

- Tie goals to funding to make them more robust and reduce the risk of weakening or elimination.

### Prioritize Goals

- One goal may inherently be in conflict with another and priorities must be determined. The building context may limit the application of certain approaches but creative solutions must ensure achievement of the broader goals.

### Make Distinctions between Goals and Strategies

- Goals are high-level objectives, distinct from the strategies used to achieve them. Goals should persist throughout the duration of a project, despite changes in design and context. Strategies depend on the opportunities available in a specific context of a project.

### Develop Simple but Compelling Goals

- Simple goals are easy to communicate and sustain throughout the project. Use the goals to service the project vision. Make them personal to spur on the design team, engage a variety of stakeholders, and appeal to the public.

### Look for Planning Synergies

- The design of CIRS and the development of the UBC Vancouver Campus Plan and Design Guidelines occurred at the same time and involved many of the same stakeholders. The high goals and innovative strategies of the CIRS project helped shape the Campus Plan, which was based on compatible sustainability principles.

## 4.8 Future Learning

Additional lessons learned over the operational life of the building will be added at periodic intervals

| Focus Areas | Category | Goals | Target | Strategies | Implemen-tation (has been or will be) | Implementation |
|---|---|---|---|---|---|---|
| DESIGN PROCESS | 1 - DIGITAL & PAPERLESS DESIGN | The building will be designed using 3D virtual design technologies. | | Use design tools to facilitate 3D virtual design and digital tender. | Y | Autodesk Revit was used. |
| | | Design will be paperless | Paperless | Use design tools to facilitate 3D virtual design and digital tender. | N | Patially succeeded - priting reproduction cost were less than similar project. |
| | 2- LIFE CYCLE ASSESSMENT | Conduct a life cycle assessment of all building assemblies and products to examine environmental impact, including embodied energy and greenhouse gas emissions - minimize carbon dioxide emissions associated with construction. | | Use tools such as the Athena Sustainable Materials Environmental Impact Estimator and other tools to assess the full life cycle environmental and costs impacts of the CIRS' building design over a time frame of 100 years. | Y | Analysis for embodied carbon in building material and construction. |
| | | | | Heating, cooling and water systems designed to adapt to anticipated changes in climate over the next 100 years. | Y | |
| | | | | Building structure is to be evaluated and designed to last 100 years or more. | Y | |
| SITE DESIGN | 3 - NET IMPACT | Neutralize ecological impact on site by having a net positive biomass and oxygen provided on-site. | New site design on existing site: 44 per cent grass & shrubs – 100 per cent of which must be native/adaptive species. Existing site plant coverage was 44% grass and shrubs. The new site will have more plant coverage (100% of which must be native/ adaptive species) than the existing site. | Native landscaping. | Y | Installed on living roof and at grade. |
| | | | | Install a green roof | Y | Installed on Auditorium roof. Comprises 31 per cent of total roof area. |
| | | | | Include community gardens and orchard. | N | Not implemented. |
| | | | | Engage a biologist to provide expertise on opportunities to bring back the native ecosystem. | N | Not implemented yet. |
| | | | | Install constructed wetland. | Y | The Solar Aquatic System contains a wetland component (indoor). |
| | | | | Bio-filter on-site. | Y | Not relevant to UBC site conditions. |
| | | Regenerate ecosystems to attract local fauna (birds, bees, herons, & butterflies). | Increase local native fauna on the site | Native landscaping. | Y | Installed on living roof and at grade. |
| | | | | Install a green roof | Y | Installed on Auditorium roof. Comprises 31 per cent of total roof area. |
| | | | | Engage a biologist to provide expertise on opportunities to bring back the native ecosystem. | N | Not implemented yet. |
| | | Eliminate on-site run-off | 100 per cent stormwater will treated, used or infiltrated on site. | Native landscaping. | Y | Installed on living roof and at grade. |
| | | | | Install a green roof | Y | Installed on Auditorium roof. Comprises 31 per cent of total roof area. |
| | | | | Reduce paved areas and build no parking on site | Y | |
| | | | | Install constructed wetland. | N | The Solar Aquatic System contains a wetland component. (indoor). |
| | | | | No stormwater connection to municipal infrastructure. | N | Stormwater from the site is used to re-charge the local aquifer through drainage on Sustainability Street. |
| | 4 - POSITIVE COMMUNITY IMPACT | Maximize sustainable contributions to the local community | | Include community gardens and orchard. | N | Not implemented. |
| | | | | Create plaza and green space for community interaction. | Y | |
| | | | | Use landscape features to affect the energy profile of the Centre. | Y | Living wall shading on west face. Living roof on the Auditorium protects internal spaces from heat gain. |
| | | | | Program for external use of space by building occupants and the neighbouring community. | Y | The MGD Auditorium and BC Hydro Theatre are resources for the entire UBC community. |

Table 4.1 CIRS Project Goals & Targets Matric

| Focus Areas | Category | Goals | Target | Strategies | Implemen-tation (has been or will be) | Implementation |
|---|---|---|---|---|---|---|
| ENERGY | 5 - SUPPLY SYSTEMS | Supply all building energy requirements from on-site sustainable and renewable energy sources. | Direct energy consumption target: Meet and exceed the best achieved to date for comparable uses (< 75kWh/m2/yr. overall, 15 kWh/m2/yr. for heating) Reduce energy loads. | Minimize energy needs for building operation. | Y | |
| | | | | Match quality of energy with usage (sensible energy use). | Y | Electricity for power and lights. Heat pumps for heating/cooling. |
| | | | | Orient the building to maximize passive solar strategies. | Y | |
| | | | | Use exterior and interior solar control strategies specific to each façade in order to minimize solar heat gain in interior spaces and to offset cooling loads. | Y | |
| | | | | Select high performance glazing systems specific for each façade. | Y | |
| | | | | Utilize thermal mass to moderate indoor temperature. | Y | Design features to be implemented. |
| | | | | Incorporate biomass as part of the evaporative cooling system and oxygenation and filtration system. | N | |
| | | | | Maximize natural ventilation through the use of operable windows, trickle vents, and air ducts. | Y | |
| | | | | Maximize daylighting opportunities through building orientation and selection of appropriate glazing. | Y | |
| | | | | Employ control systems such as daylight and occupancy sensors to control electrical lighting loads in office spaces, washrooms, stairwells, storage rooms, and parking garage. | Y | |
| | | | Harvest 100 per cent building energy from onsite renewable resources. | Install wind turbine. | N | Not feasible at this location. |
| | | | | Install ground source heat pumps. | Y | Installed |
| | | | | Use solar hot water tubes to preheat domestic hot water supplies. | Y | Installed |
| | | | | Capture waste heat | Y | Waste heat is captured from EOS and internal processes |
| | | | Install photovoltaics for 30 per cent of building operation requirements. | Install photovoltaics to meet some of building energy operation requirements | Y | Photovoltaics installed - 30 per cent not reached, achieved approximately 10 per cent. |
| | | Achieve net positive energy performance. | Reduce energy loads. | Minimize energy needs for building operation. | Y | |
| | | | | Match quality of energy with usage (sensible energy use). | Y | |
| | | | | Orient the building to maximize passive solar strategies. | Y | |
| | | | | Use exterior and interior solar control strategies specific to each façade in order to minimize solar heat gain in interior spaces and to offset cooling loads. | Y | |
| | | | | Select high performance glazing systems specific for each façade. | Y | |
| | | | | Utilize thermal mass to moderate indoor temperature. | Y | |
| | | | | Incorporate biomass as part of the evaporative cooling system and oxygenation and filtration system. | N | Not yet implmented. |
| | | | | Maximize natural ventilation through the use of operable windows, trickle vents, and air ducts. | Y | |
| | | | | Maximize daylighting opportunities through building orientation and selection of appropriate glazing. | Y | |
| | | | | Employ control systems such as daylight and occupancy sensors to control electrical lighting loads in office spaces, washrooms, stairwells, storage rooms. | Y | No daylight sensors in the stairwells |
| | | | Harvest energy exceeding the building needs. | Install wind turbine. | N | Not Implemented |
| | | | | Install ground source heat pumps. | Y | Installed |
| | | | | Use solar hot water tubes to preheat water supplies. | Y | Installed |
| | | | | Install photovoltaics to meet some of building energy operation requirements | Y | Photovoltaics installed - 30 per cent not reached, achieved approximately 10 per cent. |
| | | | | Capture waste heat from other sources | Y | EOS heat exchange system. |

| Focus Areas | Category | Goals | Target | Strategies | Implementation (has been or will be) | Implementation |
|---|---|---|---|---|---|---|
| ENERGY | 5 - SUPPLY SYSTEMS | Be greenhouse gas emission neutral. | | Minimize energy needs for building operation. | | |
| | | | | Install photovoltaics to meet some of building energy operation requirements | Y | Photovolatics installed - 30 per cent not reached, achieved approximately 10 per cent. |
| | | | | Install wind turbine. | N | Not Implemented |
| | | | | Ground source heat pumps. | Y | Installed |
| | | | | Use solar hot water tubes to preheat water supplies. | Y | Installed |
| | | | | Match quality of energy with usage (sensible energy use). | Y | |
| | | | | Orient the building to maximize passive solar strategies. | Y | |
| | | | | Use exterior and interior solar control strategies specific to each façade in order to minimize solar heat gain in interior spaces and to offset cooling loads. | Y | Exterior louvres on southern exposures, living wall on western facade and internal blinds. |
| | | | | Maximize natural ventilation through the use of operable windows, trickle vents, and air ducts. | Y | |
| | | | | Maximize daylighting opportunities through building orientation and selection of appropriate glazing. | Y | |
| | | | | Capture waste heat from other sources. | Y | EOS heat exchange system. |
| | | | | Employ control systems such as daylight and occupancy sensors to control electrical lighting loads in office spaces, washrooms, stairwells, storage rooms, and parking garage. | Y | |
| | 6 - REDUCTION (HVAC) | Design CIRS to be as passive and simple as possible. | | Orient and design the building to maximize passive solar strategies and daylighting opportunities | Y | |
| | | | | Use exterior and interior solar control strategies specific to each façade in order to minimize solar heat gain in interior spaces and to offset cooling loads. | Y | |
| | | | | Select high performance glazing systems specific for each façade. | Y | Ratio of glazing to solid panels different for each exposure. |
| | | | | Under floor displacement ventilation to be a part of raised floor system. | Y | |
| | | | | Use in slab radiant heating and cooling. | Y | Atrium and lobby. |
| | | | | Design atriums for storage and stack effect. | Y | |
| | | | | Utilize thermal mass to moderate indoor temperature. | Y | |
| | | | | Incorporate biomass as part of the evaporative cooling system and oxygenation and filtration system. | N | Not yet implmented. |
| | | | | Ensure the building works by itself and that it responds actively and autonomously to environmental stimulus. | N | Not yet implmented. |
| | | | | Eliminate reliance on mechanical systems for air conditioning. | Y | Except in the Auditorium. |
| | | | | Use natural ventilation strategies for cooling indoor environments through the use of operable windows. | Y | |
| | | | | Specify high albedo Energy Star Rated roofing membrane to reduce mechanical cooling loads for the building envelope and minimize the urban heat island effect. | Y | |
| | | | | Install green roofing system to reduce mechanical cooling loads and minimize the urban heat island effect | Y | Living roof on Auditorium. |

| Focus Areas | Category | Goals | Target | Strategies | Implemen-tation (has been or will be) | Implementation |
|---|---|---|---|---|---|---|
| ENERGY | 6 - REDUCTION (HVAC) | Demonstrate that all strategies have the lowest possible energy requirements. | | Install controls and monitoring systems to optimize total building energy consumption. Gather data from annual systems reports and use feedback to improve overall building performance. | Y | |
| | | | | Software lab - test the benefits of thermal mass and natural ventilation. | N | Future Project. |
| | | | | Create partnerships with industry - up & downstream reports, certification. | Y | |
| | | Design a high performance building envelope. | Building envelope thermal performance to average R20 (3.5 RSI)). | Orient and design the building to maximize passive solar strategies and daylighting opportunities. | Y | |
| | | | | Use exterior and interior solar control strategies specific to each façade in order to minimize solar heat gain in interior spaces and to offset cooling loads. | Y | |
| | | | | Select high performance glazing systems specific for each façade. | Y | Ratio of glazing to solid panels different for each exposure. |
| | | | | Ensure the building works by itself and that it responds actively and autonomously to environmental stimulus. | N | Not yet implemented. |
| | | | | Specify high albedo Energy Star Rated roofing membrane to reduce mechanical cooling loads for the building envelope and minimize the urban heat island effect. | Y | |
| | | | | Install green roofing system to reduce mechanical cooling loads and minimize the urban heat island effect. | Y | |
| | | | | Install controls and monitoring systems to optimize total building energy consumption. Gather data from annual systems reports and use feedback to improve overall building performance. | Y | |
| | 7 - ENERGY REDUCTION LIGHTING | CIRS will integrate daylight systems that provide 100per cent of the illumination required in occupied areas through the building during the day to minimize lighting power consumption. | Max lighting power density (LPD). xx watts/ square foot. | Orient and design the building to maximize passive solar strategies and daylighting opportunities. | Y | |
| | | | | Select glazing appropriate for each façade, optimising daylighting opportunities. | Y | |
| | | | | Use light shelves to penetrate daylight deep into the building interior. | N | Not necessary with the narrow floorplate. |
| | | | | Employ daylight sensors to control the use of interior lighting. | Y | |
| | | | | Integrate solar reflectors, mesooptic technology, light tubes, and light shelves to maximize daylight penetration. | N | Not necessary with the narrow floorplate. |
| | | | | Use high efficiency lighting such as LED lights, T5 etc. | Y | |
| | | | | Install controls and monitoring systems to minimize total building energy consumption. Gather data from annual systems reports and use feedback to improve overall building performance. | Y | |
| | | | | Test daylighting strategies in the solar and daylighting lab. | Y | |
| WATER | 8 - RAINWATER COLLECTION AND USE | 100 per cent of potable water requirements will be met with on-site collected rainwater. | 100 pre cent rainwater input. | 100 per cent of potable water collected from rainwater. | Y | |
| | | | | Capture and filter stormwater for reuse in landscape irrigation and building process loads (flushing of toilets etc.). | N | Excess stormwater is channeled to drainage basin on adjacent site and allowed to filter to the aquifer. Reclaimed water is used for irrigation and process loads. |
| | | | | Reuse greywater for mechanical system loads. | N | Not relevant to mechanical system used at CIRS. |
| | | | | Install water efficient appliances that are Energy Star Rated. | Y | |
| | | | | Install water efficient fixtures (dual flush toilets and waterless urinals). | N | Fixtures use reclaimed water. |
| | | | | Install dry fixtures (composting toilets and waterless urinals). | N | Incompatible with water management strategy. |
| | | | | Establish partnerships with Health Canada, CSA, and GVRD to test quality of on-site collected potable water and effectiveness of technologies. | Y | Parterships efforts are underway. |

| Focus Areas | Category | Goals | Target | Strategies | Implemen-tation (has been or will be) | Implementation |
|---|---|---|---|---|---|---|
| WATER | 9 - WASTEWATER COLLECTION, TREATMENT & REUSE | All wastewater will be collected and treated on-site or within the 'sustainability precinct'. | Zero wastewater output from site | Install water efficient fixtures (dual flush toilets & waterless urinals). | N | Fixtures use reclaimed water. |
| | | | | Install dry fixtures (composting toilets and waterless urinals). | N | Incompatible with water management strategy. |
| | | | | Design a wastewater treatment system using Living Machine or Solar Aquatic technologies to treat liquid waste onsite that processes all liquid 'waste' into pure water and useful feedstocks. | Y | |
| | | | | Explore constructing a wetland to treat wastewater from CIRS and neighbouring buildings. | Y | The Solar Aquatic System contains a wetland component (indoor). The reclaimed water system will treat some wastewater from the capus sewer system. |
| | | | | Treat greywater to be reused for flushing toilets. | Y | Fixtures use reclaimed water. |
| | | | | Establish partnerships with Health Canada, CSA, and GVRD to test quality of on-site collected potable water and effectiveness of technologies. | Y | Parterships efforts are underway. |
| | | | | Develop user (building inhabitants/public) education program (display screen systems). | Y | |
| | | Recognize environmental opportunities in the management of human waste | | Install water efficient appliances that are Energy Star Rated. | Y | Fixtures use reclaimed water. |
| | | | | Install dry fixtures (composting toilets and waterless urinals). | N | Incompatible with water management strategy. |
| | | | | Design a wastewater treatment system using Living Machine or Solar Aquatic technologies to treat liquid waste onsite that processes all liquid 'waste' into pure water and useful feedstocks. | Y | |
| | | | | Explore constructing a wetland to treat wastewater from CIRS and neighbouring buildings. | Y | The Solar Aquatic System contains a wetland component (indoor). The reclaimed water system will treat some wastewater from the capus sewer system. |
| | | | | Treat greywater to be reused for flushing toilets. | Y | |
| | | | | Establish partnerships with Health Canada, CSA, and GVRD to test quality of on-site collected potable water and effectiveness of technologies. | Y | Parterships efforts are underway. |
| | | | | Develop user (building inhabitants/public) education program (display screen systems). | Y | |
| | 10 - STORMWATER MANAGEMENT | 100 per cent of stormwater will be controlled, disposed of, reused and discharged on-site. | Zero stormwater output from site. | Capture and filter stormwater for reuse in landscape irrigation and building process loads (flushing of toilets etc.). | Y | Harvested rainwater is being treated to potable water quality for use in the building. |
| | | | | Capture and store stormwater on site. Filter and reuse stormwater for landscape irrigation and mechanical process loads. | Y | Stored on-site using a bio-swale and the vegetated roof. |
| | | | | Install a green roofing system to reduce the rate and quantity of stormwater runoff from roofscapes. | Y | |
| | | | | Decrease impervious surfaces on the site to encourage the infiltration of stormwater. | Y | |
| | | | | Integrate landscaped bioswales and buffers to control site stormwater runoff. | Y | |
| | | Water leaving the site should be as good or better quality than when it arrived. | Clean all water used onsite,100 per cent. | Capture and filter stormwater for reuse in landscape irrigation and building process loads (flushing of toilets etc.). | Y | Harvested rainwater is being treated to potable water quality for use in the building. |
| | | | | Capture and store stormwater on site. to filter and reuse for landscape irrigation and mechanical process loads. | Y | Stored on-site using a bio-swale and the vegetated roof. |
| | | | | Install a green roofing system to reduce the rate and quantity of stormwater runoff from roofscapes. | Y | |
| | | | | Decrease impervious surfaces on the site to encourage the infiltration of stormwater. | Y | |
| | | | | Integrate landscaped bioswales and buffers to control site stormwater runoff. | Y | |
| | | Zero net runoff from site. | Zero stormwater output from site. | Capture and filter stormwater for reuse in landscape irrigation and building process loads (flushing of toilets etc.). | Y | Harvested rainwater is being treated to potable water quality for use in the building. |
| | | | | Capture and store stormwater on site. Filter and reuse stormwater for landscape irrigation and mechanical process loads. | Y | Stored on-site using a bio-swale and the vegetated roof. |
| | | | | Install a green roofing system to reduce the rate and quantity of stormwater runoff from roofscapes. | Y | |
| | | | | Decrease impervious surfaces on the site to encourage the infiltration of stormwater. | Y | |
| | | | | Integrate landscaped bioswales and buffers to control site stormwater runoff. | Y | |

| Focus Areas | Category | Goals | Target | Strategies | Implementation (has been or will be) | Implementation |
|---|---|---|---|---|---|---|
| RESOURCE CONSERVATION | 11 - RESOURCE EFFICIENT BUILDING | Minimize resource consumption and greenhouse gas impact of building materials and construction . | Target 50 per cent of typical building ecological footprint and greenhouse gas profile of construction. | Select building materials with the lowest ecological footprint and greenhouse gas impact. | Y | |
| | | | | Select materials from sustainably harvested sources. | Y | |
| | | | | Maximize use of wood and natural materials. | Y | |
| | | | | Minimize manufacturing and transportation energy inputs. | Y | |
| | | | | Perform life-cycle analysis study on building materials assembly systems to assess life cycle impacts. | Y | Analysis on embodied carbon and material construction. |
| | | | | Explore opportunities to recover waste materials into new building materials (i.e. recycle glass into cladding material). | N | Recycled glass is used to make washroom countertops other examples |
| | | | | Explore opportunities to use "rediscovered" supplies of wood such as wood damaged by pine beetles. | Y | |
| | | | | Select materials with low embodied energy such as those from local, sustainably harvested, and salvaged sources. | Y | |
| | | | | All elements to be fully demountable / recyclable. | Y | Not applicable to all systems. |
| | | | | Minimize use of construction finishes. | Y | |
| | | | | Construct the building from locally and sustainably harvested wood. | Y | |
| | | | Maximize the life, flexibility and recycling potential of the building. | Design construction assemblies to have a 100-year life span and for deconstruction instead for demolition. | Y | |
| | | | | Design the building for assembly, modification, and disassembly (i.e. use bolted connections). | Y | |
| | | | | Design building for long term use and flexibility. | Y | |
| | | | | Test office, lab, research labs, and retail spaces for layout and use requirements. | Y | |
| | | | | Compare shear wall vs. structure flexibility. | Y | |
| | | | | Design for durability. | Y | |
| | | | | Maximize use of wood and natural materials. | Y | |
| | | | | All elements to be fully demountable / recyclable. | Y | Not applicable to all systems. |
| | | | | Minimize use of construction finishes. | Y | |
| | | | | Explore opportunities to recover waste materials into new building materials (I.e., recycle glass into cladding material). | Y | |
| | | | | Select materials that contain a high percentage of recycled content such as recycled aggregate in concrete. | Y | Approximately 35 per cent of the materials are made from recycled content |
| | | Make design and operation choices based on the lowest life-cycle costs. | Maximize intensity of use. | Select building materials with the lowest ecological footprint and GHG impact. | Y | |
| | | | | Minimize manufacturing and transportation energy inputs. | Y | |
| | | | | Perform life-cycle analysis study on building materials assembly systems to assess life cycle impacts. | Y | |
| | | | | Design construction assemblies to have a 100-year life span and for deconstruction instead for demolition. | Y | |
| | | | | Design the building for assembly, modification, and disassembly (i.e. use bolted connections). | Y | |
| | | | | Explore opportunities to recover waste materials into new building materials (i.e. recycle glass into cladding material). | Y | |
| | | | | Explore opportunities to use "rediscovered" supplies of wood such as wood damaged by pine beetles. | Y | |
| | | | | Select materials with low embodied energy such as those from local, sustainably harvested, and salvaged sources. | Y | |
| | | | | Construct the building from locally and sustainably harvested wood. | Y | |
| | | | | Select materials that contain a high percentage of recycled content such as recycled aggregate in concrete. | Y | |

| Focus Areas | Category | Goals | Target | Strategies | Implemen-tation (has been or will be) | Implementation |
|---|---|---|---|---|---|---|
| RESOURCE CONSERVATION | 11 - RESOURCE EFFICIENT BUILDING | Produce a core building that exemplifies replicable, economical solutions. | | Maximize use of wood and natural materials. | Y | |
| | | | | Design building for long-term use and flexibility. | Y | |
| | | | | Test office, lab, research labs, and retail spaces for layout and use requirements. | Y | Flexible office spaces are included in the project. |
| | | | | Compare shear wall vs. structure flexibility. | Y | Shear panel/ box beam system was used. |
| | | | | All elements to be fully demountable / recyclable. | Y | |
| | | | | Design for durability. | Y | |
| | | | | Minimize use of construction finishes. | Y | |
| | | | | Design construction assemblies to have a 100-year life span and for deconstruction instead for demolition. | Y | |
| | | | | Design the building for assembly, modification, and disassembly (i.e., use bolted connections). | Y | |
| | | | | Explore opportunities to recover waste materials into new building materials (i.e., recycle glass into cladding material). | N | Recycled glass is used to make washroom countertops. |
| | | | | Select materials with low embodied energy such as those from local, sustainably harvested, and salvaged sources. | Y | |
| | | | | Select materials that contain a high percentage of recycled content such as fly ash and recycled aggregate in concrete. | Y | |
| | 12 - WASTE ELIMINATION | Zero Waste | Zero construction waste (95 per cent minimum diversion) | All elements to be fully demountable / recyclable. | Y | |
| | | | | Design for durability. | Y | |
| | | | | Minimize use of construction finishes. | Y | |
| | | | | Design construction assemblies to have a 100-year life span and for deconstruction instead for demolition. | Y | |
| | | | | Design the building for assembly, modification, and disassembly (i.e., use bolted connections). | Y | |
| | | | | Explore opportunities to recover waste materials into new building materials (I.e., recycle glass into cladding material). | Y | |
| | | | | Establish take back programs with material suppliers (i.e., take back program for packaging). | N | Waste was sourced by contractor. |
| | | | | Develop eco-industrial networks with community organizations. | N | |
| | | | | Design a materials-handling strategy for supplies and components entering the building over their life that seeks to eliminate solid waste going to landfills | N | Limited to requirements of LEED and LBC. |
| | | | Zero operational waste | Design building for long term use and flexibility. | Y | |
| | | | | Design the building for assembly, modification, and disassembly (I.e., use bolted connections). | Y | |
| | | | | Develop an overall building composting program for food waste. | Y | UBC has campus-wide composting program. |
| | | | | Establish a contract with a recycling and composting service provider such as with Superior Disposal. | Y | UBC has its own recycling and compost programs. |
| | | | | Develop an overall occupant recycling program for office materials such as paper, cans, bottles, cardboard etc. | Y | UBC has a campus-wide reduce/reuse/ recycling program. |
| | | | | Develop "green leasing" policies for building tenants to reduce waste streams. | Y | Tenants signed a Sustainability Charter. |
| | | | | Establish take back programs with material suppliers (i.e., take back program for packaging). | N | |
| | | | | Develop eco-industrial networks with community organizations. | N | |
| | | | | Design a materials-handling strategy for supplies and components entering the building over their life that seeks to eliminate solid waste going to landfills | N | |
| | | | Recognize environ-mental opportunities in the management of food waste. | Develop an overall building composting program for food waste. | Y | UBC has campus-wide composting program. |
| | | | | Establish a contract with a recycling and composting service provider such as with Superior Disposal. | Y | UBC has its own recycling and compost programs. |

| Focus Areas | Category | Goals | Target | Strategies | Implementation (has been or will be) | Implementation |
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| RESOURCE CONSERVATION | 13 - BUILDING UTILIZATION | Maximize hours of operations and density of use. | Maximize intensity of use. | Design building for long-term use and flexibility. | Y | |
| | | | | Maximize the hours of operation and use of the building zone services | Y | |
| | | | | Design the building to be adaptable to future program uses, and for service and communications updates. | Y | |
| | | | | Ensure share spaces are flexible, allowing for a variety of uses. | Y | |
| | | | | Design for compact occupancies (partnership opportunities). | Y | |
| | | | | Building design and layout to accommodate hoteling stations for those building occupants that tele-commute. | Y | |
| OCCUPANT HEALTH | 14- DAYLIGHTING | CIRS workspaces will be 100 per cent daylit and provide connection to the natural world through views. | | Design the floor plates to maximize daylight opportunities. | Y | |
| | | | | Maximize daylight penetration through the use of light shelves, skylights, clerestories, and glazed atriums. | Y | |
| | | | | Use light tubes to penetrate daylight into the underground parking and washrooms. | N | No underground parking |
| | | | | Maximize daylighting opportunities and occupant access to views. | Y | |
| | | | | Light levels and quality appropriate to tasks, with the option of relying on natural light whenever available and appropriate to the task | Y | |
| | | | | Design interior work spaces to be 100 per cent daylit by harnessing daylight from perimeter windows, clerestories, skylights, and light wells. | Y | |
| | 15 - AIR QUALITY | The building will provide the purest possible indoor air quality. | Air that meets or exceeds outdoor air quality. | Design a living / breathing wall to filter air pollutants and oxygenate interior working environments. | N | Future project - connection in place. |
| | | | | Ensure there is effective air changing and mixing, providing all regularly occupied areas with adequate air quality. | Y | |
| | | | | Filter air in order to provide more than adequate indoor air quality for building occupants. | Y | |
| | | | | Install carbon dioxide monitoring devices to gauge the level and adequacy of indoor air. | Y | Also VOC sensors. |
| | | | | Design the building to optimize thermal comfort. | Y | |
| | | | Preclude materials on the Living Building Challenge 'Red List'. | Select construction finishes that emit low or zero volatile organic compounds (VOC) emissions, minimizing interior contaminants and poor indoor air quality. | Y | |
| | | | | Avoid toxic materials. | Y | |
| | | | | Select low VOC emitting furniture systems. | Y | |
| | 16 - OXYGENATION | The building will oxygenate indoor and exterior environments on an annual basis. | | Increase exterior planting to filter air borne contaminants. | Y | |
| | | | | Design a living / breathing wall to filter air pollutants and oxygenate interior working environments. | N | Future project - connection in place. |
| | | | | Design oxygenation system as part of the HVAC system. | N | Not feasible |
| | 17 - COMFORT & CONTROL | Provide areas for social interactions and physical activities and human health needs. | | Design to include personal spatial needs. | Y | |
| | | | | Include a fitness and health centre for building occupants and public. | N | UBC has facilitites to serve campus community. |
| | | | | Create social and peer learning spaces. | Y | |
| | | | | Democratise planning. | Y | |
| | | | | Encourage stairs over elevators and daylight stairs. | Y | |
| | | | | Provide areas for the preparation and sharing of food | Y | |
| | | | | Design the building to accommodate movement of occupants, encouraging interaction and socialization between building occupants. | Y | |
| | | | | Create a variety of spaces and terraces for interaction of building occupants. | Y | |

| Focus Areas | Category | Goals | Target | Strategies | Implementation (has been or will be) | Implementation |
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| OCCUPANT HEALTH | 17 - COMFORT & CONTROL | Provide local control over comfort conditions to adapt to individual preferences. | | Provide individual controls from temperature, lighting, and air flow. | Y | |
| | | | | Examine acoustic qualities of designed workspaces and provide for acoustic separation for privacy when needed | Y | |
| | | | | Install ergonomically sound office furniture. | Y | |
| | | | | Inhabitants receive feedback from building's smart instrumentation to create optimal indoor environments | Y | |
| | | | | The building's smart instrumentation learns from its inhabitants through monitoring to deliver comfort where appropriate | N | Future project through building BMS interface. |
| | | | | Inhabitants provide evaluations to operations management when systems run poorly | Y | |
| | | | | Operations Management provides feedback to inhabitant groups as to how their areas are performing in terms of energy, water, and material use. | Y | |
| BUILDING OPERATION AND MAINTENANCE | 18 - SEAMLESS DESIGN AND OPERATION | The building will seamlessly integrate the design and ongoing operations. | | Consult the developers' operations staff early on in the design phase to ensure a minimal level of understand of the systems and technologies proposed. | Y | |
| | | | | Create training and aware program for staff to ensure the building is operated and maintained at an optimal level. | Y | |
| | | | | Conduct regular commissioning of all mechanical and electrical systems to ensure systems are operating in accordance with the design intent. | Y | |
| | | | | Employ systems for ongoing measurement and verification of building and systems performance. | Y | |
| | | | | Conduct post-occupancy evaluations and annual reports on building performance. | Y | |
| | | | | Conduct pre and post-tenancy evaluations to gather feedback from tenants. | Y | |
| CIRS OUTREACH | 19 - BMA LAB | Utilize the building and resources in partnership with manufactures and authorities to advance knowledge of sustainable design strategies. | | Test building materials and equipment. | Y | Collaborative research with industry partners BC Hydro, Haworth and Honeywell |
| | | | | Test building materials in labs for durability and other performance qualities. | N | |
| | | | | Develop partnerships with Health Canada, GVRD, CSA and others to test products and development of new products. | Y | Parterships efforts are underway. |
| | | | | Develop partnerships with organizations to test water, rainwater, greywater and onsite treatment system. | Y | Parterships efforts are underway. |
| | 20 - SOFTWARE LAB | CIRS will be a living lab for building researchers and software companies to test predictive software for : thermal mass, ventilation models, indoor air quality and daylighting effectiveness. | | Building design to include a building simulation lab. | Y | Program includes a building simulation lab, softwarer lab, indoor environmental quality lab, building monitoring and assessment lab and operations center. |
| | | | | Thousands of points (sensor/monitoring) | Y | |
| | | | | Building design to include a solar lab. | Y | Distributed capabilities throughout other lab facilitites. |

| Focus Areas | Category | Goals | Target | Strategies | Implemen-tation (has been or will be) | Implementation |
|---|---|---|---|---|---|---|
| CIRS OUTREACH | 21 - COMMUNITY AND EXTERNAL IMPACTS | Minimize external and community environmental impacts of CIRS's staff and visitors. | | Establish a comprehensive alternative transportation plan for building occupants to include: Reduce on-site parking requirements, provision of only 100 parking stalls. Provide hybrid, fuel cell and electric vehicles for building occupants. Provide "clean fuel" mall (i.e., recharging or refuelling stations) alternative fuel vehicles. Designate preferred parking for alternative fuel vehicles. Establish a car and van-pool program for building occupants and designate preferred parking stalls. Provide over 200 secure bicycle stalls, showers and changing facilities for cyclist commuters. Encourage the use of transit by providing transit passes for employees. Develop a "pedestrian first policy" and safe linkages to existing transportation networks. Conduct tenant transportation assessment as part of lease agreement. Educate building occupants and community on alternative transportation plans. | N | No parking is provided on site. Not relevant to this context. UBC has campus-wide policies to address alternative means of transportation and to minimize automobile use. |
| | | | | Collect biomass from local parks department for biomass co-gen system. | N | |
| | | | | Provide community gardens for neighbouring residents. | N | |
| | | | | Establish a procurement policy with a mandate of purchasing products and services from local sources. | Y | Locally sourced products were used as much as was feasible |
| | | | | Procure local materials, construction services, building maintenance and services contracts. | Y | |
| | | | | Encourage community use of the facility. | Y | |
| | | | | Track and monitor the number of jobs created as a result of the creation of the CIRS project. | Y | Future project through Weestern Economic Diversification grant. |
| | | | | Encourage the development of spin off sustainable jobs and businesses. | | |
| | | | | Assess the productivity gains of the tenant occupants during their residence in the CIRS building. | Y | Future project through Weestern Economic Diversification grant. |
| | | | | Conduct and document post-occupancy evaluations once every five years. | Y | |
| | | | | Connect the campus and world to the workplace: be permeable to campus pathways, facilities that invite the campus and public to pass through parts of the facility and share food and ideas | Y | |
| | 22 - PUBLIC EDUCATION | CIRS will disseminate sustainable design practices, knowledge and experience as widely as possible. | | Encourage community use of the facility. | Y | |
| | | | | Conduct and document post-occupancy evaluations once every five years. | Y | |
| | | | | Connect the campus and world to the workplace: be permeable to campus pathways, facilities that invite the campus and public to pass through parts of the facility and share food and ideas | Y | |
| | | | | Information will be disseminated to the public and building visitors through the following communication outlets: circulation spine and tours, "Try it out" multiple technologies, monitoring labs and display screens, exhibition spaces, BC Hydro Theatre (Group Decision Environment), website virtual tours, CIRS website and technical manual. | Y | |
| | | | | Information will be transferred and shared by professionals and researchers through the following mechanisms: website, Policy Lab, partners workspaces, publications of measurement, verification and annual building assessments, "100" lectures series, undergraduate & graduate inter-institutional programs, training and certification. | Y | |
| | | | | Facilitate business opportunities by creating: partnerships with industry, academic institutions and government agencies, research capabilities through incubator space and research availability | Y | |