



# Designing Sustainable Lab Buildings

Sustainability in Science + Technology







UPSIDE Foods Research + Development Facility, Emeryville, CA

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**With your reading experience in mind, we have built in easy ways for you to navigate this document.**

**Use the bottom menu, arrows, and the table of contents to flip to different sections. Watch for arrows, buttons, and underlined hyperlinks throughout the document, they will lead you to more information.**





# We are Stantec

We design labs with the future in mind.

At Stantec, we know taking a sustainable approach isn't just smart practice, it's essential for our shared future. We want our clients and communities prepared for the long term—informed and enabled to make smart environmental and social choices. So, we design spaces and places in which our communities thrive.

We understand the complexities of designing science facilities. Flexibility to adapt to changing standards and needs, sustainable building design, and high-volume production are some of the many factors to be considered. Our cross-disciplinary, integrated team helps clients realize the full potential of their projects through sustainable strategies, including life cycle cost, energy efficiency, carbon reduction, and human health and wellness. To create labs of the future, we apply science and design to mitigate the interrelated crisis of carbon, climate, health, and justice.

Stantec offers the following disciplines and services:

- Lab planning
- Architecture (Core, Shell, Interior)
- Interior design + space programming
- Electrical engineering
- Mechanical engineering
- Structural engineering
- Sustainability consulting
- Commissioning
- Landscape design
- Civil engineering
- Feasibility studies
- Space utilization studies
- Master planning
- Acoustical, lighting and technology design
- Process engineering
- Building automation

**45+**  
LEED-certified lab projects

**2**  
Net zero-designed lab projects

**850+**  
LEED-accredited professionals

**80+**  
Sustainability & building performance specialists

**200+**  
Laboratory clients

**90+**  
Research facilities designed by Stantec



## Our Commitment to Sustainability

Stantec practitioners design with community in mind and recognize the urgency and professional responsibility of mitigating carbon emissions and their impact on the climate and built environment.

Stantec is a signatory to many industry commitments addressing environmental, social, and governance principles. Stantec Buildings is signatory to the AIA 2030 Commitment, AIA Materials Pledge, and SE 2050 Commitment. These commitments address operational carbon, embodied carbon, climate change mitigation, and material health impacts of our projects. They offer guidance to the design decisions we must make to transition to a carbon neutral and healthy future.

## Our Corporate Values Help Create Sustainable Communities

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of place and of belonging. That's why at Stantec, we always design with community in mind.

Our dedication to community and sustainability is mirrored in Stantec's corporate priorities. In recognition of our corporate sustainability efforts, in 2023 Corporate Knights ranked Stantec number seven globally, and number one in the firm's industry peer group, placing the company among the top one percent in the world on sustainability performance.

At Stantec, sustainability is a priority and considered in every aspect of the firm's operations.

# #1

Ranked most sustainable corporation among industry peers

2024 Corporate Knights Global 100

# 1%

Ranked among top 1% in the world on sustainable performance

2024 Corporate Knights Global 100



# Our Experience

## We have designed sustainable labs across North America.

Science and Technology (S+T) is a signature market sector for Stantec. It highlights our integrated approach to laboratory building and sophisticated research and production facilities design. Our depth of expertise includes integrating the latest trends and innovations while designing with sustainability at the core. Through planning and designing lab facilities across markets, we fluidly adapt and apply creative design solutions that help offset the large amounts of energy usage lab buildings often require.

### Lab types

Our S+T teams specialize in research laboratories, pharmaceutical manufacturing, vaccines and biologics, cleanrooms and suites, pilot plants and kilo labs, specialty warehouses, critical utilities, compliance and commissioning, decommissioning, and demolition.



Different lab typologies require different approaches to achieve sustainable measures. Stantec's S+T teams consists of architects, planners, and engineers, working across the globe. Together, we share a robust portfolio of all major wet and dry laboratory types, supporting both research and production, including:

- Biology labs
- Chemistry labs
- Biotech / seed labs
- Mass spec/nmr suites
- QA/QC labs
- Diagnostic labs
- Computational labs
- Physics
- Engineering
- Health science

### Cross-Sector Experience

All labs need support spaces, and most researchers need offices. Our work in S+T often crosses paths with other sectors, providing smart design experience that incorporates spaces for every user. A major benefit to being a globally integrated design firm is that our S+T teams can easily collaborate with designers in the Workplace, Health, Education, and Manufacturing sectors.

Beyond this, Stantec has a team of Carbon Impact professionals who are individually dedicated to and intimately familiar with each sector we serve.

When you hire a Stantec Lab Planner, you are also granted access to a team of programmers and designers with the experience and portfolio needed to support your project, regardless of typology.



# Integrating Carbon, Climate and Health

**We apply science and design to combat the interrelated crises of carbon, climate, health, and justice.**

Stantec Buildings is home to the Carbon Impact Team, one of the largest dedicated sustainability and building performance practices with specialized teams located across North America. Members of this team are specialists in their discipline who focus only on sustainability, applying building science and design solutions to rapidly reduce the generation of carbon emissions in the built environment, increase resilience against climate risks, and have a positive impact on the socio-ecological health of our communities.

Stantec's Integrated Design Process (IDP) offers a holistic approach to sustainable and resilient design. It creates alignment beginning in the planning phase and continuing throughout the design process. By establishing engineering strategies early in the design process, we can create a framework to significantly reduce the carbon footprint of a building.

**[Learn about our Sustainability & Building Performance Services.](#)**

## Carbon

- Building energy modeling
- Building commissioning
- Condition assessments
- Building envelope consulting
- Embodied carbon life-cycle assessments
- Decarbonization
- Green building rating systems
- Corporate esg reporting
- Greenhouse gas inventories
- Net zero energy and net zero emission assessments and certification

## Climate

- Climate risk assessments
- Climate mitigation, adaption consulting
- Resilient building, site
- Infrastructure design

## Health

- Daylight modeling
- Healthy materials consulting
- Biophilic design consulting
- Green building rating systems
- Healthy buildings rating systems



# The Urgency to Reduce Carbon Emissions

**The building industry is targeting net zero emissions by 2050 across the whole life cycle.**

The United Nations' 2030 Agenda for Sustainable Development and the Paris Agreement stress the urgency for reducing carbon emissions associated with the built environment. In recent years, the design industry has intensified its efforts to reduce greenhouse gas emissions. Stantec is signed on to be a part of the solution.

Building energy codes are a primary regulatory instrument to reduce emissions from both new and existing buildings. Codes continue to advance decarbonization of the entire building industry, including both operational carbon and embodied carbon. Many states, municipalities, and cities are pursuing adoption of these codes. We must be prepared.

We help clients navigate existing codes, and plan for future requirements.

📍 NREL Research support Facility 1 / Golden, CO



LEED Certified Platinum, Net Zero Energy Design



LEED Certified Gold

📍 University of Texas at Dallas, Science Building  
Richardson, TX, USA



LEED Certified Gold

📍 Cornell UNIVERSITY-Physical sciences building  
Ithica, NY (with Koetter Kim)

# Understanding Decarbonization

Decarbonization is the practice of reducing a building's whole life cycle greenhouse gas (GHG) emissions. The whole life cycle includes operational and embodied GHG emissions.

## Operational Carbon

Operational carbon emissions are determined by the ongoing operations of a building. It refers to the greenhouse gas emissions associated with building energy consumption.

## Embodied Carbon

Embodied carbon emissions account for 18% of global building CO2 emissions. Embodied carbon emissions are determined by how the building is built. It refers to the greenhouse gas emissions arising from the manufacturing, transportation, installation, maintenance, and disposal of building materials.



# Pathway to a net zero lab building

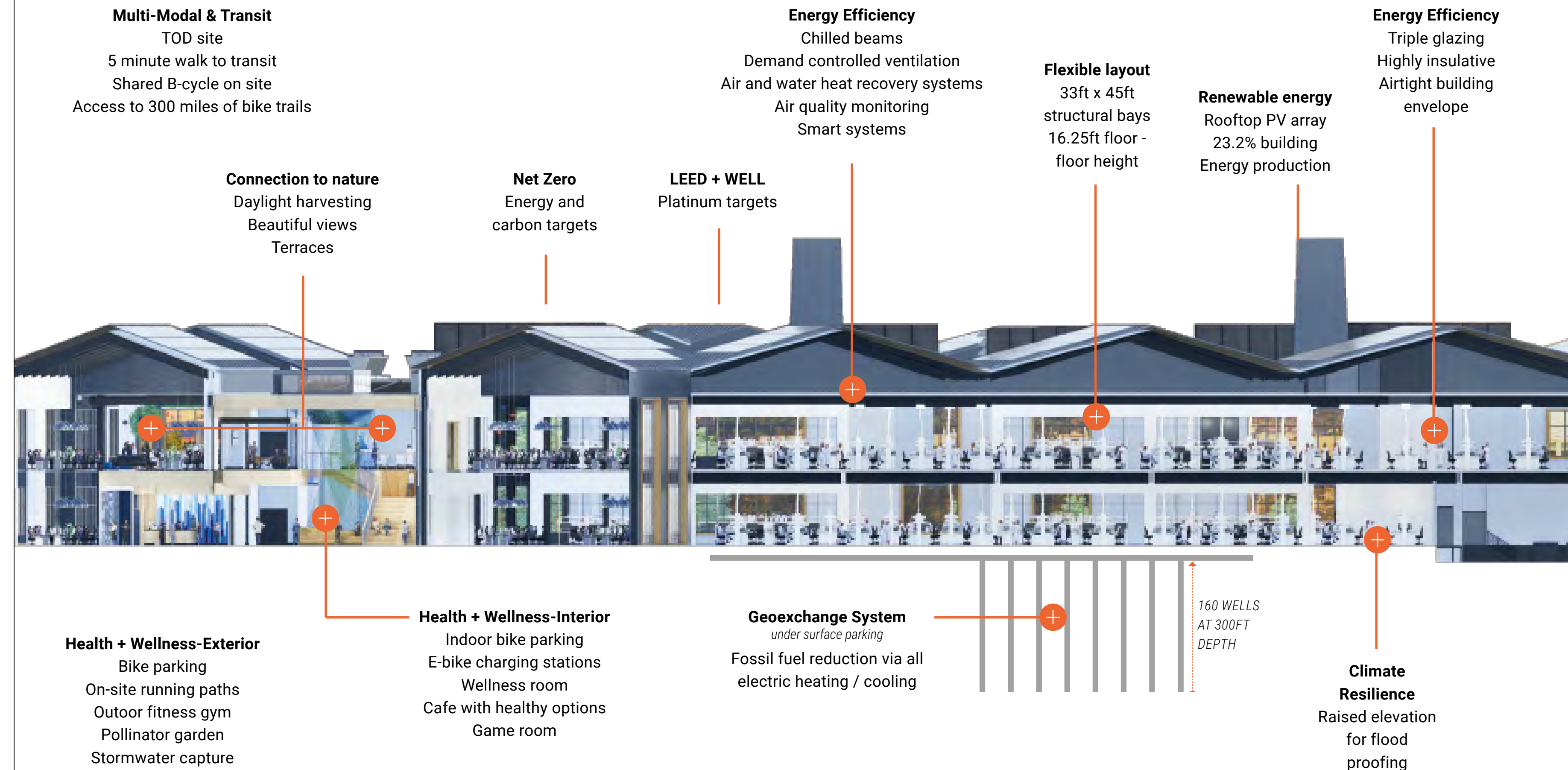
Designing to achieve net zero energy and net zero carbon requires a sequential approach where critical decisions are made at the appropriate points in the design process.

Net zero energy is addressed by prioritizing building efficiency. We explore passive strategies and high-performance building systems to minimize building energy use as much as possible, with on- or off-site renewable energy options as a last consideration.

To address net zero carbon, we perform a Whole-building Life Cycle Assessment (WbLCA). This assessment quantifies the estimated embodied carbon and environmental impact associated with the building structure and enclosure over the life cycle.

By identifying building elements that contribute large amounts of embodied carbon to the overall environmental footprint, we can investigate alternative options that will help decrease the embodied carbon of the project.

This diagram of our Ridgeway Science + Technology life sciences building project illustrates the different strategies we consider when working to achieve net zero energy in our projects.



📍 Ridgeway Science + Tech, Boulder, CO  
Colorado's first, and most sustainable, net zero Energy and Carbon Capable life sciences building





University Of Northern British Columbia Wood Innovation Research Laboratory | Prince George, BC

## STRATEGIES

# Prioritizing Efficiency

**Our designers are familiar with strategies to offset the intense energy usage of a lab building. Methods range from specialized high-performance systems and equipment to site planning and building materials.**

Prioritizing energy efficiency is the first step to reducing operational carbon emissions for new, high-performance designs and deep retrofits of existing facilities. By performing building energy modeling, we gain insight into best practices for construction techniques, materials, and systems. Energy efficient designs consider building envelope, space utilization, HVAC systems and performance, ventilation, lighting and controls, and service hot water.

### Better efficiency in labs

Determining methods to minimize air change rates could drastically improve energy efficiencies, especially in lab buildings. We have successfully used computational fluid dynamics (CFD) to model air distribution and demonstrate lab occupant safety while reducing air change rates below historical standards.

### Energy strategies may include:

- Ventilation reduction during off hours or installing variable capacity fans.
- Ductless fume hoods with specialized filters can reduce the energy required for safe ventilation while reducing the amount of pollutants entering the atmosphere.
- Electric devices and heat pumps in place of boilers.
- Operating chillers or chilled beams versus cold water.
- Incorporating geothermal fields to provide natural heat sources, depending on geography.

A facility's purpose and the region's climate can provide the opportunity for passive strategies. Building orientation can offer tremendous opportunities for energy efficiency. Our designers often look to sun patterns to take advantage of the natural warming or cooling of specific areas of a building.





📍 Evolv1, Waterloo, ON

# Renewable Energy

**Stantec has established ourselves as one of the leading firms in renewable energy design.**

When designing a net zero energy building, we start by minimizing loads. Then we leverage carbon-free renewable energy, such as solar photovoltaic paneling, to offset remaining fossil-fuel use. Our renewable energy team brings together experts from across disciplines to deliver renewable energy projects from concept through to planning and design, commissioning, and start-up. We are experienced with industry leading design standards, and have interconnection expertise with all major utilities, lending to the delivery of projects on time and on budget.

## **Our Expertise in Advanced Renewable Energy**

In addition to our deep capabilities in the traditional renewable options wind and solar, our experience with non-conventional renewable energy technologies and methods sets us apart. We create customized approaches and provide high quality service and outstanding sustainable business solutions to meeting ESG and carbon reduction goals.

**[Learn more about our Renewable Energy services.](#)**



# Natural Resources

**Conserving natural resources can increase building efficiency and provide value to the surrounding community.**

### Water Conservation

Water strategies reducing consumption lower the burden on communities' water and wastewater treatment facilities. To reduce indoor and outdoor water use, we consider strategies including low-flow and ultra-low-flow water fixtures, native landscapes that reduce or eliminate the need for irrigation, green roofs, and graywater reuse. In the lab, we can explore using vacuum pumps to reduce water usage.

### Stormwater management

Managing stormwater on-site through efficient systems serves the occupants of the building and reduces the burden on the municipal water infrastructure. We consider strategies like rainwater harvesting, permeable pavements, rain gardens or bioretention basins, and multi-story parking. These strategies contribute to reduced water demand and alleviate stormwater drains when applied together as a system.

### Helium Recovery

As the preferred carrier gas for many chemistry research and chromatographic processes, helium has quickly become an endangered element, as atmospheric recovery is nearly impossible. To avoid contributing to the depletion of this natural resource, we've worked with some research organizations to implement helium recovery suites in their lab buildings. Helium recovery suites help reduce helium sourcing while also saving money.

Denver Water Administration Building, Denver, Co, USA



LEED Certified Platinum, Net Zero Energy Building Design



## Occupant Health + Well-being

**We help our clients add measurable value to the health, well-being, morale, and productivity of facility occupants.**

Our approach focuses on the needs of the people within the facility and results in savings in personnel costs and return on investment for tenants, organizations, or building owners. Strategies include bringing daylight into the work environment, providing effective thermal comfort, using ventilation and exhaust systems that increase indoor air quality, and selecting healthy materials and products.



This space pictured to the right, at the University of Lethbridge Science Commons, includes an air intake, in which the air is passively heated.

📍 University of Lethbridge-Isttaniokaksini, Science Commons, Lethbridge, AB, Canada (with KPMB)



### Daylighting

Daylighting is the controlled use of sunlight in and around the building. It offers health benefits—including regulation in sleep patterns and improved overall health—improved mood and productivity, and connection to the outdoors.

Incorporating daylighting into building design is an environmentally responsible approach. It can reduce the need for electric lighting during daylight hours, resulting in lower energy consumption and cost savings.

### Materials Selection

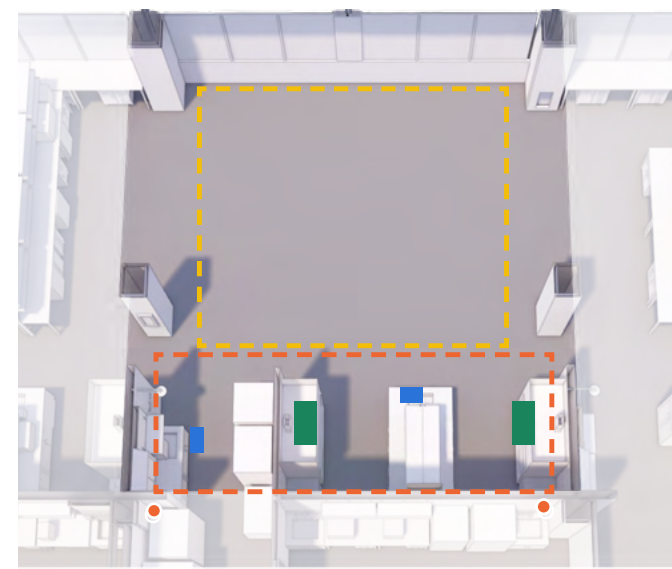
Materials selection is an essential aspect of designing for health and sustainability. We are committed to a comprehensive approach in the way we select and specify healthy products and finishes on our projects and avoid using materials and products that may have adverse effects on human and planetary health. We consider all aspects of material characteristics and impacts. Our designers and specifiers prioritize sustainable, socially responsible, and healthy products and finishes.



# Flexibility to support laboratory efficiency and sustainability

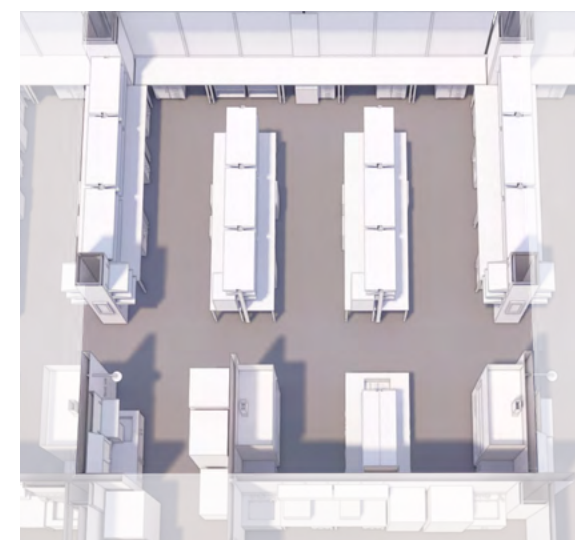
Flexible lab design addresses functionality and flexibility for multidisciplinary research. Large open labs are comprised of movable island benches with lab utilities provided from ceiling mounted service panels using quick-connect hoses. Movable lab benches can be reconfigured as required.

## Research lab framework

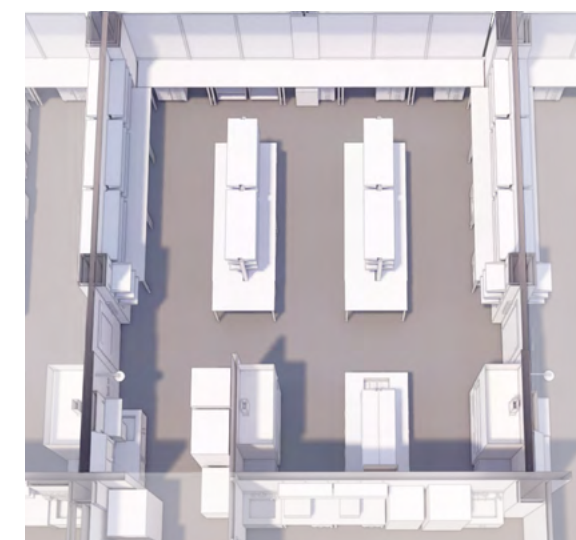


- Flexible open lab spaces
- Fixed lab service spine
- Fume hood location
- Drain / vent location
- Sink location

## Examples of Flexible configurations



8 Person Open Lab



6 Person Closed Lab Module



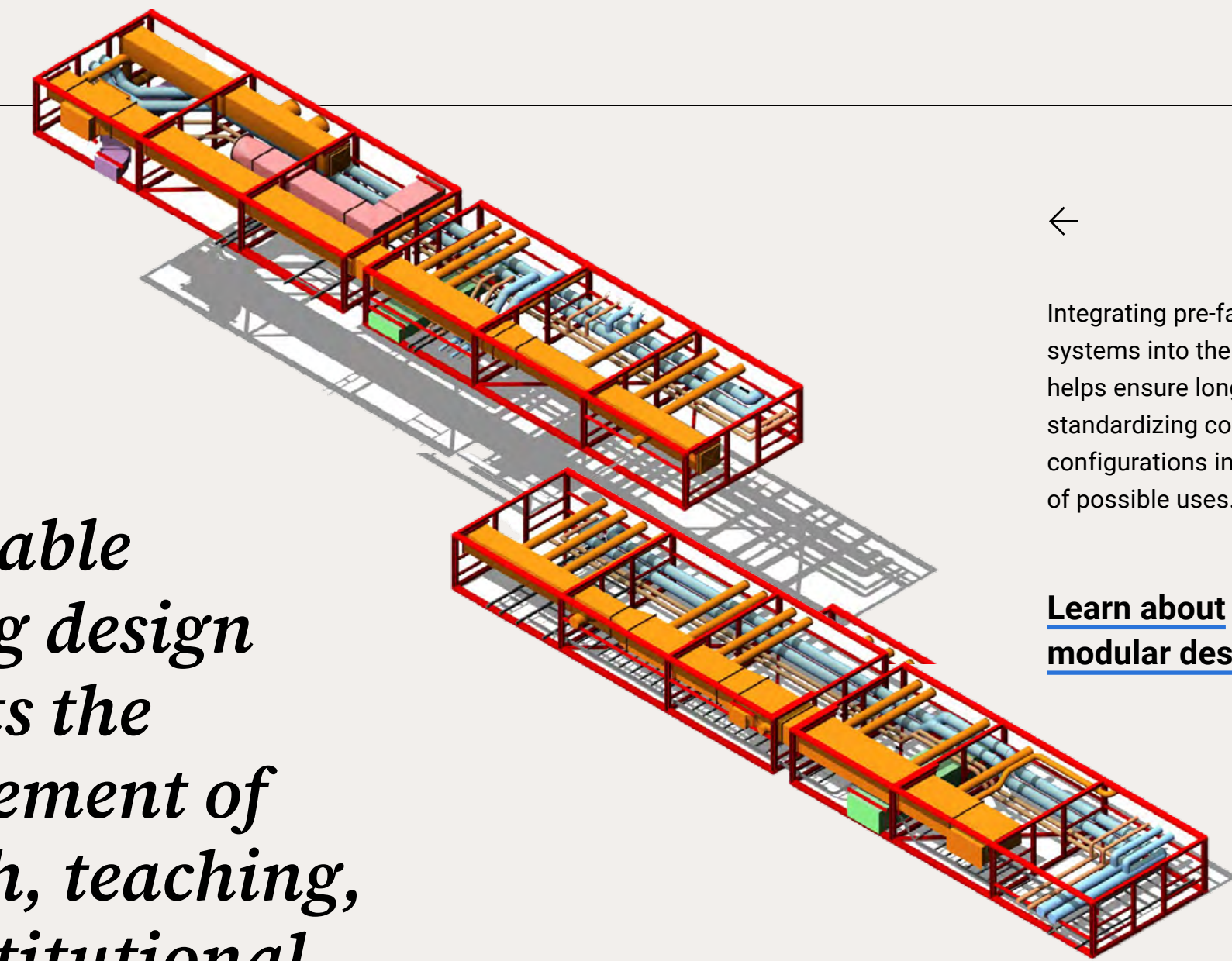
Support Labs



Compartmentalized

*Sustainable building design supports the advancement of research, teaching, and institutional culture.*

Aligning cleanroom performance with the need to adapt to constant changes in tools and research operations requires a combination of robust systems and flexible plans. Planning of these facilities is driven by the ability to modulate levels of cleanliness and easily swap out and service equipment without disrupting containment protocols. Our team devised one of the most energy efficient cleanrooms in North America, without compromising flexibility or performance.



Integrating pre-fabricated, modular systems into the building design helps ensure long-term flexibility by standardizing components and configurations in support of a range of possible uses.

[Learn about modular design.](#)





## Living Labs

Living labs look beyond a building's carbon footprint and energy use. They unite all aspects of building design where aspirations for advancing research, teaching, and institutional culture can evolve, and research and teaching priorities remain flexible enough to adapt to changing needs across days, semesters, and decades.

- Living labs provide constant feedback about the relationship between use patterns, building technologies, and building performance. They are a tool for understanding and mitigating the impact of human activity on the environment.
- Living labs demonstrate alternative construction methods, considering renewable and low-impact materials, including timber, masonry, and recyclable metals.
- Building-wide dashboards can monitor net zero goals. Users can watch for patterns and align activities with load-leveling strategies.
- Green roofs improve building performance while providing an opportunity to study the impact of materials, vegetation, and climate change on water quality. They have the potential to turn the building and its grounds into an instrument for monitoring environmental conditions.

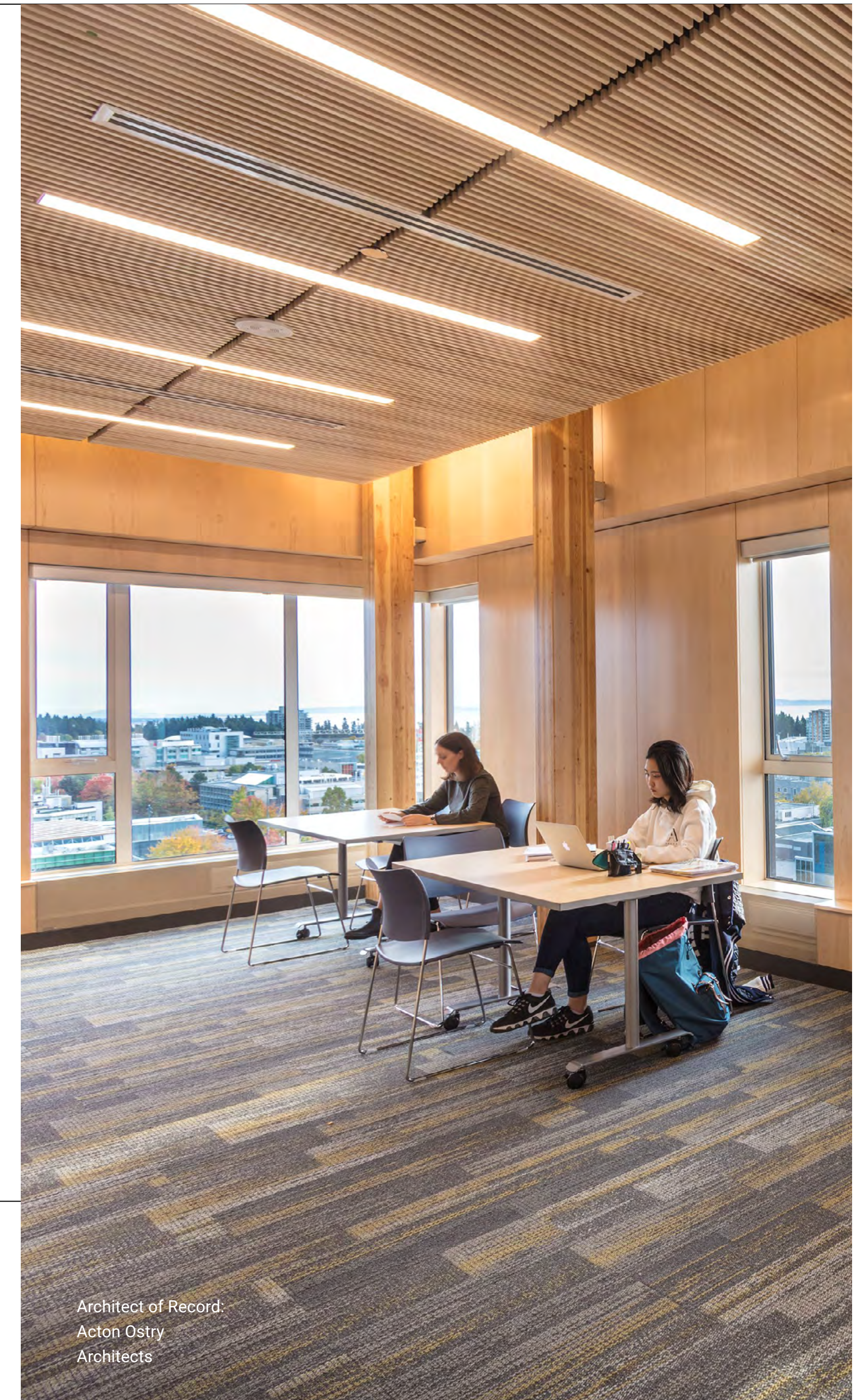
The demand for wood, either as a structural component or as an exposed interior element, has boomed over the last decade, driven by a new awareness of its beneficial properties and technology advances that have increased application possibilities.

Is mass timber a viable option for your next building project? [Take our quiz.](#)

### *Mass Timber offers safety, resiliency, and versatility, with the added value of biophilic design and sustainability*

→

The University of British Columbia (UBC) Brock Commons Tallwood is a living lab for UBC faculty and students. The building allows research and education opportunities for monitoring structural wood systems to better understand vibration, moisture, and shrinkage. The 18-storey mass timber hybrid residence demonstrates a savings of 679 metric tons of CO<sub>2</sub>. Stantec provided sustainability consulting and mechanical and electrical engineering services as part of the building's design effort.





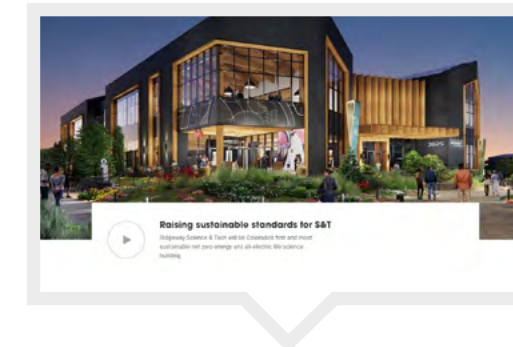
## PROJECT EXAMPLE

# Ridgeway Science + Tech

📍 Boulder, Colorado, United States

### Inspiring creativity and innovation in a net zero and healthy setting

The Ridgeway Science & Tech building will be Colorado's first and most sustainable, net zero energy capable and net zero carbon capable life sciences building. The project is aspiring to achieve LEED Gold and WELL Gold certifications, with a stretch goal to achieve platinum for both. The highly efficient 112,000 SF design embraces sustainability. Passive strategies include building orientation, daylighting, and an efficient building envelope. Smart energy management systems incorporate geo-exchange technology, chilled beams, and roof-top solar. Sustainable materials help reduce embodied carbon emissions, while biophilic design—including timber accents—increases connection to the natural environment. Outside, 35% of the exterior is usable open space with native landscaping and rain gardens that provide water. The design offers increased site permeability, resulting in new water quality functionality and resiliency against flooding.



[Watch the video](#) to discover the integrated design strategies provided by our team.

**40%**  
Energy Savings

**97.7**  
EUI

### Green Building Targets

Net zero energy and net zero carbon capable, targeting LEED Gold, targeting WELL Gold

### Stantec Services

Architecture, LEED administration, energy modeling, daylighting, lighting, interiors, landscape, signage

### Sustainable Design Features

- Geo-exchange system
- Chilled beams and heat pumps
- High performance insulated envelope
- Triple glazing
- Renewable energy
- Sustainable and healthy materials
- High-efficiency water fixtures and fittings
- Daylighting
- Air quality monitoring
- EV chargers



PROJECT EXAMPLE

# Isttaniokaksini Science Commons

Lethbridge, Alberta, Canada

## Climate-responsive, low-carbon science research building design

The Isttaniokaksini Science Commons Building at the University of Lethbridge is a 32,600M<sup>2</sup> collaborative science facility. The design minimizes energy use, emissions, and life cycle costs while providing an optimal research, teaching, and learning environment that contributes to happier, healthier, and more productive people.

The design capitalizes on Lethbridge's sunny and dry climate for passive energy. A double-façade system for perimeter offices and glazing with large-scale 'light scoops' on the east and south elevations draw light deep into the core.

One of the building's most unique sustainability features is a double-skin glazed façade on the east and west façades, with automated window vents that provide natural ventilation. In addition, an automated Venetian shade system captures or blocks solar heat gain, depending on the season.



In partnership with KPMB

**60%+**  
Energy Savings

**121**  
Predicted EUI

**Green Building Targets**  
LEED Certified Gold

### Stantec Services

Architecture, interior design, civil, sustainability, environmental graphics, furniture, fixtures, equipment

### Sustainable Design Features

- Passive energy
- Natural ventilation
- Heat recovery
- Heating and cooling systems
- Daylighting
- Health and wellness



PROJECT EXAMPLE

# Yale University, Science Building

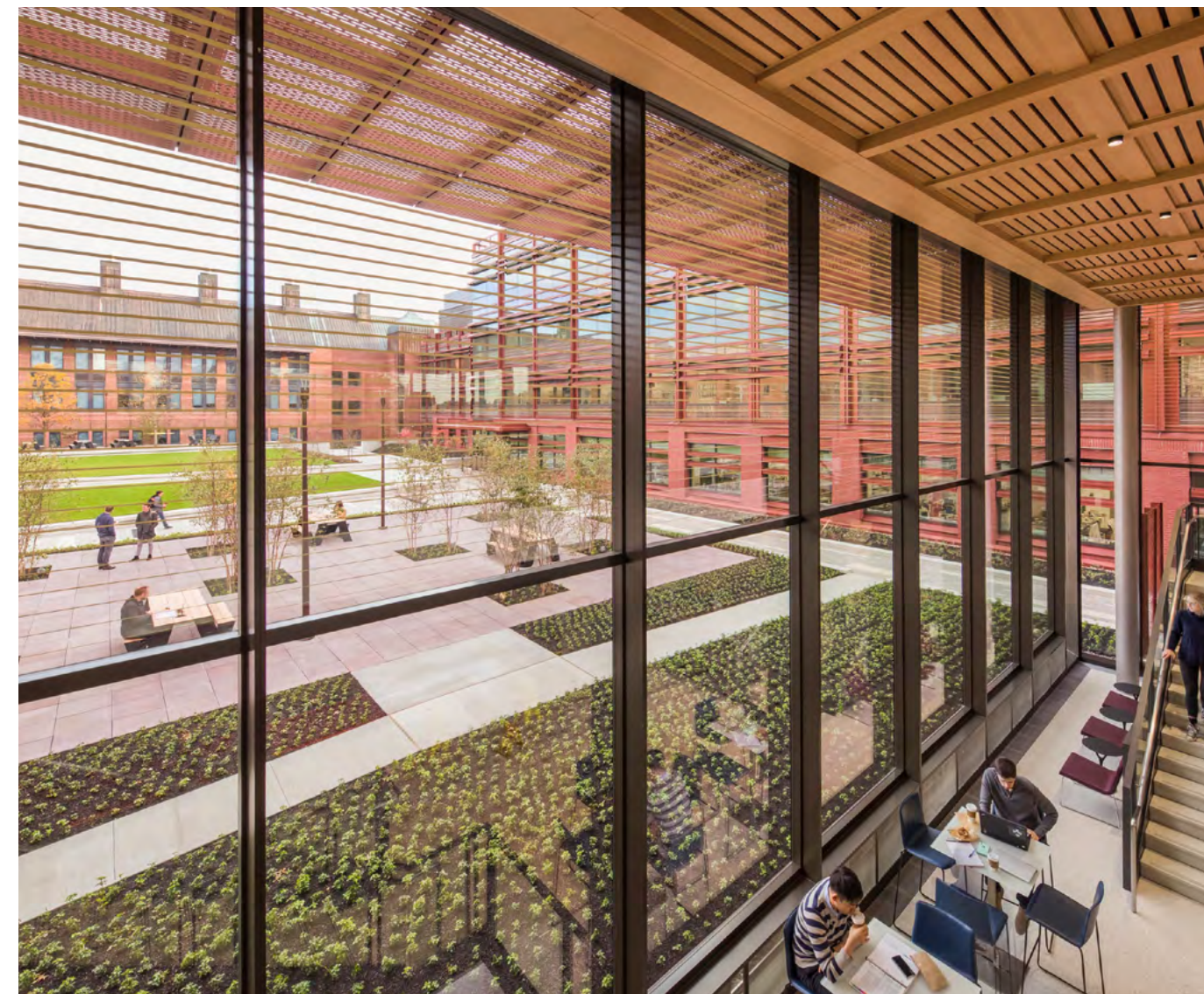
New Haven, Connecticut, United States

## Modern, energy-efficient, and flexibly-planned research and laboratory building

The 282,000 SF Yale Science Building (YSB) provides a home to members of the Department of Molecular, Cellular and Developmental Biology (MCDB), and part of the Department of Molecular Biophysics and Biochemistry, the Quantitative Biology Institute, and assorted physics labs.

Our engineers leveraged an integrated approach throughout the design process. As a result of this collaboration, Yale achieved their goal to build the most energy efficient lab on its campus to date. The building's design achieves a high indoor air quality while reducing energy. Modular and prefabricated designs minimized project waste and will provide adaptability for future program reassignments.

The incorporation of nature enhances comfort and wellness. Direct outdoor views are available from 83.3% of the occupied floor area. In addition to providing natural light, the pavilion areas' expansive windows offer natural ventilation.



25%  
Energy Savings

83.3%  
Outdoor Views

Green Building Targets  
LEED Certified Gold

### Stantec Services

Architecture, interior design, mechanical, electrical, facilities planning and operations, lighting design

### Sustainable Design Features

- Energy efficiency
- Modular systems
- Low-emitting materials
- Water recycling
- Lean construction
- Landscaped open spaces
- Nature views

In partnership with Pelli Clarke and Partners



PROJECT EXAMPLE

# University of Edinburgh Institute for Regeneration and Repair

Edinburgh, Scotland, United Kingdom

## Renewable energy and energy efficiency methods make this lab building sustainable

The Institute for Regeneration and Repair (IRR) integrates themes from the adjacent Scottish Centre for Regenerative Medicine, Life Sciences and Medical School while enhancing the overall cohesion of University operations at the Edinburgh BioQuarter.

Intelligent laboratory planning provides flexible laboratory and office accommodation that are open, visible and airy. A highly connected interior environment also connects to adjacent research facilities to strengthen building to building interactions while integrating with landscape.

The IRR is oriented to bring maximum light into its laboratories. A decentralized plant allows for dedicated power systems on each floor, which greatly reduces the amount of ducts and energy usage to power labs.



35%  
Energy Savings

7%  
Energy from Low Carbon Technology

Green Building Targets  
BREEAM Excellence

Stantec Services  
Architecture, Lab planning, MEPS  
Engineering, Sustainability  
Consulting

- Sustainable Design Features
- High-performance insulated metal panel envelope
  - Triple glazing with Aragon fill
  - Renewable energy via PV solar panels (1,000 SM)
  - Decentralized plant
  - Sustainable and healthy materials
  - High-efficiency water fixtures and fittings



# We are ready to partner

## Meet our Science + Technology team

### LEGEND

- Architecture / Lab Planning
- Engineering
- Commissioning
- Interior Design
- Global Resource
- Carbon Impact Team



**TONY RAO** *PE*  
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Architect, Research Design



**KEVIN MERRIKIN** *PE, LEED AP*  
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Western Canada Carbon Lead



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