

Green Building Design, Operations and Maintenance

The University of Alberta's commitment to sustainability is expressed throughout its institutional plans and guiding documents, including the Institutional Strategic Plan *For the Public Good*, the Comprehensive Institutional Plan and the *Long Range Development Plan*. In 2008, the University of Alberta signed off on the *Sustainability Commitment and Guiding Principles*, which affirms its commitment and guides its actions. In 2016 the university released its second Sustainability Plan (2016-2020).

Sustainability Commitment

"In alignment with its values, vision and mission, the University takes an integrated approach to sustainability that incorporates teaching and learning, research, outreach, and the operations that support them, as it builds one of the great universities for the public good. The University strives to manage all resources in harmony, recognizing the interconnectedness of ecological, social and economic systems".

Guiding Principles

Two of the five Guiding Principles are especially pertinent to the University of Alberta Green Building and Operating Practices and Guidelines.

Improvements in Operations and Practices

- Develop strategies and objectives that conserve resources, decrease the production of waste, minimize ecological footprints, and decrease greenhouse gas emissions.
- Provide practices aimed at sustainable supply chain management.
- Develop processes that support long-term ecological, socially, and fiscally responsible decision-making in activities, operations & practices.

Stewardship

- Protect the natural environment by enhancing local and global ecosystems and biodiversity for both present and future generations.
- Contribute to the protection of the Earth's environmental life-supporting systems by minimizing the pollution of air, water, and soil.
- Aim to enhance the global environment through balanced and positive social, economic, and ecological activities.

The design, operations and maintenance of campus buildings has a large impact on the sustainability of overall campus operations. This document compiles the core set of green building design, operations, and maintenance standards, practices and guidelines adopted by the University of Alberta. Information on current green building ratings can be found at sustainability.ualberta.ca/greenbuildings.

A. Green Building Design Guidelines

It is the intention of the university to embody the principles of sustainable design in all its planning, design and construction projects, whether new construction or renovations.

In general, the university's principles and goals are to promote multi-purpose space use, flexibility and adaptability as well as better utilization of space to minimize needs for new construction. Newly constructed and renovated facilities are designed to be:

- Functional and meet the needs of users.
- Safe and reliable.
- Consistent with a highly satisfactory indoor environment.
- Institutional quality and provide a long building systems service life.
- Efficient and cost effective for operation and maintenance.
- Designed to provide low operating and maintenance costs for the life of the facility.
- Composed of environmentally friendly and recyclable materials.

LEED and Green Globes. Since 2008, the Government of Alberta has required all new buildings and major renovations that receive substantial provincial government funding to achieve at minimum LEED® Silver certification. The Green Globes rating system and guidelines are used on projects that do not require LEED certification to rate and guide sustainable designs. Although not all projects at the university will be formally certified, all projects should endeavour to incorporate sustainable measures as identified by the LEED® and/or Green Globes Rating Systems. Information on current green building ratings can be found at sustainability.ualberta.ca/greenbuildings.

Each project will undergo a thorough review by the university and the Design Team before arriving at a final decision. The project must be evaluated to ensure that design and construction practices being implemented significantly reduce or eliminate the negative impact of the project facility on the environment and its occupants in five broad categories:

- Surrounding environment
- Water use and efficiency
- Energy use and efficiency
- Materials, resources, and waste
- Indoor environment

More detailed design guidelines and construction documents can be found at facilities.ualberta.ca.

Surrounding Environment

Reduced Impact

- Site planning should consider the incorporation of xeriscaping principles and stormwater management systems.
- Site planning should consider the incorporation of native plant species wherever feasible.
- Site selection should favour the use of infill development techniques when feasible.

Accessibility

- Universal design should be used to provide features to enhance accessibility for all.
- Site planning must accommodate persons with mobility and sight impairment without the need of assistance on primary routes.
- Site planning must allow access universally regardless of ability, from the moment of entry to the university campus, into and through its buildings and lands.

Water Use and Efficiency

- Water and plumbing design should adhere to the University of Alberta *Mechanical Guidelines*.
- In brief, low flow fixtures should be used and motion sensors installed wherever feasible; lab facilities should have a dual riser system to allow for proper separation of potable water (drinking fountains and washrooms) and lab services water.
- Equipment requiring water as a cooling medium will be connected to closed plug loop recirculation systems to prevent wasting of water.

Energy Use and Efficiency

- Building design should use best practices for energy management; design should consider passive systems, heat recovery, high efficiency lighting, and harmonic correction.
- Facilities should be designed with energy conservation and occupant comfort in mind.
- Where possible new construction and major renovations will incorporate sustainable energy measures like photovoltaic panels or micro cogeneration systems.

HVAC Systems

- Systems must meet or exceed the latest edition of ASHRAE 90.1 Guidelines on Energy and the latest edition of National Energy Code of Canada for Buildings 2015 (NECB).
- In general mechanical system designs are to incorporate heat recovery systems for both air and water side designs.
- Lab environments are to incorporate the latest control systems for lab design, including air quality sensing, fume hood sash position sensors and occupancy zone sensors.
- Plug load heat capture systems are to be installed for all research applications to capture waste heat from research equipment for re-use in the building.

Lighting

- Lighting choices must adhere to the University of Alberta *Lighting Design Guidelines and Standards*, which communicate recommended energy efficient lighting design practices and university expectations.
- In general, lighting choices should be efficient, meet designated luminary requirements, and be easy to operate and maintain.
- In most instances common area lighting should be on motion detectors, with one fixture on normal power at all times.
- Timers or connection to the building automation system for lighting should be considered for all new buildings.

Equipment

- Energy efficient equipment is a minimum standard to be procured and installed.

Materials, Resources, and Waste

- Design should exercise a preference for materials that demonstrate a greater degree of responsibility to the environment.
- Life cycle costs should be optimized while ensuring long life for building components and elements.
- Green demolition techniques are specified as a standard for all construction projects for removal, recycling, and reuse of building materials.
- Laboratory design should facilitate long term maintenance and retain flexibility of reuse of casework; modular casework designed in accordance with university cabinet and millwork standards will be used.
- Classroom finishes should be easy to repair and replace; resilient flooring is preferred.

Indoor Environment

Ventilation

- Ventilation design must follow ASHRAE 62-2001 Standards, “Ventilation for Acceptable Indoor Air Quality”, and should allow for easily accessible equipment for inspection, cleaning and testing.
- In classrooms, consideration should be given to both adequate ventilation and noise of the ventilation system; quiet systems are preferred (preference for low velocity, large duct systems).
- Smoking is restricted in all buildings, around buildings entrances and air intakes.

Laboratory Air Quality

- Fume hoods in research laboratories must comply with ANSI/AIHA Z9.5 Class A performance standards. Capture efficiency as installed and used must be at least 4AU0.1. (reference: Design Standards - Function and Use - 5.2.2 Laboratory Design)

Volatile Organic Compounds (VOCs)

- Only latex paints containing zero volatile organic compounds (VOCs) are allowed to be used. Other coatings must not exceed the VOC and chemical component limits of Green Seal Standards GS-03 and GS-11 and South Coast Air Quality Management District (SCAQMD) Rule # 1113. (reference: Design Standards - Architectural - Painting Specification).

Accessibility and Social Sustainability

- Minimum one unisex washroom per building (preferred one per floor).
- Classrooms should provide a variety of locations to accommodate wheelchair stations. These should not always be located at the front and/or rear of the room. Coordinate the selection of furniture with the University Universal Design Guidelines.
- Washroom countertop design, and all fittings/accessories to be barrier free.

B. Green Building Operations and Maintenance

University of Alberta Facilities and Operations acts as a steward that develops, maintains, and renews the buildings that house teaching, research, and administration on our campuses. Facilities and Operations supports the university's sustainability commitments by striving to provide efficient, healthy, and ecologically sound working and studying environments for all campus users.

BOMA BEST. Since December 2010, University of Alberta Facilities and Operations has been committed to progressively certifying all campus buildings under BOMA Canada's BOMA BEST (Building Environmental Standards) program for operations and maintenance. BOMA BEST certification assesses current practices and provides guidelines for ongoing improvement of the environmental performance and maintenance of campus buildings.

The university's Building Operations and Maintenance principles and guidelines are rooted in the same five broad categories as the Sustainable Building Design Practices and Guidelines.

Surrounding Environment

- A comprehensive landscape management plan strives to decrease maintenance and watering needs and will continue to pursue more sustainable practices wherever feasible.
- The **Integrated Pest Management** strategy promotes healthy growth of desired species and controls invasive pests while maintaining native wildlife and habitats.
- Composting and mulching programs reduce waste, decrease irrigation needs, and promote healthy growth of vegetation.

Water Use and Efficiency

- All buildings are metered and monitored for water usage.
- In the course of maintenance, upgrading, and retrofit activities, low flow fixtures are utilized and water reduction measures are taken.
- Efficient water use is encouraged and systems are in place for reporting any problems, such as leakages or broken fixtures.

Energy Use and Efficiency

- All buildings are metered and monitored for energy usage.
- Campus closures and associated shutdowns overnight and during holiday breaks result in environmental and financial savings.
- The university encourages efficient use of campus lighting by students and employees, including shutting off lights when rooms and/or buildings are not in use, during holidays, etc.

- Effective use of the Building Automation System ensures provision of efficient and optimal operation of building heating, ventilating and air conditioning systems.

Envision: Intelligent Energy Reduction

- The *Energy Management Program (EMP)* has been a leader in energy reduction since its inception in 1975, reducing greenhouse gas emissions by more than 2.5 million metric tonnes and generating savings of over \$353 million with \$16.9 million saved in 2015-2016 alone.
- After its approval in June 2011, the Next Generation EMP was rebranded under the name *Envision*; a program committed to adopting new technologies and approaches that advance sustainability on campus today, while continuously looking to the future and seeking out the most intelligent energy reduction solutions for generations to come.
- *Envision* will invest \$35 million from 2012-2019, and will reduce the University of Alberta's greenhouse gas emissions by 30,000 tonnes while saving the university approximately \$4.5 million per year.
- *Envision* will focus on key initiatives to further establish the University of Alberta as a leader in sustainability. Planned initiatives include:
 - Further energy reduction & infrastructure renewal
 - Energy reduction throughout Ancillary Services
 - Implementing renewable energy technologies,
 - Campus-wide water conservation, and
 - Creating awareness of sustainability practices through campus-wide education.

District Energy System

- The **District Energy System** located on North Campus provides heating, cooling, and electricity, as well as compressed air, domestic water, demineralized water, storm and sanitary drainage services to North Campus and several customers in the greater campus area.
- The Heating Plant has a capacity of 650 tonnes/hour steam.
 - A 13 MW back-pressure steam turbine generator tracks the North Campus heating load, most power produced from this unit occurs during the winter months.
 - A 26 MW condensing steam turbine operates when local power prices exceed the cost of on-site production.
 - The Heating Plant uses natural gas boilers instead of coal to provide combined heat and power, which is less emissions-intensive.
- The two cooling plants on campus as well as a 60,000 ton-hour thermal energy storage system reduce costs and increase efficiency because of their close proximity to campus.
 - The original Cooling Plant (1983) has a capacity of 26,000 tons of cooling; in addition to its proximity to campus, the Cooling Plant increases efficiency by operating in free-cooling mode in the winter months taking advantage of the cold waters in the North Saskatchewan River.

- o The new Cooling Plant on Campus (CPOC) was completed in 2011 to provide an additional 10,000 tons of cooling capacity.

Building Re-commissioning Program

- The **Building Re-commissioning Program** assesses existing buildings' HVAC systems for proper operation, energy efficiency, thermal comfort, and indoor air quality performance.
- Issues identified through these building re-commissioning assessments are appropriately addressed through maintenance and system upgrade projects, in collaboration with Energy Management Program initiatives, to ensure and restore optimal performance.

Materials, Resources, and Waste

Waste Diversion

- Goal: to increase the amount of waste diverted from the University of Alberta's North Campus to 90% by 2020, and to continue to reduce waste per campus user.
- To achieve this goal, Facilities and Operations is implementing a four stream Zero Waste program that collects Mixed Paper, Recyclables, Organics, and Landfill materials. This is simplified from the previous six stream system at UAlberta.
- The university collects organics from nearly all food service areas.
- Recyclables and organics collected on campus are consolidated at the university's Recycle Transfer Station before being hauled off site. Buildings with high generation of recyclables are provided with their own mixed paper compactor or mixed recyclables front load bin.
- The university has partnered with the City of Edmonton on an Anaerobic Digestion Facility which will be located at the Edmonton Waste Management Centre. The university has committed to providing 1,500 tonnes of organics annually for the facility.
- Education and awareness initiatives aim to increase waste diversion and reduce the total amount of waste produced by all campus users.
- The university maintains a central furnishing inventory to encourage the reuse of furniture on campus.
- More information on the Zero Waste program can be found at sustainability.ualberta.ca/zerowaste.

Materials and Resources

- In the course of maintenance, upgrading, and retrofit activities, the university exercises a preference for materials that demonstrate a greater degree of responsibility to the environment.
- Life cycle costs are optimized while ensuring long life for building components and elements.
- Green demolition techniques are to be used when appropriate for removal, recycling, and reuse of building materials.

Environment, Health and Safety

- The university Environment, Health and Safety division runs a chemical reuse inventory to address surplus chemical accumulation on campus.
- A comprehensive **Hazardous Waste Program** ensures proper handling and disposal of chemicals, radioisotopes, bio-hazardous waste and some recyclables such as paint and mercury.

Indoor Environment

General Comfort

- Operations and Maintenance ensures comfortable air temperatures.
- Facilities are monitored for occupant use and temperatures are adjusted to optimize comfort and energy efficiency.
- Facilities and Operations utilizes Direct Digital Control (DDC) Building Automation Systems to schedule the operation of systems, control and monitor HVAC systems, and provide space temperature setbacks.
- Occupants can provide feedback via the Quality Assurance call centre for follow up and resolution of any concerns identified.

Green Cleaning

- The **Cleaning For a Healthy U** green cleaning program focuses on reducing harmful VOC and airborne particles to ensure a clean and healthy work and study environment.
- The university is committed to sourcing and implementing industry best practices for all equipment and cleaning products. As of 2015 the number of cleaning products was reduced, simplifying purchasing and training, and reducing packaging waste through bulk purchasing.
 - All approved cleaning products meet ECOLOGO (Canada) and/or Green Seal (USA) regulations, non-green certified options are prohibited.
 - All mechanical equipment must be certified by GreenGuard (North America) or the Carpet and Rug Institute.
 - For disposable products and equipment, products with specified recycled content will be chosen wherever possible.
- Scraper mats and/or entrance matting systems shall be used at all moderate and high traffic entrance points of a building to prevent snow, dirt, dust, pollen and other materials from being tracked into the building.
- Low environmental impact integrated pest management practices shall be used, according to the Cleaning for a Healthy U program. This program seeks to balance the use of chemicals for the control of insect pests and the need to provide an environment that is free from pests that may affect the health of occupants of our buildings or cause destruction to university property.

Air Quality

- The Indoor Air Quality (IAQ) Management Program is designed to protect the health and safety of building occupants and decrease exposure to indoor air contaminants.
- All occupied building spaces are monitored using Direct Digital Control (DDC) systems to ensure proper ventilation.
- Ongoing HVAC improvements and retrofits maintain air quality standards and improve system efficiency.
- Our mechanical design guidelines and systems operation follow ASHRAE 62-2001 Standards, “Ventilation for Acceptable Indoor Air Quality.”
- High efficiency particulate HEPA-like filters are installed on all vacuums.
- Aircurity systems will be implemented in university laboratories and other valuable occupancy areas to optimize building ventilation for sustainable energy efficiency, safety, and operational performance through healthy demand control ventilation. This program will make significant progress towards several university goals including: energy savings, reduced carbon footprint, lowering overall maintenance expenses, and optimizing building operations.
- Facilities and Operations works closely with Environment, Health and Safety to receive, investigate and respond to IAQ concerns from building occupants.