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PART ONE SECTION 5 ENVIRONMENT

ENVIRONMENT

1.1 UNIVERSITY POLICY

The University's strongly expressed desire to institute and maintain exemplary strategies aimed at enhancing the campus and global environment is set out in its Environmental Protection Policy dated March 7, 1994. (attached, Part 1 Section 9 Environment Appendix A).

This policy has had, and will have, increasingly important ramifications for University construction on many levels, from siting policy to material selection. No one underestimates the difficulties of making the most effective environmental choices nor can the budget implications of such choices be ignored, but buildings represent the most important single element affecting our environment - not only by actually giving it its recognizable form but also by their consumption of natural resources in construction, servicing, maintenance and disposal, and all the building professions have a particular responsibility to foster good environmental practices.

One of the complicating factors in making optimum environmental decisions is that such decisions routinely involve a simultaneous assessment of a variety of factors dealt with by different consultants and trades, for example: the most effective energy saving strategy might easily involve siting, aspect, wall construction, window type and mechanical services. Under these conditions it is imperative that each of the consulting and trade sectors be prepared both to innovate in its own field and to seek optimum solutions through dialogue with other sectors. The architectural consultants will normally bear the overall responsibility for co-ordinating such efforts.

1.2 ENVIRONMENT IN THE DESIGN AND APPROVAL PROCESS

The University will be involved in decisions that have significant environmental implications. Selection of architects and other consultants for University of Toronto building projects will depend, in part, upon their understanding and experience of environmental issues.

Architects and other consultants will follow the following environmental design principles:

.1 When making decision about designs, processes and products that influence resource use (e.g. energy, water, materials) and other environmental impacts (e.g. indoor air, waste management), alternative choices, including innovative but proven alternatives, are to be considered.

.2 *Change* is a constant in University life, as elsewhere. Designs which facilitate future changes and which minimize the potential environmental impacts of demolition and renovation are preferable. (e.g. see Material Choice).

.3 Preference will normally to be given to choices which minimize the life-cycle costs but those which offer greater environmental benefits than those with the lowest life-cycle cost should also be presented for consideration by the University.

.4 *Environmental impact* must be assessed broadly - impact in one area must be assessed in relation to others so that the "system" as a whole can be seen to be effective.

Below are specific requirements concerning the environment that architects and other consultants are expected to follow. Through these the University hopes to achieve its environmental objectives. Some, however, may present new challenges to architects and consultants and may not be possible for certain projects. As a way of informing the University about the degree to which these guidelines and requirements can be met on each project, the architect and other consultants must complete and submit the attached Environmental Design Standards check list with accompanying explanations.

1.3 SPECIFIC REQUIREMENTS

1.3.1 MINIMIZE ENERGY USE

.1 Selection:
Energy efficiency must be considered on a system basis. The most efficient energy production method - ideally non-polluting, using renewable resources and with long-term potential - should be used.

.2 University Systems:
The energy use of individual projects must be considered in the light of the University-wide heating and cooling systems and a decision to use them (or not) should be subject to the same scrutiny as noted above.

.3 Equipment:
High priority must be given to energy efficiency in the selection of all mechanical and electrical devices such as high-efficiency electric motors with minimum power factor.

.4 Heating, Cooling & Ventilating:
Building design should maximize the use of natural energy. This should include the use and control of sunlight**:** maximum solar access through well-located efficient windows in winter, shading by deciduous landscape materials or built shades in the summer.

Simple methods of personal control of indoor environment - e.g. opening windows, - should be applied wherever possible. This proposition should, like all others be evaluated in related contexts such as safety and security.

Mechanical devices should be used only where necessary and where the use of low energy or passive systems are impractical.

.5 Lighting:
Natural daylight should be utilized for task lighting whenever possible. Sizable, well-placed windows will be important. For additional artificial lighting, low energy fixtures should be used. Lighting should be of a comfortable level which discourages the use of artificial lighting. The aim being the lowest level of energy use in combination with comfort.

1.3.2 MINIMIZE WATER USE

Ultimately, minimizing water use will depend heavily on the responsibility of individual users. The building design, however, can influence this use in a number of ways:

.1 Water saving fixtures should be installed wherever possible.

.2 The re-use of water for useful purposes should be encouraged. For example, rain water and treated "grey" water can be used for some building and landscape purposes.

.3 The use of fresh water for cleaning purposes should also be minimized by the choice of material surfaces, or by water recycling systems.

.4 Water used to cool equipment including research equipment should be minimized through the use of close looped system.

1.3.3 MATERIAL CHOICE

.1 Products and building processes to be applied to University building projects should be benign. Assessment of such things is complex, but ideally the environmental consequences of all aspects of products' life cycle need to be considered including:

Extraction
Transportation
Manufacture
Erection or Fabrication
Use
Maintenance
Demolition … Reuse
Recycle
Dump

The architect and other consultants involved in material specification must give a broad consideration to these aspects in order to choose environmentally benign materials.

.2 The same requirements for benign, emission-free products applies to the selection of furniture and furnishings. Selected carpet fabrics and other materials should meet the highest environmental standards.

1.3.4 EFFLUENTS & EMISSIONS

Every effort should be made to ensure that a new or renovated building has the lowest possible detrimental effect on the larger environment as well as on its interior spaces. Previous sections deal largely with the reduced use of resources. The University also seeks a reduction in the undesirable by-products of building.

.1 Air-Borne

Careful ventilation is required to reduce the harmful effects of toxic gases, odour and noise within a building, but these should not simply be exported to the outdoor environment. *Where and how* they are exhausted or dissipated requires special consideration to mitigate or, preferably, eliminate these exports**.**

.2 Water-Borne

Wastes which may appropriately be introduced into the sewage/waste water systems can be considered in three categories: *Hazardous ... sewage ... "grey" water.*

Known *hazardous* wastes must be reduced as much as possible and dealt with appropriately at source.
Grey water is recyclable (see above) and there are biological systems which can deal with *sewage* to provide useful water. Any opportunity to introduce such systems to the campus should be exploited.

Designs that put wastes, either treated or untreated, into water borne system must consider the impacts of these wastes on their final destinations.

1.3.5 OUTDOOR ENVIRONMENT

.1 Building Location and Orientation

Where choice is possible, new buildings should be *sited* for maximum access to sun and ventilating air movement (but not to the detriment of these assets in existing neighbouring buildings).

Building *configuration* should be subject to the same consideration and, in addition, should increase the all-season habitability of adjacent outdoor spaces. Shading and cooling air movement for summer, as well as sun-trapping and wind shelter for winter must be considered.

.2 The Campus "Floor"

It is desirable for the surface of the campus to be as receptive as possible to water absorption. The area of paved surface should be reduced wherever possible. Where paving is required, water penetrable systems should be considered.

.3 Planting

Plant material is normally thought of as *decorative*. In addition to this quality, it can be used for many purposes, such as food, for educational purposes and as a reflection of history. In the context of environment some of these qualities should be capitalized upon**.**

.4 Habitat

The University Campus is a significant element of the city's open space network. It provides habitat for birds and animals. This role should be maintained and enhanced.

.5 Climate

The vital contribution which plants make to general air quality is well known. At a local level planting can - sometimes in conjunction with buildings improve micro climates. In the city, plants' capacity for making places smell better cannot be ignored. Roofs can be plausible places for planting and this additional territory can be utilized. Planting policy of any individual project should, reinforce University-wide systems and also consider related policies such as safety and security.

.6 **Maintenance**

The University is continuing to seek ways of minimizing chemical use in campus maintenance and to find an economical and effective substitute for salt in snow clearance. Designs which can assist this policy - by material choice or other means - must be considered. Plant design should minimize the necessity for high maintenance wherever possible. *Naturalization* - the untrammeled use of local species - is encouraged.

1. All main building entrances and accessibility ramps must contain provision for the prevention of snow and ice accumulation.

2. The width and slope of the area requiring prevention of snow and ice accumulation must meet all requirements under AODA.

3. Snow and ice accumulation prevention must extend from the main University and/or municipal sidewalk to the doors of the building, excluding stairs, but including any other horizontal surfaces.

4. It is recommended that hydronic heating systems be installed to prevent snow and ice accumulation. The system must activate automatically at outdoor ambient temperatures below zero degrees Celsius when moisture is present and must remain active until temperatures rise above zero degrees Celsius.

5. It is recommended that dedicated electric-fired boilers be used as the source of heat for the snow/ice melt systems as they are low greenhouse gas content (when recovered heat from the Central Steam Plant is not available) The hydronic heating medium must be a fluid suitable to withstand ambient temperatures to -25C.

6. Proper slope and drainage must be provided adjacent to any hydronic heating system in order to remove meltwater.

7. Any hydronic heating system must provide ready access for repair to pumps and control systems.

8. Any hydronic heating system must be constructed in such a way as to allow for future extension of the system in the easiest and most cost effective manner possible.

9. Smaller systems with only one heat exchanger feeding a header must incorporate isolation capacity to each zone.

   Larger systems with individual heat exchangers for each zone must incorporagte the following requirements:

   - Cushion tank required for each heat exchanger
   - Air vents for each zone loop
   - Flow meters for each zone loop
   - Commissioning agent must ensure the design flow is met for each loop at the required system pressure.

10. The Grounds Manager must approve the type and extent of measures used to prevent snow and ice accumulation.

1.3.6 WASTE MANAGEMENT

All projects should minimize the amount of waste sent to landfill by following the 3R's hierarchy - reduce, reuse and recycle, and assist the University in meeting the requirements of The Waste Management Act.

.1 Construction and Demolition

Design and planning of building renovations and/or new construction should ensure that, during the construction and demolition phases waste is avoided through the reuse of old materials, where practicable, either in the existing project or elsewhere. Scrap materials that cannot be reused, such as drywall, carpet, corrugated cardboard, wood or metal must be separated and recycled, where possible.

.2 Indoor Spaces

Designs for new or renovated spaces must consider placement of recycling containers. Public, lobby and lounge spaces require a system of depots for source-separation of waste that do not impede traffic flow. Offices and residence rooms require personal recycling and waste containers, as well as garbage/recycling rooms or centralized common disposal areas**.**

.3 Food Outlets

Any new food service areas require containers and space for the collection of source separated waste.

.4 Central Waste Facilities

New building construction requires sufficient space for the consolidation of and access to recycled materials and garbage.

.5 Outdoor Spaces

Outdoor public plazas, parkettes and corridors require a system of depots for source separation, the number of depots being dependent on the volume of pedestrian traffic**.**

1.3.7 MONITORING

It is increasingly necessary for Departments and Divisions of the University to take individual responsibility for maintaining good environmental standards within their purview. This will require an improved ability to measure performances and designers should consider effective methods of metering resource use and - in some cases - waste production in new and renovated premises.

ENVIRONMENTAL DESIGN STANDARDS CHECK LIST

A completed copy of this check list must be submitted by the design team to the University's Project Manager at the end of the design development phase. In all cases, items that do not comply (NC), must indicate the reason why. Attach additional sheets if necessary.

	C	NC	NA
1. Minimize Energy Use			
Life cycle assessments have been carried out on building equipment and operation.	☐	☐	☐
Explain process:____			
Were central University systems used to supply thermal energy/cooling.	☐	☐	☐
What energy efficient equipment was used:			
High efficiency motors	☐	☐	☐
Variable speed drives			
Thermal heat recovery (type:____________________________________	☐	☐	☐
Presence sensor-activated light switching (type:_____________________	☐	☐	☐
Other energy efficient equipment (type:__________________________	☐	☐	☐
Was the use of natural energy maximized:	☐	☐	☐
List ways:____			
Does roofing design, type and colour minimize cooling requirements in summer.	☐	☐	☐
Thermal envelope equals or exceeds the energy provision of____________________. (i.e. R2000+, ASHRAE 90.1-1989, etc.)	☐	☐	☐
Can windows be opened by occupants to maximize cross ventilation.	☐	☐	☐
Use of natural daylight for illumination purposes has been maximized.	☐	☐	☐
List ways:____			
Low energy use fixtures have been used for artificial lighting.	☐	☐	☐

2. Minimize Water Use

What water saving fixtures were used:

Low flow toilets/showerheads	☐	☐	☐
Presence sensor-activated lavatories	☐	☐	☐
Presence sensor-activated urinals	☐	☐	☐
Other water saving fixtures (type:________________________________	☐	☐	☐

	C	NC	NA
Is ‘grey’ water re-used.	☐	☐	☐
List ways:____			
Is rain water used for landscaping purposes.	☐	☐	☐
List ways:____			
Has the use of city water to cool research equipment of building air conditioning been avoided. If not, list locations and explain why:	☐	☐	☐

____

____

3. Material Choice

	C	NC	NA
Life cycle assessments have been carried out on products.	☐	☐	☐
Itemize products:____________________________________			
Are these products emission free.			
Carpets	☐	☐	☐
Furniture	☐	☐	☐
Fabrics	☐	☐	☐
Treated Wood	☐	☐	☐
Wall Coverings	☐	☐	☐
Paint	☐	☐	☐
Adhesives	☐	☐	☐
Have these products been selected to minimize the use of chemicals for cleaning.			
Carpets	☐	☐	☐
Furniture	☐	☐	☐
Fabrics	☐	☐	☐
Treated Wood	☐	☐	☐
Wall Coverings	☐	☐	☐
Paint	☐	☐	☐
Adhesives	☐	☐	☐

4. Effluents and Emissions

	C	NC	NA
Have certificates of approval been obtained for emissions to the outside.	☐	☐	☐
Has ventilation been provided specifically to reduce effects of gases and odours.	☐	☐	☐
Where and how is exhaust dissipated:________________________			

____

	C	NC	NA
Have airborne emission dispersion studies been executed.	☐	☐	☐
Will hazardous wastes be dealt with at source.	☐	☐	☐
How:____			
Will any wastes go into the water system.	☐	☐	☐
If yes, has the impact been considered. How:____________________			
____			

5. Outdoor Environment

	C	NC	NA
The positioning of the new building maximizes naturally occurring sunlight and air movement.	☐	☐	☐
A water-penetrating pavement system has been used.	☐	☐	☐
Does the design of paved areas minimize the use of salt for ice-clearing.	☐	☐	☐
How:____			
The campus flora and habitat have been respected and the purpose of the planting materials have been addressed.	☐	☐	☐
The choice and location of trees provide building shade in summer and windbreaks in winter.	☐	☐	☐
If the roof used for planting.	☐	☐	☐
The use of local plant species has been encouraged.	☐	☐	☐

6. Waste Management

	C	NC	NA
Will demolition /construction waste be recycled/reused.	☐	☐	☐
How:____			
Placement of indoor recycling containers has been addressed in the design.	☐	☐	☐
Placement of outdoor recycling containers has been addressed in the design.	☐	☐	☐
Food outlets have source-separated waste collection containers designed in the facility.	☐	☐	☐
Sufficient space has been allowed for consolidation of waste and recycling.	☐	☐	☐

7. Monitoring

Environmental standards have to be monitored and measured. Indicate that this has been provided for each discipline and describe the proposed monitoring method.

	C	NC	NA
Thermal energy use:	☐	☐	☐
Electrical energy use:	☐	☐	☐
Water use:	☐	☐	☐
Effluent and emissions:	☐	☐	☐
Waste management:	☐	☐	☐

END OF PART ONE SECTION 9 - ENVIRONMENT SECTION

Environmental Design Standards

DRAFT
(Revised December 14, 2011)

This Design Standard has not yet received approval through University governance. It is included here as a reference for planning new facilities to be built in the near future.

1. **New Construction**
   a. At a minimum, all new buildings***** shall be designed to meet the Toronto Green Development Standard, Tier 1 and LEED Canada – NC Silver rating with at least 10 points achieved for "Optimizing Energy Performance", 2 points achieved for "Enhanced Commissioning" and 4 points achieved for "Water Use Reduction". This will significantly reduce the building's operating costs over its lifetime. The attached chart indicates the University's minimum point expectation in all categories.
   b. It is recommended that the building undergo full LEED Canada – NC Silver certification, not just be designed to be equivalent to LEED without certification. This will ensure that features planned at the beginning of the project to enhance the environmental sustainability of the building will still exist at the end of the construction, will be properly commissioned and will be monitored for performance after the construction is complete.
   c. It is recommended that glazing be limited to no more than 40% of the exterior wall area.
   d. Equipment and systems must be put in place so that the long term energy and water efficiency can be monitored and verified.

2. **Major Renovations**
   a. For major renovations requiring governance approval affecting 100% of the mechanical and electrical systems and 50% of the interiors, the re-constructed area shall be treated as "New Construction" above.

3. **Related Relevant Documents**
   a. Other University of Toronto Design Standards can be found at http://www.fs.utoronto.ca/aboutus/design.htm. Of particular relevance are the Mechanical and Electrical Design Standards.
   b. *A Pledge from the Executive Heads*, Council of Ontario Universities, November 2009 http://www.cou.on.ca/issues-resources/key-issues/more/pdfs/committed-to-a-greener-world---a-pledge-from-execu.aspx

* = Wet labs and data centre buildings will be considered on an individual basis.

UofT Environmental Design Standard for New Construction
based on LEED Canada 2009

Sustainable Sites

Min. point expectation			Possible LEED points
R	Prereq 1	Construction Activity Prevention	R
1	Credit 1	Site Selection	1
5	Credit 2	Development Density and Community Connectivity	3,5
0	Credit 3	Brownfield Redevelopment	1
6	Credit 4.1	Alternative Transportation - Public Transport Access	3,6
0	Credit 4.2	Alternative Transportation - Bicycle Storage & Changing Rooms	1
0	Credit 4.3	Alternative Transportation - Low-Emitting and Fuel Eff. Vehicles	3
1	Credit 4.4	Alternative Transportation - Parking Capacity	2
1	Credit 5.1	Reduced Site Disturbance - Protect/Restore Habitat	1
0	Credit 5.2	Reduced Site Disturbance - Maximize Open Space	1
1	Credit 6.1	Stormwater Management - Quantity Control	1
0	Credit 6.2	Stormwater Management - Quality Control	1
1	Credit 7.1	Heat Island Effect - Non-Roof	1
1	Credit 7.2	Heat Island Effect - Roof	1
0	Credit 8	Light Pollution Reduction	1
17		points	**26**

Water Efficiency

R	Prereq 1	Water Use Reduction	R
2	Credit 1	Water Efficient Landscaping	2,4
0	Credit 2	Innovative Wastewater Technologies	2
4	Credit 3	Water Use Reduction	2to4
6		points	**10**

Energy & Atmosphere

R	Prereq 1	Fundamental Commissioning of Building Energy Systems	R
R	Prereq 2	Minimum Energy Performance	R
R	Prereq 3	Fundamental Refrigerant Management	R
10	Credit 1	Optimize Energy Performance	3to19
0	Credit 2	On-site Renewable Energy	1to7
2	Credit 3	Enhanced Commissioning	2
1	Credit 4	Enhanced Refrigerant Management	2
1	Credit 5	Measurement and Verification	3
0	Credit 6	Green Power	2
14		points	**35**

Materials & Resources

R	Prereq 1	Storage & Collection of Recyclables	R
0	Credit 1.1	Building Reuse: Maintain Existing Walls, Floors, Roof	1to3
0	Credit 1.1	Building Reuse: Maintain Interior Non-Structural Elements	1
2	Credit 2	Construction Waste Management	1to2
0	Credit 3.1	Materials Reuse	1to2
2	Credit 4.1	Recycled Content	1to2
1	Credit 5.1	Regional Materials	1to2
0	Credit 6	Rapidly Renewable Materials	1
0	Credit 7	Certified Wood	1
5		points	**14**

Indoor Environmental Quality

R	Prereq 1	Minimum IAQ Performance	R
R	Prereq 2	Environmental tobacco Smoke (ETS) Control	R
0	Credit 1	Outdoor Air Delivery Monitored	1
0	Credit 2	Increased Ventilation	1
1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
0	Credit 3.2	Construction IAQ Management Plan, Testing before Occupancy	1
1	Credit 4.1	Low-Emitting Materials: Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials: Paints & Coatings	1
1	Credit 4.3	Low-Emitting Materials: Flooring Systems	1
1	Credit 4.4	Low-Emitting Materials: Composite Wood & Agrifibre Products	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
0	Credit 6.1	Controllability of Systems: Lighting	1
0	Credit 6.2	Controllability of Systems: Thermal Comfort	1
1	Credit 7.1	Thermal Comfort: Design	1
0	Credit 7.2	Thermal Comfort: Verification	1
0	Credit 8.1	Daylight & Views: Daylight	1
0	Credit 8.2	Daylight & Views: Views	1
7		points	**15**

Innovation & Design Process

4	Credit 1	Innovation in Design	1to5
1	Credit 2	LEED Accredited Professional	1
5		points	**6**

Regional Priority

1	Credit 1	Durable Building	1
1	Credit 2	Regional Priority Credit	1to3
2		points	**4**

	LEED CANADA 2009 NC minimum:	
	LEED Certified 40-49	
56	**LEED Silver 50-59**	**110**
	LEED Gold 60-79	
	LEED Platinum 80-110	