



University of Calgary

Architecture Program
Winter 2002
EVDA 782.08
Vertical Studio

SUSTAINABILITY

Instructor: Adjunct Visiting Professor
Barry Johns
Assistants
Chad Oberg
Troy Smith

University of Calgary

Architecture Program, winter 2001



EVDA 782.08 Vertical Studio

TITLE: Sustainability

Instructor: Adjunct Visiting Professor, Barry Johns
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Duration: Friday, January 11 – Tuesday April 16, 2002 (13 weeks)

Evaluation: Research 20%
Studio 70%
Portfolio 10%

“I am I, plus my surroundings and if I do not preserve the latter, I do not preserve myself.”
(Jose Ortega y Gasset: ‘Meditaciones del Quijote’ 1914)

1.0 INTRODUCTION

The significance and urgency attached to global environmental degradation has prompted a search for environmental criteria to guide policy and decision-making in all sectors; the building industry is no exception.

“Decisions by architects and engineers have considerable impact on both local and global environment thus attention is turning firmly and permanently to these professions to see how they are exercising their responsibility”. (Bradmand 1989).

Consequently, ensuring that the materials and systems used in construction minimize impact on the environment will increasingly be an emphasis in practice. Changing the economic equation to include current hidden environmental costs and to restrain the rapid depletion of certain resources will also affect the way the public and building owners perceive buildings. The significance for the construction industry will be the expansion of environmental auditing to include the assessment of resources and raw material consumption which form the built environment and ensuring that these resources are used more efficiently in the future.

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System authored by the US Green Building Council is one such auditing and performance measuring standard emerging in North America and will possibly be adopted in one form or another in Canada. Others such as BREEAM and Greenleaf are being developed as well, that promulgate the improvement of environmental and economic performance of buildings and sites using advanced industry principles, practices, materials and standards. The LEED Documents are available at <http://www.usgbc.org>, and the introduction to the recently delivered RAIC Course Sustainable Design Fundamental for Buildings is included with this Briefing Document.

It is expected that within this decade, green building initiatives will become part of the standards by which development permits will be awarded and that such standards will work in concert with building codes in this regard. Unlike building codes which prescribe a minimum standard for life safety, standards for GREEN architecture represent an enormous design opportunity (and responsibility) for architects – to improve the overall quality of the environment as well as to explore new areas of innovation.

2.0 COURSE OUTLINE

Overview

This course will take the student through a process of research and data collection on green building strategies that will then be used to influence the design of a new "Information Commons" facility on the University of Calgary Campus.

Part 1 Research – The Tectonics of Sustainability

This part of the course will involve the study of architectural precedents in which sustainability is embodied in architecture and the making of places. Students will analyze, diagram, and document the systems and ideas inherent in a work of precedent within the context of the LEED system of green building performance criteria. Compiled documentation from this exercise will be catalogued into a coherent a Planning Guide and student reference. This material will also be published for University use.

Part 2 Design – The Sustainability of Tectonics

Students will spend the second part of the term developing a project - a new **Information Commons** on the U of C campus – using the principles of LEED and the Part 1 data collected to inform their work.

Seminar

BJohns – ICT case study and tour, LEBDA, EATC, PGAG, Julia Kiniski (one day)

Lectures

BJohns – Why sustainable architecture? How is it measured?
 Vivian Manasc – Case Study – Intuit Headquarters
 Faculty Involvement – Jim Love, Tang Lee, others
 University Involvement – Frits Pannekoek, Linda Fraser, Barry Kowalsky

Field Trip

Vancouver – Details TBA

Recommended Reading

19 October 2001 RAIC Workshop / Calgary – Sustainable Design Fundamentals of Buildings
LEED Green Building Rating SystemTM, Green Building Council, Version 2.0, March 2000

The results of the term work will be published and will form a data archive of student work plus a manual on **Sustainability** for future use by the University Campus Planning Department and EVDS student community.

3.0 COURSE SCHEDULE

WEDNESDAY 9 JANUARY

2:00 pm Presentation to prospective studio participants

Week 1

FRIDAY 11 JANUARY

2:00pm Lecture – Why Sustainable Architecture? How is it measured?
 Introduction to Part I

Week 2

TUESDAY 15 JANUARY

2:00PM Part I Continued

WEDNESDAY 16 JANUARY

2:00PM Part I Continued

FRIDAY 18 JANUARY

2:00PM BJohns – ICT case study and tour, LEBDA, EATC, PGAG, Julia Kiniski (one day)

Week 3

TUESDAY 22 JANUARY

2:00PM Part I Continued

WEDNESDAY 23 JANUARY

2:00PM Part I Continued

FRIDAY 25 JANUARY

2:00PM Part I Final Review

Introduction to Part IIa – Site and Master Planning

Week 4

TUESDAY 29 JANUARY

2:00PM Workshop – Barry Kowalsky

WEDNESDAY 30 JANUARY

2:00PM Part IIa Continued

FRIDAY 1 FEBRUARY

2:00PM Part IIa Continued

Week 5

TUESDAY 5 FEBRUARY

2:00PM Part IIa Continued

WEDNESDAY 6 FEBRUARY

2:00PM Lecture – Jim Love – Day lighting Strategies

3:00PM Lecture – Jim Love – Mechanical Systems

Part IIa Continued

FRIDAY 8 FEBRUARY

2:00PM Part IIa – Final Review

Introduction to Part IIb – Schematic Design



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Week 6

TUESDAY 12 FEBRUARY

2:00PM SITE VISIT CAA AND MACKIMMIE LIBRARY– Frits Pannekoek, Linda Fraser
Part IIb Continued

WEDNESDAY 13 FEBRUARY

2:00PM Part IIb Continued

FRIDAY 15 FEBRUARY

2:00PM Part IIb Continued

(Block Week 18-28 February)

Week 7

TUESDAY 26 FEBRUARY

2:00PM Part IIb Continued

WEDNESDAY 27 FEBRUARY

2:00PM Part IIb Continued

FRIDAY 1 MARCH

2:00PM Lecture – Vivian Manasc
Part IIb Continued

Week 8

TUESDAY 5 MARCH

2:00PM Part IIb Continued

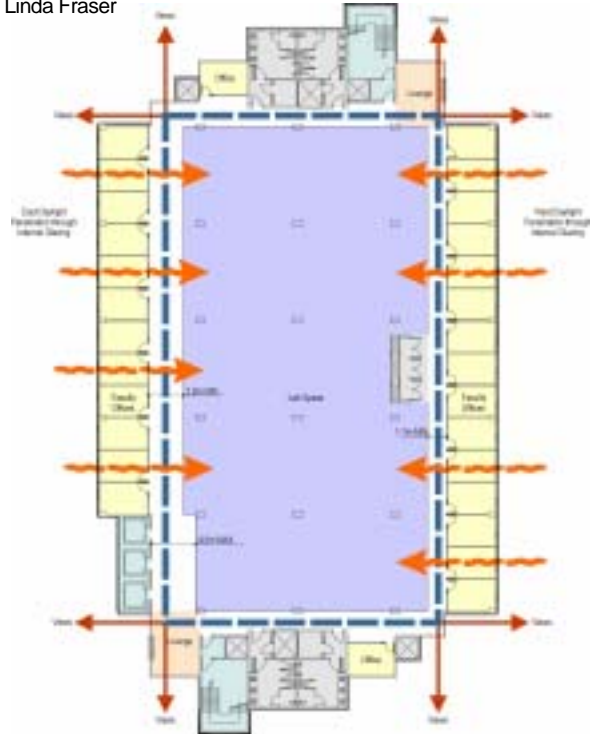
WEDNESDAY 6 MARCH

2:00PM Part IIb Continued

FRIDAY 8 MARCH

2:00PM Part IIb Final Review

Introduction to Part IIc – Detailed Design



Week 9

TUESDAY 12 MARCH

2:00PM Part IIc Continued

WEDNESDAY 13 MARCH

2:00PM Part IIc Continued

FRIDAY 15 MARCH

Vancouver Field Trip – Details TBA

Week 10

TUESDAY 19 MARCH

2:00PM Part IIc Continued

WEDNESDAY 20 MARCH

2:00PM Part IIc Continued

Introduction to Part IId - Pulling it All together

FRIDAY 22 MARCH

2:00PM Part IIc Continued

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Week 11

TUESDAY 26 MARCH

2:00PM Part IIc/IId Continued

WEDNESDAY 27 MARCH

2:00PM Part IIc/IId Continued

FRIDAY 29 MARCH

2:00PM Part IIc Final Review

Week 12

TUESDAY 2 APRIL

2:00PM Part IIId Continued

WEDNESDAY 3 APRIL

2:00PM Part IIId Continued

FRIDAY 5 APRIL

2:00PM Part IIId Continued

Week 13

TUESDAY 9 APRIL

2:00PM Part IIId Continued

WEDNESDAY 10 APRIL

2:00PM Part IIId Continued

FRIDAY 12 APRIL

2:00PM Part IIId Continued

Week 14

TUESDAY 16 APRIL

2:00PM Part IIId Continued

Final Juried Reviews TBA (April 17-19)

Within one week following Final Reviews, Students will be expected to submit a portfolio from the term for evaluation and inclusion in future publications.

4.0 INTRODUCTION TO PART I – *The Tectonics of Sustainability*

This part of the course will involve the study of architectural precedents in which sustainability is embodied in architecture and the making of places. Students will analyze, diagram, and document the systems and ideas inherent in a work of precedent within the context of the LEED system of green building performance criteria. Compiled documentation from this exercise will be used as a planning guide and student reference.

Students will break into teams of two and charged with the task of researching precedents which explore to varying degrees the following topics that form the design fundamentals to LEED:

Site Sustainability

Water Efficiency

Energy and Atmosphere

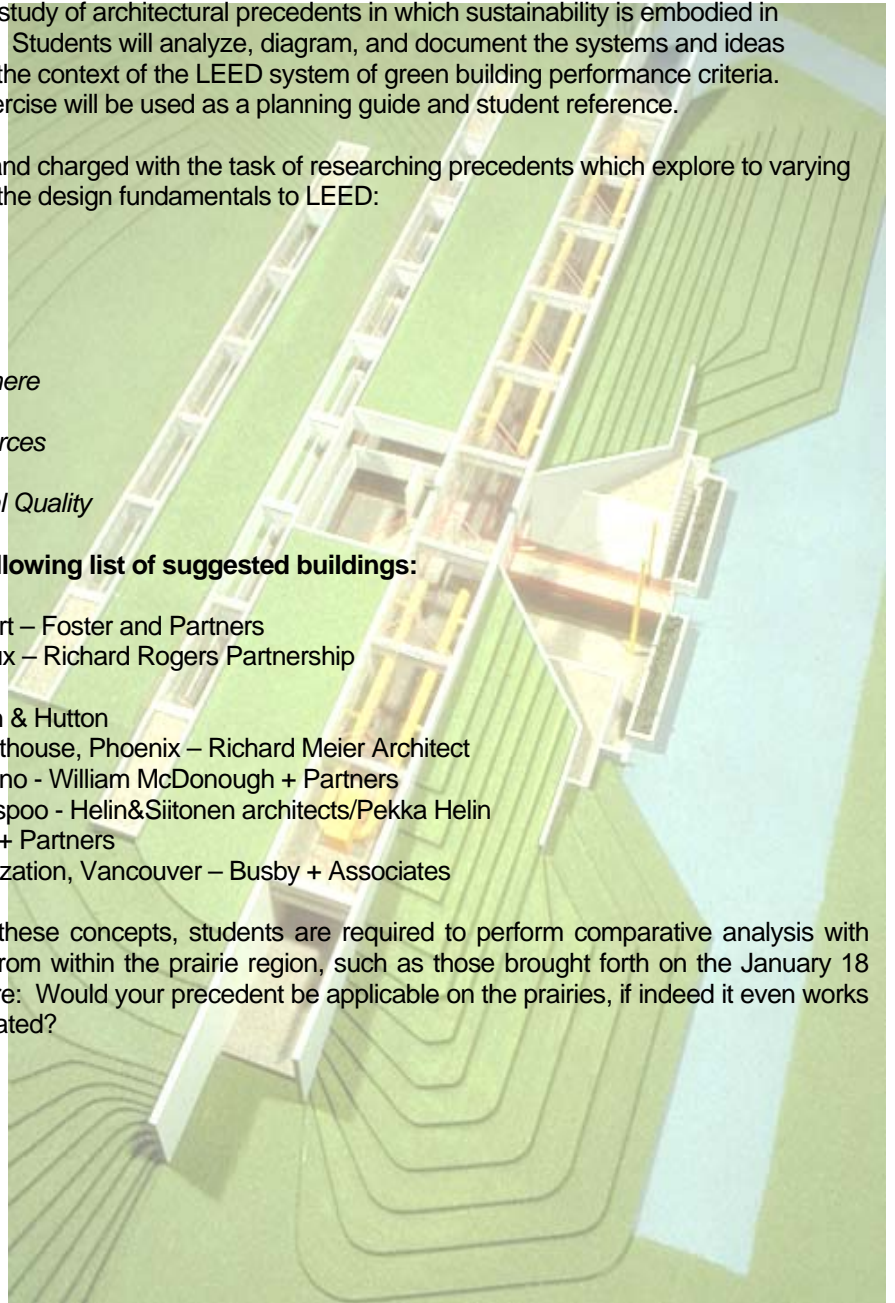
Materials and Resources

Indoor Environmental Quality

Each group will choose from the following list of suggested buildings:

Commerzbank Headquarters, Frankfurt – Foster and Partners
 Tribunal de Grande Instance, Bordeaux – Richard Rogers Partnership
 Villa Al-Kufa, Iraq – Hassan Fathy
 Photonics Centre, Berlin – Sauerbrach & Hutton
 Federal Building & United States Courthouse, Phoenix – Richard Meier Architect
 Gap Inc. 901 Cherry Avenue, San Bruno - William McDonough + Partners
 Nokia House (Nokia headquarters), Espoo - Helin&Siitonen architects/Pekka Helin
 Linz Design Centre - Thomas Herzog + Partners
 Telus / William Farrell Building Revitalization, Vancouver – Busby + Associates

In the illustration and explanation of these concepts, students are required to perform comparative analysis with sustainable architectural precedents from within the prairie region, such as those brought forth on the January 18 lecture. Questions to in this context are: Would your precedent be applicable on the prairies, if indeed it even works in the climate in which it has been situated?



4.1 INTRODUCTION TO PART II – *The Sustainability of Tectonics*

Context(s)

“There is a desire on campus for a greater sense of community; a gathering place; a central building seen by all as the heart of the campus. The traditional symbol for the centre of the University learning experience has been the library. The existing building—a small floor-plate multi-level tower—does not function well as a library. The traditional content of the library—print—is being rapidly supplemented and transformed by computer technology. There is a trend to combining the storage and display of print, electronic media, museum and art objects. Information Technology services are scattered and need to be consolidated. They occupy space that can be put to good use by others. The ideal information centre is readily accessible, part of main circulation routes, at the focus of activity, with all of its floor area closely related to ground level. It would contain i) consolidated library, archives (Canadian Architectural Archives) and media resources; ii) the Information Technology department; iii) museums and art gallery; iv) study space; and v) social gathering space.” (University of Calgary Campus Community Plan, February 2 2001)

“Back in December 1997, more than 160 nations met in the Japanese city to negotiate binding limitations on greenhouse gas emissions by the developed nations, following the objectives agreed at 1992’s Earth Summit and the United Nations Framework Convention on Climate Change. The outcome of the meeting was the Kyoto Protocol, in which the developed nations agreed to limit their emissions, relative to 1990 levels. It commits signatories to achieving a global 5% reduction in greenhouse gas emissions by 2010, compared with 1990 levels...”

Such a significant reduction will require more than ordinary energy saving measures. Expect to see buildings that achieve 100% daylight efficiency during daylight hours; buildings that are principally cooled by naturally driven air-conditioning systems; systems that use innovative cooling and heating mechanisms such as geothermal heating, borehole water cooling, desiccant cooling systems (solar-driven); wind driven ventilation; intelligent or interactive facade design.

Even so, the choice of system is only ever likely to result in a 20-30% saving in energy bills, and its architectural impact is limited. Real reductions will only be achieved by more radical ‘climate-responsive’ architecture.”

“International Style Architecture – where one high-rise building looks the same as the next despite the fact that they are on different continents – will be phased out. Instead, we will see the emergence of a climatic regionalism.” (Guy Battle , “Kyoto or Bust,” World Architecture 100 October 2001)

Buildings constitute over 40% of consumed energy and utilize 40% of available raw materials. (RAIC Sustainable Design Fundamentals for Buildings).

“There are 8000 architects in Canada. If each of us could reduce energy consumption in our buildings by 25% we alone would reach 50% of the Kyoto expectations in 5 years”. (Peter Busby, RAIC Workshop October 19, 2001, Calgary, RAIC Sustainable Design Fundamentals for Buildings).

Each of us has a role to play, and this challenge is another formidable way to reaffirm the relevance of the profession of architecture within our society.

Within this context, your task is to design the new Information Commons on the University of Calgary Campus.

The task is divided into 4 phases:

<i>Part IIa</i>	<i>Site and Master Planning</i>
<i>Part IIb</i>	<i>Schematic Design</i>
<i>Part IIc</i>	<i>Detailed Design</i>
<i>Part IId</i>	<i>Pulling it all together</i>

Part IIa – Site and Master Planning

You will divide into 3 groups to find out as much information as possible about the proposed site for the new library facility. One group will gain a thorough understanding of available survey data and historic aerial photographs in order to construct a model of the surrounding context. The second group will gain an understanding of pedestrian flows and master planning issues relevant to the future directions of the campus, including any current reports or documentation from the Campus Planning Department. The third group will investigate all available data with respect to both macro and micro climate issues. The goal is to as a group compile a base of site information from which each member of the studio can make informed decisions regarding a siting strategy from which the building may begin to emerge.

Part IIb – Schematic Design

With siting issues established, each individual will begin to develop a building that responds to climatic conditions and space allocation requirements with respect to programmatic usage. The building will be developed in plan and section, with specific regard to diagramming how the proposed design responds or initiates a framework with respect to the following conditions:

- Human Circulation and Functional Areas
- Day lighting Strategy
- Air Flows & Ventilation
- Heat Flows & Thermal Inertia
- Envelope Strategy
- Water Flows
- Waste Flows
- Energy Consumption
- Roofing Strategy

Each of these criteria, while based on green building standards, affords a unique design opportunity.

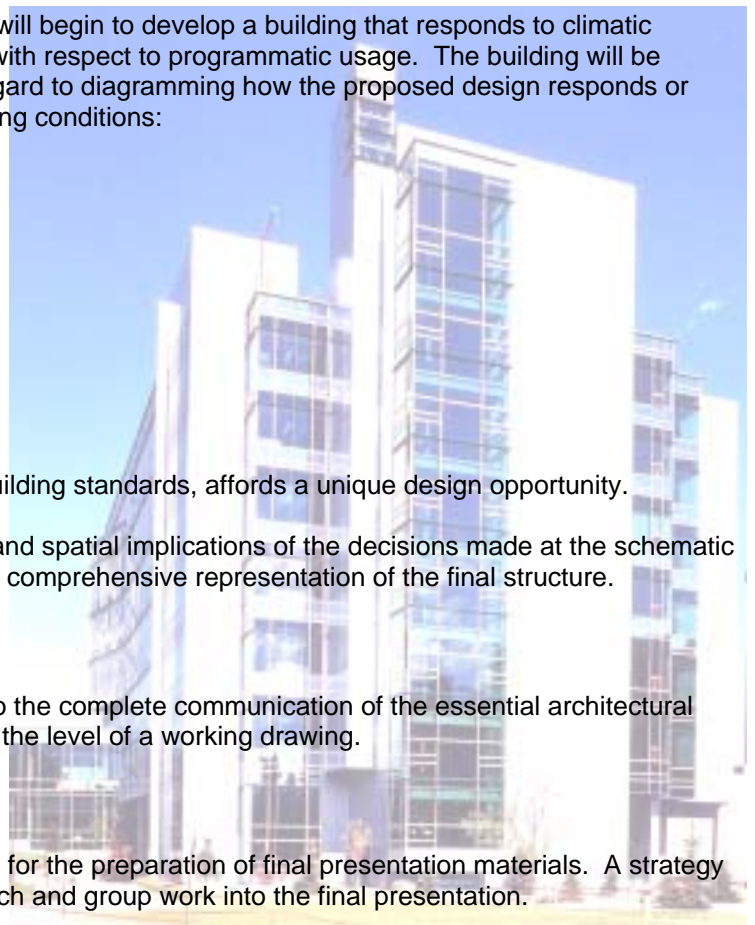
In this phase the specific materiality, tectonic, and spatial implications of the decisions made at the schematic stage will be further developed into a clear and comprehensive representation of the final structure.

Part IIc – Detailed Design

In this phase, one specific area that is critical to the complete communication of the essential architectural ideas inherent in the design will be explored to the level of a working drawing.

Part IId – Pulling it all together

At this point in the course time will be allocated for the preparation of final presentation materials. A strategy will also be developed for integrating all research and group work into the final presentation.



5.0 INFORMATION COMMONS – PROGRAM REQUIREMENTS

5.1 Existing Space Summary

		NASM	GFA	Footprint	Fllrs	Net/Gross Ratio	Cumul've GFA
Main Campus Academic Buildings							
4	MacKimmie Block	1963	9,121	12,480	2,423	4+B 73.1%	75,749
17	MacKimmie Tower	1972	13,225	19,508	1,954	12+B 67.8%	297,020

5.2 Projected Space Requirements

PHASE 1 b	NASM	GFA	Construction Cost		Development Cost	
			Sq.m	Per bldg	Sq.m	Per bldg
InfoCommons	37,393	56,000	\$1,500	\$84,000,000	\$2,000	\$112,000,000
Infocommons u/g parking		12,500	\$690	\$8,625,000	\$900	\$11,250,000

5.3 Space Programme Summary

	NASM
Library Block	9,100
Library Tower	13,200
Museums/Gallery	2,500
Learning Commons	1,400
Info Technology	5,900
Total	32,100
GROWTH @ 15%	36,915
GFA (approx.)	50,000



5.4 Space Programme Details

<i>Number</i>	<i>Component Name</i>	<i>Net Area (m2)</i>
1	<i>Circulation Desks and Administration</i>	1200
2	<i>Meeting and Study Rooms</i>	400
3	<i>Main Reading Room</i>	500
4	<i>Auditorium</i>	450
5	Main Collections	14500
6	<i>Special Collections</i>	2350
7	<i>Reference/Indexes/ Government Docs</i>	2450
8	<i>Newspapers/Current Periodicals</i>	1750
9	<i>Canadian Architectural Archives</i>	1500
10	<i>Main Copier / Printer Area</i>	200
11	<i>Student Work Areas</i>	650
12	<i>Search Stations and Help Desk</i>	250
13	<i>Learning Commons</i>	1600
	<i>(Videoconference/Multimedia Classrooms</i> <i>& High Perf. Computer Labs)</i>	
14	<i>Gallery (Staff, Prep & Exhibition)</i>	2650
15	<i>Information Technology Department</i>	6,785
16	<i>Food Service (Servery & Prep)</i>	170
17	Building Sub Total	37,400
	<i>Gross Area (including,</i> <i>Mechanical/Electrical/IT, Service Areas,</i> <i>Loading Docks, Washrooms, Overall</i> <i>Building (non-component) Circulation,</i> <i>Gathering Areas</i>	12,600
	Building Total	50,000
18	<i>Underground Parking</i>	12,500
	Development Total	62,500

6.0 BIBLIOGRAPHY AND SUGGESTED READINGS

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