EVDA 682.04
Comprehensive Architectural Design Studio
Winter 2004

M, W, F
1400-1800
PF2140

Sustainability in the Scalar Spectrum

1.0 Introduction

Within the normative endeavour of facility design there is much separation between the various disciplines involved. Much of the process consists of minimizing conflicts between building systems, as each is conceived largely in a vacuum responding to discipline-specific agendas and irrespective of the possibilities for integration.

The obverse of this, an integrated collaborative design process, allows not only for greater efficiencies and benefits, but also presents the potential to strengthen an architectural idea, whereby spaces, the structures which create them, and the mechanical and lighting systems that make them habitable are inseparable to the overall experience.

An architect who is not only versed in these various disciplines but also able to formulate architectural ideas in an integrated fashion will be well served to advance beyond the deficiencies of normative practices.

By way of example, consider the area of Sustainable Design. While awareness, acceptance and standards for Green architecture are growing, a majority of green design precedents reveal environmental strategies as largely technological 'add-ons' to pre-established building types and practices. When sustainable 'systems' are not integrated with a core architectural idea, they become easy targets for short-sighted cost cutting and 'value engineering' exercises. The point is that considerations of sustainability need to be intrinsic to the design process.

This studio explores the discovery and application of building systems and sustainable building design ideas as an integrated holistic process that will further inform site planning and building design. Utilizing such an approach, all components to place-making and space-making ought to be seen as a cohesive and complementary and integrated whole. This of course includes structural, mechanical, and electrical building systems. Architecture can thus be seen as a logical response to climate/environmental, cultural, and economic factors of its location and thus derives more meaning in each of these respective domains.

> 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, Issue 100, October 2001, pp. 64-67.)

2.0 Objectives and Requirements

This studio is a comprehensive design studio where, beyond designing and representing a building, students are expected to develop skills in building systems integration and learn the basics of construction documentation. This studio is developed to operate in parallel with several building technology courses (EVDA 611, EVDA 719, EVDA 615, and EVDS 617). Students are expected to complete the various phases of the project according to the schedule (there will be handouts during the term), and the deliverables that are submitted for each phase will be included in the final presentation package. Students are expected to demonstrate an ability to develop architectural and construction ideas using appropriate drawing, modeling, and computer rendering techniques.

Objectives:

1. To develop an ability to design a project based on a program of room types through the various stages of design development, building systems integration and technical documentation.

2. To demonstrate an ability to incorporate building systems and basic sustainable strategies into an integrated design. This includes detailing materials, components and assemblies.

3. To develop an ability to technically document the design.

3.0 Course Outline

Part I: Contemporary Approaches in Educational Facility Design
(January 12)

The studio focuses on the design of a K-6 school as an integral part of a sustainable mixed use community development.

The normal process of precedent research is accelerated, whereby examples of K-6 schools and their underlying design methodologies are presented to the students by invited practicing architects. In addition, presentations are given by representatives of the local chapter of the Council of Educational Facilities Planning International (CEFPI), a professional organization dedicated to designing innovative educational facilities.

At the conclusion of this phase students are presented with a program outlining the spatial requirements for their projects. The requirements (attached), while simplified, are a direct reflection of the needs of a typical school board in Alberta, and follow best practices of the CEFPI.

In addition, CEFPI representative(s) play a role throughout the studio, including the determination of the best project that is eligible for a small monetary scholarship. In addition, the best of the student work will be exhibited in the Spring CEFPI Annual Alberta Conference.

Deliverables:
1. Handouts supplied to students as a part of the presentations
2. The functional program for a K-6 school is introduced (attached)

Part II: Site Planning (10%, January 14-15)

At one end of the scalar spectrum is Site Planning, the division of raw land into building sites and supporting networks. The Site Planning exercise affects all aspects of built form, as site selection impacts upon Building Orientation, Access Points, Natural Features, Utility Services, etc. Essentially, Site Planning involves the analysis and response to the constraints and opportunities presented by a site to which the building must respond. This includes orientation to sun, wind, snow drift, density, uses, access to transit, reliance on the automobile, and efficiency of civic infrastructure.

Part II of this studio involves a two-day charrette intended to provide an introduction to sustainable building practices and a conceptual framework for the detailed development of a building within a new community. The University of Alberta's West 240 is "a large undeveloped university holding that falls between two residential communities, Grandview Heights and Landsdowne, which the University sees as being a significant part of its plans for growth over the next 10 to 50 years." (http://www.seemagazine.com/Issues/2001/1115/news1.htm) A component goal for the future of the West 240 will be a private residential community, implementing recognizable community / neighbourhood components such as mixed-use residential, commercial, and community functions, including a primary school, which as mentioned previously will be the main design focus for the rest of the semester.

Students are introduced to basic planning principles to establish a broad vision for this area, paying particular attention to Districts, Pathways, Edges, Nodes, and Landmarks. Overall Site Plan concepts will be developed during an all-day session with representatives of both the University's Campus Planning and Real Estate Departments. The class is divided into three groups, and each is to develop and present a Site Plan concept, including the identification of a site that would be appropriate for the design of a Primary School.

Student deliverables for this as well as all subsequent phases of the studio are in an 11 x 17" electronic format, suitable for both archival (printed) and presentation (projected) purposes.

Deliverables:
1. Area Analysis Drawings
2. Conceptual Network Drawings
3. Conceptual District Design Diagrams
4. Conceptual Site Site Development Plans / Sections identifying opportunities for K-6 school

Part III: Site and Building Code Analysis (5%, January 17-21)

With knowledge of both design precedents and the program elements required for the design exercise, the next phase involves the choice and study of a proposed site and the implications of both program and siting within the context of relevant building codes and planning criteria.

Each student chooses one of the three sites identified in the Site Planning exercise to develop his or her project. Students then prepare a series of individual site analysis drawings, identifying climatic, geographic, and physical features of the site as well as identifying the opportunities and constraints from which a siting strategy for the building may begin to emerge.

From the analysis students develop a conceptual site plan, showing how the mass of the building will respond to the surrounding context, organizing the various discrete modules of the building, solving site access, site development (parking, active and passive recreation, growth, etc.) and building placement issues at a relatively small scale.

In addition, to ensure compliance with the Alberta Building Code each student individually reviews criteria including size (floor area), occupancy, determine construction type, context, etc. and perform a complete code analysis appropriate to the building programme. The findings of this analysis are implemented at the schematic design phase, identifying required fire separations, building classification, exit travel path, distance and widths required.

Deliverables:
1. Site Analysis Drawings
2. Site Plan / Sections
3. Design Brief – Programme Analysis and Building Code Design Requirements

Part IV: Schematic Design (10%, January 21-28)

Each student develops a parti for the building that resolves the location of the building on the site with the sizing and locations of program requirements within the building. Schematic plans for the building in this phase are focussing on circulation, spatial orientation, building sectional opportunities and functional relationships. Students identify a logical spatial module for the project as well as a 'principle space' to assist the process of building systems design.

Deliverables:
1. Site Plans / Site Sections
2. Building Footprint Schematic Plan / Section
3. Life Safety/Building Code Criteria Plan
4. Project Module Plan / Section
5. Principle Space Study

Part V: Building Systems (40%)

Building upon the established Schematic Design direction, the design develops specifically from the perspective of building systems, with the objective of integrating sustainable building strategies.

In turn, an integrated approach to building systems further informs the ongoing development of the base building (e.g. relationship of artificial lighting to daylighting, relationship of daylighting to natural ventilation, passive cooling, etc.)

a. Structural Systems (January 28 – February 9)

At this phase students identify a structural system appropriate to the project module, illustrate how the initial schematic design is supported or advanced by the structural strategy; and isolate a major space and show in detail the application of the system, illustrating its advantages.

Deliverables:
1. Plan depicting comprehensive system application
2. Isometric of system components applied to Project Module
3. Isometric of system applied to principal space

b. Mechanical Systems (February 9 – 18)

In this exercise, students develop skills in mechanical systems design (this assessment runs in conjunction with the assignment in EVDA 615), including system sizing, equipment selection, layout, and visual treatment.

Deliverables:
1. Plan showing overall duct locations and risers
2. Section showing location of air handling equipment, risers, and distribution
3. Visual treatment of the systems for a major space

c. Electrical (Lighting) Systems (February 28 – March 11)

Similar to and running simultaneously with the mechanical systems exercise, students select lighting fixtures; indicate layouts, and visual treatments.

Deliverables:
1. Fixture schedule
2. Reflected Ceiling Plan indicating location of fixtures
3. Detailed photometric study for a major space

d. Building Envelope (March 11 - 18)

At this phase students review research, identify an envelope system(s) appropriate to the chosen project module, illustrate application of same to the plan developed at the schematic design phase, and isolate a portion of the module and show in detail the application of the system(s), illustrating advantages of choice.

Deliverables:
1. Foundation/Wall/Roof Sections
2. Exterior elevation studies illustrating detail and context of application

Part VI: Design Development (10%, March 18-28)

Following a detailed look at building systems, students have a chance to revisit and refine the initial design of the base building prior to preparing construction documents.

Deliverables:
1. Building Plans
2. Long and Cross Section
3. Major Building Elevation

Part VII: Technical Documentation (15%, March 28 – April 15)

In this phase the specific materiality, tectonic, and spatial implications of the decisions made at the previous stages are developed into a basic set of construction drawings, providing a clear and comprehensive representation of the final building.

Deliverables:
1. Building Plans
2. Building Sections
3. Building Elevations
4. Axonometric of Principal Space

Part VIII: Presentation Materials (10%, March 28 - April 15)

Finally, course time is allocated for the compiling of final presentation materials. In addition to the gathering and formatting of existing materials, students construct a physical model for the final juried critique.

Deliverables:
1. Compilation/Formatting of existing course deliverables.
2. Physical Model

4.0 Course Schedule

Week 1

Monday 10 JANUARY
2:00 PM Introduction to Course – Barry Johns, Chad Oberg
Wednesday 12 JANUARY
2:00PM *Part I* – Guest Lecture – Contemporary Approaches in Educational Facility Design – Barry Johns, Craig Webber, Doug Gage
Friday 14 JANUARY
2:00 PM Guest Lecture – Site Planning – Len Rodrigues
Introduction to Part II Assignment
Saturday 15 JANUARY
9:00 AM – 5:00 PM Part II Presentation and Charrette – Len Rodrigues

Week 2

Monday 17 JANUARY
2:00PM Guest Lecture - Part III-Building Code Analysis – Alan Partridge
Introduction to Part III Assignment – Site and Building Code Analysis
WEDNESDAY 19 JANUARY
Part III Continued (Group Pinup)
FRIDAY 21 JANUARY
2:00PM *Part III Presentation*
Introduction to Part IV Assignment – Schematic Design

Week 3

Monday 24 JANUARY
2:00PM Part IV Continued
WEDNESDAY 26 JANUARY
2:00PM Part IV Continued (Group Pinup)
FRIDAY 28 JANUARY
2:00PM Part IV Presentation and Review
Introduction to Part V-A Assignment – Structural Systems

Week 4

Monday 31 January
2:00PM Guest Lecture – Structural – Gino Ferri
Part V-A Continued
WEDNESDAY 2 February
2:00PM Part V-A Continued
FRIDAY 4 FEBRUARY
2:00PM Part V-A Continued (Group Pinup – Lorraine Fowlow)

Week 5

Monday 7 FEBRUARY
2:00PM Part V-A Continued
WEDNESDAY 9 FEBRUARY
2:00PM Part V-A Presentation and Review – Lorraine Fowlow
Introduction to Part V-B Assignment – Mechanical Systems
FRIDAY 11 FEBRUARY
2:00PM Guest Lecture – Mechanical – Jim Sawer
Part V-B Continued

Week 6

Monday 14 FEBRUARY
2:00PM Part V-B Continued
WEDNESDAY 16 FEBRUARY
2:00PM Part V-B Continued (Group Pinup – Jim Love)
FRIDAY 18 FEBRUARY
2:00PM Part V-B Presentation and Review – Jim Love

(Block Week 22-25 February)

Week 7

Monday 28 February
2:00PM Guest Lecture – Electrical – Gary McTighe
Introduction to Part V-C Assignment – Electrical (Lighting) Systems
WEDNESDAY 2 March
Part V-C Continued
FRIDAY 4 March
Part V-C Continued

Week 8

Monday 7 MARCH
Part V-C Continued (Group Pinup – Jim Love)
WEDNESDAY 9 MARCH
Part V-CContinued
FRIDAY 11 MARCH
2:00PM Part V-C Presentation and Review – Jim Love
Introduction to Part V-D Assignment – Building Envelope

Week 9

Monday 14 MARCH
Part V-D Continued (Group Pinup – Chris Roberts)
WEDNESDAY 16 MARCH
Part V-D Continued
FRIDAY 18 MARCH
2:00PM Part V-D Presentation and Review – Chris Roberts
Introduction to Part VI Assignment – Design Development

Week 10

Monday 21 MARCH
2:00PM Part VI Continued
WEDNESDAY 23 MARCH
2:00PM Part VI Continued (Group Pinup)
FRIDAY 25 MARCH
Good Friday – No Lecture

Week 11

Monday 28 MARCH
2:00PM Part VI Presentation and Review
Introduction to Part VII Assignment – Technical Documentation
WEDNESDAY 30 MARCH
2:00PM Lecture – Introduction to Working Drawings and Construction Details
Part VII continued
FRIDAY 1 April
Part VII Continued (Group Pinup)

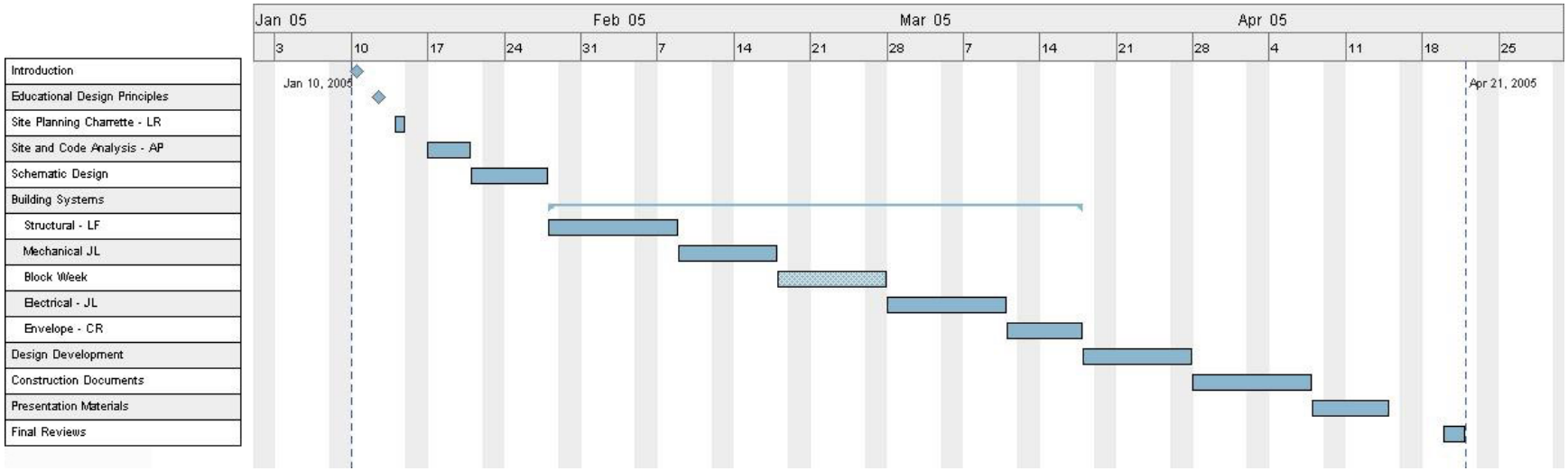
Week 12

Monday 4 APRIL
2:00PM Part VII/VIII Continued
WEDNESDAY 6 APRIL
2:00PM Part VII/VIII Continued
FRIDAY 8 APRIL
2:00PM Part VII Presentation and Review
Introduction to Part VIII Assignment – Presentation Materials

Week 13

Monday 11 APRIL
2:00PM Part VII/VIII Continued
WEDNESDAY 13 APRIL
2:00PM Part VII/VIII Continued
FRIDAY 15 APRIL
2:00PM Part VII/VIII Continued

Final Juried Reviews TBA (April 20-22)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Introduction
Educational Design Principles
Site Planning Charrette - LR
Site and Code Analysis - AP
Schematic Design
Building Systems
Structural - LF
Mechanical JL
Block Week
Electrical - JL
Envelope - CR
Design Development
Construction Documents
Presentation Materials
Final Reviews
Jan 10, 2005
Apr 21, 2005

5.0 Design Program Requirements

		No.	Size	m2	Total Area	m2	Capacity
Instructional Areas							
Kindergarten		1 @	100	m2	100.00	m2	25
Classrooms		10 @	80	m2	800.00	m2	250
Computer Lab		1 @	130	m2	130.00	m2	25
Gym		1 @	430	m2	430.00	m2	
Library		1 @	220	m2	220.00	m2	
TOTAL INSTRUCTIONAL AREA/CAPACITY					**1,680.00**	**m2**	**300**
Non-Instructional Areas							
Administration							
Admin Area inc. Waiting/Reception		1 @	395	m2	395.00	m2	
Infirmary/H/C washroom		1 @	20	m2	20.00	m2	
Staff Washrooms		2 @	6	m2	12.00	m2	
Subtotal					**427.00**	**m2**	
Physical Education							
Office/Staff Shower		1 @	23	m2	23.00	m2	
Gym Storage		1 @	43	m2	43.00	m2	
W/C /Change Rm.		2 @	50	m2	100.00	m2	
Subtotal					**166.00**	**m2**	
Student Area							
Student Gathering/		1 @	102	m2	102.00	m2	
Washrooms-Elementary		2 @	27	m2	54.00	m2	
Subtotal					**156.00**	**m2**	
TOTALNON-INSTRUCTIONAL AREA					**749.00**	**m2**	
Gross-up							
Circ/Mech/Stor/Cust	35% Instructional				588.00	m2	
Subtotal					**588.00**	**m2**	
TOTAL GROSS AREA/CAPACITY					**3,017.00**	**m2**	**300**

6.0 Bibliography and Suggested Readings

Alberta Building Code 1997 and Alberta Fire Code 1997. Edmonton: Learning Resources Distributing Centre

Barnett, Dianna Lopez, with William D. Browning. *A Primer on Sustainable Building.* Snowmass, Colo.: Rocky Mountain Institute, 1995. [To order, call 970/927-3851 or see www.rmi.org/catalog/gds.htm]

Bishrat, Kieth A. *Construction Graphics: A Practical Guide to Interpreting Working Drawings*. Toronto: John Wiley & Sons Canada, Ltd., 2004.

Brown, G. Z. *Sun, Wind, and Light.* New York: John Wiley, 1985.

Cottom-Winslow, Margaret. *Environmental Design: The Best of Architecture and Technology*. New York: Rissoli International Publications, 1990.

Ching, Francis D.K. *Architecture: Forms, Space & Order 2nd Edition*. Toronto: John Wiley & Sons Canada, Ltd., 1995.

Hawkin, Paul; Lovins Amory; Lovins L. Hunter. *Natural Capitalism – Creating the Next Industrial Revolution*. Little Brown and Company, The Rocky Mountain Institute, 1999.

Leatherbarrow, David. *Uncommon Ground: Architecture, Technology, and Topography*. Boston: MIT Press, 2000.

Reid, David. *Sustainable Development: An Introductory Guide*. London: Earthscan, 1995. [www.earthscan.co.uk]

Watson, Donald, and Kenneth Labs. *Climatic Design: Energy–Efficient Building Principles and Practices.* New York: McGraw-Hill, 1983.

White, Edward T. Site Analysis: Diagramming Information for Architectural Design. Talahassee: Architectural Media Ltd. 1983.

Yeang, Ken. *Designing With Nature*: *The Ecological Basis for Architectural Design*. New York: McGraw-Hill, 1995.