

Green Buildings

USP 529 [3 Cr.], Winter 2010
 Tuesdays 6:40-9:20 pm, Shattuck Hall 249
 Department of Urban Studies & Planning
 College of Urban and Public Affairs
 Portland State University

Professor: **Eric Ridenour**

Address: c/o SERA Architects
 338 NW Fifth Av.
 Portland, OR 97209
 Phone: (503) 805-7453
 E-mail: ericr@serapdx.com

Course Syllabus

Description: *Green Buildings* is an elective course in the Certificate in Real Estate Development program. The course offers an overview of contemporary green building practices, as well as the design and development processes essential to their success. The emphasis is on strategies that have the highest economic return and/or the greatest environmental benefits. The full cycle of the built environment is considered, from planning and design through construction and operation, and the end of use for a building.

The course looks briefly at the community context of a building project and how it affects environmental performance before considering the scale of a single project. Sessions are devoted to the environmental aspects of energy, water use and materials choices. Specific design strategies with multiple positive impacts are analyzed in some detail, such as daylight design, energy conservation, and site layout.

Students: This course is designed for graduate students who intend to take an active role in shaping the built environment, either as developers or planners. Specific knowledge of the building industry is helpful, but not a requirement for the course.

Professor: *Eric Ridenour is an Associate, Project Architect and Urban Designer with SERA Architects of Portland. He has fourteen years' experience in architecture as well as community and campus planning on projects throughout the Northwest. He has experience on a wide assortment of building types, including: fire stations, a convention center, golf/resort, community centers, retail, affordable housing, housing-retail mixed use at Orenco Station, and single family homes. Planning projects include: Wilder master plan [Newport, OR], Pacific University master plan, Villebois and Crescent Village. Earlier experience in planning includes assisting with CEQA Environmental Impact Reports, and transportation planning studies.*

Eric was a key part of SERA's team for the new Aquatics Addition to East Portland Community Center, which recently was designated LEED® Platinum. He is also managing Southern Oregon University's Master Plan Update and the Wilder community master plan, located in Newport, Oregon. Mr. Ridenour has served as co-chair of the Portland Branch of Cascadia Region Green Building Council. He holds a Masters in Architecture from the University of Oregon and a B.A. in Environmental Studies from the University of California, Santa Cruz.

Materials: The required readings for the class will come from four sources:

- A required subscription to the web site **BuildingGreen.com**, which includes the journal **Environmental Building News**. Information on accessing this information will be provided at the first class meeting.
- A course packet, with readings from selected sources (available at Clean Copy)
- A text booklet: **Engineering a Sustainable World**, by Interface Engineering – a case study of the LEED Platinum OHSU Health and Wellness Center in Portland's South Waterfront district (print copies available at cost from Clean Copy – order in advance - or non-print PDF will be provided by professor)
- Additional, non-subscription web-based articles, as listed in the syllabus.

Additional readings are also recommended for a deeper understanding of each major topic.

Class Requirements: Students are expected to be active participants in the course, with participation and readings contributing to final grades. The major portion of grading will be based on a case study of a successful green building project. One or two brief sketch projects will also be assigned.

Participation: Active participation in class is encouraged and expected. Lessons from case study research, course readings and direct experience outside the classroom help to set a context for class presentations. Attendance in class sessions is expected. In particular, missing more than two sessions will result in a reduced grade.

Response to Readings: Students are asked to keep notes on readings. These do not need to be long, but are intended to be a useful resource for your own future reference. They can be in the form of a synopsis, or questions and thoughts provoked by the readings, or both. They will be collected periodically during the course and evaluated for general conformance with this requirement, though not graded on content *per se*. Acceptable formats include: a paper notebook dedicated to this task, emailed notes or a blog-type format.

In-class exercises: One or two in-class exercises will be assigned, to illustrate concepts and engage problem-solving skills.

Case Study: The goal of the case study assignment is for each student to understand the opportunities, constraints and trade-offs involved in a green building project. Both the specific systems and the team structure that contributed to the project should be discussed. To the greatest extent possible, case studies must include original research^{*}, such as interviews with project team members, review of post-occupancy data, etc.

Case studies will be due at the final class meeting. Case studies will be presented briefly by students during the final exam period, in PowerPoint or other approved digital format. A complete written report will also be due at that time.

Recommended case studies: A list of potential case studies will be provided, and certain projects will be excluded from study due their extensive study in published works and/or course materials. Projects for which the student has access to members of the project team would be most advantageous. Projects from other U.S. regions are acceptable; in these cases, provide basic climate data and other distinguishing characteristics that would affect major design decisions.

Despite the strong technical examples set by projects from abroad, case studies for this course must be drawn from the U.S., due to the unique economic factors of development here. Completed, occupied projects are heavily preferred; projects which are fully funded and in construction are acceptable.

Week-by-week Topics and Readings:

The following pages list the topics to be covered each week, and the associated readings. Green bars start each week's session. Note that most sessions have two sub-parts with separate reading for each sub-topic, i.e.: **1A & 1B**.

* **NOTE:** Plagiarism in class projects will be considered grounds for failure of both the project and course.

Key to Sources: B = Case study booklet; P = Course Packet; W= Web readings, general access, S = Web Subscription

1/5/10

1A Valuing Nature: the case(s) for Green Building

Topics

- The Environmental Case
- The Business Case
- The Humane Case
- Green Building: A Brief History

Required Readings

- S Alex Wilson, ***Making the Case for Green Building***, Environmental Building News, April '05
 P *A New View of Real Estate*, Chapter 1, ***Green Development***, Rocky Mountain Institute
 P Stephen Kellert: *Ecological Challenge, Human Values of Nature & Sustainability in the Built Environment*

Recommended Readings

- S Alex Wilson, ***Biophilia in Practice: Buildings that Connect People with Nature***
Environmental Building News July 2006

1B Cost Factors

Topics

- Capital costs
- Life Cycle Costs
- Net Operating Income
- Externalized costs

Required Readings

- W Sieglinde Fuller: **Life-Cycle Cost Analysis (LCCA)** www.wbdg.org/resources/lcca.php

Recommended Readings

- W USGBC/ULI/Real Estate Roundtable handout: ***Making The Business Case For High Performance Green Buildings***
https://www.usgbc.org/Docs/Member_Resource_Docs/makingthebusinesscase.pdf

1/12

2A Urban Form and Natural Systems

Topics

- Sprawl and Density
- Urban Form
- Land Use & Infrastructure

Required Readings

- P Timothy Beatley: ***Land Use & Urban Form: Planning Compact Cities***
 S Alex Wilson, ***In the Pipeline: District Energy and Green Building***, *Environmental Building News*, March 2007

Recommended Readings

- W Dr. Reid Ewing & Dr. Richard Kreutzer for LEED-ND Core Committee: ***Understanding The Relationship Between Public Health And The Built Environment***, especially Introduction and Summary Conclusions
<https://www.usgbc.org/ShowFile.aspx?DocumentID=1480>
 W Leonard Shabman & Paul Scodari: ***The Future of Wetlands Mitigation Banking***, *Choices Magazine*, 1st Quarter 2005
<http://www.choicesmagazine.org/2005-1/environment/2005-1-13.htm>

2B Transportation, Parking And The Car

Topics

- Land use and transportation interface: density and infrastructure
- Parking: role in successful retail / driving incentive; strategies for providing parking

Required Readings

- S Alex Wilson with Rachel Navaro, ***Driving to Green Buildings: The Transportation Energy Intensity of Buildings***, *Environmental Building News*, September 2007
- S Alex Wilson, ***Sprawl and Health: Are Modern Land-Use Patterns Making Us Sick?***, *Environmental Building News*, April 2002
- P Donald C. Shoup: ***The High Cost of Free Parking***, Introduction

1/19

3A **Design Strategies and Processes****Topics**

- o Integrated Design
- o Eco-Charrette
- o Defining a Vision

Required Readings

- B ***Engineering a Sustainable World***: Pages 1-11
- S Nadav Malin: ***Integrated Design***, *Environmental Building News*, November 2004
- W ***Natural Step Systems Conditions*** <http://www.ortns.org/framework.htm>

Recommended Readings

- W American Institute of Architects, ***Writing the Green RFP*** http://www.aia.org/cote_rfps
- S Nadav Malin: ***The Mindset Thing: Exploring the Deeper Potential of Integrated Design***, *Environmental Building News*, December 2005
- W Nathan Good: ***What is an Eco-Charrette?*** *BetterBricks* <http://www.betterbricks.com>
- W ***Design Briefs***, Energy Design Resources: ***Performance-Based Compensation***
<http://www.energydesignresources.com/publication/db/>

3B **Construction Process & Commissioning****Topics**

- o Key Stages Of The Construction Process
- o The Value of Commissioning
- o How a green building process differs
- o Soft costs v hard, capital v. operating, etc.

Required Readings

- S Nadav Malin: ***Building Commissioning: The Key to Buildings That Work***, EBN, Feb. 2002
- B ***Engineering a Sustainable World***: Pages 36-45

Recommended Readings

- S Nadav Malin: ***Getting From Design to Construction: Writing Specifications for Green Projects***, EBN, July. 2002
- W ***Design Briefs***, Energy Design Resources: ***Building Commissioning***
<http://www.energydesignresources.com/publication/db/>

1/26

4A **Site Design Factors****Topics**

- o Solar Orientation
- o Wind
- o Soils and Hydrology
- o Open Space & Habitat

Required Readings

- S Alex Wilson: ***Getting to Know a Place: Site Evaluation as a Starting Point for Green Design***, *Environmental Building News*, March 1998
- S Alex Wilson: ***Development and Nature: Enhancing Ecosystems Where We Build***, *Environmental Building News*, February 2001
- P Mark Francis: ***Village Homes: Design & Planning Concepts***
- W Anne Guillette: ***Low-Impact Development Technologies***, *Whole Building Design Guide*
<http://www.wbdg.org/design/lidtech.php>

Recommended Readings

- W Judy Fosdick, *Passive Solar Heating*, WBDG www.wbdg.org/design/psheating.php
 S **Checklist: Site Planning and Design Strategies: A Checklist for Rural Building Sites**, Environmental Building News, March 1998

4B **Water Systems: Stormwater and Water Use****Topics**

- Stormwater Management
- Water Efficiency
- Wastewater Treatment

Required Readings

- S Alex Wilson: *Water: Doing More With Less*, Environmental Building News, Feb. 2008
 S Alex Wilson: *Cleaning Up Stormwater: Understanding Pollutant Removal from Runoff*, EBN, February, 2002
 B *Engineering a Sustainable World*: Pages 26-30

Recommended Readings

- S Alex Wilson: *Porous Pavement: A Win-Win Stormwater Strategy*, EBN, Sept. 2004
 W **MERTS Phase III, "The Living Machine®", How It Works** (interactive website)
<http://www.clatsopcollege.com/livingmachine>

2/2

5A **Daylighting for Energy Savings and Enhanced Productivity****Topics**

- Daylighting Strategies
- Daylighting Controls
- Productivity Benefits

Required Readings

- W Joel Loveland and New Buildings Institute, *Daylighting 101* betterbricks.com
 S **Daylighting: Energy and Productivity Benefits** - Environmental Building News, September 1999
 S **Shedding Light on Light Quality** - Environmental Building News, March 2008
 W Heschong-Mahone Group: *Skylighting & Retail Sales: Condensed Report*
http://www.pge.com/003_save_energy/003c_edu_train/pec/daylight/di_pubs/RetailCondensed820.PDF

Recommended Readings

- W Heschong-Mahone Group: *Daylighting in Schools: Condensed Report*
http://www.pge.com/003_save_energy/003c_edu_train/pec/daylight/di_pubs/SchoolsCondensed820.PDF
 W **Design Briefs**, Energy Design Resources: **Daylighting**
<http://www.energydesignresources.com/publication/db/>

5B **Indoor Air Quality:****Topics**

- Reducing Indoor Toxins
- Reducing Mold Risks
- Ventilation

Required Readings

- S Alex Wilson: *Mold in Buildings: What It Is and How to Keep It Out*, EBN, June, 2001
 S Alex Wilson and Nadav Malin: *The IAQ Challenge: Protecting the Indoor Environment*, EBN, May 1996
 S **Checklist: Avoiding IAQ Problems – Recommendations**, EBN, May, 1996

Recommended Readings

- S Alex Wilson: *Air Filtration in Buildings*, EBN, October 2003
 S Alex Wilson: *Radon and Other Soil Gases: Dealing with the Hazards from Below*, EBN, July 1998

W **Design Briefs**, Energy Design Resources: **Indoor Air Quality**
<http://www.energydesignresources.com/publication/db>

2/9

6 **Energy: Efficiency & Renewable Production**

Topics

- o Building Efficiency: Building Envelope
- o Building Efficiency: Systems
- o Renewable Energy: Green Tags, District Systems, On-Site, & Building-Integrated

Required Readings

- S Alex Wilson: **Keeping the Heat Out: Cooling Load Avoidance Strategies**, EBN, May 1994
- P **A Green Vitruvius**, selected excerpts on energy & building envelope
- W Peter Rumsey, P.E., and Chris Lotspeich: **Reinventing HVAC Design for Green Buildings**, *Environmental Design & Construction* January 26, 2002
- S **How the Sun's Path Can Inform Design**, *Environmental Building News*, April 2008
- S **Thermal Mass: What It Is and When It Improves Comfort**, EBN, November 2007
- W BetterBricks: **Enclosure Systems Design Guide**
betterbricks.com/graphics/assets/documents/DesignSystemEnvelopguideline_pa.pdf
- W BetterBricks: **Which Glass Should I Use? Sorting It All Out**
betterbricks.com/DetailPage.aspx?ID=808
- S Jessica Boehland with Nadav Malin: **Expanding the Engineers' Comfort Zone: Working with Adaptive Thermal Comfort**, EBN, July 2004
- B **Engineering a Sustainable World**: Pages 16-25 & 31-35
- S Tristan Roberts: **Greening Your Electricity** - *Environmental Building News*, Oct. 2006

Recommended Readings

- W Gail S. Brager, Erik Ring, Kevin Powell: **Mixed-mode ventilation: HVAC meets Mother Nature**, *Engineered Systems*, May, 2000
http://www.cbe.berkeley.edu/research/pdf_files/Brager2000_mixedMode.pdf
- S Alex Wilson & Peter Yost: **Building-Integrated Photovoltaics: Putting Power Production Where It Belongs**, *Environmental Building News*, March 2001
- S Alex Wilson: **In the Pipeline: District Energy and Green Building**, EBN, March 2007
- S Alex Wilson: **Insulation: Thermal Performance is Just the Beginning**, EBN, Jan. 2005
- S Nadav Malin: **LEED Delivers on Predicted Energy Savings**, EBN, December 2007
- Design Briefs**, Energy Design Resources:
<http://www.energydesignresources.com/publication/db>

Design For Your Climate

Integrated Design for Small Commercial HVAC

Air Conditioning & Ventilation

Displacement Ventilation

Improving Mechanical System Energy Efficiency

Options & Opportunities

Smart Buildings

Glazing

Radiant Cooling

2/16

7A **Environmental Aspects of Materials Selection**

Topics

- o Factors in Materials Selection: Recycled Content, Source Location, Methods of Production, End-of-Life Disposal, Toxicity, etc.
- o Prioritizing Issues: Life Cycle Analysis, Precautionary Principle
- o The Problem of Greenwash
- o Air Quality

Required Readings

- S **Building Materials: What Makes a Product Green?** EBN
- S **Establishing Priorities with Green Building** EBN
- S Nadav Malin, **Life-Cycle Assessment for Buildings: Seeking the Holy Grail**, *Environmental Building News*, March 2002

- W Joe Thornton, Ph.D.: **Environmental Impacts of Polyvinyl Chloride (PVC) Building Materials** <http://www.healthybuilding.net/pvc/ThorntonPVCsummary.html>
- W Jennifer Atlee & Tristan Korthals Altes, **Behind the Logos: Understanding Green Product Certifications**, Environmental Building News, January 2008

Recommended Readings

- W *Pharos Program Framework* <http://www.pharosproject.net/framework/index.php>
- S Allyson Wendt: **Prefabricating Green: Building Environmentally Friendly Houses Off Site**, Environmental Building News, October 2007
- S Tristan Roberts: **Historic Preservation and Green Building: A Lasting Relationship**, Environmental Building News, January, 2007

7B Certification: Overview of major systems

Topics

- o LEED & LEED-ND
- o EarthAdvantage
- o EnergyStar and HERS
- o Residential GreenBuild Programs

Required Readings

- S Nadav Malin: **LEED: A Look at the Rating System That's Changing the Way America Builds**, Environmental Building News, June 2000
- W USGBC: **LEED-NC Version 3.0** www.usgbc.org/ShowFile.aspx?DocumentID=1095
- S Nadav Malin: **Green Globes Emerges to Challenge LEED**, EBN, March, 2005
- S Nadav Malin: **LEED Gets User Friendly**, Environmental Building News, Dec., 2005
- W EarthAdvantage Program: **Certification** <http://www.earthadvantage.com/certification/>
- W **A Comparison of the American Forest & Paper Association's Sustainable Forestry Initiative & the Forest Stewardship Council's Certification System** <http://www.greenpressinitiative.org/documents/SFIvs.FSC.pdf>

Recommended Readings

- W *Energy Star National Builder Option Package* www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/PerfPathTRK_060206.pdf
- W **Home Energy Ratings: A Primer** <http://www.resnet.us/ratings/overview/resources/primer/default.htm>
- W American Lung Association: **Health House Program, Builder Guidelines** <http://www.healthhouse.org/build/2006HHbuilderguidelines.pdf>
- W Smart Communities Network: **Community Green Building Programs** <http://www.smartcommunities.ncat.org/buildings/gbprog.html>
- S Allyson Wendt: **Homes Get Their Own LEED**, EBN, December, 2007

2/23

8A Valuing Green & Metrics

- o Studies of the Costs of Green Strategies
- o Documented Benefits of Green
- o Cost-control Strategies
- o Sharing the costs: Green Leases

Required Readings

- S Nadav Malin: **Investing in the Environment: The Financial Industry's Approach to Green Building**, Environmental Building News, November 2007
- S Alex Wilson: **Productivity and Green Buildings**, EBN, October 2004
- W Institute for Market Transformation: *Recognition Of Energy Costs And Energy Performance In Commercial Property Valuation* <http://www.imt.org/PDF%20files/CA%20RGs%202-99.PDF>
- W **EXECUTIVE SUMMARY: Gregory Kats: The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force** <http://www.usgbc.org/Docs/News/News477.pdf>
- W **EXECUTIVE SUMMARY: Davis Langdon, 2007 The Cost of Green Revisited** davislangdon.com/upload/images/publications/USA/The_Cost_of_Green_Revisited.pdf

Recommended Readings

- W Gregory Kats: ***The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force***
<http://www.usgbc.org/Docs/News/News477.pdf>
- W Davis Langdon, ***2007 The Cost of Green Revisited***
davislangdon.com/upload/images/publications/USA/The_Cost_of_Green_Revisited.pdf
- W Mark T. Jewell: ***ENERGY-EFFICIENCY ECONOMICS: What You Need to Know***,
 BetterBricks, January 2003
http://www.betterbricks.com/graphics/assets/documents/RealEstate_Articles_-_Energy_Efficient_Economy.pdf

8B Incentives & Constraints**Topics**

- BETC
- Federal Tax Credits
- Energy Trust and Utility Incentives
- Permitting Incentives
- Emerging financial mechanisms: Green Leases, EEMs, LEMs, etc.

Required Readings

- S Allyson Wendt: ***Navigating Incentives and Regulations for Green Building***,
 Environmental Building News, April 2008
- W BETC overview <http://www.oregon.gov/ENERGY/CONS/BUS/BETC.shtml>
- W ETO New Buildings Info <http://www.energytrust.org/newbuildingefficiency/index.html>
- W ***Green Lease***, by Alan Whitson, *Environmental Design & Construction* 7/17/2006
<http://www.edcmag.com/CDA/Articles/Column>
- S David Eisenberg & Peter Yost, ***Sustainability and Building Codes***, *Environmental Building News*, September 2001
- Recommended Readings**
- S Alex Wilson: ***USGBC, ASHRAE, and IESNA to Develop a Green Building Standard***,
Environmental Building News, March 2006
- W DCAT: ***Breaking Down the Barriers: Challenges and Solutions to Code Approval of Green Building***
resourcesaver.org/file/toolmanager/O16F24735.pdf

3/2**9 Pushing the envelope**

- Architecture 2030
- Net Zero
- Living Buildings
- Natural Building
- Bio-Mimicry

Required Readings

- W *The Living Building Challenge* <http://ilbi.org/the-standard/LBC2-0.pdf>
- S Nadav Malin and Jessica Boehland, ***Getting to Zero: The Frontier of Low-Energy Buildings*** - *Environmental Building News*, Oct. 2005
- S Mark Piepkorn, ***The Natural Building Movement*** – *EBN*, May 2005

Recommended Readings

- W Biomimcry.net: ***Termite-Inspired Air Conditioning*** biomimcry.net/casestudiesB.htm &
Butterfly-inspired Pigment-free Color biomimcry.net/casestudybutterflycolour.htm
- W ***2030 Challenge and Implementation Guidelines***
<http://www.architecture2030.org/pdfs/2030ImplementationGuidelines.pdf>

3/9**10 Special Class session, TBD****3/16****11 Finals Period: Case Study Presentations**