

The Society of Building Science
Educators

www.sbse.org

James Wasley – U of Wisconsin Milwaukee

Terri Meyer Boake – U of Waterloo

Mary Guzowski – U of Minnesota

Chris Theis – Louisiana State University

John Quale- U of Virginia

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Carbon Neutral Design (CND) Project

Phase I: CND SUMMIT AND RESOURCE DEVELOPMENT

*In the Carbon-Neutral Design (CND) Project the **Society of Building Science Educators (SBSE)** will collaborate with the AIA, the AIA Sustainability Discussion Group (SDiG), AIA Committee on the Environment (COTE), and the AIA Educator/Practitioner Network (EPN), to produce educational and resource materials for carbon-neutral design...*



The best of CND practice...

Above: the carbon neutral Aldo Leopold Legacy Center, Baraboo WI. Kubala Washatko Architects Inc.

Right: Students with sun study model, University of Cincinnati

+ the best of CND studio pedagogy



Producing produce peer reviewed, web-ready content on carbon-neutral design.

Jim Wasley
University of Wisconsin-
Milwaukee

The Arch. 825 Zero-Emissions Manifesto

Masses must be thin!

Spaces must be daylit!

Volumes must be vented!

Structures must be massive!

Surfaces must see air flow!

Apertures must control solar gains!

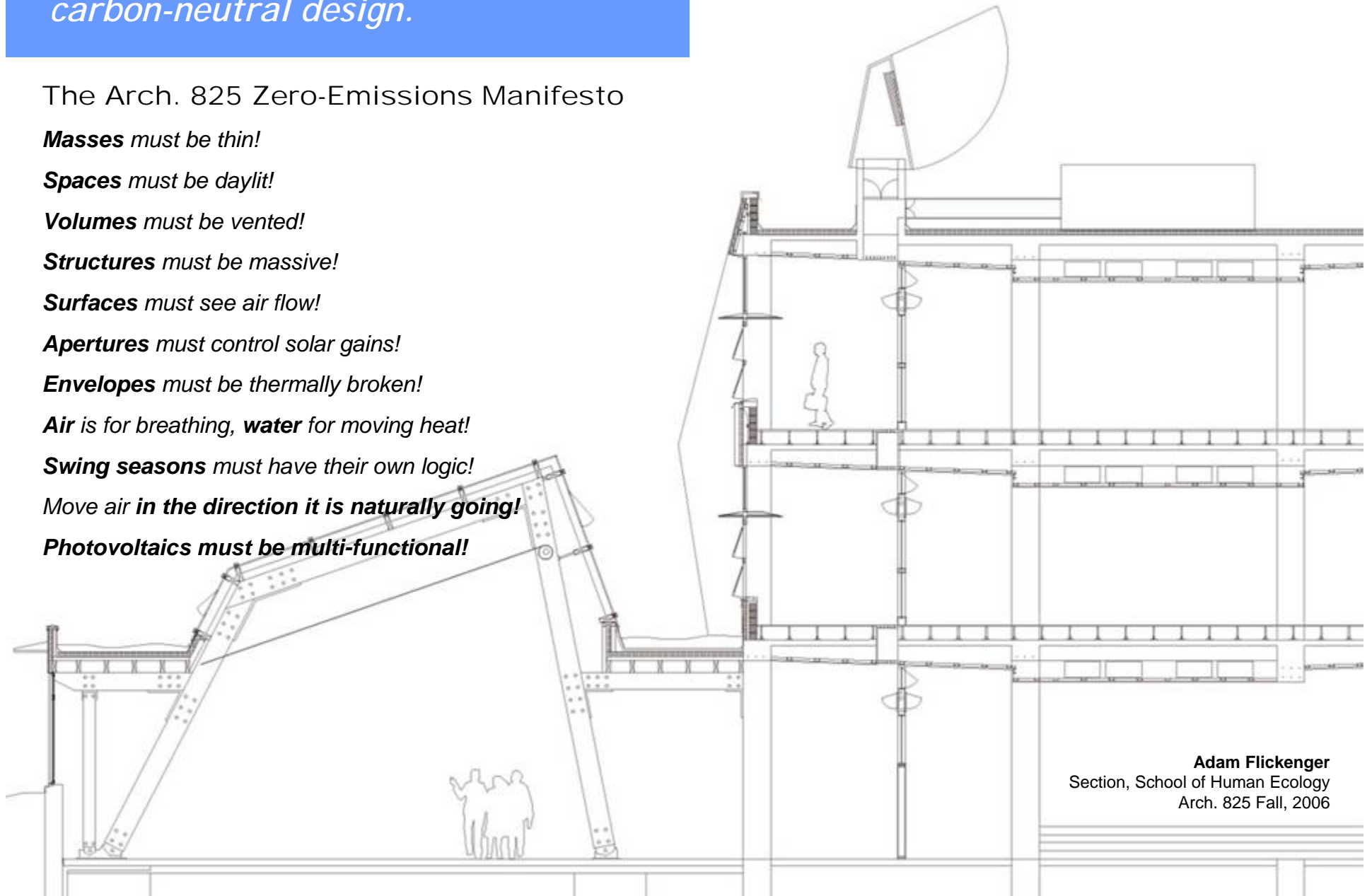
Envelopes must be thermally broken!

Air is for breathing, **water** for moving heat!

Swing seasons must have their own logic!

Move air **in the direction it is naturally going!**

Photovoltaics must be multi-functional!



Adam Flickenger
Section, School of Human Ecology
Arch. 825 Fall, 2006

Early Results- Studio work from Carbon Neutral Studios

Mary Guzowski, Loren
Abraham, & Ian McLellan
University of Minnesota

TECHNOLOGY MODULE ZERO ENERGY CARBON NEUTRAL DESIGN

(SPRING, 6.5 WEEKS)

thermal + lighting design

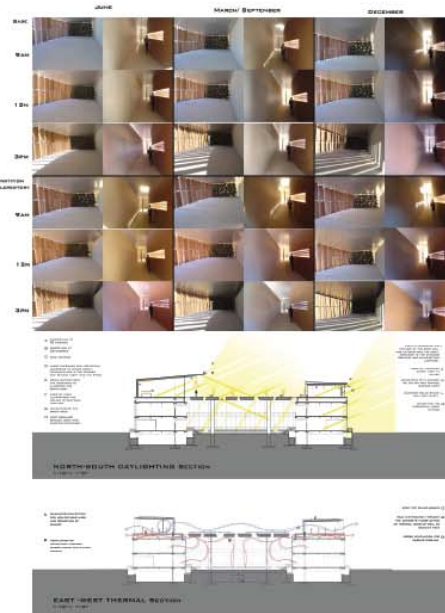
This intensive technology module incorporated zero energy carbon neutral design as the framework for the design investigation. The course was structured around an integrated lecture/seminar and studio program in which graduate students worked in teams to critically investigate how sustainable strategies of lighting and thermal challenges in architectural design can be synchronized with a strong design focus. The module was co-taught between regular faculty and practicing architects (both with expertise and research interests in these areas).

mnZED Lab

PHASE ONE Site and Bioclimatic Analysis, Rapson Hall



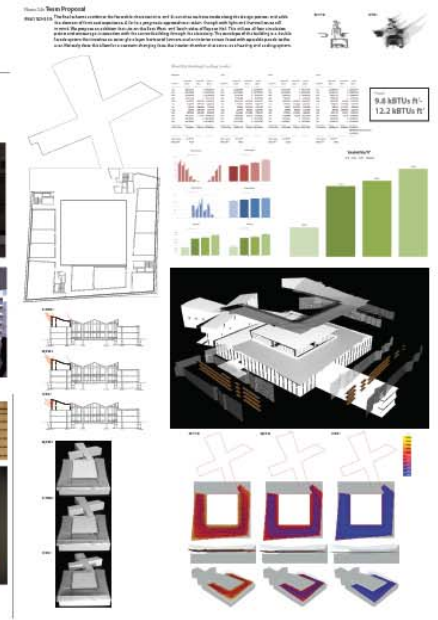
mnZED Lab



mnZED Lab



mnZED Lab



instructor(s): abraham, guzowski and mclellan

AN INCOMPLETE CURRICULUM FOR TRANSFORMATION: AIA 2008 EDUCATION HONOR AWARDS

SCHOOL OF ARCHITECTURE, UNIVERSITY OF MINNESOTA

Why SBSE?

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SBSE has a 20+ year history as a non-profit educational organization serving as an incubator for new approaches to teaching environmentally responsive architectural design and delivering training to architectural educators across the globe.



Mountain meadows await SBSEers at Sorensen's. Will Christian Norberg-Schulz there tread?

RETREAT INFO: [HTTP://WWW.SBSE.ORG/RETREAT/](http://www.sbse.org/retreat/)

ECOLOGICAL LITERACY FITNESS: PRE-RETREAT EXERCISE

Match the following quotations with authors from this list:

A. Tang Lee, B. Bruce Haglund, C. Yelena Chenchik, D. Jim Waley, E. Christian Norberg-Schulz, F. Nate Irtag, G. Christopher Theis.

1. "The projects are then assessed using two criteria that apply to all of them in an attempt to determine if the use of a specific site that represents many of the fundamental issues implicit in a discourse on humanity's place in nature can improve the students' ability to perceive the site as a human construct and to conceptualize its potential to be reconstructed and interpreted through architecture."
2. "To transform this activity from a lonely one of counter-cultural rebellion into one of mainstream practice requires only a critical mass of people who take it for granted as the basis for technical/cultural merit."
3. "Is there a *sustainable architecture*?"
4. "That way some of the key elements of teaching sustainable architecture would be integrated into architecture curriculum: students are introduced to the issues early in their studies, the exploration of them continues throughout their education and they have an opportunity to get an in-depth knowledge of the applicable strategies and methods."
5. "It is easy to teach students environmental technology and building science. However, it is more important to instill values and attitudes in our students. All technologies become obsolete, but principles, ethics, and values rarely change."
6. "Their awareness expands to an understanding of the ecology of their question, with each system contributing to the rest of the whole."
7. "We only recognize the fact that man is an integral part of the environment, and that it can only lead to human alienation and disruption if he forgets that. To belong to a place means to have an existential foothold, in a concrete everyday sense."

Answers will become clear(er) at the retreat—June 11–14—at Sorensen's Resort in Hope

Valley, California. Registration for the retreat is open until May 1, or until all 40 spots have been filled. ■

—*Charles Oakley*

SBSE CALENDAR

2002	
May 22–26	ARCC/EAAE Research Conf., Montréal, QB
Jun 11–14	SBSE Retreat, Hope Valley, CA
Jun 14–15	Tool Day @ Patagonia, Reno, NV
Jun 15–19	ASES Solar2002 Conf., Reno, NV
Jun 18	SBSE Annual Meeting, Reno, NV
Jun 22–26	ASEIRAE Conf., Honolulu, HI
Aug 1	TIA Competition entries due
Sep 4–12	TIA Conf., Yazd, Iran
Oct 10–13	ACSA Tech. Conf., Portland, OR
2003	
Jun 21–25	ASES Solar 2003, Austin, TX
Jun 28–Jul 2	ASEIRAE Conf., Kansas City, MO
2004	
Jun TBA	ASES Solar 2004, Portland, OR
Jun 26–30	ASEIRAE Conf., Nashville, TN
2005	
Aug TBA	Solar World Congress, Orlando, FL
Jun 25–29	ASEIRAE Conf., Denver, CO ■



Michael Garrison takes a stance on ecological literacy before an ardent, shaded retreat audience.

SUMMER SUMMARIES: [HTTP://WWW.SBSE.ORG/RETREAT/](http://www.sbse.org/retreat/)

SUMMER—AN SBSE TRIPLE HEADER

rapid succession—the retreat at Sorensen's, Tool Day at Patagonia, and S in Reno. All were well-attended and well-received.

RENSSEN'S RESORT, HOPE VALLEY, CA (JUNE 11–14)

Ina Mallory, and Robert Marcial put together a great retreat at *valhalla* is *aspen* powered." Our *trial* of *place!*—ed.). Forty first-time retreaters [*a healthy sign!*—ed.], gathered to discuss the Architectural Curriculum." And although a highway ranted serious discussion and fostered valuable networking. The stages comfortable, and the food delicious.

at Tacos, retreat details are being archived on the SBSE web site >.

PATAGONIA SERVICE CTR., RENO, NV (JUNE 14–15)

nia employee, gave an insider's history of the company and a of the office and warehouse spaces. His talk and walk provided tgn process, its systems, and operation. Our collective reaction



Don Ashan dropped in on Sandra, Mark, et al. at the retreat.

SBSE CALENDAR

2002	
Aug 1	TIA Competition entries due
Sep 4–12	TIA Conf., Yazd, Iran



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SBSE Photo CD Slide Library

As a subsection of the SBSE Image Gallery, SBSE has created a collection of Kodak PhotoCDs containing the images formerly available via manual slide duplication under the SBSE Slide Library. The images are available in compressed image format. Images are available in two sizes: 192 x 128 pixels and 384 x 256 pixels.

- [Using the Images](#)
- [Which CDs ?](#)
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Using the Images

Images on the CD are compressed image files. Images are available in two sizes: 192 x 128 pixels and 384 x 256 pixels.

Curriculum Information

Building science courses in schools of architecture are often described as "environmental control," "environmental technology," or "building technology" courses. SBSE has assembled a partial listing of curriculum offerings related to building science. The list represents an effort to collect descriptions of required building science courses at North American architecture schools -- along with a sampling of descriptions of building science electives. For each school that has provided information to SBSE, the following is generally available: building science course descriptions, course length and credit hours, the year-level(s) the course is geared toward, and links to copies of course materials [when these are available].

arch college
 Mod 1: (7 weeks) Monday, August
 Mod 2: (7 weeks) Monday, October
 Mod 3: (5 weeks) Monday, August
 See <http://arch.ced.berkeley.edu/>
 classes - fall
 COURSE SEC UN
 ARCH 243 - 1 NAT
 CCN# 04006
 SEMINAR
 ARCH 249X - 1 THE
 CCN# 04009



▶ HOME ◀
INFORMATION
RESOURCES
ACTIVITIES
CASE STUDIES
WHAT'S NEW
SEARCH

NEW

The **Vital Signs Curriculum Materials Project** addresses a secret life of buildings, one related to physical performance. Think of a building that has been a source of architectural inspiration for you. How much do you know about the physical environment it creates? Its amenities as viewed from an occupant's perspective? The energy it consumes?



*VITAL SIGNS-
Chris Benton, U.C. Berkeley, P.I.*

A multi-year curriculum development and training program on the field evaluation of building performance, using the SBSE network



VITAL SIGNS

Vital Signs **EQUIPMENT TOOLKIT LOAN PROGRAM**

REQUEST FOR PROPOSALS
1998-99 ACADEMIC YEAR



Eight equipment toolkits are available to ACSA member schools of architecture and ABET member schools of architectural engineering for a quarter, semester or year-long period. Through this loan program, faculty and students will be able to gain experience with a range of measurement devices as they conduct field investigations of existing buildings.



Agents of Change- Alison Kwok, Univ. of Oregon, P.I.

A program of regional workshops training faculty and their graduate teaching assistants in the art of field evaluation of building performance, using the SBSE network



August 2003: **Oberlin College**
Adam Joseph Lewis Center



January 2004: **Arizona State University**
Phoenix Public Library



August 2004: **Cal Poly San Luis Obispo**
Bren School of Environmental Science and Management, UC Santa Barbara

AGENTS OF CHANGE

ABOUT AOC • WORKSHOPS • ANNOUNCEMENTS • TOOLKITS • DOCUMENTS • CASE STUDIES • STAFF • LINKS

Training Workshop: Falmouth 2004 Schedule

Falmouth, MA (October 14-16, 2004)

Organizer: Alison Kwok akwok@woods-hole.edu

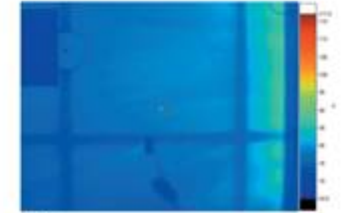


AoC WORKSHOP, October 2004

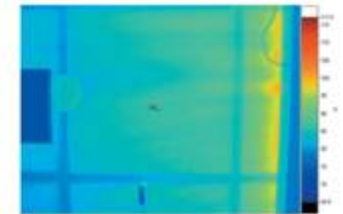
Agents of Change is a FIPSE funded project run by Professor Alison Kwok at the University of Oregon and aimed at training faculty and their graduate teaching assistants in new methods of teaching building science. It is an outgrowth of the VITAL SIGNS PROJECT and backed by SISE.

As a faculty trainer, I was able to use this workshop to introduce the IR camera to the faculty/ student teams from around the country, and have them improvise questions to ask and answer using IR images.

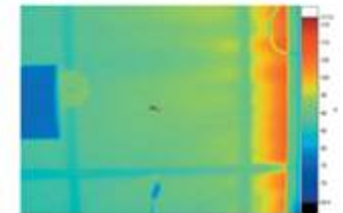
As with our experiences at UVM, the results were exceptional. The teams were able to use the camera with minimal instruction and it proved to be one of the most powerful tools available.



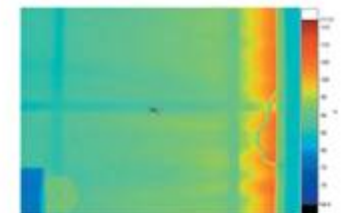
9:45 a.m.



10:25 a.m.



10:45 a.m.



11:35 a.m.

Agents of Change Workshop Woods Hole Research Institute October, 2004

Center left- early morning IR imaging shows the concrete base of the north wall to be significantly warmer than the wood frame wall above it, highlighting their differing insulation details.

Above- Time lapse IR imaging reveals the heat distribution patterns of an innovative overhead fin-tube system in a typical office. Through this and other experiments, the team concluded that the so-called 'convective' valence distributed heat through radiation rather than convection.



Photo courtesy of Alison Kwok

Why is this important?



*Architecture 2030
SustAIAnability 2030
2010 Imperative*

*All require that we learn to
Design to Carbon Neutral*

CND Project Structure

The CND Project acknowledges that there are identifiable starting positions and best practices that are required to succeed in reducing the energy demands of a building to allow it to reach a state of Carbon Neutrality.

Arch. 825 comparative massing of 13 student schemes-
all designed to facilitate daylighting
Jim Wasley
University of Wisconsin-Milwaukee

Massing Diagrams



A. Lance Dickman



B. Nicholas Bedare



C. Adam Flickinger



D. Micah Dines



E. Adam Larkhardt



F. Renee Schneider



G. Adam Witz



H. Steve Threlkoff



I. Christopher Love



J. Tami McCullough



K. Michael Kautsch



L. Dustin Nelson



M. Matthew Frydack

Focusing on operating energy vs. embodied energy for Phase I of the project...

For a building to have any hope of truly becoming Carbon Neutral it can use no more energy than a vacant building as defined by ASHRAE.

CND Program Goals:

- 1. To capture and distill best practices in carbon neutral studio pedagogy and design practice..*
- 2. To create web and print resources based on identified best practices in both education and practice...*
- 3. To fill identified gaps by creating new analytical tools and metrics for teaching and practicing carbon neutral design...*
- 4. To implement a multi-year, climate specific and regional "train the trainer" program on carbon neutral design for both educators and practitioners...*

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CND Program Phases I - III:

1. To capture and distill best practices in carbon neutral studio pedagogy and design practice..

2. To create web and print resources based on identified best practices in both education and practice...

3. To fill identified gaps by creating new analytical tools and metrics for teaching and practicing carbon neutral design...

4. To implement a multi-year, climate specific and regional "train the trainer" program on carbon neutral design for both educators and practitioners...

Phase I: SUMMIT and ONLINE RESOURCES

Jim Wasley, UW-Milwaukee

Mary Guzowski, U. Minnesota

Terri Meyer Boake, U. Waterloo

John Quale, UVA

Phase II: CND TOOLS

Harvey Bryan, Arizona State

Murray Milne, UCLA

Marc Schiler, USC

Phase III: CND WORKSHOPS

Walter Grondzik, Ball State

Bruce Haglund, U. Idaho

Alison Kwok, U. Oregon

Margot McDonald, Cal Poly

San-Luis Obispo

Board Opportunity
Fund Request



Private Industry

Federal Funding-
DOE, EPA

Principle Investigators

Phase I: SUMMIT and RESOURCES

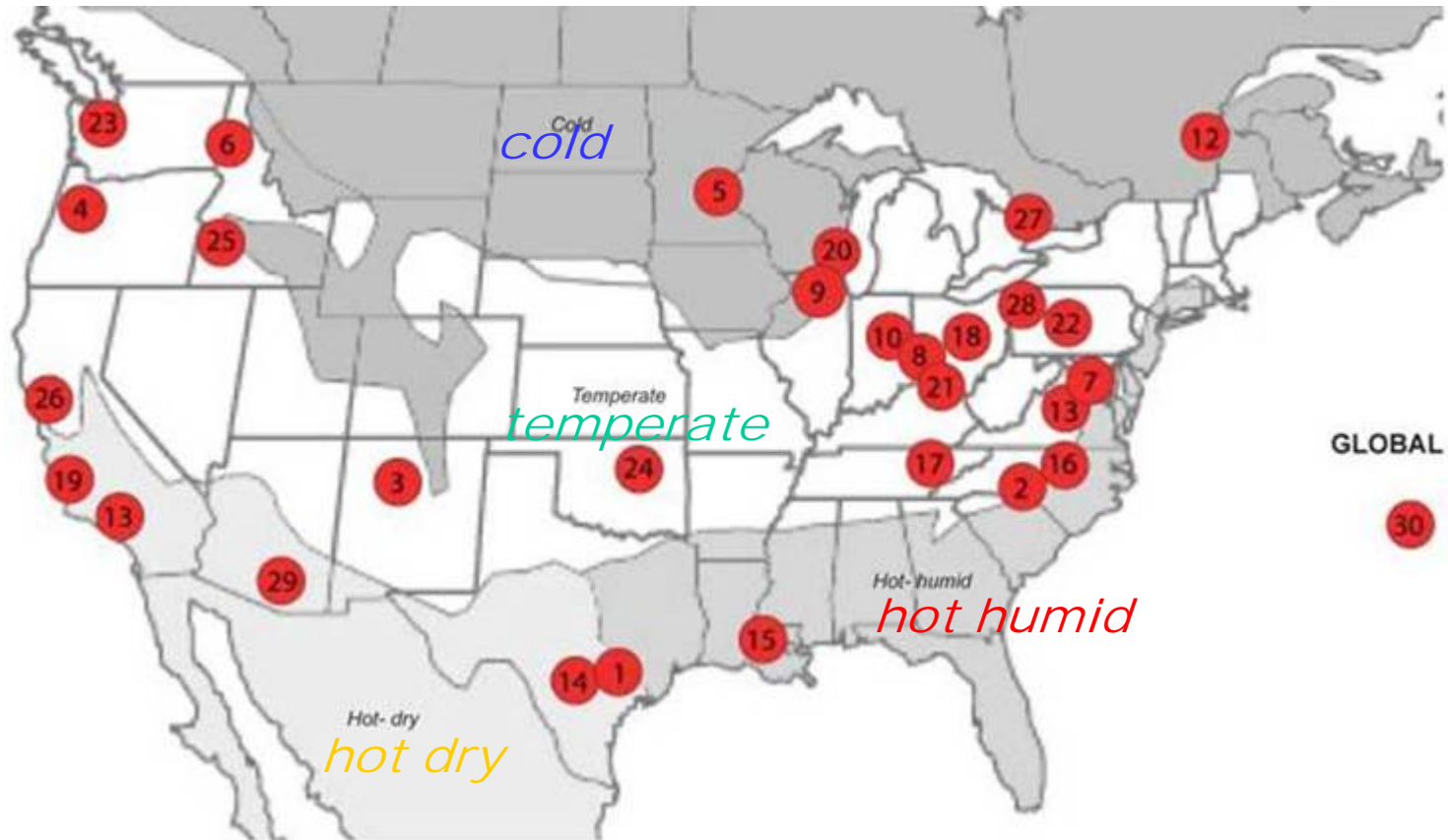
1. **Jim Wasley, UW-Milwaukee** *past SBSE president*
2. **Mary Guzowski, U. Minnesota**
3. **Terri Meyer Boake, U. Waterloo** *SBSE president*
4. **John Quale, UVA**

?

4.



2007 SBSE Retreat- Islandwood, Bainbridge Island



- 1. Prairie View A&M University
- 2. University of North Carolina - Charlotte
- 3. University of New Mexico
- 4. University of Oregon
- 5. University of Minnesota - Twin Cities
- 6. University of Idaho
- 7. Howard University
- 8. Miami University
- 9. Judson College
- 10. Ball State University

- 11. Université Laval
- 12. University of Virginia
- 13. Cal Poly Pomona
- 14. University of Texas - San Antonio
- 15. Louisiana State University
- 16. North Carolina State University
- 17. University of Tennessee
- 18. Kent State University
- 19. Cal Poly San Luis Obispo
- 20. University of Wisconsin - Milwaukee

- 21. University of Cincinnati
- 22. Pennsylvania State University
- 23. University of Washington
- 24. Oklahoma State University
- 25. University of Idaho Boise Center
- 26. University of California Berkeley
- 27. Ryerson University
- 28. Carnegie Mellon University
- 29. University of Arizona
- 30. North South University, Bangladesh

Carbon Neutral Design Studio Project Participating Institutions
 mapped on the four climate zones of North America

Collaborating Organizations



- *AIA COTE*
- *AIA SDiG*
- *AIA EPN*
- *ACSA*
- *Architecture 2030*
- *USGBC Formal Education Committee*
- *BuildingGreen.com*

Educators + Practitioners + Researchers + Students

CND Project Themes

**Commercial /
institutional
buildings**

**Affordable
Housing**

**Resources for
Design Studio
Instruction**

**climate
specific
case
studies**

**climate
specific
case
studies**

**Resources for
AIA Member
Professionals**

**climate
specific
case
studies**

**climate
specific
case
studies**

WEB RESOURCE OUTLINE:

1. Project Introduction:

Provide introduction and overview of the project, goals, resources, partners, etc.

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WEB RESOURCE OUTLINE:

2. Terms and Definitions:

**Provide baseline /
common ground on
basic terms and
definitions;**

**frame the problem of
CND as nested scopes
of work**

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WEB RESOURCE OUTLINE:

3. Carbon Design Tools and Calculators:

**Catalog existing design
tools and carbon
calculators**

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WEB RESOURCE OUTLINE:

4. Building Performance Case Study Protocol:

Develop a case study protocol that isolates design variables for comparative analysis of carbon footprint impacts, using easy to obtain building documentation and performance data.

Support this protocol with calculator tools as necessary for non-specialist adoption

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WEB RESOURCE OUTLINE:

5. Building Case Studies:

Develop a data base of low and zero-energy / carbon buildings across types and North American climate zones as proof of concept of the case study protocol and as a source for CND project educational materials.

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WEB RESOURCE OUTLINE:

6. The Carbon Neutral Design Process:

Outline tangible design process(es) for architects and students to achieve CN design, illustrated with CN case-studies and CN student design studio work.

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WEB RESOURCE OUTLINE:

7. Carbon Neutral Design Strategies:

Provide introductions to the essential design strategies for CN design; daylighting, passive climate response, new strategies for passive and active systems integration etc....

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WEB RESOURCE OUTLINE:

8. Design Studio Resources:

Develop educational resources for CN design studio education, answering the question:

“How do you validate the claim of Carbon Neutrality in the design studio setting?”

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WEB RESOURCE OUTLINE:

9. Links and Other Sources:

**Provide list of related
online websites and
design resources**

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The Society of Building Science
Educators

www.sbse.org

Thank You!

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Carbon Neutral Design (CND) Project