The Carbon Neutral Design Project

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Abstract

Never before have architectural educators and professionals faced the magnitude and urgency of today’s ecological challenges resulting from global warming and climate change. To meet these challenges, the Society of Building Science Educators (SBSE) has initiated the Carbon neutral Design (CND) Project to create and disseminate the resources and tools needed to integrate carbon neutral and zero-energy design into professional architecture programs and practice (SBSE [1]). This project is a direct response to the 2010 Imperative (which is a call for architectural educators to address carbon neutral design and fossil fuel reduction in the design studio, to improve ecological literacy for design students, and to integrate related issues in the design and operations of university facilities and campuses) as well as the Architecture 2030 Challenge which proposes the realization of carbon neutral architecture by the year 2030 (Architecture 2030 [2]). This paper provides an overview of the CND Project, including: 1) project goals; 2) carbon neutral design studio project, 3) online carbon neutral design resource, and 4) SBSE carbon neutral design education opportunities.


1 Introduction: Project Goals and Overview

The Carbon Neutral Design (CND) Project is a multi-faceted, multi-year project designed to bring together architecture’s professional and academic
communities around the topic of carbon neutral design. Our goal is to codify and disseminate the knowledge base that is emerging in both practice and academia on producing zero energy and carbon neutral buildings. This means not only applying the current best practices of high performance sustainable design to design education, but also envisioning the next generation of design thinking and communicating it to both the profession and to design students.

Phase I and II: The first phase of the CND Project includes two existing efforts: the Carbon Neutral Studio initiative and the SBSE 2008 Summer Retreat focusing on carbon neutral design education. The second phase of the project is a proposed Carbon Neutral Design Summit and development of an online Carbon Neutral Design Resource to be initiated over the coming year. The proposed CND Summit will bring together design practitioners and educators to discuss best practices and innovations in professional practice and design studios. The resulting list of design strategies, simulation tools, web resources, case studies and other educational materials will be assembled for web-based dissemination. The University of Wisconsin-Milwaukee is proposed as the venue for the CND Summit in August 2008. Web-ready content will be created by the end of the year.

Phases III and IV: The third and fourth phases of the CND Project focus on further development of the online and educational resources as well as regional and national educational efforts during the next five years. Phase III will further develop the online resources, assess and develop new computer simulation tools, and develop case studies of carbon neutral buildings. Phase IV envisions a multi-year training program based on regional partnerships between design practitioners and educators that will emphasize climatic and bioregional implications of carbon neutral design. The SBSE is currently seeking regional, national, and international partnerships for all phases of the project. The following discussion considers current resources and efforts.

2 Carbon Neutral Studio Initiative

The SBSE Carbon Neutral (CN) Studio initiative was implemented in Fall 2007 to develop carbon neutral teaching resources and tools; to pilot those resources and tools; and to develop a means to share educational resources and studio outcomes for carbon neutral design education. The studio initiative includes a network of 50 participants from around the world and thirty-one carbon neutral studio projects taught during the 2007-2008 academic year (see Figures 1 and 2). Fourteen studios were completed in Fall 2007 and the remaining studios will be completed by the summer of 2008. Ten studios are undergraduate, graduate, or mixed-level elective studios; at least four are designed to satisfy the U.S. National Architectural Accreditation Board’s “comprehensive design” requirement; and four are either capstone or thesis studios. The studio problem statements include: affordable and green housing programs; schools; nature
centers and other public programs; high-volume retail environments; an office park/data center; other commercial programs; and several higher education projects including a 20–30 story mixed-use dormitory.

**Geographic and Program Distribution:** As illustrated in Figure 1, the participating institutions are geographically diverse. The studios include a range of degree programs (BSAS, B.ARCH, and M.ARCH) as well as varied curricular approaches within the different programs. One segment of architectural education not well represented is the beginning design curriculum. To address this issue, SBSE would like to partner with other groups, such as the annual Conference on the Beginning Design Student, to solicit participants from early design studios.

**Participating Studio Projects by Climate and Type:** As illustrated in Figure 2, the studio projects include a wide range of building types and climates. Small-scale building projects are popular since they easily lend themselves to in-depth investigations and most studio projects are located in temperate climates. These biases will be analyzed during the evaluation and tool distillation process to ensure that tools appropriate for each scale and climate type are developed. Preference will be given to the underrepresented climates and project types during a proposed second round of studio evaluations during the 2008-2009 academic year. The results of the design studios will become part of an online
The proposed online CND Resource will be a vehicle to refine and develop educational materials that will prepare educators, students, and practitioners to undertake carbon neutral design. This resource database will include outcomes from the various components of the CND Project as they are completed. The online CND Resource website will provide educators and practitioners with access to guidelines, strategies, case studies, and tools, including the following design resources for educators and practitioners:

CND Processes and Strategies: Reframing the Design Problem: The CND Resource will provide practical design guidelines and strategies to assist carbon neutral design planning and processes. It will include methods to frame carbon neutral project goals, strategies to establish proposed energy and carbon profiles, and evaluation methods to assess performance. Design lessons, processes,
strategies, and examples will be drawn from practitioners’ projects and from the studio work of design educators participating in the CND Summit.

**CND Case Studies: Real World Solutions:** The CND Case Studies will document successful built projects that combine design excellence and performance goals for carbon and fossil fuel reductions, including design processes, strategies, assessment methods, and lessons. The CND Case Studies will include projects from practitioners participating in the CND Summit and the AIA COTE Top Ten Green Projects Awards Program.

**CND Tools and Software: Evaluation and Assessment Resources:** An annotated bibliography of CND Tools and Software will be compiled from the CND Summit to provide practitioners and educators with a guide to current assessment tools and their applicability for different aspects and phases of carbon neutral design. Phase III will include an in-depth analysis of design tools, software, and performance metrics.

## 4 Carbon Neutral Design Education Opportunities

The SBSE annual summer retreats provide additional opportunities for design educators to participate in the CND Project. In the spirit of the 2008 Oxford Conference, “Resetting the Agenda,” the July 2008 SBSE New Forest Retreat will focus on defining new directions in building science research and architectural education (SBSE [3]). The objectives of the retreat are to share new and emerging best practices and to chart a course for the engagement of the SBSE in global discussions on the future of research and education. Two themes will be explored: 1) “New Topics and New Approaches,” focusing on sharing emerging ideas and approaches to teaching energy and other green building topics, and 2) “Resetting the Agenda,” which will create position statements representing SBSE’s vision for the future of building science research and education. The outcomes of the retreat will become part of the online CND Resource available through the SBSE website.

The SBSE welcomes participation in the CND Project from faculty, students, administrators, allied organizations, and the building industries. For more information on the related carbon neutral design efforts please see the SBSE website at [www.sbse.org](http://www.sbse.org).

### References