
FSU/SESEC

presents:

the OGZEB



Proposal	1
Special Features	3
Design plans	4
Energy system	12
Who is the USGBC?	13
What is LEED certification?	13
LEED brochure	14
Supporting the project	18

SUSTAINABLE ENERGY SCIENCE & ENGINEERING CENTER



FLORIDA STATE UNIVERSITY
Mail Stop 4471
Tallahassee, Florida 32306-4471
Voice: 850-644-5885; Fax: 850-644-5262

THE OFF-GRID, ZERO EMISSION BUILDING AT FSU



Purpose of the Project

The OGZEB involves the design, construction and operation of a completely solar-powered building that achieves LEED-NC platinum certification. A 1000 square foot building, the OGZEB will be partitioned so that 750 square feet will be a two-bedroom, graduate style flat with the remaining 250 square feet serving as office space. This arrangement will allow for the building to serve as an energy efficient model for campus designers in student living and office space. More specifically, though, the building will serve as a prototype for developing and implementing cutting edge, alternative energy technologies in both residential and commercial settings.

Project Description

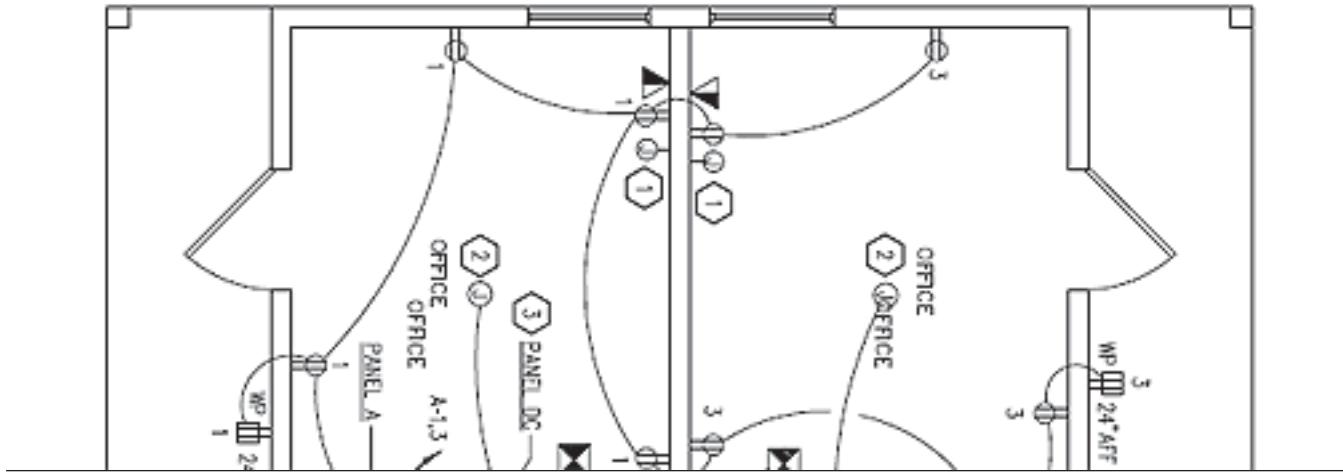
Since the sun is not a constant source of energy throughout the entire day, excess energy will need to be generated to provide energy storage that allows power to be continuously supplied to the house during non-daylight hours. The most common solution to this problem is the use of high efficiency batteries for energy storage. This approach has been, and continues to be, the de facto solution used by the teams in the Solar

Decathlon. However, high efficiency batteries are extremely expensive and they have a limited lifetime. Alternatively, the OGZEB will use excess energy from photovoltaic (PV) panels, also known as solar panels, to produce hydrogen through the use of a highly efficient water electrolysis device that is currently being developed at SESEC. This hydrogen will be stored until it is required, at which time it will be fed to an innovative fuel cell, which is also being developed at SESEC. This project will not be the first to use hydrogen as an energy storage medium, but it will be the first to employ innovative hydrogen technologies that are not currently commercially available.

The hydrogen will also be used to address the biggest consumers of energy in a building: space heating, cooling and the generation of hot water. Through combustion in a furnace, the hydrogen will provide sufficient heat for space heating and will also generate sufficient heat to use advanced ammonia absorption technology for air-conditioning. The hot water will be generated through the use of an on-demand hot water heater that will be modified to use hydrogen as its working gas. The use of hydrogen to meet these needs is unique to this project. Using an ammonia absorption cycle is also an original concept, especially considering that one does not exist for a building this small.

High efficiency electronics and lighting, along with good insulation, can greatly reduce the energy needed to make the atmosphere in the building comfortable and enjoyable. The OGZEB will include low energy, spectrally selective windows, LED lighting, low air infiltration and extensive use of passive solar heating.

Environmental consciousness is also considered during the design and construction of the OGZEB. Every attempt



will be made to build the home with recyclable materials that are not detrimental to the environment during their creation and use. In fact, the design and construction of the OGZEB will be guided by the LEED (Leadership in Energy and Environmental Design) Green Building Rating System, which has been developed by the United States Green Building Council (USGBC/www.usgbc.org). The LEED system is based on well-founded scientific standards and emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. There are four levels that companies can achieve from the LEED rating system: Certified, Silver, Gold and Platinum. Platinum LEED-NC will be pursued for the OGZEB so that it can be the first such building to exist in the southeastern U.S. In fact, there are only nine platinum-certified "new construction" buildings in the entire world, seven in the U.S. and two in India.

The students and staff of SESEC, in close collaboration with local architects and engineers, will design the OGZEB so that it meets all of the above-mentioned goals, as well as any federal, state, local and university building codes. The students and staff of SESEC will carry out the basic construction of the home, such as the framing and the plumbing. Contracted professionals will perform the more advanced construction, such as the building wiring. Construction on the OGZEB is anticipated to begin during the summer of 2006 with project completion expected during the spring of 2007.

Conclusion

The successful completion of the OGZEB will accomplish a number of goals. First, it will provide SESEC with a test bed for the further development of alternative energy based technologies that can be implemented in residential and commercial applications. Second, it will provide FSU, Tallahassee, and the State of Florida with a LEED-NC platinum-certified building, the first of its kind in the southeastern U.S., that will demonstrate both graduate student

housing and office space without burdening the local utility system. Due to its novelty, it is expected that the OGZEB will attract a number of people for tours and garner positive national attention. Third, it will provide the students and staff of SESEC with the experience required to be competitive in the Solar Decathlon 2009, the proposals for which must be submitted during Fall 2007. Lastly, and possibly most important, the OGZEB will expose the students at FSU and the citizens of Tallahassee to the benefits of sustainable, "green" building and engineering, as well as alternative energy sources. This type of exposure is necessary to change public opinion and overcome some of the negative stereotypes that have been promulgated regarding these types of technologies.

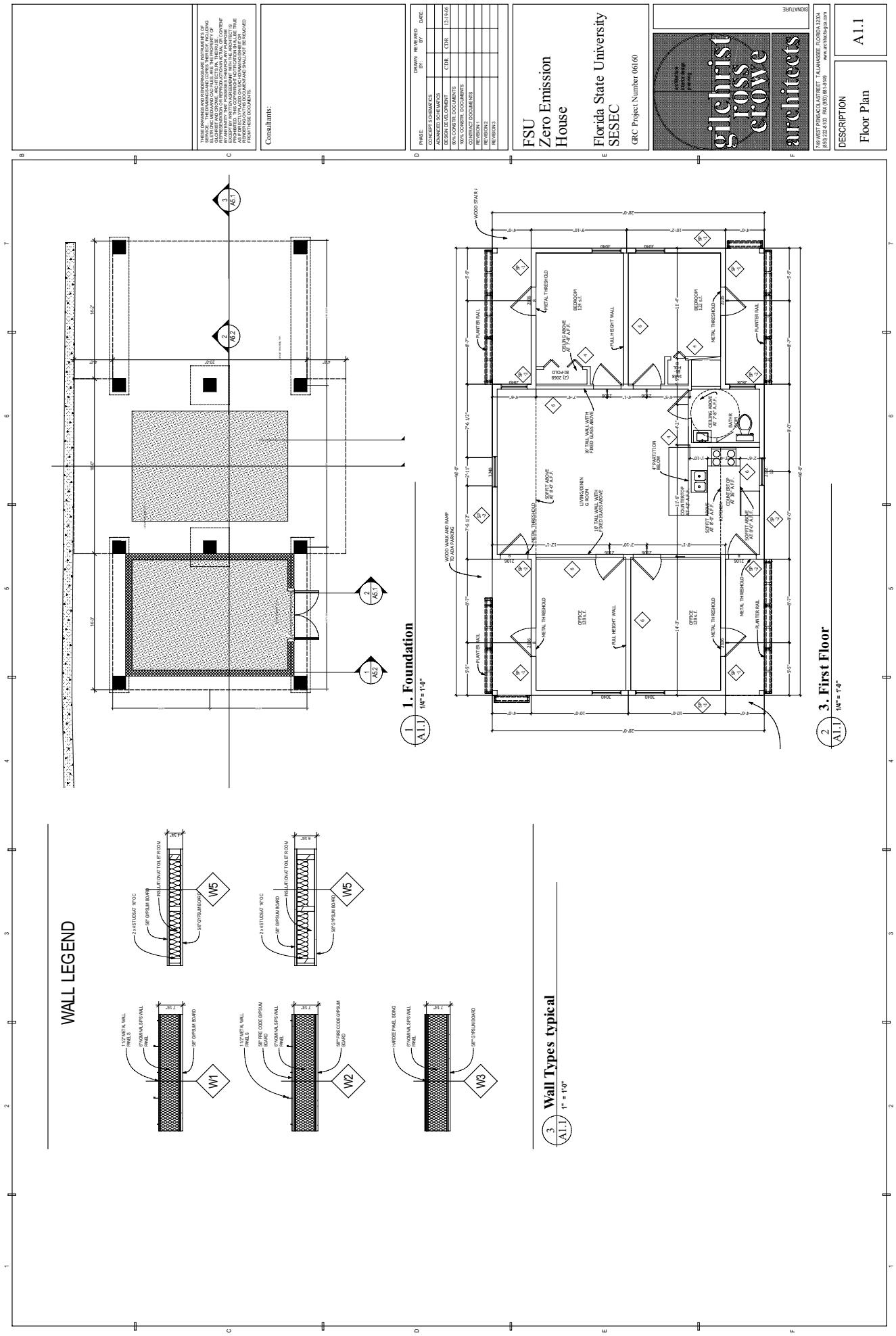
Description of the Solar Decathlon Competition

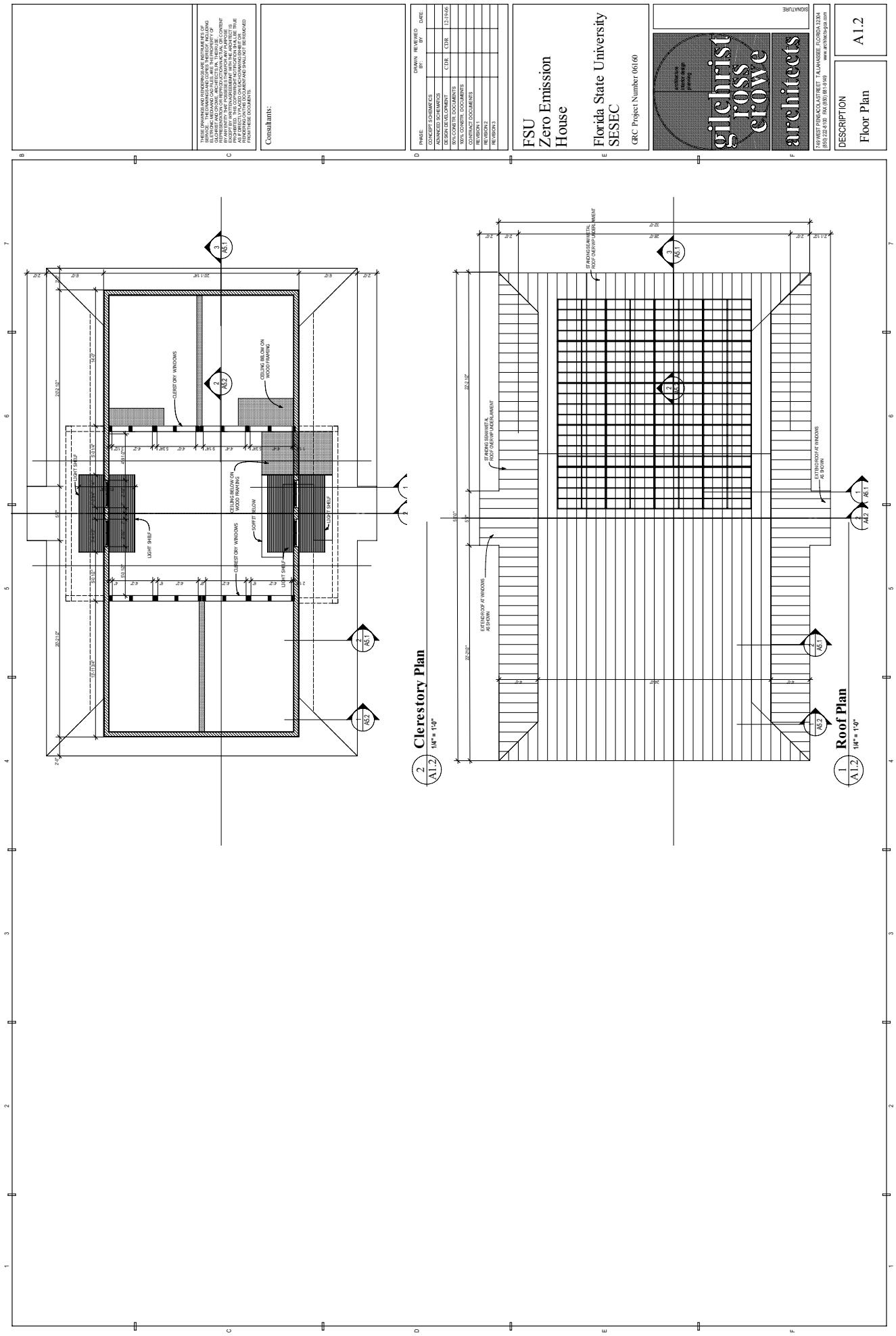
The long-range goal of this competition is to develop and demonstrate solar powered homes in which the whole house levelized energy cost is \$0.10/kWh by 2015. University teams must submit an extensive proposal to participate in the Decathlon, and only twenty teams are selected to compete. Each of the selected teams designs and builds a 500 – 800 square foot modular home that must be powered entirely through solar energy. For the competition, the home must be moved from its construction site to Washington, D.C., where it is scored based on ten specific tasks. On average, the top ten houses from the Solar Decathlon 2005 competition cost \$550 per square foot. As mentioned above, the OGZEB will be at the upper size limit (1000 square feet) with a lower projected cost (\$375 a square foot). This significant savings is the result of using cutting edge technology not found in any of the previous Solar Decathlon homes.

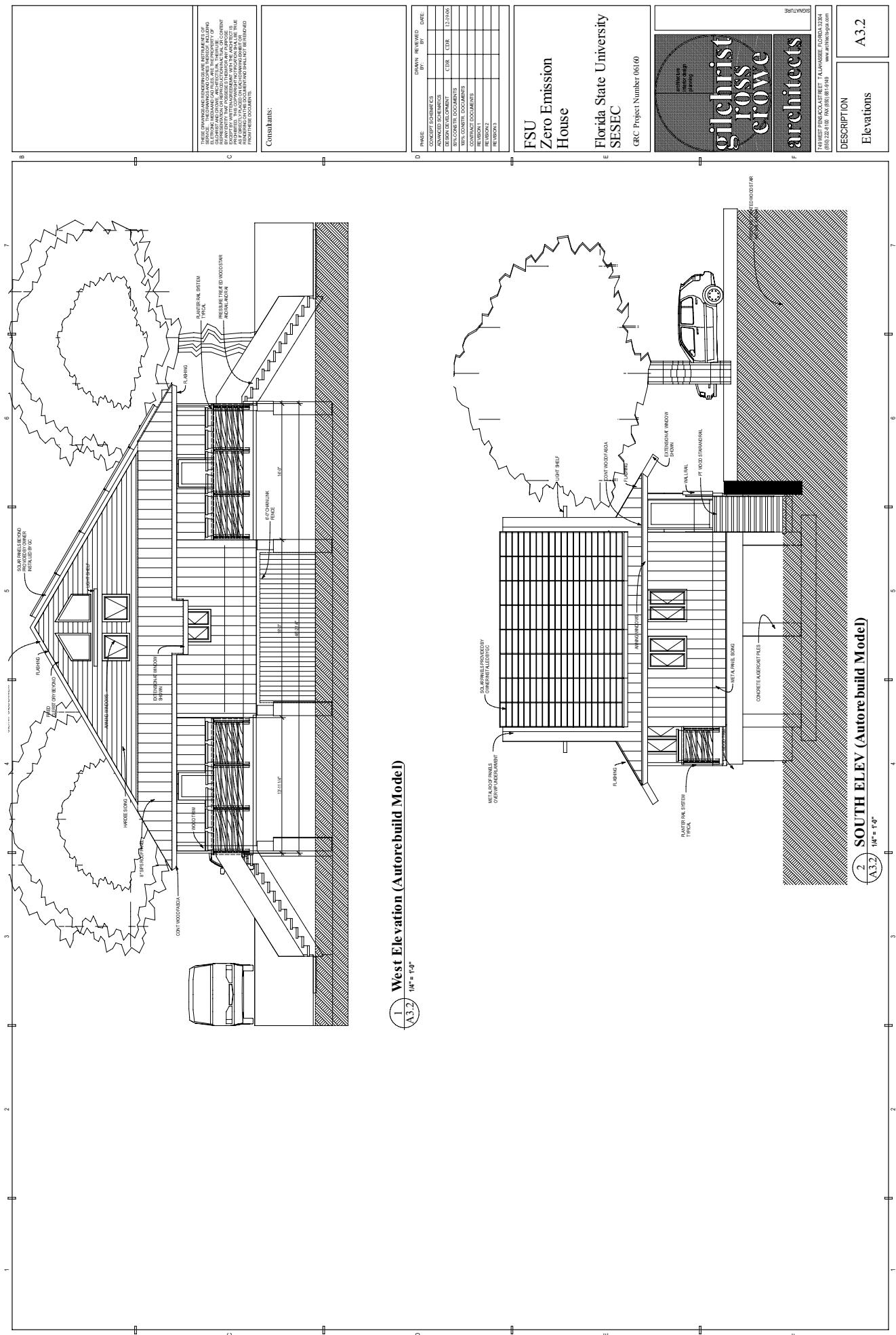
Special Features of the OGZEB:

- Hydrogen Appliances – (Burn hydrogen rather than natural gas, cleaner)
 - Water Heater
 - Stove/Oven
 - HVAC
- Rain Water Collection
 - Store water for irrigation purposes
 - Manage storm water run off
- High Efficiency Water Use
 - Low flow fixtures
 - Recycle grey water
- High Efficiency Lighting
 - LEDs
 - § Reduce power consumed
 - § Reduce heat emitted by lights
 - Passive Solar Skylights
 - § Harness sun light efficiently
 - § Our Design reduces heat transfer
 - Reduce Light Pollution
 - § Prevent light from escaping building and effecting the environment
- Completely Solar Powered
 - Solar Cells provide electricity
 - Collectors Concentrating Solar Provide
 - § Hot water
 - § Solar Heat Powered HVAC
- Hydrogen Production and Use
 - New electrolyzer developed by SESEC
 - New fuel cell developed by SESEC
- Construction Waste Management and Reuse
 - Design the building based on available materials to reduce building waste
 - Reuse when at all possible
- Regional Materials
 - Utilize materials within a 500 mi radius of Tallahassee
- Rapidly Renewable Materials
 - Use materials that take under 10 yrs to grow
 - Easy to replace and less detrimental to the environment
- Data Collection
 - Collected data
 - § Inside conditions
 - § Outdoor air used in house
 - § Ventilation and emissions
 - § Lighting effectiveness
- Platinum Certification from the United States Green Building Council
 - Highest Level of Certification
 - One of only 15 buildings with this level of certification

Drawing Index







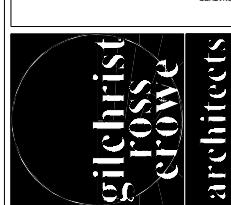
THESE DRAWINGS AND RENDERINGS ARE INSTRUMENTS OF
ENGINEERING AND ARCHITECTURE. THEY ARE THE PROPERTY OF
GIBRALTAR MECHANICAL AND CIVIL LTD. AND ARE NOT TO BE COPIED,
REPRODUCED OR BORROWED BY ANYONE EXCEPT
BY AN ENTITY THAT POSSESSES THEM FOR ANY PURPOSE
EXCEPT BY WRITTEN AGREEMENT WITH THE ARCHITECT IS
NOT PERMITTED. THIS DOCUMENT IS THE PROPERTY OF GIBRALTAR MECHANICAL AND CIVIL LTD.
RENDERINGS OUTSIDE DOCUMENT AND SHEET NOT BE REMOVED
FROM THESE DOCUMENTS.

Consultants:

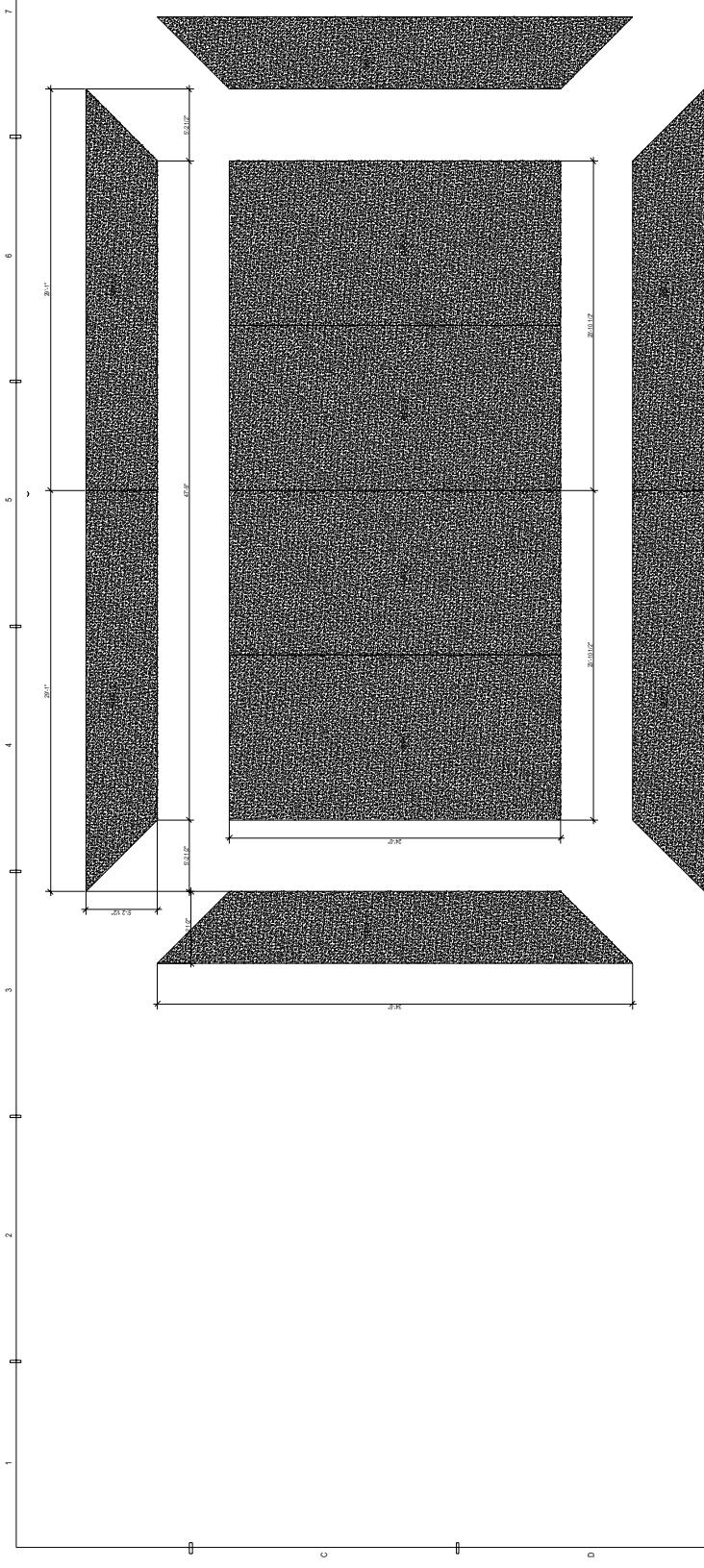
PHASE:	DRAWN BY:	REVIEWED BY:	DATE:
CONCEPT STUDIES	CDR	CDR	12-1944
ADVANCED DEVELOPMENTS	CDR	CDR	12-1944
90% CONSTR. DOCUMENTS	CDR	CDR	12-1944
100% CONSTR. DOCUMENTS	CDR	CDR	12-1944
CONTRACT DOCUMENTS	CDR	CDR	12-1944
REVISION 1	CDR	CDR	12-1944
REVISION 2	CDR	CDR	12-1944
REVISION 3	CDR	CDR	12-1944

FSU
Zero Emission
House

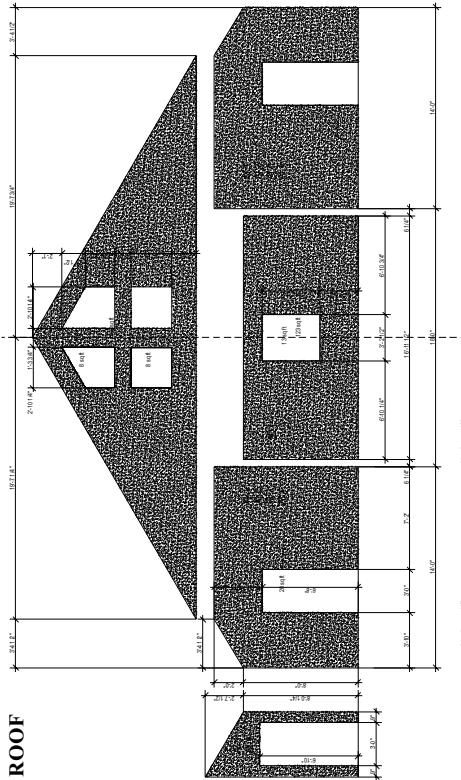
Florida State University
SESEC
CNC Dept. at Number 00160



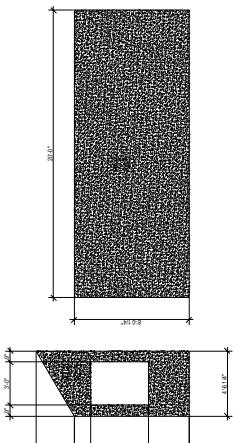
DESCRIPTION	A 4.1
Panel Elevations	



PANEL ELEVATIONS, ROOF



2 PANEL ELEVATIONS (WALL)



PANEL ELEVATIONS (WALL)

THESE DOCUMENTS ARE THE PROPERTY OF THE STATE OF CALIFORNIA. THEY MAY NOT BE COPIED OR REPRODUCED, IN WHOLE OR IN PART, WITHOUT THE EXPRESS WRITTEN CONSENT OF THE STATE OF CALIFORNIA. THESE DOCUMENTS ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND ARE NOT TO BE USED AS A SUBSTITUTE FOR THE OFFICIAL DOCUMENTS WHICH ARE LOCATED AT THE OFFICE OF THE ATTORNEY GENERAL, 1000 KODAK AVENUE, SACRAMENTO, CALIFORNIA 95814. THE ATTORNEY GENERAL'S OFFICE IS NOT RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY OCCUR DURING THE PROCESS OF COPYING OR TRANSMISSION. THE ATTORNEY GENERAL'S OFFICE IS NOT RESPONSIBLE FOR ANY DAMAGES WHICH MAY RESULT FROM THE USE OF THESE DOCUMENTS.

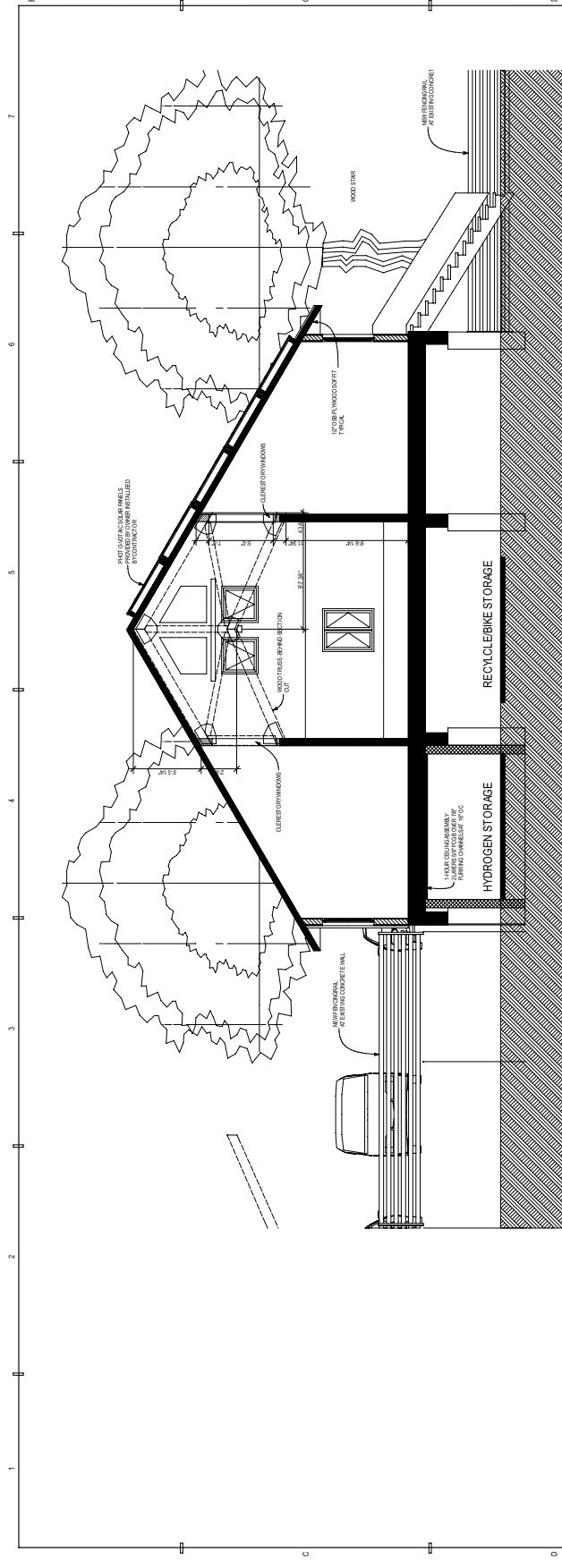
C

CONSULTANT:

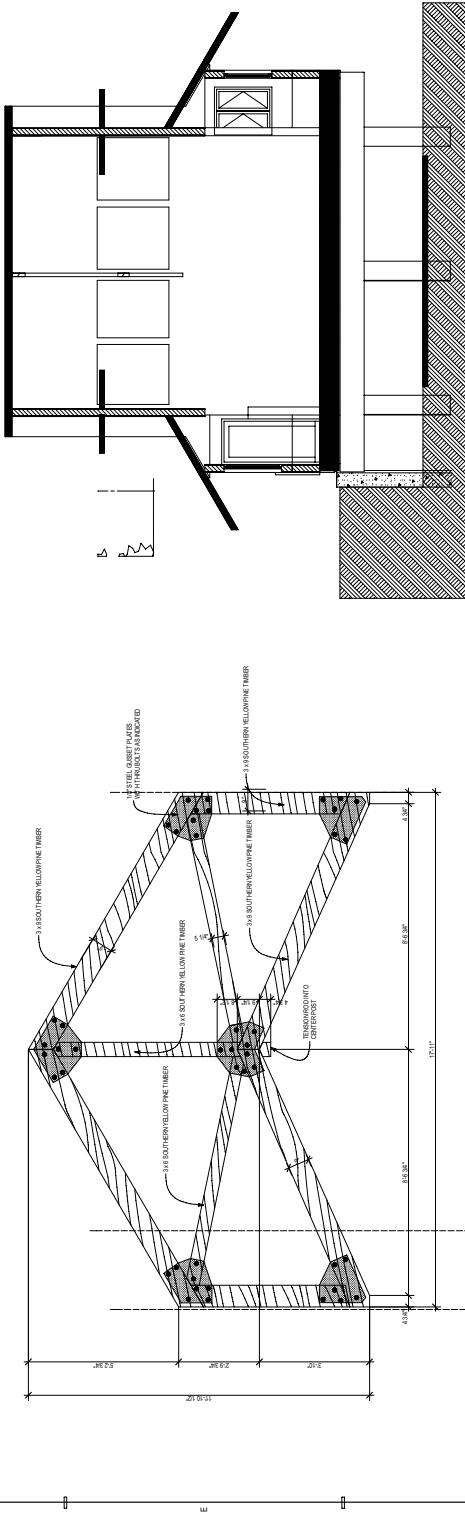
C

Phase	Concept Scheme CS	By:	By:	Date:
ADVANCED SCHEMATICS				
DESIGN DEVELOPMENT	CDR	CDR	12-20xx	
DESIGN DOCUMENTS				
WORKING DOCUMENTS				
CONTRACT DOCUMENTS				
FEASIBILITY				
VISION 1				
VISION 2				
VISION 3				

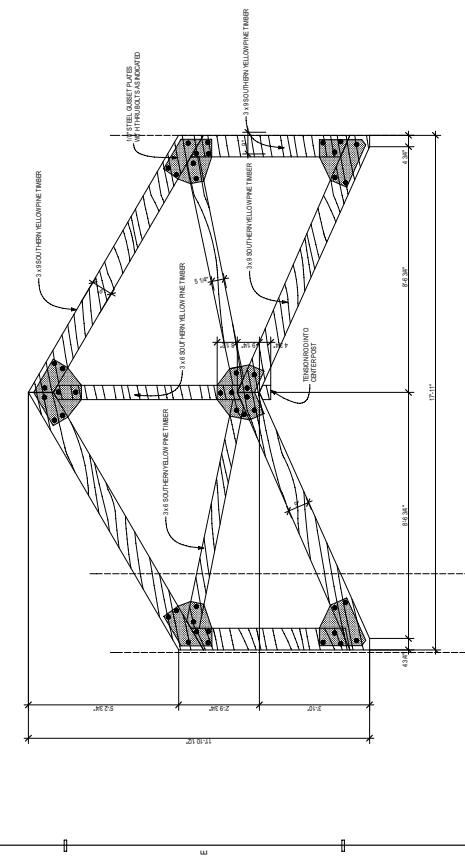
DESCRIPTION	A4.2 Bldg Sections
748 WEST PERCIVAL STREET TALLAHASSEE, FLORIDA 32304	(850) 221-5100 FA: (850) 221-5949 www.activesiteplus.com



1 Longitudinal Section (Autore build Model)



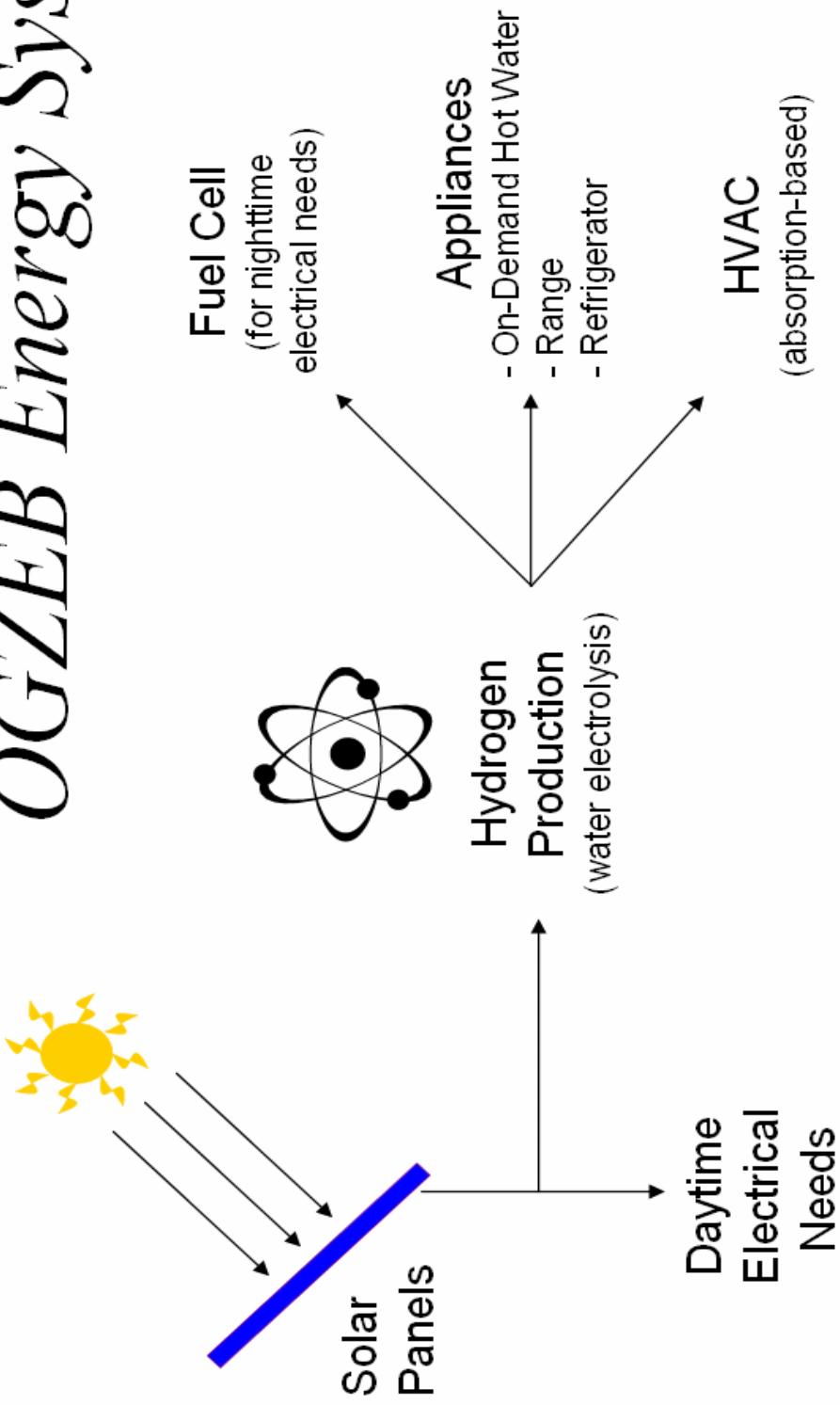
2 Cross Section (Autore build Model)



Wood truss elevation



OGZEB Energy System



Who is the USGBC?

Core Purpose

The U.S. Green Building Council's core purpose is to transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life.

Who is the U.S. Green Building Council?

The U.S. Green Building Council (USGBC) is the nation's foremost coalition of leaders from every sector of the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work. Our more than 6,000 member organizations work together to develop a variety of programs and services, and forge strategic alliances with key industry and research organizations and federal, state and local government agencies. Our collective power is leading the transformation of the building industry and market to sustainability. Council programs are Committee-Based, Member-Driven, and Consensus-Focused. Click on the links below to learn more about:

- The LEED® Green Building Rating System™
- The annual Greenbuild International Conference and Expo
- Educational offerings, including LEED workshops and the LEED Professional Accreditation program
- Tools for federal, state and local government agencies
- Green building research and publications
- Local and regional advocacy and education

What is the LEED Certification?

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System® is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. USGBC's members, representing every sector of the building industry, developed and continue to refine LEED. LEED standards include:

- LEED-NC: New commercial construction and major renovation projects
- LEED-EB: Existing building operations
- LEED-CI: Commercial interiors projects
- LEED-CS: Core and shell projects
- LEED-H: Homes
- LEED-ND: Neighborhood development
- LEED Application Guides: Retail (currently in pilot), Multiple Buildings/Campuses, Schools, Healthcare, Laboratories, Lodging

Product Manufacturers and Service Providers: Learn how you can get involved with USGBC and LEED.

LEED was created to:

- define "green building" by establishing a common standard of measurement
- promote integrated, whole-building design practices
- recognize environmental leadership in the building industry
- stimulate green competition
- raise consumer awareness of green building benefits
- transform the building market

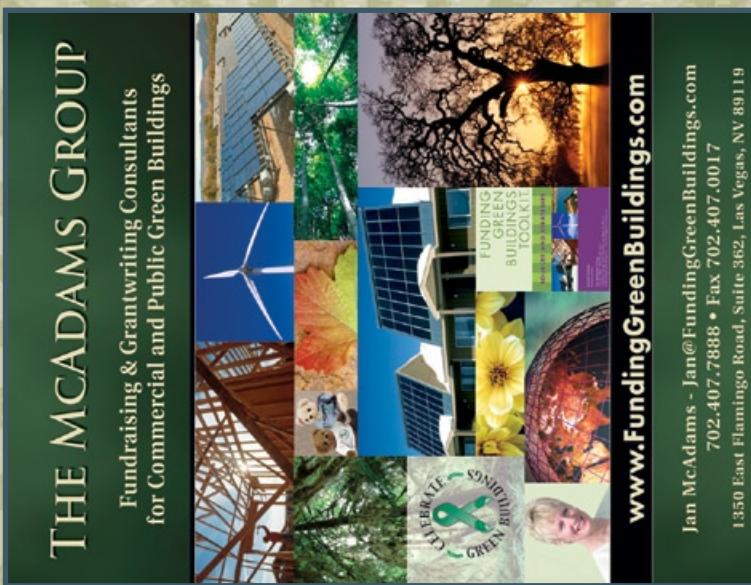
LEED provides a complete framework for assessing building performance and meeting sustainability goals. Based on well-founded scientific standards, LEED emphasizes state of the art strategies for sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. LEED recognizes achievements and promotes expertise in green building through a comprehensive system offering project certification, professional accreditation, training and practical resources. Click below to view the LEED Foundations documents:

- LEED Committee Charters - describes the purpose and scope of each LEED Committee
- LEED Foundations Policy Manual - describes USGBC policy for consensus based development of the LEED family of products
- LEED Product Development Handbook - describes the operating procedures for management and administration of LEED Products

Audubon Center at Debs Park Indiana Empire Utilities Agency NREC - Seneca Monile Office Donald Breen School of Environmental Interface, Inc. Showroom and Offices Joe Serna Jr. Cal/EPA Headquarters Building Philip Merrill Environmental Center The Chicago Center for Green Technology Cambridge Office Building Courtneyinwealth of Pennsylvania Capitol Area East End Complex Cuttree Park Environmental Learning Center Cleantech Elementary School David L. Lawrence Convention Center DEP

Map of the Nation's Platinum and Gold LEED® Certified Buildings

Brought To You By



The image features a large, vibrant yellow sunflower in the lower right corner, partially cut off by the edge. The background is a solid light blue. On the left side, there is a vertical logo for "THE VISUAL SENSE" with "PROFESSIONAL GRAPHIC DESIGN" written below it. To the left of the logo is a graphic of a stylized heart or flower shape composed of small blue dots. The central text "Providing Quality Graphic Design for the Green Industry." is positioned above the sunflower. To the right of the sunflower, there is promotional text and a call to action.

Current as of 04/11/06

Map Legend

14 Philip Merrill Environmental Center
Annapolis, Maryland

Gold LEED® Certified

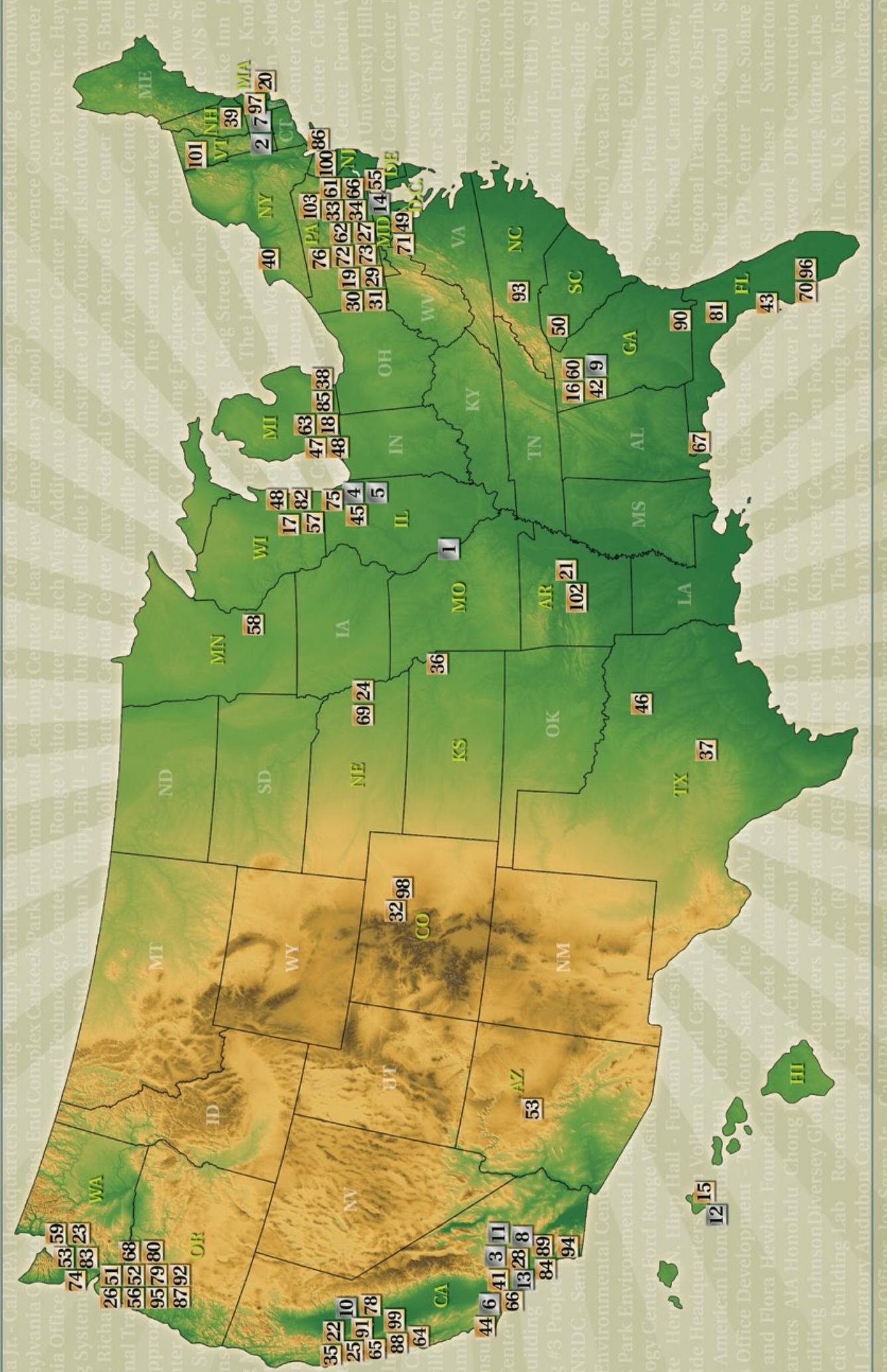
- 1** Alberici Corporate Headquarters
St. Louis, Missouri
- 2** Artists for Humanity EpiCenter
Boston, Massachusetts
- 3** Audubon Center at Debs Park
Los Angeles, California
- 4** Chicago Center for Green Technology
Department of the Environment
Chicago, Illinois
- 5** CNT Renovation Center
for Neighborhood Technology
Chicago, Illinois
- 6** Donald Bren School of Environmental
Science & Management
Santa Barbara, California
- 7** Genzyme Center
Genzyme Corporation
Cambridge, Massachusetts
- 8** Inland Empire Utilities Agency
Administrative Headquarters
Chino, California
- 9** Interface, Inc. Showroom and Offices
Atlanta, Georgia
- 10** Joe Serna Jr. - Cal/EPA Headquarters
Sacramento, California
- 11** Lake View Terrace Branch Library
Los Angeles Public Library District
Lake View Terrace, California
- 12** Natural Energy Laboratory of Hawaii
Authority Gateway Distributed and
Renewable Energy Center
Kailua-Kona, Hawaii
- 13** NRDC - Santa Monica Office
Santa Monica, California
- 14** Philip Merrill Environmental Center
Annapolis, Maryland
- 15** AIA Honolulu
Honolulu, Hawaii
- 16** Arthur M. Blank Foundation Family Office
Atlanta, Georgia
- 17** Brengel Technology Center
Johnson Controls, Inc.
Milwaukee, Wisconsin
- 18** Calvin College Bunker Interpretive Center
Grand Rapids, Michigan
- 19** Cambria Office Building
Commonwealth of Pennsylvania
Department of Environmental Protection
Ebensburg, Pennsylvania
- 20** Cambridge City Hall Annex
Cambridge, Massachusetts
- 21** Camp Aldersgate Commons Building
The Women's Division of the General Board
of Global Ministries of the United
Methodist Church
Little Rock, Arkansas
- 22** Capitol Area East End Complex
Block 225 Office Building
State of California
Sacramento, California 95814
- 23** Carkreek Park Environmental
Learning Center
Department of Parks & Recreation
Seattle, Washington
- 24** Carl T. Curtis Midwest Regional
Headquarters
National Park Service/U.S. Dept.
of the Interior
Omaha, Nebraska
- 25** Chong Partners Architecture S.F. Office
San Francisco, California
- 26** Clean Water Services Administrative Offices
Hillsboro, Oregon
- 27** Clearview Elementary School
Hanover Public School District
Hanover, Pennsylvania
- 28** Colorado Court
Community Corporation of Santa Monica
Santa Monica, California
- 29** Conservation Consultants Inc. Center
Pittsburgh, Pennsylvania
- 30** CORO Center for Civic Leadership
Pittsburgh, Pennsylvania
- 31** David L. Lawrence Convention Center
Pittsburgh, Pennsylvania
- 32** Denver Place N/S Towers
Denver, Colorado
- 33** DEP California Office Building
State of Pennsylvania
Harrisburg, Pennsylvania
- 34** DEP Southeast Regional Office Building
State of Pennsylvania
Norristown, Pennsylvania
- 35** DPR Construction, Inc. Office Building
Sacramento, California
- 36** EPA Science and Technology Center
Kansas City, Kansas
- 37** Far Southeast Austin EMS Station # 28
Austin, Texas
- 38** Ford Rouge Visitor Center
Dearborn, Michigan
- 39** French Wing Addition to Conservation
Center
Society for the Protection of NH Forests
Concord, New Hampshire
- 40** Frito-Lay Jim Rich Service Center
Henrietta, New York
- 41** The Getty Center
Los Angeles, California
- 42** Goizueta Business School
Emory University
Atlanta, Georgia
- 43** Happy Feet Plus, Inc.
Clearwater, Florida
- 44** Hayward Building Systems Plant
Santa Maria, California
- 45** Haworth Chicago Showroom
Chicago, Illinois
- 46** Hensley Field Operations Center
Dallas, Texas
- 47** Herman Miller CI Main Site
Zeeland, Michigan
- 48** Herman Miller MarketPlace
Zeeland, Michigan
- 49** Herman Miller National Design Center
Washington, DC
- 50** Herman N. Hipp Hall - Furman University
Greenville, South Carolina
- 51** Hillsdale Library
Portland, Oregon
- 52** Howard Hall, Lewis & Clark College
Portland, Oregon
- 53** Institute of EcoTourism
Sedona, Arizona
- 54** IslandWood: A School in the Woods
Bainbridge Island, Washington
- 55** J. Richard Carnall Center
PFPC Worldwide Headquarters
Wilmington, Delaware
- 56** Jean Vollum Natural Capital Center
Portland, Oregon

Map Legend Continued

57	Johnson Diversey Global Headquarters Sturtevant, Wisconsin	71 Nusta Spa Washington, DC	86 Solaire New York, New York	101 Wind NRG Partners, LLC. Hinesburg, Vermont
58	Karges-Faulconbridge Office Building St. Paul, Minnesota	72 PA DEP Bureau of Laboratories Harrisburg, Pennsylvania	87 State of Oregon North Mall Office Building Salem, Oregon	102 Winrock International Headquarters Little Rock, Arkansas
59	King Street Center Seattle, Washington	73 PA DEP Moshannon District Office Philipsburg, Pennsylvania	88 SUGEN Building #3 Project South San Francisco, California	103 WRT - Philadelphia Office Wallace Roberts & Todd, LLC Philadelphia, Pennsylvania
60	Len Foote Hike Inn Georgia Department of Natural Resources Dawsonville, Georgia	74 Park 90/5 Building C Seattle, Washington	89 Sun Valley Branch of the Los Angeles Public Library Los Angeles, California	
61	Lubin Manufacturing Facility - Knoll Inc. East Greenville, Pennsylvania	75 Pharmacia Q Building Lab Skokie, Illinois	90 Suwannee River Visitor Center Georgia Department of Natural Resources Fargo, Georgia	
62	McGowan Institute for Regenerative Medicine University of Pittsburgh Pittsburgh, Pennsylvania	76 Pennsylvania Housing Finance Agency Harrisburg, Pennsylvania	91 Swinerton Inc. Headquarters San Francisco, California	
63	Michigan Alternative and Renewable Energy Center Muskegon, Michigan	77 Plaza at PPL Center Allentown, Pennsylvania	92 The Henry (at The Brewery Blocks) Portland, Oregon	
64	Moss Landing Marine Labs - CSU Moss Landing, California	78 Pleasanton Fire Station 4 Livermore Pleasanton Fire Department Pleasanton, California	93 Third Creek Elementary School Statesville, North Carolina	
65	Natural Resources Defense Council, S.F. Office San Francisco, California	79 Recreational Equipment, Inc. (REI) Portland, Oregon	94 TKG Consulting Engineers, Inc. Oberlin Office San Diego, California	
66	Navy's Energy & Sustainable Demonstration Facility Port Hueneme, California	80 Regional Training & Distribution Center American Honda Gresham, Oregon	95 Toyota Portland Vehicle Distribution Center Portland, Oregon	
67	Navy Federal Credit Union Beaverton, Oregon	81 Rinker Hall - University of Florida Gainesville, Florida	96 Twin Lakes Park Office Complex Sarasota County Government Sarasota, Florida	
68	Nike, Inc. Ken Griffey Jr. Building Omaha, Nebraska	82 Schlitz Audubon Nature Center Milwaukee, Wisconsin	97 U.S. EPA, New England Regional Laboratory North Chelmsford, Massachusetts	
69	Noddle Development Company North Sarasota Library Sarasota, Florida	83 Seattle Terminal Radar Approach Control Federal Aviation Administration Burien, Washington	98 University of Denver College of Law Denver, Colorado	
70	S.T. Dana Building Renovation The University of Michigan Ann Arbor, Michigan	84 South Campus Office Development Toyota Motor Sales Torrance, California	99 William and Flora Hewlett Foundation Menlo Park, California	
71	Johnson Diversey Global Headquarters Sturtevant, Wisconsin	85 Sun Valley Branch of the Los Angeles Public Library Los Angeles, California	100 Willow School Phase I Gladstone, New Jersey	

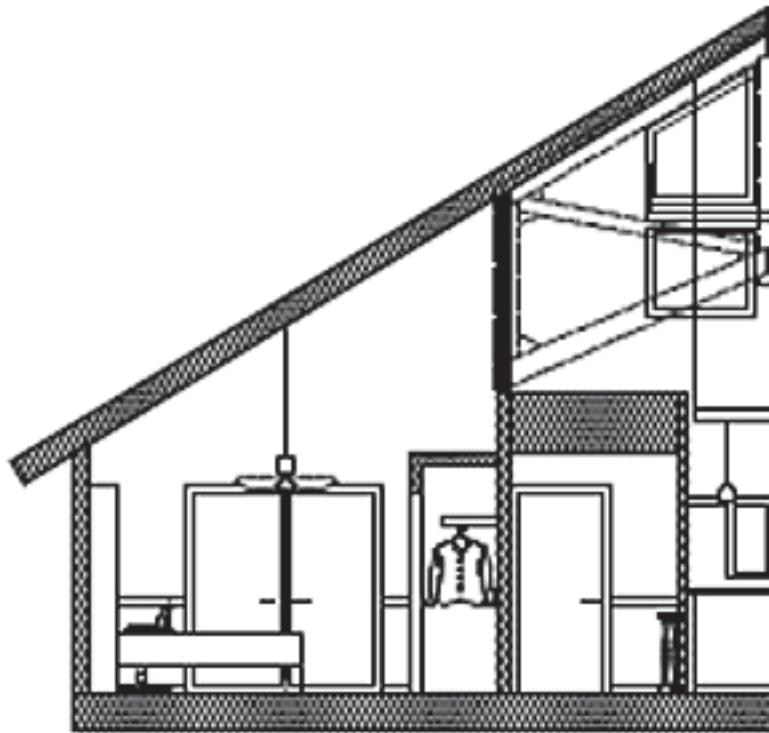
Map of the Nation's Platinum and Gold LEED® Certified Buildings

Current as of 04/11/06



*Sponsored by: GreenTouchScreen - www.GreenTouchscreen.com | TheMcAdams Group - www.FundingGreenBuildings.com
Design by The Visual Sense - www.TheVisualSense.com*

Supporting the Sustainable Design Project



How to make a donation:

Make Checks Payable to:
Florida State University Foundation
For: Sustainable Design Project

Mail To: John Gehrm
FSU Foundation
2010 Levy Avenue
Building B, Suite 300
Tallahassee, FL 32306-2739

Phone: 850-410-6600
Email: jgehrm@foundation.fsu.edu

Benefits of Donation:

- Tax Write-off / Deduction
- Exposure in Press Release
- Credit at the Site of the House
- Membership in the “Friends of Sustainable Design”
- Exposure on the Website
- Invitation to Special Events