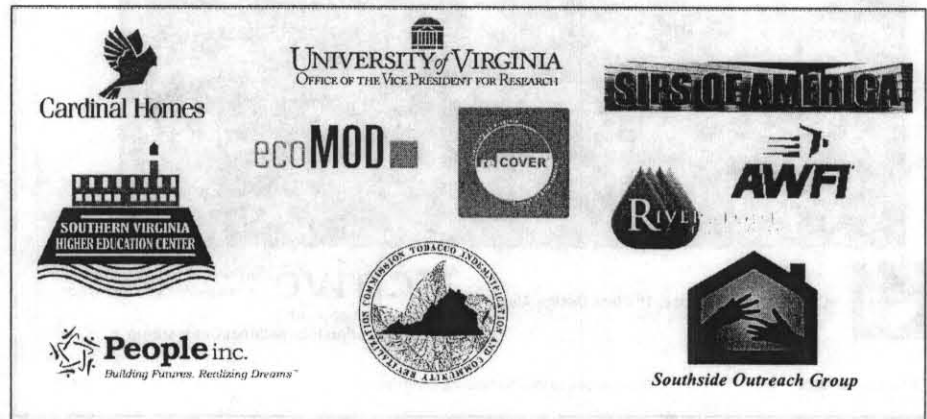


Partnership for Design and Manufacture of Affordable, Energy Efficient Housing Systems

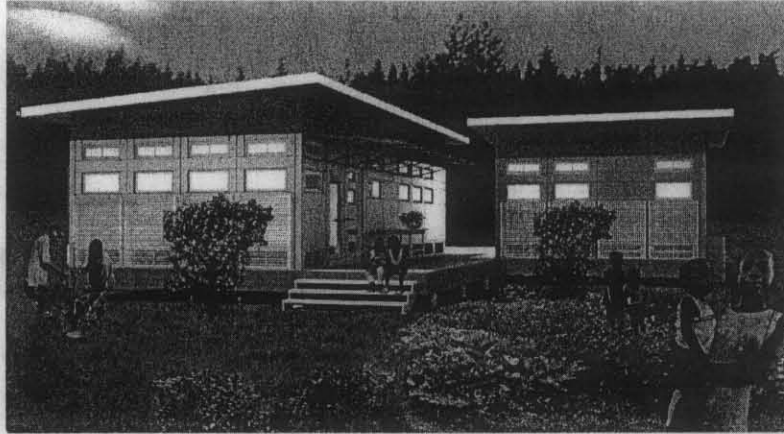
Dr. Phil Parrish, Associate VP Research, UVA
 Profs. Anselmo Canfora and John Quale, UVA School of Architecture



Affordable, Energy-efficient Housing Systems Partnership - Overview

- **Affordable** = initial acquisition cost + ongoing costs for homeowners (especially energy costs)
 - Applied R&D to foster economic development & jobs creation
 - Development of a robust housing systems industry in Southside VA: Goal of 35+ new jobs in 3 years based upon current funding
 - SIPS of America, Blairs, VA
 - Cardinal Homes, Wylliesburg, VA
 - American Wood Finishing, Inc., South Boston, VA
 - TopSolid, Inc., South Boston, VA
 - Other Tobacco Region companies in years 2&3 (specialty windows, specialty wood products, advanced HVAC control systems, alternative energy systems, energy-efficient lighting systems, sustainable flooring materials, etc.)
 - Two market thrusts:
 - Transitional disaster recovery systems
 - Affordable permanent systems
- } UVA School of Architecture
international award winning designs

*Affordable, Energy-efficient Housing Systems Partnership -
Transitional Disaster Recovery Housing System*



reCOVER Breathe House: 1st Place Design Award

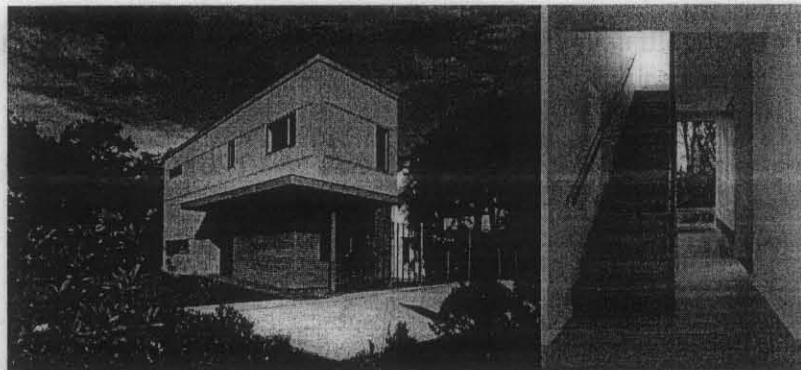
archive ⁺ architecture for health
in vulnerable environments
Kay e Sante nan Ayiti
Open Innovation International Competition

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*Affordable, Energy-efficient Housing Systems Partnership -
Award winning ecoMOD Project design - affordable, energy-efficient housing system*



completed ecoMOD4 THRU house for Habitat for Humanity of Greater Charlottesville

- For Partnership project, **3-bedroom multifamily units** are being designed based upon ecoMOD4, and will be built in South Boston (Southside Outreach Group; lot provided by Town of South Boston) and in Abingdon (People Inc)
- Will use SIPS panels manufactured by SIPS of America, and modules constructed by Cardinal Homes

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Highly integrated project - Partners' roles (year 1):

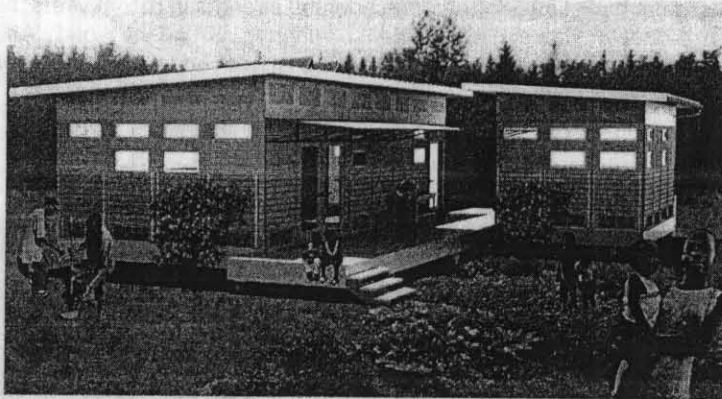
- **SIPS of America:** inhouse development of capability for automated, computer aided design and manufacture of SIPS panels, complete with all features (door and window openings, wire chases, coatings) to supply modular builder – will provide SIPS panels for both markets.
- **Cardinal Homes:** upgrading of ability to incorporate SIPS (from SIPS of America) into modular construction; focus upon both markets.
- **Southern VA Higher Education Center:** major support to SIPS in manufacturing automation; design for manufacture of key components of Breathe House; instrumentation of ecoMOD for on-going measurement of energy use. (working in the new Computer Aided Manufacture lab)
- **Riverstone Energy Center/American Wood Finishing Institute:** development of fire, pest, moisture, UV resistant coatings for SIPS panels; transition to SIPS of America. (work in new C-CARE coatings facility)
- **Southside Outreach, Inc:** demonstration of ecoMOD affordable multi-family homes in South Boston utilizing modules from Cardinal Homes; development of new construction expertise in Southside
- **People Inc:** Same as Southside Outreach, but in very different microclimate (Abingdon)

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Initiative reCOVER™



Transitional Disaster Recovery Housing™

Anselmo Canfora
Assistant Professor of Architecture
Initiative reCOVER Founder & Director



UNIVERSITY OF VIRGINIA
OFFICE OF THE VICE PRESIDENT FOR RESEARCH



PATENT
FOUNDATION
UNIVERSITY OF VIRGINIA

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reCOVER Objectives

Revolutionize disaster recovery housing to improve the quality of daily life for disaster victims

Replace current mediocre temporary housing solutions in the form of UN tents and FEMA trailers

Rethink manufacturing and deployment strategies and design for sustainable reuse

Reconnect victims of disasters to their community through a process of occupant-centered rebuilding

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"Natural disasters have struck with unprecedented strength in recent years, causing large-scale destruction and immense suffering around the world. **As many as 50 million people are estimated to be displaced in any given year due to tsunamis, earthquakes, landslides, flooding and natural disasters.**"

United Nations Office for the Coordination of Humanitarian Affairs



Japan, Tōhoku earthquake and tsunami, March 11, 2011



Haiti, earthquake, January 12, 2010

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Exacerbating the Problem

Lack of viable housing strategies by government agencies and NGOs

- Answered with reactionary, quick-fix responses to complex scenarios
- Relief shelters (temporary tents and trailers) become permanent homes
- Health and wellbeing of vulnerable populations is jeopardized



Port au Prince, Haiti



Pearlinton, MS



Pearlinton, MS

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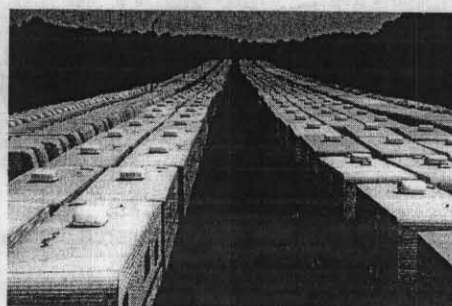
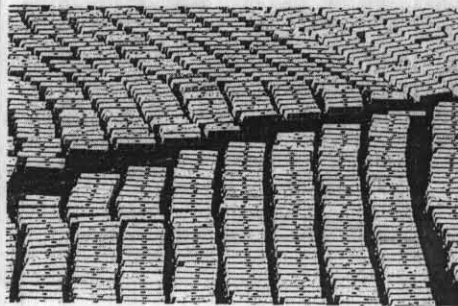
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FEMA Approach to Disaster Recovery

In response to Hurricane Katrina:

- FEMA purchased 145,699 travel trailers and mobile homes
- Production Cost: \$2.7 billion
- Storage Cost (13 sites): \$36 million



FEMA Storage Facility, Arkansas

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reCOVER Breathe House
1st Place Design Award

archive architecture for health
in vulnerable environments

Kay e Sante nan Ayiti
Open Innovation International Design Competition

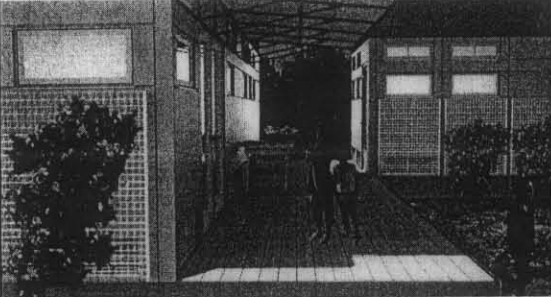




General views of the Breathe House

- 1st place out of 400 registered teams, 200 eligible entries, 147 designs, 20 finalists, top 5 designs selected for construction
- Scheduled to build first structure in St. Marc, Haiti in November, 2011
- Anticipate building 3 to 5 more units for St. Marc community

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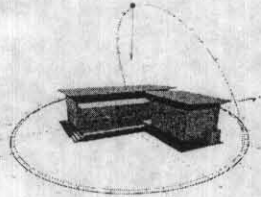
The reCOVER Approach: Community Involvement

- Begins with occupant-centered design and adapts to local customs, traditions and daily life
- Involves communities affected by a disaster in a rebuilding process and contributes to a sense of empowerment during a recovery phase

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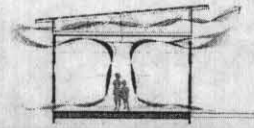
The reCOVER Approach: Energy Efficiency



Solar energy



Point-of-use water collection & filtration



Passive & active cooling

- Employs passive design strategies, renewable energy systems, and environmentally friendly building materials for optimal environmental quality
- Allows for the use of locally sourced materials to introduce new building skill sets in the local community



Interior view looking out to porch

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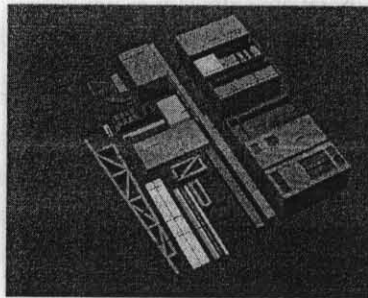
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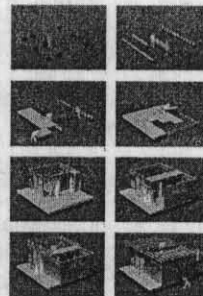
The reCOVER Approach: Anticipatory Design



Unitized panel



Prefabricated building components staging



Assembly sequence and personnel

- 1. Construction Requirements and Project Requirements
- 2. Conceptual Design
- 3. Preliminary Design
- 4. Final Design
- 5. Construction
- 6. Occupancy

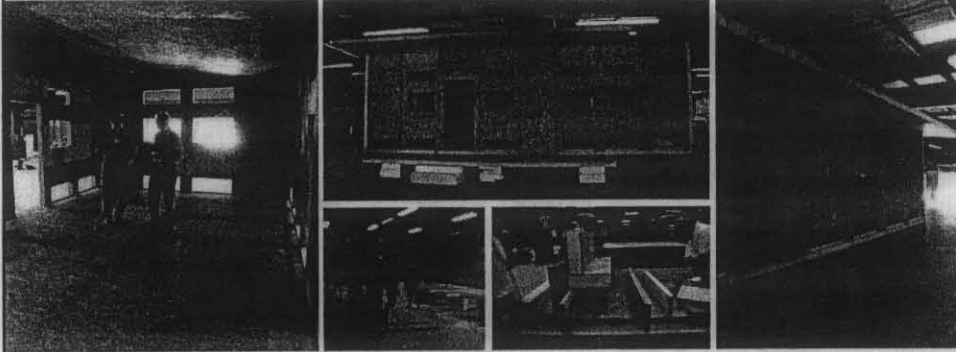
- Optimizes prefabricated panelized and modular manufacturing for anticipatory disaster recovery housing deployment
- Supplements prefabrication with conventional on-site construction and the use of locally sourced materials to help with the local economy

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The reCOVER Approach: Manufacturing Base



- Anticipates a growing supplier base capable of executing rigorous building specifications and producing large-scale quantities on demand
- Forges partnerships with government agencies and consultancy groups to enable viable procurement channels and deployment logistics

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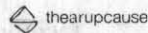
reCOVER: Business Solutions

- CEO/VP recruitment and incorporation underway
- Current manufacturing partnerships in Southside, Virginia
- Expand the network of manufacturers with special emphasis on companies in Southside, Virginia
- Currently discussing a strategic partnership with a company in the D.C. area
- Actively exploring alternative market segments
 - Housing for the homeless (TJACH)
 - Migrant housing in rural areas in U.S.
 - Informal housing settlements (Central and South America)
 - Military housing
 - Detached home additions and vacation "cabins"
- Competitive advantage
 - Registered copyright on architectural designs
 - Anticipated patent protection on new methods of manufacture/assembly
 - Exclusive access to UVa reCOVER team for specialized design and R&D
 - Continuously growing commercial partnership network

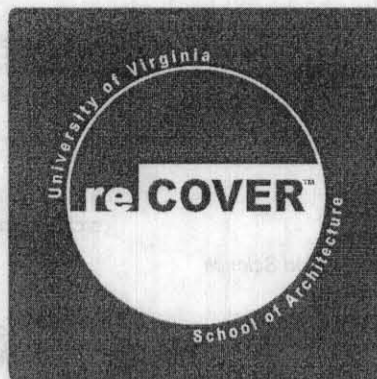
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6 September 2011



Anselmo Canfora
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Director, Initiative reCOVER
University of Virginia School of Architecture
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anselmo@virginia.edu

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PREFAB or REHAB?

ecoMOD ■

ecoREMODO ■

creating sustainable housing units for affordable housing organizations

ecoMOD and ecoREM0D

a multi-disciplinary collaborative research project

John Quale

Associate Professor
ecoMOD Project Director
University of Virginia
School of Architecture

Paxton Marshall

Professor
ecoMOD Engineering Director
University of Virginia
School of Engineering and Applied Science

Nancy Takahashi

Chair, Landscape Architecture
ecoMOD Landscape Advisor
University of Virginia
School of Architecture

Louis Nelson

Associate Professor
ecoMOD Historic Preservation Advisor
University of Virginia
School of Architecture

students:

architecture; engineering; landscape
architecture; planning; historic preservation;
business; environmental science;
economics; history

faculty:

architecture; engineering; landscape
architecture; planning; historic preservation;
business

professionals:

contractors; engineers; subcontractors /
fabricators; modular building experts;
affordable housing experts; daylighting and
passive design experts

community:

neighborhood associations; local non-
profits; preservation organization

ecoMOD and ecoREM0D

a multi-disciplinary collaborative research project

ecoMOD1: Charlottesville, VA, Piedmont Housing Alliance, 2004-05

two unit condominium; \$114 per square foot

ecoMOD2: Gautier, MS, Habitat for Humanity, 2006-07

single family detached; \$65 per square foot

ecoMOD3: Charlottesville, VA, Piedmont Housing Alliance, 2006-08

two housing units: historic house renovation and new accessory dwelling unit; \$123 per sq ft (new)

ecoMOD4: Charlottesville, VA, Habitat for Humanity, 2008-09

single family detached; \$125 per square foot

ecoREM0D1: Charlottesville, VA, City of Charlottesville, 2009-11

two housing units: historic house renovation and basement accessory dwelling unit

ecoREM0D2: Falmouth, Jamaica, Falmouth Heritage Renewal, 2011

historic house renovation and addition

COMPLETED TO DATE: 9 housing units

UPCOMING:

ecoMOD SOUTH: South Boston and Abingdon, VA, Southside Outreach and People Incorporated, 2011-2012

four new townhome housing units based on ecoMOD4 design

ecoMOD5 and ecoREM0D3: Charlottesville, VA,

Albemarle Housing Improvement Program and Habitat for Humanity, 2012-13

one new construction and several renovation and addition projects

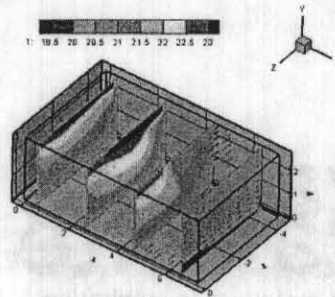
design

- interdisciplinary and collaborative
- inspired by best practices from around the world
- rigorous assessment of climate response and environmental impact

build



evaluate

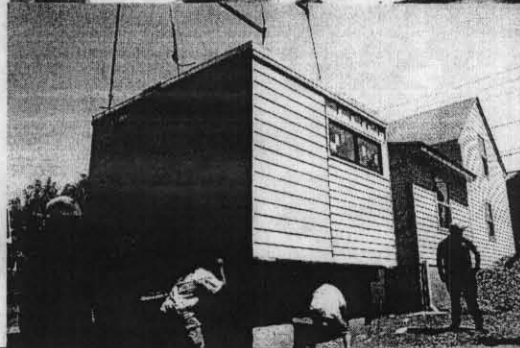
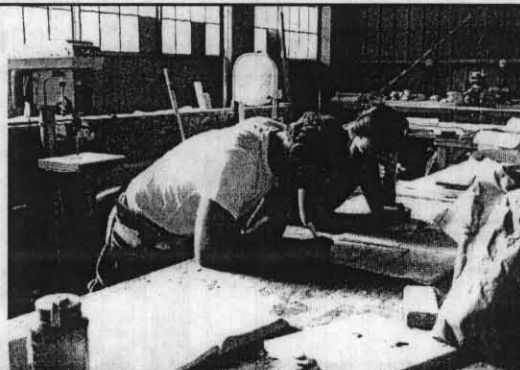


design

build

- local and regional materials
- built to LEED and Passive House standards
- strict adherence to budget of affordable housing partners

evaluate

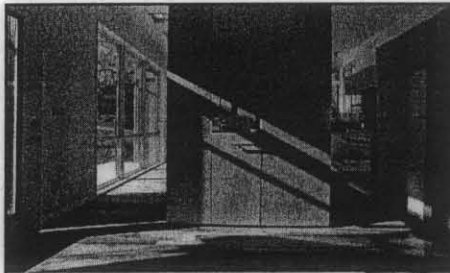
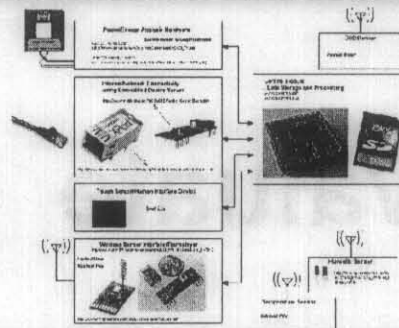
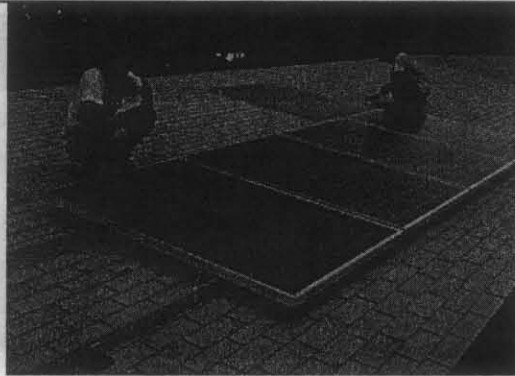


design

build

evaluate

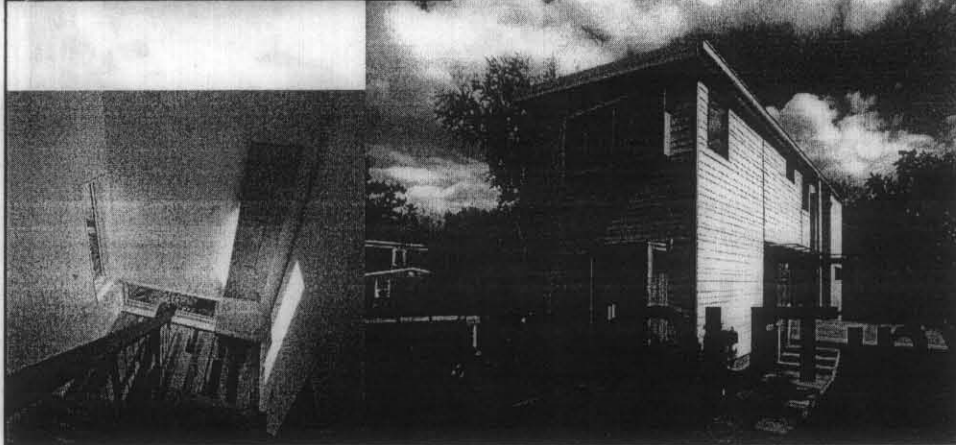
post-occupancy evaluations and
extensive performance monitoring

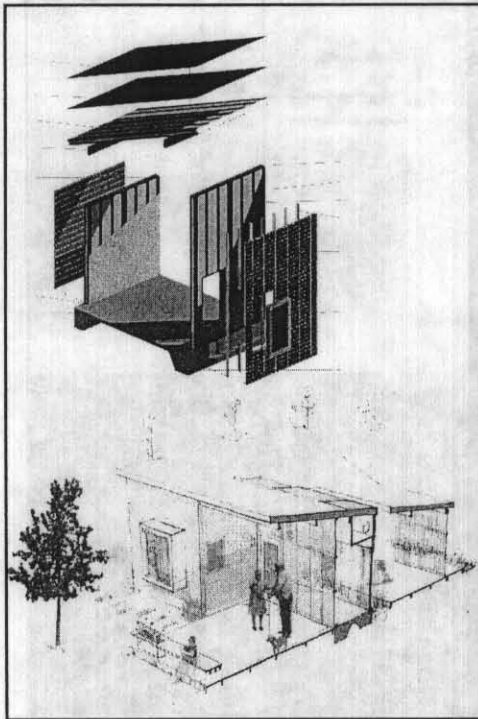


ecoMOD **OUTin house**

for Piedmont Housing Alliance
Charlottesville, VA 2004-05

- two unit condo
- potable rainwater collection
- SIPs and modular construction
- solar hot water system
- 50-65% utility savings

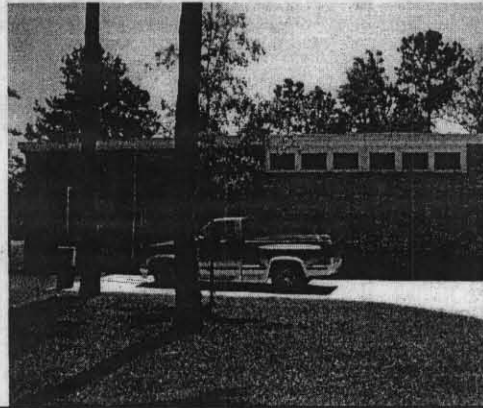




ecoMOD 2 preHAB house

for Habitat for Humanity
Gautier, MS 2004-05

- post Katrina replacement housing
- Thermasteel panelized construction
- photovoltaic system
- desuperheater water heating
- reclaimed materials from demolished homes



historic house (after)

ecoMOD 3 SEAM house

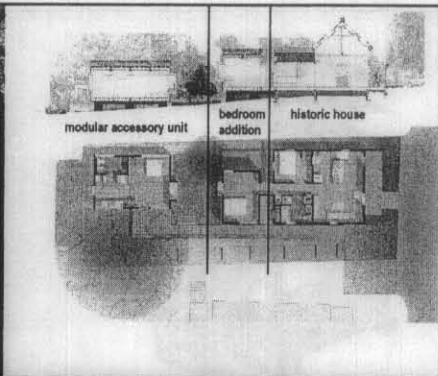
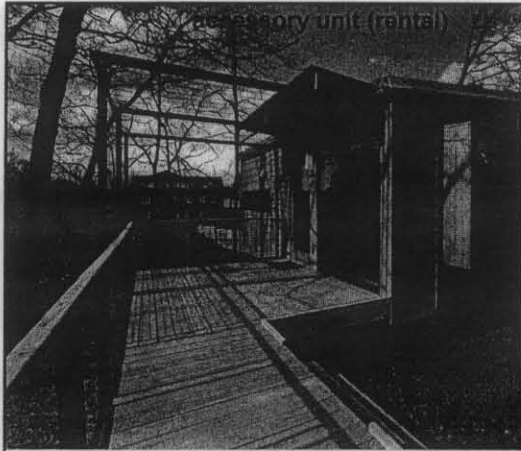
for Piedmont Housing Alliance
Charlottesville, VA 2006-07

- historic preservation of former slave quarters with new modular additions
- two units: historic house plus accessory rental unit in backyard
- Thermasteel and modular construction
- evacuated tube solar hot water system
- green roofs
- reused and repurposed materials

historic house (before)

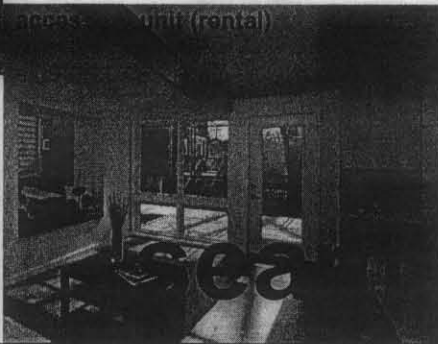


historic house (after)



fully accessible accessory dwelling unit

LEED for Homes Platinum Certification
(smallest LEED building in the world)



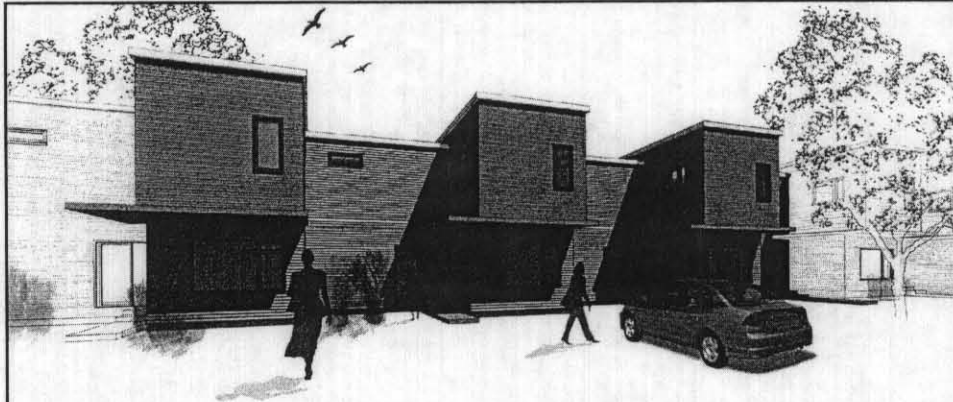
ecoMOD the THRU house

for Habitat for Humanity of Greater
Charlottesville

*ecoMOD4 was designed for use by any Habitat
affiliate, and the built prototype for Habitat-
Charlottesville was occupied by an Afghani refuge
couple in May, 2010*

*the collaborative design process occurred during
the 2008-09 academic year in a series of design
studios, engineering courses and research
seminars*





Based on the ecoMOD4 design, the **ecoMOD SOUTH** project will create four housing units – two in Southside and two in Southwest – using exactly the same design. The variables of differing sites, occupants and microclimates will contribute to the research.

TARGETS: Passive House standard and LEED for Homes Platinum

CLIENT PARTNERS: Southside Outreach and People Incorporated

ecoMOD ■ **SOUTH**

Acknowledgement of Support

- The Partnership is grateful for the generous support being received from Virginia Tobacco Indemnification and Revitalization Commission for this project