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[Home](#) > [Awards](#) > [R+D Awards](#) > 2013 R+D Awards Winner: EcoMod

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2013 R+D AWARDS

2013 R+D Awards Winner: EcoMod

The University of Virginia is redefining the notion of high-performance, modular housing, beginning in the neighborhoods that need it most.

By [GIDEON FINK SHAPIRO](#)

ABOUT THE AUTHOR

[Gideon Fink Shapiro](#)

Gideon Fink Shapiro is a research based in Brooklyn, N.Y. A frequent ARCHITECT and other publication currently a Ph.D. candidate in architecture history and theory at University of



Trent Bell Photography

EcoMod recently completed two prefab houses in South Boston, Va. Sited side-by-side, the structures look nearly identical, but the one on the left is designed to Passive House standards—a challenge given the area’s hot, muggy summers and cold winters—while the other serves as a control house against which to compare building performance. Both use materials rated with the team’s system of radial charts that quantify key project goals.

Sustainable and affordable are two words that aren’t typically seen together in the building industry. The juxtaposition is what caught the eyes of the jury as it reviewed the high-performance, modular housing design led by John Quale, an associate professor of architecture at the University of Virginia (UVa). Over the past decade, the [EcoMod](#) project has pooled the research and development efforts of more than 370 students from UVa’s architecture, engineering, landscape architecture, planning, business, and historic preservation programs. Together, they’ve ventured into merging ecology with economy, and modern design with modular construction and community partnerships.

This summer, EcoMod is wrapping up its first three modular, “commercially viable,” and affordable houses. Juror Jing Liu praised Quale’s dedication “to hold on to something so unflashy and make it happen eventually.”

Reaching this current state of imminent commercialization required the completion of several one-off housing prototypes. The first iteration of EcoMod, an energy-efficient, two-unit condominium in a low-income neighborhood of Charlottesville, Va., was realized in 2004 in collaboration with the local affordable housing organization, Piedmont Housing Alliance. The next iteration, designed and built in collaboration with Habitat for Humanity of the Mississippi Gulf Coast in 2005 and 2006 for a family displaced by Hurricane Katrina, was a steel-and-foam panel house with both passive and active energy-saving technologies. In 2009, the group realized a prototype house for Habitat for Humanity of Charlottesville that featured a super-insulated building envelope, stormwater recapture, and a photovoltaic array donated by the local utility company.

In 2011, Quale received a \$2.45 million research grant to redevelop and “commercialize” the Charlottesville prototype into a replicable, economically sustainable design. Working with a Passive House consultant, a local modular homebuilder, and two nonprofit housing organizations, Quale and his students experimented with massing studies and building components in an attempt to optimize housing costs, livability, and energy

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performance.

To determine which building system or component to implement, the team developed a Decision Analysis Tool (see examples below), a radial chart that quantifies any number of parameters in six categories: social, environmental, financial, technical, aesthetic, and energy. For example, after comparing the benefits of structural insulated panels (SIPs) with a more conventional double-stud wall, the team opted to combine aspects of both: SIPs on the outside plus an extra stud wall on the interior, for a three-layer wall separated by two layers of insulation.

Fabricated earlier this year, the first three commercially viable modular units—all two-story, 1,800-square-foot, four-bedroom residences—are being installed on site this summer. All three houses are slated to be rented or purchased by low-income families. Two of the houses have been built to international Passive House (PH) standards at the construction and delivery cost of \$105 per square foot (this does not include design fees or foundation work). One PH unit is sited in muggy South Boston, Va., while another is sited 200 miles west in mountainous Abingdon, Va., where winters are much colder. The third unit, sited next door to the South Boston PH unit, was built to the local code requirements and cost \$70 per square foot—it serves as a sort of control unit. EcoMod plans to monitor the thermal and energy performance of all three units throughout occupancy to compare the effect of climate variation and to “assess the return on investment” on energy-saving components and systems.

“I don’t see anything super innovative here,” juror Bill Zahner said, but the project’s objectives “to deliver energy efficiency and build affordable housing in an area that is depressed are great.” To which juror Lawrence Scarpa noted, “Well, here’s something innovative: \$105 a square foot. The project is doing more than just providing shelter: It’s really adding to the environment and community and the economy.”

The modules were fabricated just 20 miles away from the South Boston building site in the Cardinal Homes factory. Meanwhile, many of the building materials were regionally sourced: the FSC-certified red oak flooring hails from Abingdon, the bark siding from just south of the Virginia–North Carolina border, the decking lumber from in-state, and the SIPs and cementitious fiber board siding—which contains 50 percent flyash recovered from nearby coal-burning power plants—from Georgia.

EcoMod is on the verge of redefining what affordable housing means. Its high-performance modular house could proliferate in the coming years; it can now be licensed to potential homeowners, developers, affordable housing organizations, and modular home builders. Meanwhile, Quale and his collaborators are embarking on another energy-efficient renovation initiative in Charlottesville, while pursuing the dream of designing a LEED certified residential ranch that costs \$65 to \$70 per square foot.

To see all of the winners of the 2013 R+D Awards, [click here](#).

Project Credits

Project EcoMod South: High Performance Affordable Housing

Client Southside Outreach, South Boston, Va.—Earl Howerton, Earlene Powell; People Inc., Abingdon, Va.—Mike Rush, Michael Weaver

Primary Investigators University of Virginia, School of Architecture, School of Engineering and Applied Science

Project Team John Quale (associate professor and EcoMod project director); Michael Britt, AIA (project manager); Elizabeth Rivard, Assoc. AIA, Erik de los Reyes (research assistants: architecture); Beth Bailey (research assistant: landscape architecture); Barbara Gehrung (Passive House consultant); Paxton Marshall



A Look at the 2016 Venice Biennale Participants

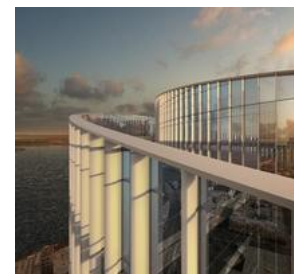
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(engineering director); Nancy Takahashi (landscape architecture adviser); Eric Field (digital simulation adviser); Galen Staengl, Staengl Engineering (mechanical design); Phil Parrish (associate vice president for research)

Prototype Design Team The EcoMod South design is based in part on EcoMod4, a modular home completed in 2009 for [Habitat for Humanity](#) of Greater Charlottesville; the design and construction team included more than 70 architecture, engineering, landscape architecture, planning, and commerce students.

Off-Site Construction Cardinal Homes, Wylliesburg, Va.—Bret Berneche (president)

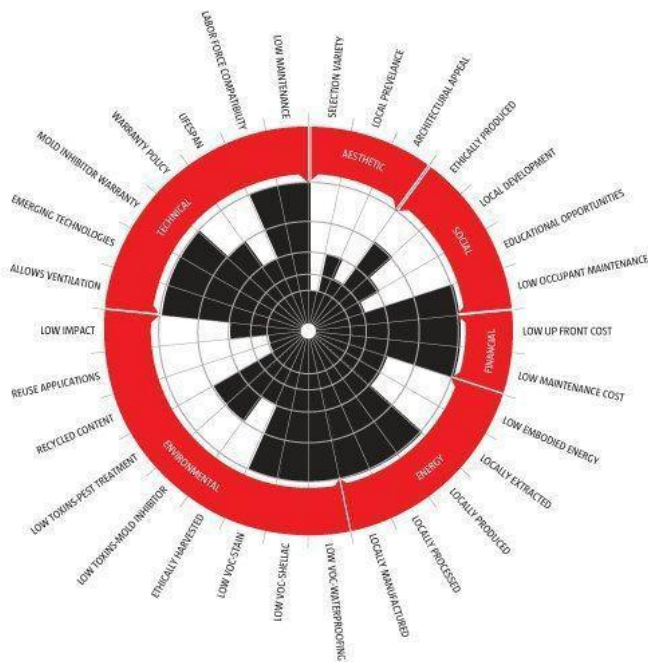
On-Site Construction Allen Stevens Construction (site in South Boston, Va.); People Inc., C.W. Denton Construction (site in Abingdon, Va.)

Funding Tobacco Indemnification and Community Revitalization Commission of Virginia



Trent Bell Photography

One of EcoMod's prefab houses in South Boston, Va.



Courtesy University of Virginia School of Architecture EcoMod project

The EcoMod team used an analytical model, the Decision Analysis Tool, to quantify parameters and aid in decision-making. Shown here is an analysis of Timbersil, a treated wood siding and decking material.



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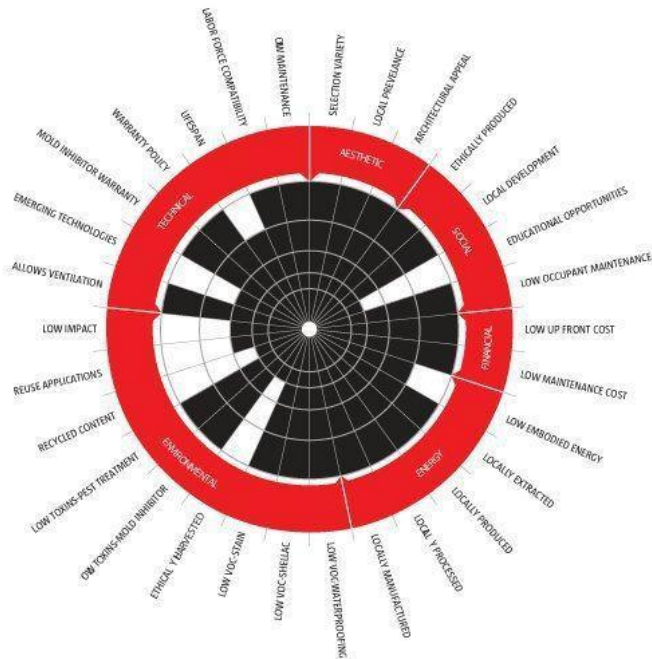
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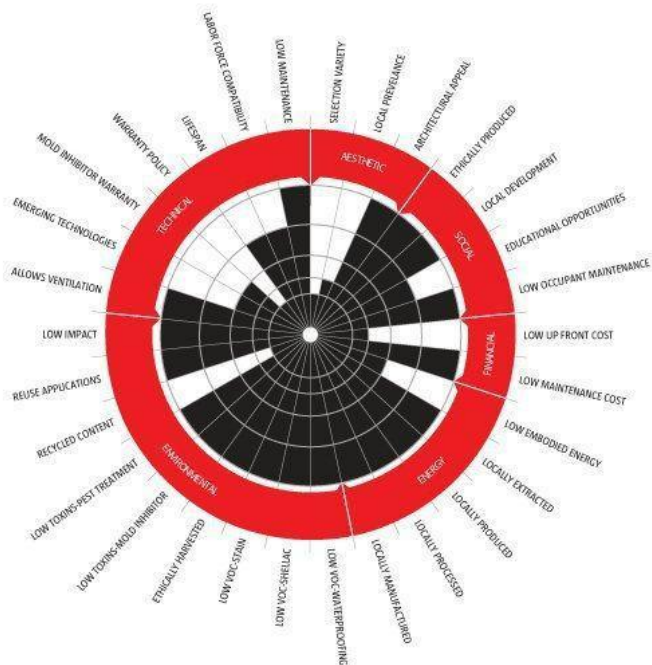


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Courtesy University of Virginia School of Architecture EcoMod project

Decision Analysis Tool: the model for Nichiproducs, a cementitious fiberboard plank siding material.



Courtesy University of Virginia School of Architecture EcoMod project

Decision Analysis Tool: a model for Highland Craftsmen poplar bark siding.



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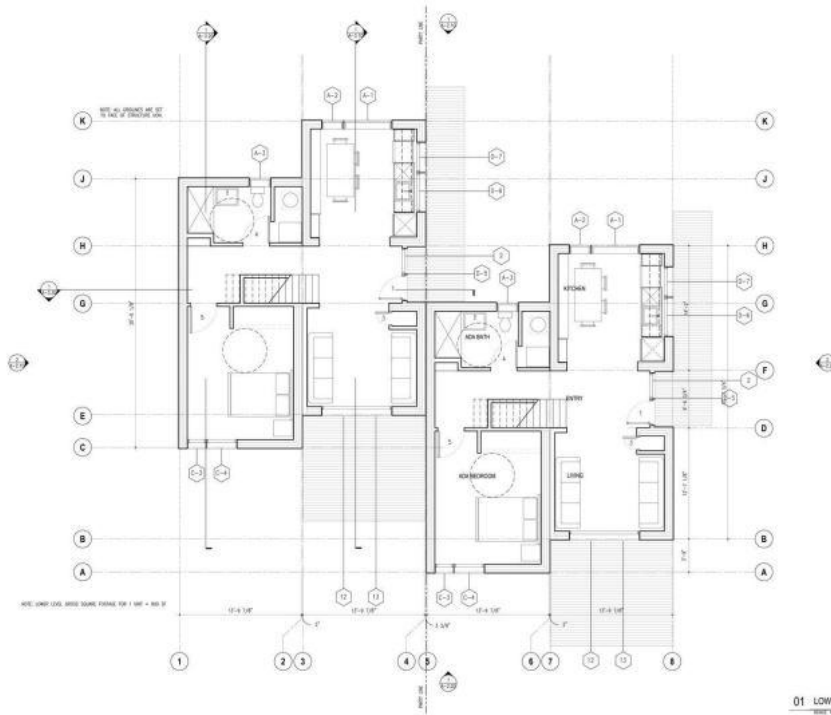


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01 LOWER LEVEL FLOOR PLAN

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 EcoMOD South
 South Boston, VA, Arlington, VA
 University of Virginia
 School of Architecture & Applied Science
 Charlottesville, VA 22904
 EcoMOD Project Director
 John G. H. ...
 EcoMOD Engineering Director
 ...
 Client
 ...
 SHEET NUMBER
A-1.10

Courtesy University of Virginia School of Architecture EcoMod project

Lower-level floor plan.

BRIEFS

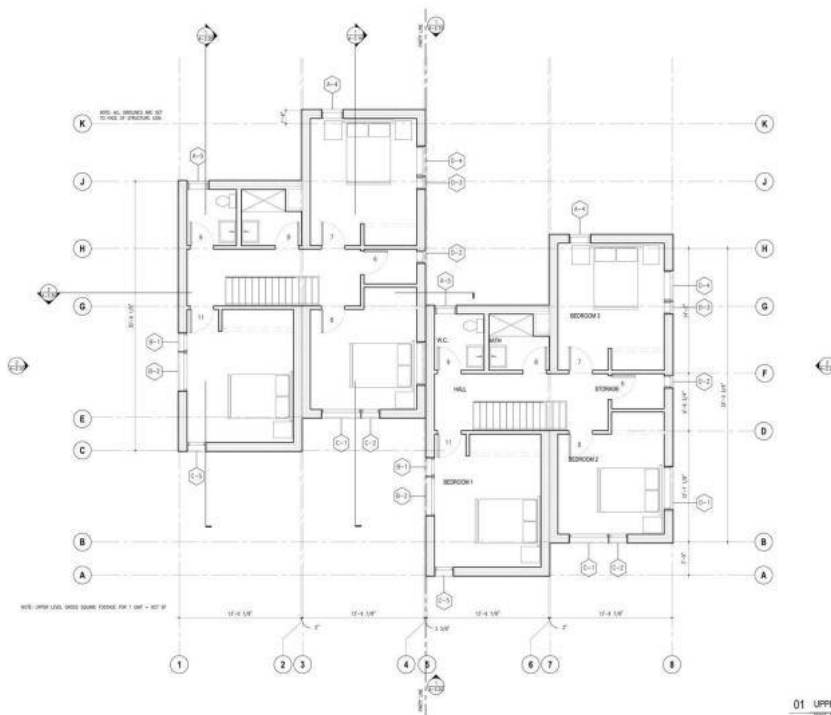
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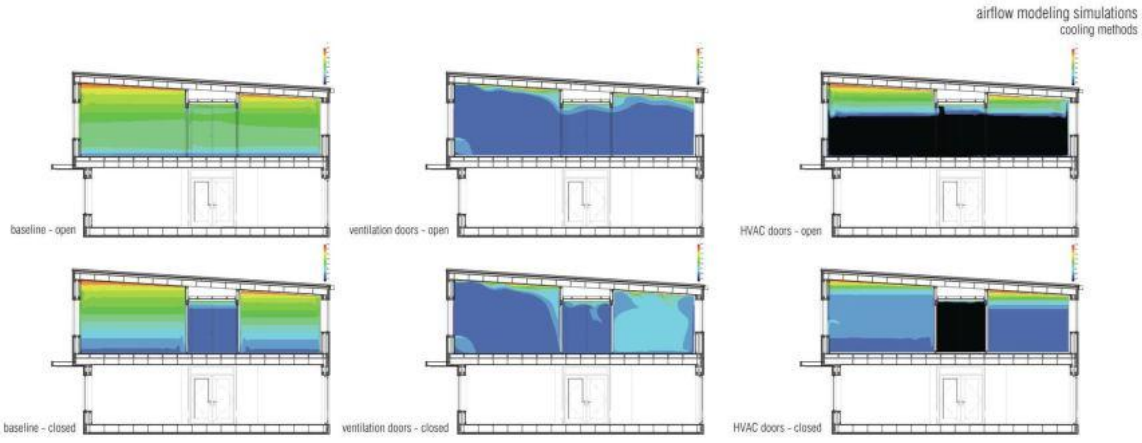


01 UPPER LEVEL FLOOR PLAN

EcoMOD
 EcoMOD South
 South Boston, VA, Arlington, VA
 University of Virginia
 School of Architecture & Applied Science
 Charlottesville, VA 22904
 EcoMOD Project Director
 John G. H. ...
 EcoMOD Engineering Director
 ...
 Client
 ...
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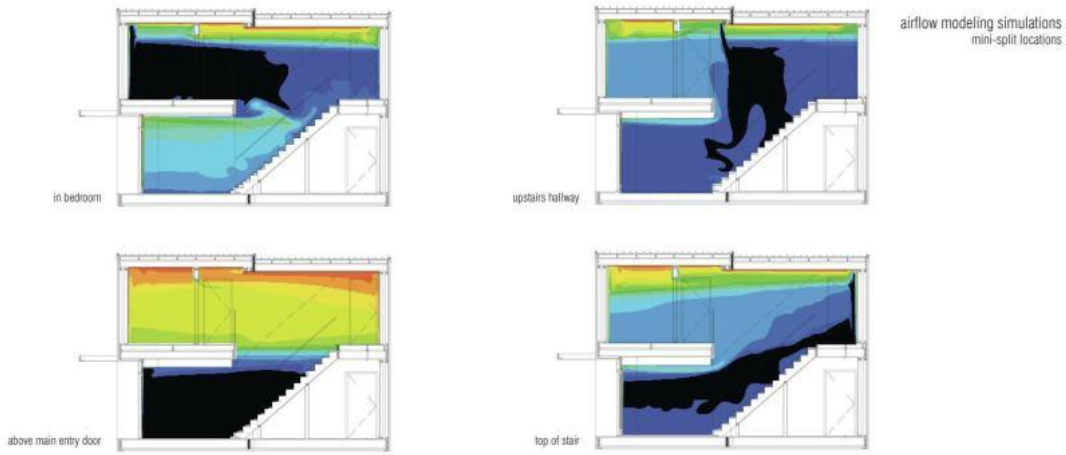
Courtesy University of Virginia School of Architecture EcoMod project

Upper-level floor plan.



Courtesy University of Virginia School of Architecture EcoMod project

Airflow modeling simulations.



Courtesy University of Virginia School of Architecture EcoMod project

Airflow modeling simulations.



Trent Bell Photography

Designed to meet Passive House standards, the prefabricated unit is scheduled to be completed by the end of this summer.



Trent Bell Photography

The houses feature NichiProducts fiber board plank siding by Nichiha and poplar bark siding by Highland Craftsmen.

Advertisement

Keywords:

SUBJECT:

Affordable Housing Green Building Community Projects

STATE:

Virginia

LOCATION:

New York-Northern New Jersey-Long Island, NY-NJ-PA

PEOPLE:

Lawrence Scarpa Bill Zahner Jing Liu John Quale

ORGANIZATION:

Habitat for Humanity Piedmont Housing Alliance University of Virginia

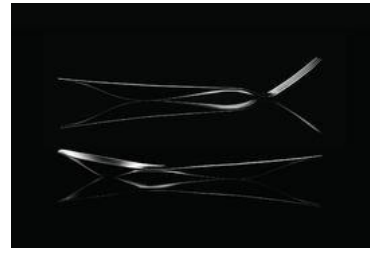
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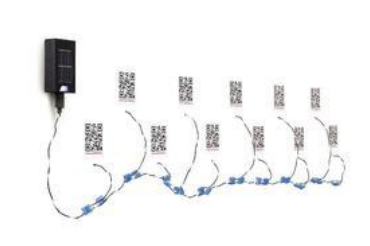
Award: [NYC Loop](#) >



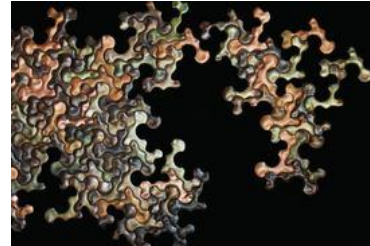
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Peter B

957 days ago

Why does architectural experimentation on low cost housing for lower income consumers always have to be so sterile and homely looking? Virginia has a wonderful tradition of colonial architecture that could be employed here and create a home-like atmosphere.

It would be so much warmer and pleasing to the eye and have so much more of the connotation of home.

All this brutalist and angular modernism ought to be saved for those with money who desire to be cutting-edge in design.

These two houses for all their practicality and green-ness are not in the least loveable!

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Terre Tulsiaik

945 days ago

Agreed! Even though up close there is texture seen, it otherwise looks like an ugly 2-story trailer.

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