# ecoMOD3 — The SEAM House: Preservation as Social and Environmental Justice

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## JOINING OLD AND NEW

ecoMOD is a design-build-evaluate initiative for interdisciplinary teams of students and faculty to work together to address the important issues of sustainability and affordable housing. By working with affordable housing organizations like Piedmont Housing Alliance and Habitat for Humanity, the project strives to provide students with an in-depth learning experience collaborating on projects to produce well-designed, prefabricated homes within the reach of low-income Americans. Previous projects include ecoMOD1, a two-unit condominium in Charlottesville and ecoMOD2, a single-family detached home built with Habitat for Humanity in Gautier, Mississippi for a family displaced by Hurricane Katrina.

The kernel of this combined historic preservation / new construction project began in the fall of 2004. Piedmont Housing Alliance (PHA) acquired a house in a traditionally African-American neighborhood, along with a small cottage behind it. PHA wanted to tear down both the house and the cottage, and put up more affordable homes. Both buildings were in a serious state of disrepair, and had been condemned. The foundations for both, which were probably not adequate to begin with, had been undermined by the constant flow of water off the street and on to the foundations set at a lower elevation. The buildings were leaning over, and the cottage in particular could have fallen over in a major windstorm.

The city was financially supporting PHA's efforts in the neighborhood, and had encouraged them to purchase the condemned properties so they could be torn down and replaced. PHA submitted the paperwork for a demolition permit for the house and the accessory cottage in February '05. To everyone's surprise, the city issued the permit for the cottage, but not the house. Apparently it had been individually designated as an important historic property, and while the neighborhood was not an historic district, the designation had the effect of putting the demolition and any potential new construction on the site under the purview of the local Board of Architectural Review (BAR). PHA was in a state of disbelief since the house was in such bad shape. It was difficult to imagine that it had any historic value. It appeared to have been occupied by squatters and used as a crack den. It would undoubtedly cost a lot more to renovate than to build a new affordable house, especially since it needed to meet the guidelines of the BAR for historic properties. They soon learned the historic designation was due to evidence that the house dated from the mid 19th century, not the mid-20th century as had been assumed, and there was reason to believe the original core of the house had been built as a slave quarters.

Figure 1. ecoMOD3 historic house before

Figure 2. historic house after renovation

Figure 3. plan diagram of modular accessory unit (left), modular bedroom addition (center) and historic house (right)

Over the next year, PHA officials considered a variety of solutions to the problem of being stuck with a historic property without the budget to restore it. One option was simply to put the house and cottage back on the market. In the summer of '06, as ecoMOD was about to start the design process for the third iteration of the project, PHA approached me about taking on the historic house. PHA had already worked with ecoMOD for ecoMOD1. PHA and I decided to make the home the focus of an extensive effort to research its history, carefully restore and improve it, and place a prefab bedroom addition behind it, as well as a new detached, prefab accessory unit – replacing the original cottage that had by then been torn down.

Over its long life the house had been layered with a hodge-podge of materials and room additions. The previous owner, and many of the long-time neighbors were surprised to learn it had received a historic designation. The neighbors felt the home was an eyesore, and should be torn down to make way for more affordable housing. The linkage between preservation and sustainability was part of the ecoMOD team's justification for helping to keep the structure, but it became pretty clear that the team would have to remove so much of the fabric of the building to stabilize it that the final result would essentially be a new building. A report from a local structural engineer validated this assessment. The foundation and much of the original framing would have to be replaced and / or supplemented.

In the fall of 2006, the ecoMOD3 team –graduate and undergraduate architecture and engineering students, as well as graduate historic preservation, planning and landscape architecture students – started working on the design phase. As the fall semester got into gear, a few themes were floating around in the students' heads: the *connection* between the historic building and the new additions, and the architectural idea of a spatial *overlap* between inside and outside. These themes became fused together when the team discussed possible solutions to the construction joint between the modules as they are placed next to each other on the foundation. This gap is always a challenge because even though the modules are built with everything plumb and level, separate modules tend to be slightly different from each other. When they travel down the highway at 65 miles per hour a 1/4" misalignment is not unexpected. As the student designers discussed an architectural solution to this problem, involving a joint or 'seam' of plywood and cabinetry located where the modules meet that would allow us to avoid drywall in that area and hide any misalignment, the name SEAM house was born. The SEAM concept extended to the old / new and inside / outside ideas of the project. The literal plywood SEAM strategy also found its way into the interior of the historic house at the undulating plywood that forms the kitchen countertop and guardrail at the loft above.

The ecoMOD3 historic preservation team (HP for short) consisted of two graduate students with historic preservation backgrounds, four architecture undergraduates with an interest in the topic, and several engineering students how helped with structural, mechanical and site issues. The HP team was a sub-set of the entire team, which totaled 48

students. Louis Nelson, chair of the UVA Department of Architectural History, advised the students on historic research efforts, helping the team decipher both the physical and documentary evidence. The director of the department's Historic Preservation Program, Daniel Bluestone, also advised occasionally, and was partly responsible for saving the house. He attended the BAR meetings and the City Council meeting in '05 where he voiced his opinion that the house probably represents a unique example of an anti-bellum slave quarters and ought to be saved.

Nelson was particularly effective at helping students balance the need for rigorous scholarship with the importance of defining an accurate and compelling narrative for a building. He helped date the building through elements such as nails and saw marks. There were plenty of these to observe as the team removed some of the layers of the building and researched the history. The team mined the city property and historic records to find information. Like many African-American neighborhoods in the south, much of its history is unrecorded. The earliest documentary evidence was missing – there was no record of when the land was transferred from John Barksdale, a white slaveholder to Armistead Smith. Smith clearly owned the property after the Civil War, as the deed was transferred to his adult son upon his death in 1870, and his son paid some of the remaining debt on the property to Barksdale. The physical evidence of the earliest phase of construction suggests that an educated builder, who used methods common to slave quarters, built the structure. Smith may have been one of Barksdale's slaves. Though there is no documentary evidence of this, it was not uncommon for freed slaves to purchase homes from their former masters in the era immediately after the war.

A common strategy in historic preservation is to establish an important date in the history of the house, and gear the renovation effort toward remaking the building in that year. The team rejected this strategy because the exact year of construction was unknown, and the multiple layers of additions and materials made it difficult to design to any one year with confidence. In addition, the preservation team recognized there was value in the many layers of history, and while the renovation required most of the recent materials to be removed, they didn't want to 'beautify' the building into something it never was. The various materials and construction strategies represented a wide range of skill levels, and a 'repair as you go' attitude. The creative reuse of materials to patch walls, floors and roofs, and the additive nature of the building meant the precise history would never be known. The HP team felt the spirit of this idiosyncratic 'make-do' strategy should be revealed in the final building. To the degree that it was realistic, the team wanted to save the earliest materials and quirks of the building. So the HP team aspired to a process of selective editing, with complete removal of something only when doing otherwise would affect the budget, or the energy performance.

The historic designation of the house required that the design team present drawings to the BAR. The board was supportive of the design, as most of them recognized that they were fortunate PHA was willing to restore the building given the state of it. Fortunately, the BAR guidelines require that an addition to an historic structure be clearly distinct from the original building and easily removed. The massing of the addition had to be shorter and narrower than the original, which limited the addition to one story (although the house is technically two stories, the original ceiling heights would not be allowed today). After a series of meetings the project was approved. As required, the modular addition is clearly different, but the HP team also added joints and material differences to the historic house to demark the contrast between the original part of the structure and the additions that had been masked over time. For example, vertical trim pieces were added between the new exterior siding at the joint between the phases of construction.

Extensive analysis revealed that the house was built in five phases spanning from the early 1860's to the 1980's. The HP team did extensive visual documentation of the home, including 2-D and 3-D drawings, as well as a 3-D scanning process that captured all of the detail of the rooms after some of the interior finishes had been removed. The team worked to carefully identify the vintage of many elements of the home, and formulate a story of its construction. The multiple additions made it difficult to know exactly the form of the house at each stage of construction. The HP team found plenty of contradictory evidence in the building. Most notably the hand-riven lathe found underneath the original plaster in the living room, which if seen

in isolation would date the building to the 1820s or 30s, contradicted a few saw marks on the roof framing indicating an earliest possible initial construction phase in the late 1850s or early 1860s.

The team formed a hypothesis that the front portion of the home was built in two phases – with a slender stair room addition on the north side added later. This was based on the odd placement of the stair as a separate room; indicating the wall closing it off from the main living area was probably a structural wall. If that segment were to be sliced away a nearly perfect example of a 16' square slave quarters of the early to mid-19th century would be left. The odd asymmetry of the front windows and doors reinforced this interpretation, but it was only when the drywall on the roof framing and the baseboard at the downstairs wall were removed that the HP team was able to confirm their theory. This was further confirmed when the exterior siding was removed on the front, revealing the framing of the front window (which would be roughly centered on the façade without the stair room addition) was originally a door. The team also discovered traces of framing and whitewash finish that suggest a ladder was used to access the upper loft prior to the addition of the stair.

The most difficult decision the team made in the effort to design new interiors was the choice to remove the wall between the living room and stair room/entry. The narrow space was unusable, but the designers hated the idea of removing the wall that the team had only recently discovered was an exterior wall in the original scheme. However, the home had to be marketable. At only 644 square feet on the first floor, there wasn't a lot of extra space for the extravagance of honesty in historic preservation – the family needed a kitchen, two bedrooms, bathroom and living room – all handicapped accessible. So the team saved the wood studs from the wall, and put them together like a column at the two end points of where the wall once stood. The ceiling was removed under the loft framing to expose the difference in framing on the two sides of the wall. Since the 'original' flooring (probably installed between the 1930's and 1950's) had to be removed so the builder could lift the house and install a new foundation, when it went back down, the team changed the orientation of it along the wall line, further reinforcing the old wall location.

The unique and intricate history of the house tells the story of vernacular affordable housing in Charlottesville, as well as the social conditions in the traditionally African-American neighborhood of Castle Hill-Fifeville. From the core of what was probably a slave quarters; to the addition of an interior stair and kitchen in the era of Reconstruction; to the addition of a first floor bedroom in the Jim Crow Era; and the enclosure of a bathroom after the civil rights era, the house is something of a text book on the history of housing for African-Americans in the south.

## THE PREFAB ADDITION SYSTEM AND ACCESSORY UNIT

Despite the emphasis on the very specific history of the house, the design team's goal with the bedroom addition and detached accessory unit was to create a modular system that was flexible enough to attach to any home. The team was constantly aware of the immediate context, but simultaneously strived to imagine the adaptations that would be required to create a variety of permutations. The team avoided a 'one-size-fits-all' solution and instead designed a system that included three module types, two roof profiles and a variety of window locations and sizes that could be arranged according to the climate, solar orientation, topography and preferences of the homeowner. A 12' x 16' volume is constant, but the modules can be attached to each other in a variety of ways, and can even be stacked.

Figure 4. interior of ecoMOD3 accessory unit, showing 'SEAM' at right

The rear accessory unit has super-insulated wall and roof panel construction; low-impact materials;

a modular green roof system; a deck with trellis-shade device; a rain garden and courtyard. The landscape and green roof mitigates the storm water on the site. The team aims for a gold or platinum rating for the accessory unit within the LEED for Homes certification program, choosing not to certify the historic house because of the complexities of submitting an existing structure.

**CONSTRUCTION PHASE**

It was clear from the beginning that PHA would have to hire a builder with expertise in historic preservation to handle the construction work in the historic house. It was structurally unstable, and even a very good builder would face some difficult challenges. It was agreed that the student team would handle the historic research and design the renovation, and then focus their construction work on the modules (which were challenging enough), and provide some assistance on the historic house interior finishes. Fortunately, PHA had worked with an excellent builder, Bruce Guss, who had completed a renovation for the organization a block away. He has also done high-end renovation work, and is a master finish carpenter. He proved to be essential for the success of the project. He had the right balance of know-how and curiosity, and became an excellent mentor for the students.

The first major job on the house was to lift it off its crumbling foundation, excavate around it, and replace it with a new foundation that pushed the house up slightly higher. To lift it, Guss had to replace the perimeter beams that had rotted due to water (the team saved them and reused parts of them in the house), and use jacks to place the new floor framing temporarily on steel beams sitting on wood cribbing. After the foundation was complete, they lowered the house onto its much-improved foundation.

The next major task was to stabilize the rest of the wood framing. Perhaps not that surprisingly, the older portions of the home were in better shape than the newer ones -- with the exception of the perimeter beam. The sequence of construction seemed to indicate a stepping down in material quality and skilled labor as the years progressed, with the latest work (probably from the 1980's) of the poorest quality. In the end, the builder removed some of the very worst framing in the newest areas. In the older areas, the existing framing was either reinforced, or supplemented with an entirely new wall or roof sitting outside of the original. This strategy allowed us to keep much of the original interior plaster in the oldest part of the building, but make the exterior walls and the roof plumb and level on the outside. The frame was in such bad shape that the construction team spent several days just trying to knock the walls into alignment. They used 'pull along' straps to push and pull the walls, and were constantly frustrated that just as they got one wall plumb, the other would be out by 8". The new framing 'hid' the misalignments, and made the installation of new siding much easier. The team briefly considered the possibility of keeping the original exterior siding. However, it was in bad shape and was covered with lead paint. With the exception of the siding and old roof shingles, the team kept most of the material that was not reused in place, and did their best to integrate it somewhere.

During this 'chiropractic' session, the builders discovered a lot of household items in the ceiling framing above the first floor. It was an unusual mix of stuff: children's toys, a homemade fishing rod, early 20th century ketchup and whiskey bottles, etc. The HP team researched the vintage of the items, and selected a portion of them to return to the home on a series of shelves with plexi-glass panels in front of them as a kind of permanent display in the loft area of the home. The design team also left half the shelves empty and uncovered, so the new occupants could add their own 'history.'

The team elected to keep two areas of original siding that had been exterior walls many years ago, but had been buried beneath new interior walls as various additions were constructed. One area in particular had never been painted, and was clearly part of the oldest siding from the section that the HP team assumes was a slave quarters. There was evidence of white washing that had faded, but it appeared the surface had not been viewed in over 100 years. The HP team wanted to keep the section, which was in the corner of what would be the bedroom, and put a clear finish on it to protect the surface and reveal the original color. Unfortunately, a professional painter did not get this message, and a new coat of paint went over it. It was probably the most painful moment for the team, as the HP team felt as if something has really been lost. Stripping the paint would have simply damaged the wood, so everyone grinned and bared it.

Another challenge the team faced was with the re-installing the flooring. Much of it appeared to be in good condition, and some of it was not. The builder was concerned about the difficulty of reinstalling the flooring, but the HP team was committed to saving as much of it as possible, and reusing it in the home. The students took the flooring to the ecoMOD fabrication facility and sorted it by size, vintage and condition. They trimmed the good pieces, and sent all the truly 'bad' pieces to a wood recycler, but were able to clean up the vast majority of the material. They didn't have quite enough of the newer (perhaps mid-20th century) oak flooring that was going into the bathroom, so the builder purchased some inexpensive new oak that matched it perfectly. When the floor was sanded and finished, the students felt vindicated because the floor looked terrific – almost too good because it was difficult to tell it was old wood.

Figure 5. interior of ecoMOD3 historic house

At the start of the renovation, all the windows in the house were inexpensive 1960's replacements, with the exception of one late 1800's window in what was to become the bedroom. The builder replaced them with historically appropriate and energy efficient windows, but the HP team decided to keep the one old window. A student made it her project to research, deconstruct, stabilize and reassemble the window – a process that took longer than any of us expected. To bring the performance in line with the new windows, she added a wood storm window.

The design team carefully considered the best way to balance historic preservation with sustainable design. The roof of the historic house was insulated with highly energy-efficient foam insulation, and the walls with wet cellulose. Energy and water efficient appliances, equipment and plumbing fixtures were used throughout. An evacuated tube solar hot water system sits on the roof above the bathroom, coupled with on-demand water heating. To allow for the original roof framing and decking to be exposed in the bedroom, the builder placed new structure and insulation on top of the roof, including the use of several steel and foam panels left over from an earlier project on half of that roof.

## CONCLUSION

The cost of the preservation effort was far above the normal budget for a PHA home, but was subsidized in part by funding from the city and non-profit organizations. The historic house and accessory unit were put on the market in the early winter of '08, and PHA received an offer from a buyer qualified for affordable housing assistance almost immediately. The new owner has moved in and the team will monitor the home's energy efficiency and evaluate the success of this project to help further understand the energy impacts of updating an historic structure.

The benefits derived from this project have been innumerable. Not only did ecoMOD provide housing for a low-income individual, the team also brought to light new insights into the value of this building within its community. By looking at the building as a history in action rather than frozen in time the designers were able to make it truly sustainable as well as historically relevant.

*(Note: The author would like to recognize the contributions of the entire ecoMOD team to the project – the complete list is found on our website at www.ecomod.virginia.edu. As ecoMOD Project Director, I worked closely with Paxton Marshall, ecoMOD Engineering Director, PHA representative Mark Watson, and homebuilder Bruce Guss. I would also like to recognize following current and former graduate students for their direct and indirect contributions to this essay: Sarita Herman, Master of Architectural History, '10; Eryn Brennan, Master of Architectural History and Master of Urban and Environmental Planning, '08; Lorenzo Battistelli, Master of Architecture and Master of Architectural History, '07; Tom Hogge, Master of Architecture and Master of Landscape Architecture, '09; and Beth Kahley, Master of Architecture, '08.)*