

House + Home

Integrated Approaches to Affordable Housing

Thomas Barrie, AIA

School of Architecture | NC State University

NC State University College of Design Publication

Raleigh, NC

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ISBN

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House + Home: Integrated Approaches to Affordable Housing

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Service Learning Projects and North Carolina State University

North Carolina State University is North Carolina's largest comprehensive university. Founded in 1887 as a land-grant institution under the Morrill Act of 1862, NC State has a three-part mission: instruction, research, and extension. The latter describes the unique model of land-grant universities that were founded following the Civil War. Congress deeded land to establish new universities that would not only educate students but would serve their citizenry. This unique American model has the goal of accessible education paired with an extensive outreach and service mission.

Like other land grants, NC State began by serving the agricultural needs of the mostly-agrarian state through its schools of agriculture and veterinary medicine. Today all 100 counties continue to be served through the County Extension program. As the state's demographics and industrial profile have changed, however, so have the services provided by NC State. Its broader service mission now includes economic development, re-tooling industry, technology transfer, urban affairs, community services, housing and urban design. Where in the past a farmer might contact a County Extension Officer to seek answers to a problem, now it is municipal and business leaders who come for the expertise that only a Research I institution can provide.

Increasingly NC State is serving more and more cities, small towns and communities in areas of housing and urban design—most of which is performed in the College of Design's Office of Research, Extension and Engagement. Through a diverse group of initiatives and faculty, issues such as environmental health, universal design, landscape urbanism, community art programs and the design of home environments are addressed. The Affordable Housing and Sustainable Communities Initiative, founded in 2008 by Thomas Barrie, focuses on research, community-based demonstration and service-learning projects, and the development and dissemination of a knowledge base in its subject area. Its mission is primarily educational—to provide educational resources for government, non-profit and community leaders, students and the general public, and innovative and applicable solutions to the housing and urban challenges that North Carolina communities face. Traditional research and applied research through funded projects and service-learning studios are potent means to produce substantive, applicable and measurable outcomes. The education of qualified practitioners and future leaders in the profession remains central to our mission, and therefore the integration of professional education and research is essential.

About NC State, the College of Design and the School of Architecture

NC State University is a member institution of the sixteen-campus University of North Carolina system and has a long and distinguished history. When it opened in 1889 as the North Carolina College of Agriculture and Mechanic Arts it offered courses in agriculture, horticulture, pure and agricultural chemistry, English, bookkeeping, history, mathematics, physics, practical mechanics, and military science. During the ensuing 120 years, its leadership has established new programs and expanded the breadth and scope of the institution, and in 1917 the institution's name was changed to North Carolina State College of Agriculture and Engineering. The faculty and student population more than doubled during the post-World War II period, and in 1965 the name of the institution was changed a final time to North Carolina State University, signifying its new role as a comprehensive university. Since its founding, NC State has been a nationally recognized leader in science and technology with historic strengths in agriculture and engineering. But NC State has evolved into a comprehensive community of scholars that also has outstanding degree programs in design, the humanities and social sciences, education, life sciences, management, natural resources, physical and mathematical sciences, textiles and veterinary medicine. NC State serves all North Carolina communities through statewide research, extension and engagement activities.

The School of Design was established in 1948 with two original academic components: the Department of Architecture and the Department of Landscape Architecture. In its early years the School of Design experienced a remarkable period of creative and intellectual development. Designers and theorists such as Buckminster Fuller, Matthew Nowicki, Lewis Mumford, and Eduardo Catalano joined the faculty and helped build a reputation for innovation and experimentation. Frank Lloyd Wright, Mies van der Rohe, Walter Gropius, Louis I. Kahn, Pier Luigi Nervi, Charles Eames, Marcel Breuer, and numerous other internationally prominent figures came to lecture, to conduct design experiments, and to inspire a new generation of designers. The legacy of imagination, diversity, and excellence set by this first generation has continued throughout the school's history.



From left to right: David Maurer, Carrie Strayhorn, Kevin Campbell, Megan Toma, Judith Finkner, Brielle Cordingly, Eric Goldman, Matteo Rapallini, Scott Leonard, Jennifer Gailey, Thomas Barrie, James Leonard, Damon Leverett, Jeff Wilkins, Kay Bea Jones
Kneeling: Brian Casto, Jimmy Leonard

Acknowledgements

This project was the result of a unique partnership between Habitat for Humanity of Wake County and the School of Architecture at NC State. Community-based projects of this type provide special research and educational opportunities and depend on the sustained efforts of many. The following are those who gave their time and expertise in ways that were essential to its success.

First of all I would like to thank my students whose sustained and committed efforts throughout the semester-long design project exceeded the requirements of the course. A special thanks to Habitat for Humanity of Wake County and to Executive Director Kevin Campbell who participated in the project from its initial planning stages to completion, Construction Manager Brad McHue who conducted a tour of Habitat homes and participated in reviews of student designs, and Family Support Manager Syretta Hill who served as community liaison and organized information sessions and tours. Funding for the project was provided by a Faculty Development Grant from the College of Design at NC State.

Others generously provided their time and expertise during the design and research phases of the project. Professor Georgia

Bizios, Emily Fischbein, Community Development Specialist at Wake County Human Services Housing and Community Revitalization Division, Professor Kay Bea Jones from the Ohio State University, Professor David Hill, Damon Leverett, Design Director at Einhorn Yaffee Prescott, and David Maurer, Principal of Tighlines Designs/Maurer Architecture, served as design critics and provided invaluable input at critical points throughout the semester. And sincere thanks to Graduate Architecture student Ryan Wallace who served as a Research Assistant for the project and produced the Urban Design Strategies and Housing Survey sections of this publication, and to Graphic Design alumnus Riley Huston for the design of the publication you hold in your hands.

The project is also an outcome of my College of Design Research, Extension and Engagement appointment in Affordable Housing and Sustainable Communities. A special thanks to Dr. Jim Zuiches, Vice Chancellor for the NC State Office of Research, Extension and Economic Development for his support.

Thanks to all for our collective efforts to find answers to the housing and community-building challenges we face.

Thomas Barrie
 Professor of Architecture

Introduction

Project Description and Background

The need for home lies deep in the human heart: when our homeland is threatened we go into action to defend it, and when our family house is violated we are profoundly offended. We spend our lives trying to “make a home”—building, buying, renting, borrowing houses, staying in the old family homestead or moving from house to house according to the winds of fate. Few things are more important than finding a home and working at it constantly to make it resonate with deep memories and fulfill deep longings.

Thomas Moore
The Re-enchantment of Everyday Life

The House + Home: Integrated Approaches to Affordable Housing project was a research and design project conducted by faculty and graduate students from the School of Architecture at NC State University. The multifaceted project aimed to incorporate integrated approaches to affordable housing and included research on recent and emerging trends in affordable housing appropriate to the needs of Wake County, the design of housing prototypes, and site-specific proposals for Habitat for Humanity of Wake County. It included explorations of the ontological significance of home, reviews of current research on a broad range of issues germane to affordable housing, analysis of best practices in affordable housing and typical Habitat for Humanity single family

home designs, urban design strategies for the Longacres community, proposals for affordable housing prototypes, and the design of single-family homes on four sites in the Longacres community of East Raleigh. Issues such as “tipping points” of community redevelopment, cultural and economic sustainability, and the interrelationship of sustainable development, multi-modal transit options, building energy performance, and affordability, were intrinsic to the project. It is hoped that the project outcomes will provide useful research outcomes for housing advocates and providers, and assist Habitat for Humanity of Wake County in their efforts to provide affordable housing in Wake County.

Home + Homelessness

Everyone, no matter what socio-economic status, deserves well-designed and affordable housing. But what we all want most of all is a home, a place to call our own, a center for our lives that shelters our bodies and nurtures our souls. To be homeless is to be uncentered, disoriented and bereft of these essential physical and psychic needs.

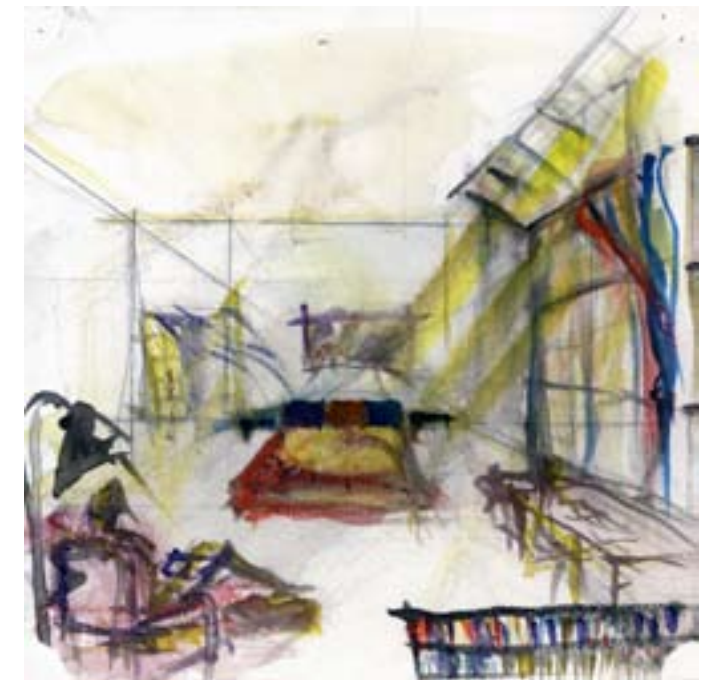
The studio began with an exercise entitled Home + Homelessness that explored ideas and imagery regarding the multiple aspects of being at home and of homelessness – the homely and the unhomely. Through sketches, paintings and other two-dimensional media, the students defined, depicted and delineated their interpretations of these separate but often-paired conditions.



Carrie Strayhorn



Megan Toma



Megan Toma



Judith Finkner



Carrie Strayhorn



Megan Toma

Project Goals

The overall goals of the project included the following:

- ✦ To provide *the students* with the enriched educational experience of a real-world project, as part of their education as future leaders in the profession.
- ✦ To provide *the public* with research on, and the design of, prototypical single and multi-family affordable housing models.
- ✦ To provide *Habitat for Humanity of Wake County* national best practices and leading-edge strategies and models for affordable housing as a foundation for further research and the professional design of future projects.

Project Process

The House + Home, Integrated Approaches to Affordable Housing Project included directed research by a Graduate Research Assistant and a semester-long graduate design studio conducted during the 2011 spring semester. The project had a particular focus on home qualities, plan efficiencies, adaptability, materials and assemblies, energy efficiency and performance, and sustainable building practices and development. The students critically analyzed examples of single and multifamily housing that integrated a broad range of issues regarding affordability, and examples of a current Habitat for Humanity of Wake County designs. Concurrently, leading edge research on trends and approaches to housing in general, and affordable housing in particular, were researched, summarized and discussed in studio colloquia. These preliminary exercises then led to the development of affordable housing prototypes—all of which were reviewed at mid-term.

The second half of the semester was devoted to site-specific proposals for four Habitat for Humanity of Wake County sites in the Longacres community. A bus tour of the area provided by Habitat and an information session at the Ralph Campbell Community Center in Apollo Heights initiated the project. The students then engaged in documentation and analysis of the specific sites. Concurrently, the project research assistant documented and analyzed the physical conditions of the community and developed urban design strategies for the future. Site specific proposals for single family homes were then developed in the context of the community, urban design proposal, specific site conditions, and Habitat for Humanity conventions—all of which were brought to the mid-project and final reviews.

Best Practices, Contemporary Models, and Prototypes of Affordable Housing



National Best Practices

Successful precedents and best practices can provide valuable resources and assist in developing appropriate strategies for affordable housing. The following are selected examples that provide a range of approaches germane to the project.

Tesoro Grove Apartments



PROJECT DATA:

DESCRIPTION:

Affordable Multi-Family Housing

TYPE:

Affordable apartment community

CONTEXT:

Site is a left over parcel between a major freeway and a wastewater pumping station.

ARCHITECT:

Studio E Architects, San Diego California

UNIT/ACRE:

12 Freeway Units, 32 through units, 24 townhouses
9 each 1 bedroom units, 42 each 2 bedroom units,
26 each 3 bedroom unit

HOME QUALITIES:

In response to the site, the setting of the project looks inward and is organized around a village street that links plazas, common areas and a large community lawn. Buildings are arranged to create usable space and form a legible realm. Porches, terraces and stoops give individual units a semi-private, yet engaged relationship with the larger community.

MATERIALS AND ASSEMBLIES:

Studio E hewed to it's budget with a simple kit of parts that includes fiber-cement board, MDF, and painted steel. Lexan sunshades and low concrete block walls help define each resident's entry area.

SUSTAINABILITY:

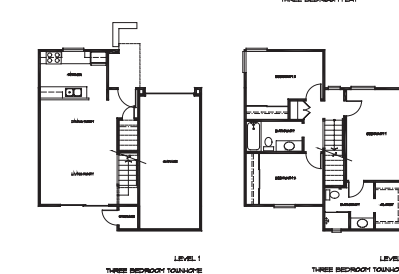
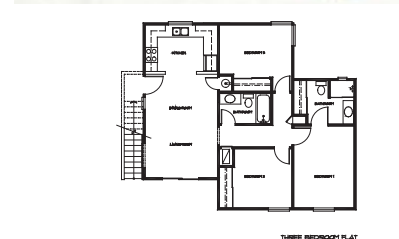
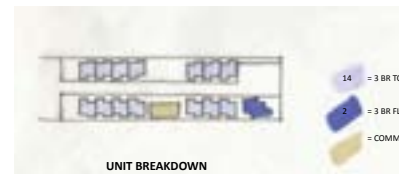
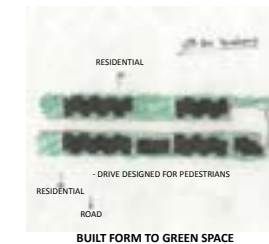
A special feature of the development is the common building- all of the electricity used to run the management office and laundry room is generated by using a photovoltaic system. The design team created a award winning site plan which created a walkable residential neighborhood, orienting the buildings is such a way that the buildings mitigated nearly all of noise generated by the adjacent freeway.

Images by Studio E Architecture



Brian Casto & Jimmy Leonard

11th Avenue Townhomes



PROJECT DATA:

DESCRIPTION:

An urban infill site next to Interstate 15 that is in an area of recent redevelopment. The project is located between a small apartment complex and single family houses at the end of 11th Avenue. The townhomes were designed with minimal circulation to maximize the interior space. Also, attached garages are used to create a space for trades people to store their materials and working tools.

TYPE: Townhome and Flat Community

CONTEXT:

A mixture of 3 bedroom flats and 3 bedroom townhomes with an attached garage. All units have rear private gardens along with a semi-private sitting area to the front of the units. The units share a common vegetable garden along with a laundry facility.

The units are arranged along an avenue that encourages community activity in the shared paved space. A large green space for the community is located across from the community center. A minimal parking lot at the rear of the complex and the attached garages decrease the amount of vehicular traffic.

ARCHITECT:

Studio E, San Diego, CA

UNIT/ACRE:

1 acre = 22 units/acre

UNIT BREAKDOWN:

3 Bedroom Townhomes	14
3 Bedroom Flats	2

HOME QUALITIES:

Studio E utilizes several design features to extend the units to the exterior. Large sliding doors in the open living and dining spaces help bring the private gardens into the unit. The paved drive is designed as a pedestrian zone and not for the car. This allows for the community to walk to the shared public space that includes a large play structure.

MATERIALS AND ASSEMBLIES:

The project incorporates standard wood construction on top of concrete slab foundations. The exteriors are finished in the local tradition of stucco along with horizontal cement fiberboard siding. Vinyl windows are used due to the low cost. Stucco is predominantly used as it is a local material. By using a local finish, stucco, the project is able to have a more competitive bidding process as more workers are familiar with the process.

SUSTAINABILITY:

The project meets the strict Title 24 California energy code that has some of the more stringent energy use codes in the nation. Operable windows were used to allow for the use of natural ventilation for most of the southern Californian year.

Brian Casto & Jimmy Leonard

HomeSafe



Images: Studio E Architecture



First Floor



Second Floor



PROJECT DATA:

DESCRIPTION:

This project explores the co-housing model as an environment. This shared housing scheme creates a safe and uplifting environment for women and children fleeing domestic abuse.

TYPE:

Multi-Family

CONTEXT:

Six "big" houses consisting of four suites and shared living, cooking, and eating areas are gathered around a communal outdoor space

ARCHITECT:

Jeana Kim, Studio E Architects

TOTAL SF:

13,488 sq. ft

UNIT/ACRE:

1.1 acre

UNIT BREAKDOWN:

360 to 560 square feet per unit (sleeping area plus one-quarter of common living area) construction cost: \$185 per square foot rental price: \$390 to \$410 per month units in project: 25

HOME QUALITIES:

A daycare and counseling facility stands watch at the "front door" to the project. Careful consideration was given to the creation of thresholds of privacy for the recovering families. HomeSafe divided the development's 25 units into three main residential buildings, layering common kitchen, dining, and living areas with private bedroom suites for each resident.

MATERIALS AND ASSEMBLIES:

recall the vernacular architecture of Santa Clara Valley's agricultural past High sloping ceilings lend an unexpected expansiveness to the communal areas of the homes. The architect chose a light, neutral-colored plaster for the sides of buildings that face the property lines; bright, warmer hues enliven the courtyard facades. Saw-toothed metal roofs and deep awnings

SUSTAINABILITY:

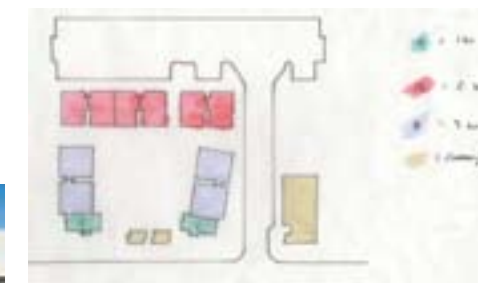
The project meets the strict Title 24 California energy code that has some of the stringest energy use codes in the nation. Bright exterior colors contribute to the project's cheerful atmosphere, while the courtyard is a key part of the project. You can look across it and are able to look at your neighbor.

Brian Casto & Jimmy Leonard

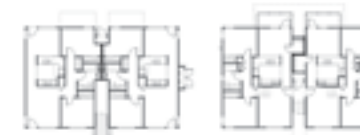
Eucalyptus View



BUILT FORM TO GREEN SPACE



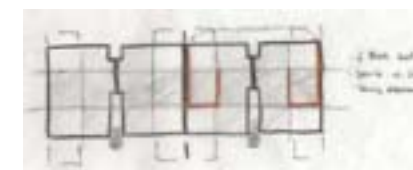
UNIT BREAKDOWN



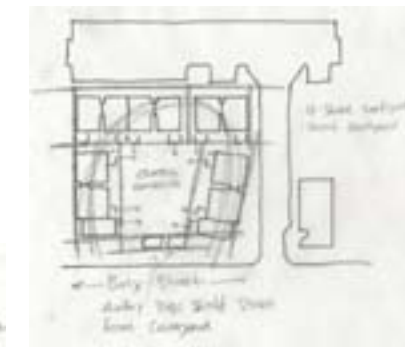
FIRST FLOOR PLAN



SECOND FLOOR PLAN



EFFICIENT GRID WITH CORE IN CENTER



SITE CONFIGURATION

PROJECT DATA:

DESCRIPTION:

Urban site between Interstate 15 and Escondido Blvd. Adjacent to a shopping center and residential areas which include apartments and single family housing. Sited to meet the needs of local agriculture workers and their families, the site includes a daycare and community rooms with computer access along with a laundry center.

TYPE:

Apartment Community

CONTEXT:

A mixture of 1,2,3 bedroom units arranged in around a central courtyard. Porches and patios create a threshold between each unit and the shared court. Instead of stacking units directly on top of each other, Studio E uses a staggered section and plan to create ten-foot ceilings in the living space.

The two bedroom units create a wall from the parking lot, while the shared community rooms create a barrier from the busy Escondido Blvd. The shared courtyard becomes an extension of the living space for each unit.

ARCHITECT:

Studio E, San Diego, CA

UNIT/ACRE:

1.5 acres = 16 units/acre

UNIT BREAKDOWN:

3 Bedroom	8
2 Bedroom	12
1 Bedroom	4

HOME QUALITIES:

Studio E utilizes several design features to make Eucalyptus View feel more like a house, rather than an apartment unit. Each unit has a ten-foot high living space with tall windows to allow for more natural light and views to the shared courtyard. Semi-private porches marked by trellises create a personal entry to each unit and allow for an exterior sitting space.

MATERIALS AND ASSEMBLIES:

Using standards construction details and assemblies, Studio E is able to create a competitive bid process for the developer. Standard wood construction is used along fiber cement board for the exterior cladding. Vinyl windows are used due to the low cost. Stucco is predominantly used as it is a local material. By using a local finish, stucco, the project is able to have a more competitive bidding process as more workers are familiar with the process. Trellises are used as they are simple to construct and provide the needed shade

SUSTAINABILITY:

The project meets the strict Title 24 California energy code that has some of the more stringest energy use codes in the nation. Wood trellises' cover the entry and windows to prevent major heat gains during the day.

Brian Casto & Jimmy Leonard

Oroysom Village



Site plan: 1 in = 90 ft



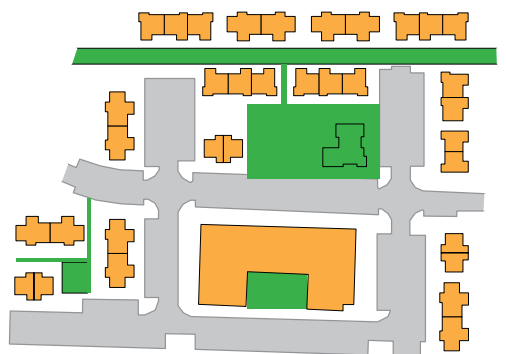
Complex Entrance



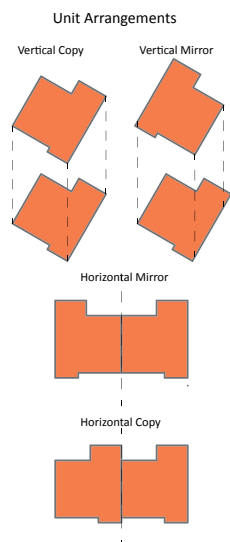
Public Greenway



Pedestrian and Vehicular Circulation



Private, Public and Vehicular Spaces



PROJECT DATA:

DESCRIPTION: Covering six acres next to Mission San Jose, one of California's original Spanish missions, founded in 1797, Oroysom Village is a mix of family townhomes and senior apartments.

TYPE: Multi-family housing: Townhomes and Senior Housing

CONTEXT: Fremont, CA, near Mission San Jose

ARCHITECT: David Baker + Partners

TOTAL SF: 90,000

UNIT/ACRE: 16

UNIT BREAKDOWN:

1 Bedroom	40
2 Bedroom	29
3 Bedroom	32
Total	101

Parking spaces 162

COMMUNITY QUALITIES:

To create a sense of community, the site is organized as a neighborhood grid, with parking for residents and guests arranged along the streets. A network of broad pathways pass between the homes, creating a setting for socializing as well as connecting community recreation facilities and play areas.

Brielle Cordingly

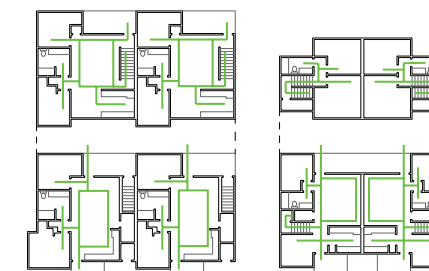
Oroysom Village (cont.)



Unit plans: 1 in = 16 ft



Unit Public/Private, Utility and Circulation Space



Unit Circulation



Rear of Unit with Rose Garden



Rear of Unit with Existing Pepper Tree



Front Facade Showing Traditional Details

PROJECT DATA:

DESCRIPTION: The family townhomes, which range in size from one to four bedrooms, are grouped into diverse buildings to create a relaxed organization and maximize landscaped open space. Individual homes are personalized with private entries, trellises and patios, and feature distinct elevations and roof lines.

One-bedroom apartments designed for seniors occupy an L-shaped building that bends around a courtyard garden, providing a sheltered shared environment. Senior apartments feature individual balconies with trellises that overlook the streetscape or the garden, and share dedicated laundry and community rooms.

UNIT BREAKDOWN:

1 Bedroom	no unit information
2 Bedroom	925-975sf
3 Bedroom	1300sf
4 Bedroom	no unit information

HOME QUALITIES:

Every unit has a private exterior patio or balcony, generous glazing and a private entrance. Traditional details such as a gabled roof and shaded porches appeal to the residents. 9-ft ceiling heights make the units seem larger and stunning views of Mission Hills provide a backdrop not normally reserved for affordable housing. Existing pepper trees were retained on the site and supplemented by additional greenery and shade, including shade structures over the parking areas.

MATERIALS AND ASSEMBLIES:

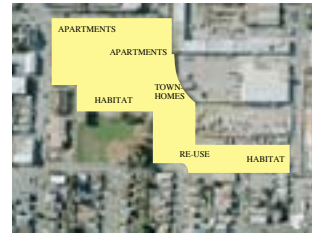
Precise data unavailable. Units are most likely stick built on site using readily available materials. Unit appear to use vinyl windows and siding as well as traditional shingles.

SUSTAINABILITY:

Precise data unavailable. The abundance of greenspace and the retention of existing trees seem to suggest that sustainability was considered by the architect. Possibly, the early completion date of 2001 places this project before these issues were perceived as necessary in affordable housing.

Brielle Cordingly

TASSAFARONGA VILLAGE



Site Plan - Not to Scale



Floor Plan Lower Level Scale: 1/64 = 1'



Floor Plan Upper Level Scale: 1/64 = 1'

PROJECT DATA

David Baker and Partners Architects

Tassafaronga Village
Oakland California
Completed May 2010

Number of Units	
Oakland Housing Authority Studios	7
Oakland Housing Authority Townhomes	77
Oakland Housing Authority 1 Bedroom	16
Oakland Housing Authority 2 Bedroom	34
Oakland Housing Authority 3 Bedroom	23
Oakland Housing Authority total	157
Oakland Habitat for Humanity total	22

Density Ratios	
Project at Oakland Housing Authority	222,092
Site Acres Oakland Housing Authority + Habitat	7.5
Total Bedrooms Oakland Housing Authority + Habitat	441
Bedrooms/Acre Oakland Housing Authority + Habitat	58
Units/Acre Oakland Housing Authority + Habitat	25

Parking	
Oakland Housing Authority total	200
Habitat total	30
Spaces/Unit OHA + Habitat	1.2
Type	garage and surface

HOME QUALITIES

Tassafaronga Village provides numerous home qualities for inhabitants. Underground parking allows for complete utilization of the lot size, creating more density per square mile than developments that are more spread out. Shifting volumes create spaces for semi-private entrances into each unit and also for private exterior spaces. Variable facades lend a feeling of individuality to each apartment. There is a generous courtyard on the interior of the main complex, which includes spaces for gardens, and is maintained primarily by rainwater reuse. This courtyard provides a community gathering area. Carefully placed fenestration allows for pleasant light quality and good views. Bike racks and rooms encourage the use of public transportation. The development also leases spaces to groups providing community services - medical facilities and grocery stores.

MATERIALS and ASSEMBLIES

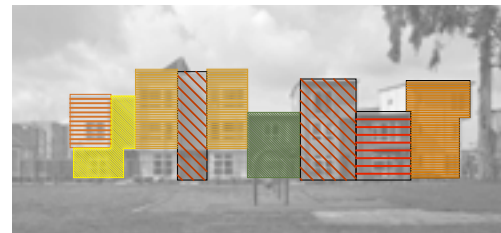
Although actual details of the materials and assemblies were unavailable from the architects, photographs lead to certain educated assumptions. The structure is primarily of light wood assembly with wood sheathing, finished with stucco or EIFS panels. Some units have cementitious siding of various widths. The building that is a rehab has rigid frame construction. Roofing appears to be bituminous roofing. There are vinyl windows and off-the-shelf fixtures and materials. The parking deck is poured concrete.

SUSTAINABILITY

Sustainability plays a major part in the complex. The architects use white ballast on roofing, which reflects the sun's heat, and bituminous roofing which lasts longer and is more water resistant than roofs which are built up. Solar power (photovoltaic cells) is used for heating hot water and providing some electricity. The courtyard plan allows for a green space on the level above ground, which features garden areas and recycled rubber under the playgrounds. There is another green roof area which is not occupiable, but which reduces the solar heat gain. Water retention and reuse keeps the courtyard green. The complex incorporates adaptive reuse of an existing building. It is situated near existing public transportation routes and provides generous space for bike racks and rooms.



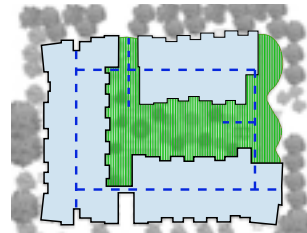
Perspective of East Elevation



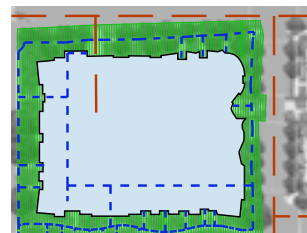
Material Changes for Individual Units



Rear Elevation

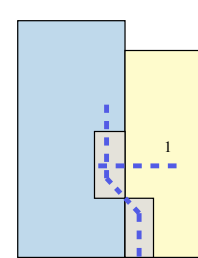


Pedestrian / Vehicular Circulation Green / Built

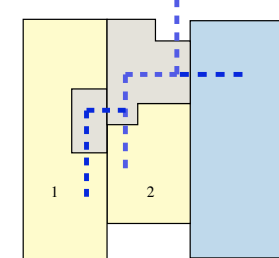


Pedestrian / Vehicular Circulation Green / Built

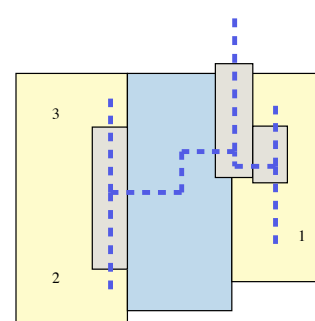
TASSAFARONGA VILLAGE



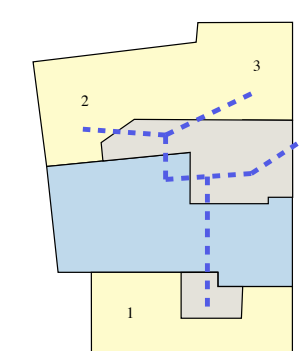
One Bedroom



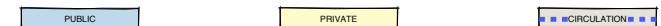
Two Bedroom



Three Bedroom



Three Bedroom



Public and Private Areas and Circulation for Individual Units



Elevation



Material Changes for Individual Units



Rear Elevation



Elements of Sustainability

Judith Finkner

Judith Finkner

EcoMOD 1 | OUTin House



PROJECT DATA

PROJECT DESCRIPTION:
EcoMOD is a student design build and evaluation program at the University of Virginia that works with local agencies to create affordable and environmentally responsive housing. The OUTin House was the first of four completed examples of which implemented prefabrication.

PROJECT TYPE:
Originally planned as a single family housing prototype for the Piedmont Housing Alliance, the basement was later converted into an additional unit making it the first two unit condominium in the area.

PROJECT CONTEXT:
The project is located on an infill site in the Filiville neighborhood of Charlottesville, Virginia. Filiville is centrally located in town, socially diverse and facing gentrification.

COMPLETION: 2008

ARCHITECTS: UVA students and faculty advisors

SQUARE FEET: 1,410 - 1 bed 1 1/2 bath unit
750 - Basement studio unit

COST: \$115 /SF

HOME QUALITIES

The concept behind the design of the house was to extend the living space of a compact affordable home to the exterior. Rooms of the house are staggered to help define outdoor living areas at both sides. Apertures were located to enhance this relationship as well as bring in ample daylight.

Extra care was also given in planning how home owners would use, and live in, the space. Abundant water proofers were used for flooring, cabinetry and doors. Storage is built in whenever possible including the stair landing. The HVAC unit is concealed in a room slender element in the kitchen and features a fold-up table and work surface. This allows the occupant the flexibility to use the space for kitchen work, dining area, or open space.

MATERIALS + ASSEMBLIES

The house consists of eight prefabricated modules, floor at each level. Due to the sloping site, the team constructed a full basement with CMU blocks. Modules were constructed at a university owned airplane hangar. The completed building chunks included exterior and interior walls, windows, floor and roof structures. Sizes of the modules were kept small, 10' x 12' long x 12' x 10' wide x 11' tall, to allow for ease of transportation on Charlottesville's neighborhood streets.

Structural insulated panels (SIP) were utilized in the exterior wall and roof systems and were chosen for their excellent thermal performance. They are made of two layers of OSB with expanded polystyrene insulation sandwiched in between. The panels were manufactured at a Virginia based plant with holes for doors and windows pre-cut. Traditional wood studs frame openings and panel joints. Having factory made panels facilitated in the efficiency of the module construction.

SUSTAINABILITY

The OUTin House incorporates several environmentally sustainable features and design strategies including:

Passive Solar - the house opens up to the south with the entry deck and large windows in living areas. Overhangs protect it in the summer while allowing winter rays to penetrate.

Solar Hot Water Panel - reduces water heating costs by about 1,000 per year.

Portable Rainwater Collector - the single sloped roof channels water through two downspout downspouts to cisterns below the deck. The water is filtered before it is circulated into the house as clean water. This system provides approximately 20% of water used in a year by a family of four.

Sustainably Harvested Wood Flooring - instead of laminate, which has to be shipped from China, a lot of wood was chosen. The paper flooring came from the Sustainable Woods program of the Appalachian Sustainable Development organization.

SIPs - create a more continuous thermal envelope, less energy loss, and efficient use of materials. Using SIPs improved the energy efficiency of the house by 65% as compared to a stick built home.

OUTin House can be replicated at additional locations. The plans have been licensed to Modern Module, who facilitates manufacturing and installation of homes. The UVA team of designers considered modularity at three scales for replication: 1 (site, orientation, topography); 2 (budget and needs, number of modules); 3 (materials, finishes, and details). Decisions made at all of these scales presents many design options for potential homeowners. Additionally, the sustainable features of the original are optional.

IMAGES:
1. <http://www.virginia.edu/ahab/ahabnews-and-features/project-details>
2. <http://www.dwell.com/article/outin-house>
3. Max, Karl, Integrative Design in Contemporary Architecture, Princeton Arch Press, NY, 2008, pg. 97
4. Max, Karl, Integrative Design in Contemporary Architecture, Princeton Arch Press, NY, 2008, pg. 71
5. Max, Karl, Integrative Design in Contemporary Architecture, Princeton Arch Press, NY, 2008, pg. 71



Unit 1 Second floor 765 SF



Unit 1 First floor 705 SF



Unit 2 Basement 700 SF



Blu Homes_ Evolution House

Pre-Fab_ Modular Single Family Home



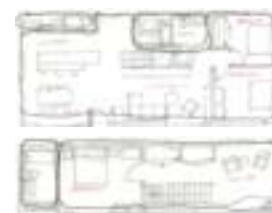
Second Floor Plan



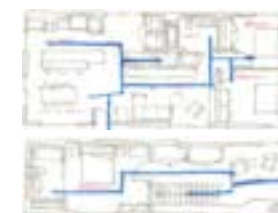
First Floor Plan



Floor Plan Configuration Options



Plan Diagram



Circulation Diagram



Module Diagram



PROJECT DATA:

DESCRIPTION: Blu Homes builds its homes in a 80,000 square foot factory in Massachusetts and are based on a proprietary folding delivery system. BLU | EVOLUTION homes are designed for single-family primary residences, townhouses and development communities. The modular nature of the construction process allows for up-grades from varied packages for home customization.

TYPE: Single Family Residence, 3-4 Bedroom/ 1-2 Baths

CONTEXT: Materials, Orientation, and Layout can be modified for site context.

ARCHITECT: Blu Homes

COST: \$260,000 for standard (not including site work/ permits)

TOTAL SF: 984 sf (1st Floor) + 576 sf (2nd Floor) = 1560 sf Total

HOME QUALITIES:

The standard floor plan for the first level of the Evolution features a living space with private bedrooms to one side. The high ceilings, abundant large windows, open floor plan and modern finishes provide a simple clean layout. The ability to customize most facets of the building provides great adaptability for growing families.

The standard layout for the second floor of the EVOLUTION includes a large bedroom with an attached full bathroom and a family room area, leading to a deck. Plan configuration options are designed to adapt to different site contexts.

MATERIALS AND ASSEMBLIES:

The EVOLUTION home is delivered complete with windows, doors, flooring, plumbing, appliances, fixtures, and most of the cladding and trim already installed. All that needs to be done onsite is minimal finish work. As a result, there is limited site work costs and fewer risks of a typical construction project. Other features of the EVOLUTION home system include:

- Radiant floor hot water heating
- Standing seam metal roof with 50-year lifespan
- 9-16' ceilings with operable transom windows
- Solar hot water and photovoltaic ready roofs
- Able to offer prefabricated building spans that are 18' to 20' 6" wide and ceilings up to 16' high

SUSTAINABILITY:

The off-site factory construction also reduces waste and uses less materials overall (approximately 50% to 75% less waste during construction). The structural and light steel framing is 77% recycled content, and exterior rigid foam insulation provides a tight air seal and radiant barrier to maintain a constant interior temperature. Blu Homes use computer modeling software to site for passive heating and cooling, and optimal views, resulting in 50% to 60% less carbon emissions compared to other energy compliant homes.

All photographs and images are taken from the Blu Homes website, <http://www.bluhomes.com>.

Jennifer Gailey

Eric Goldman & James Benson

Rocio Romero - LV Series Homes



PROJECT DATA

DESCRIPTION: The modular kit is derived from the first incarnation of the prefab unit the architect completed for her parents in Laguna Hills, Calif. The LV series prefab homes are sold in kit form that includes plans, instructions, and the structural parts for the exterior shell of the home. They are designed to be built individually and/or combined to create a larger home or compound.

TYPE: Prefab Single Family dwelling combining precision construction and mass production

ARCHITECT: Rocio Romero LLC, St. Louis, MO

UNIT BREAKDOWN:

Basic Living Size	1st level	Basement option	Kit Cost \$
LVM (studio) 1 Bed, 1 Bath	627 sq. ft.	N/A	24,950
LV 2 Bed, 2 Bath	1190 sq. ft.	1150 sq. ft.	36,870
LVL (long) 3 Bed, 2 Bath	1410 sq. ft.	1400 sq. ft.	42,950

Add-ons	Cost
LVC (courtyard) - creates outdoor living area	5,990
LVT (basement) - creates a taller entry, approx. 218 sq. ft.	19,790
LVG (garage) - approx. 623 sq. ft.	20,570
LV2 (two story) - allows ability to stack LV series units	Same as kit

LV Add-ons are custom connect-ons between LV series units requiring additional engagement of the design staff for integration.

HOME QUALITIES

These homes are designed according to principles of minimalism to produce comfortable spaces with balanced proportions and simplicity to keep construction straightforward and affordable. With square footage driving the cost of projects, careful consideration for the quality of spaces is essential. These designs create comfortable spaces through careful proportioning of room dimensions and glazing ratios. Living spaces are maximized by taking the clutter of kitchens, bathrooms, and closets in the back.

Many feel modern architecture is better suited to benefit from prefabrication, with clean lines featured and open floor plans. Often there is concern for a loss of home individuality with prefab, and especially modern designs. Romero resolves this by structuring her designs toward simplicity while offering the homeowner numerous options.

MATERIALS + ASSEMBLIES

The LV series prefab homes are sold in kit form and include plans, instructions, and the structural parts for the exterior shell of the home. The plans are a complete set that can be used to obtain a building permit, construction bids, and used as construction documents. The kit of parts consists of open wall panels, materials, and exterior siding. The wall panels are either 2" x 8" or 2" x 10" framing with 1/2" OSB nailed to the studs and pre-drilled holes for wiring. Major structure consists of 4"x4" steel posts with pre-drilled welded top and bottom plates for connections to the foundation and glaze bolt roof beams. The exterior siding is Fiber 100 coated galvanized steel, with an array of color options.

The process makes building the kit home easy for qualified general contractors. Prior to delivery, the chosen foundation (crawl space, basement, and/or slab on grade) must be complete, as well as installation of floor framing and decking.

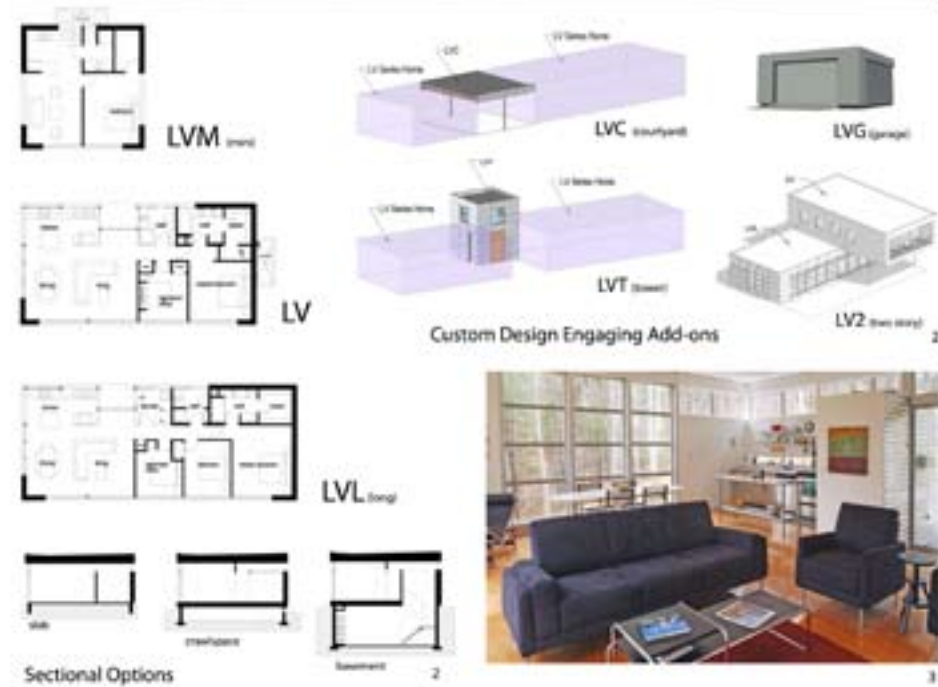
SUSTAINABILITY

Prefabricated homes have a distinct sustainable advantage over conventional construction in that the factory built environment reduces waste and minimizes consumed resources while eliminating the effect of weather on conventional construction progress. Flat packing the products after assembly minimizes the space required for shipping thereby using less fuel and creating fewer truck emissions. Romero's designs also intentionally target more long-term building performance sustainability. Wall and roof cavities are made deeper to achieve R values double the norm. The designs embrace the beauty of the landscape by visually bringing the outdoors in.

The initial design process involves working with the client and the potential site to arrive at the desired orientation to maximize the advantages of the site conditions. The designs then strive to embrace the beauty of the landscape by visually bringing the outdoors in, with lighting and ventilation configurations that make for a comfortable environment.

IMAGES:

1. <http://modularhomes.com/2014/02/28/modular-housing-modern-lifestyle-made-easy/>
2. All images of plans, sections, and diagrams courtesy <http://www.rocioromero.com/>
3. <http://www.rocioromero.com/2014/02/28/modular-housing-modern-lifestyle-made-easy/>

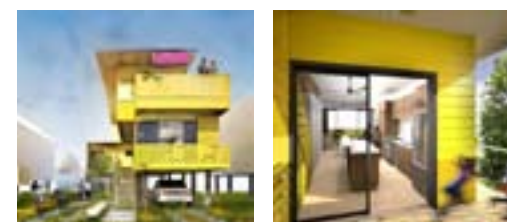


Jeff Wilkins

The Flow House



IMAGES TAKEN FROM WWW.MODULAR.ORG



PROJECT DATA:

The Flow House was designed as disaster relief housing in New Orleans, LA, post-Hurricane Katrina. It was designed based on William McDonough's Cradle to Cradle approach of sustainability. It is a prefabricated, modular duplex that can be adapted based on the needs of the occupants, and incorporates a series of outdoor rooms which serve as an expansion of the interior living space.

"Flow House celebrates Earth's abundance, promoting and nurturing connections between human and natural communities. The design looks to natural systems for inspiration and relies on the belief that all design decisions should support the creation of community and family. Embodying the ideas and ideals of the Lower Ninth Ward and New Orleans, through the Flow House the office strives to create a safe and healthy environment, both natural and built, with all material nutrients returning safely to biological or technical cycles - manifesting a true Cradle to Cradle residential icon." from Architecture in Times of Need by Kristin Feireiss

PROJECT TYPE: duplex
COMPLETION: Not yet built - in construction document phase
Architect: William McDonough + Partners, Charlottesville, VA
TOTAL SQUARE FEET: 1,900
UNITS PER ACRE: 2
COST PER SQUARE FOOT: not known
UNIT 1 BREAKDOWN: 3 bedroom, 2.5 bath, kitchen, living room, dining area, access to four outdoor decks
UNIT 2 BREAKDOWN: 1 bedroom, 1 bath, living/kitchen, and deck

HOME QUALITIES:

"The Flow House reflects the Make It Right Foundation's vision for safe, healthy, and high design quality homes - inspired by Cradle to Cradle thinking - that preserve the community spirit of the Lower 9th Ward. The design celebrates the movement of light, shade, air and water as a means of connecting a family with their community and the natural world."

"Referencing vernacular typologies, Flow House responds to the gulf coast's hot, humid climate by providing cool shaded spaces and promoting passive ventilation. The living room fully extends from the 'dogtrot' to the front porch. The design provides views up and down the street to promote a more secure and connected community."

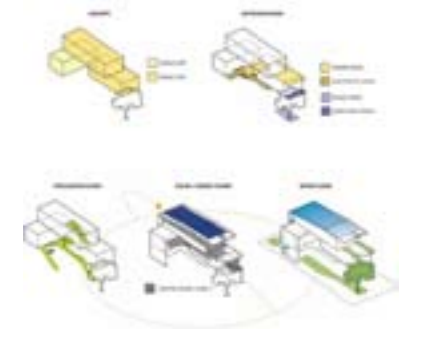
MATERIALS AND ASSEMBLIES:

The Flow House is composed of three prefabricated modular units. Each unit is 16'0" wide and constructed off site. The house was designed by the architects to be 100-percent Cradle to Cradle, which means that each part has the potential to be disassembled and reused and/or "returned to the Earth within biological cycles or to industry within technical cycles."

Wall and roof assemblies are conceived as metal structural insulated panels (SIPs) while foundations, exterior cladding, and millwork are specified as wood (biological nutrients). "Wood will either be FSC certified, formaldehyde-free, and responsibly harvested for millwork, or (non-toxic) acetylated for exterior cladding, structural columns, and foundation piles. Interior walls will be finished with gypsum-free, mold-resistant, and low-VOC drywall (biological nutrient)."

SUSTAINABLE STRATEGIES:

The sustainable strategies include: deep overhangs, multiple connections with exterior areas allowing for lots of daylight and natural ventilation, roof mounted PV panels, water cisterns to harvest rainwater runoff and rain gardens to absorb any storm runoff. According to the architects: "Flow House is designed to maintain materials in biological and technical metabolisms, a goal that informs everything from the selection of products to disassembly strategies at both the building and product level. The material palette is comprised of Cradle to Cradle Certified products and materials that embody Cradle to Cradle principles - meaning that after its useful life, all materials in the house can be either recycled or returned to nature."



Carrie Strayhorn & Megan Toma

TULANE URBANbuild 01



IMAGES TAKEN FROM WWW.TULANEURBANBUILD.COM



PROJECT DATA:

DESCRIPTION:

Tulane URBANbuild 01 places a particular emphasis on programmatic adaptability as well as the relationship between public and private in connection to the street. The building is elevated from the ground addressing flooding issues in the area, yet still maintains a good connection to the public street life. "In this project, the differentiation of public and private components is achieved by shifting the linear volumes of the typical symmetrical shotgun house into a new planimetric and section spatial asymmetry, enriching lateral communication across the site while maintaining the narrow building to lot relationships emblematic of the historic neighborhoods of the city." (urbanbuild.net) This design is strong in keeping the traditional connection to the street while still allowing the primary living spaces to be elevated above the flood plain.

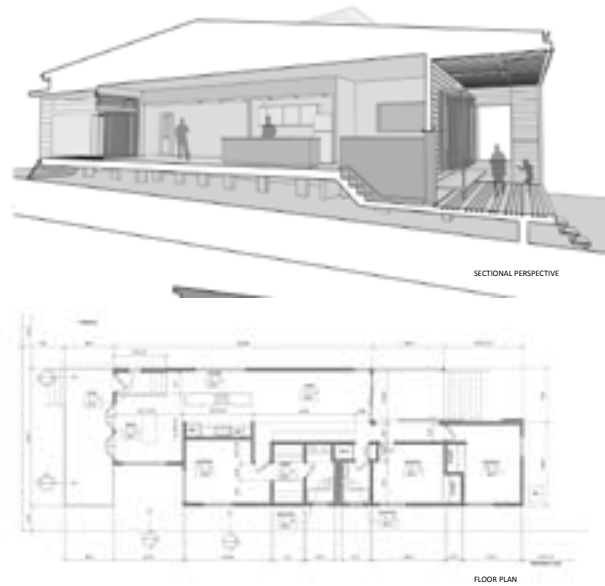
PROJECT TYPE: single family home
 CONTEXT: prototype, New Orleans, LA, hot and humid climate
 COMPLETION: 2006
 ARCHITECT: Tulane URBANbuild
 TOTAL SF: 1370
 UNITS/ACRE: 1
 UNIT BREAKDOWN: 3 bedrooms, 2 baths, kitchen, living, and dining area

HOME QUALITIES:

The programmatic adaptability of URBANbuild 01 is an important home quality. It "...can be built with slight variations which produce a duplex scheme; accommodating multigenerational living, two family living, or a mixed use scenario in which part of the house can be used as an office or small commercial space. There is also a strong connection from the house to the porch (where it is traditional to spend time), to the street- while still being elevated to keep the home safe from future flooding. The interior spaces are dynamic and flow well, with maximum natural daylighting.

MATERIALS AND ASSEMBLIES:
 wood frame- built on site, masonry piers, siding, operable low-e coated windows, ceiling fans, tin roof with a slight slope

SUSTAINABLE STRATEGIES:
 Appropriate placement of windows to allow maximum daylighting (minimal east and west glazing and optimum on the south side shaded by the porch roof). Ceiling fans and operable windows are used to take advantage of natural ventilation. The efficient floor plan minimizes circulation and therefore unnecessary square footage.



Carrie Strayhorn & Megan Toma

TULANE URBANbuild 04



Images taken from tulaneurbanbuild.com



PROJECT DATA:

DESCRIPTION:

Tulane URBANbuild 04 is a house built in New Orleans, LA, that explores the relationship between public and private spaces and the connection of the house to the street. Design efforts were focused on sustainability and ultimately achieved LEED Silver Certification.

The design process involved investigating typical characteristics of the neighborhoods including lot orientation, programmatic elements, and spatial typologies, etc. The intention of URBANbuild was to create "low-cost, well designed, environmentally responsive houses... with the goal of contributing substantial and relevant proposals of progress amidst the preservation of an existing historic fabric." from urbanbuild.net

TYPE: single family home
 CONTEXT: prototype, New Orleans, LA – post Katrina, hot and humid climate
 COMPLETION: 2009
 ARCHITECT: Tulane URBANbuild
 TOTAL SF: 1200
 UNIT/ACRE: 1
 UNIT BREAKDOWN: 3 bedrooms, 2 baths, kitchen, living, dining, and private garden

HOME QUALITIES:

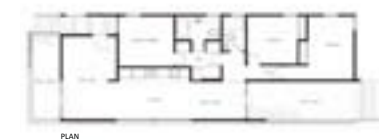
The design of the house puts emphasis on its connection with the street and takes advantage of the corner lot on which it was built. Porches allow for this connection, and movable screens controlled by the homeowner provide flexibility with privacy as well as the amount of light that enters the house. This flexibility allows the occupier of the house to control his own comfort level. An efficient plan also provides for comfort and ease of use.

MATERIALS AND ASSEMBLIES:

wood- stick built on site, concrete foundation, siding, bamboo floors, ceiling fans, low-e coated windows, zero-VOC interior paint

SUSTAINABLE STRATEGIES:

The use of certain materials allows for better energy efficiency: advanced insulation, low-e coated windows, Energy-Star electrical fixtures, an energy saving air conditioner, sustainably harvested and manufactured materials like bamboo flooring and zero-VOC interior paint. The house also takes advantage of natural daylight, which can be controlled via the exterior screening system. The lot location is also close to public transportation and community services.



Carrie Strayhorn & Megan Toma

ELEMENTAL: New Orleans



PROJECT DATA:

DESCRIPTION:

The overall intention of the designer was to build a home that can be adaptable and expand based on the families physical as well as cultural needs. The structure for an addition is built during initial construction, allowing for simple future renovations. The house was designed with a "do it yourself concept," prepared to change over time within a previously defined layout. "We just designed the most difficult part of a future 2,700 sqf house, so that expansions can be done in an easy, economical, quick and safe way. The scheme accommodates the required program in half of the maximum allowed volume. The other half is initially a big porch able to accommodate expansions of the original home or even a second house. This is the space for the expression of the families' own cultural and living traditions, and ultimately increasing their assets thanks to a larger house or the additional income." Alejandro Aravena

PROJECT TYPE: Single family home with possible expansions
COMPLETION: 2009
ARCHITECT: Elemental Architects, Santiago, Chile
TOTAL SQUARE FEET: 1,800-2,700
UNITS PER ACRE: 1-2
COST PER SQUARE FOOT: not known
UNIT BREAKDOWN: First floor contains 1 bedroom, 1 bath, kitchen, living, dining area – second floor has potential for 6 bedrooms, and 2 baths
CLIENT: Make It Right Foundation

HOME QUALITIES:

The most important quality of this home is its ability to adapt to the family's needs. "This means that we have to create an open system rather than a closed design, a structural framework that is responsible for difficult, complex duties and operations, but that allows for personal interventions and customization." The intention is that the difficult construction will be taken care of upon the first building of the house so that when the family needs more space, additions can easily be added. The home is thus easily adaptable to the needs and wants of the family, both physically and culturally.

MATERIALS AND ASSEMBLIES:

wood- stick built with a tin roof (steeply pitched), elevated on concrete piers, operable windows, flexibility with exterior materials- siding is likely, given the traditional context of the neighborhood

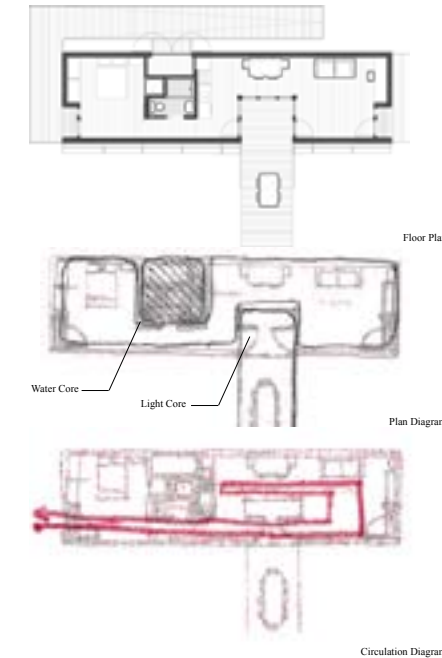
SUSTAINABILITY:

There are many windows to allow for maximum daylighting. These windows are shaded on the porch side of the original plan. The windows are also operable to take advantage of natural ventilation. The steep roof pitch provides for a naturally cooler room by drawing heat upward. Preparing the home for future additions during construction also keeps the family from having to tear out too many sections of the house for renovations.



Carrie Strayhorn & Megan Toma

Rice University_ ZeRow House



PROJECT DATA:

DESCRIPTION: The ZEROW HOUSE design by Rice University addresses the small size and limited budget of typical row houses through replication, innovative use of current technologies, local materiality, and an understanding of life-cycle costs. The ZEROW HOUSE is a re-imagining of zero-energy living for an affordable solar home for Houston.

TYPE: One Bedroom Unit with Full Bathroom, Living and Dining

CONTEXT: Located in Lot 105 on the North Side of Deathlete Way, Washington D.C. during the Solar Decathlon Competition.

ARCHITECT: Rice University Solar Decathlon Team

TOTAL SF: 620 square feet

HOME QUALITIES:

The ZEROW HOUSE's organizational concept is to utilize a "wet core" to divide public and private space while a "light core" penetrates the interior space with an exterior environment. This method provides strong natural daylighting, winter solar gain, and opens up the tight floor plan. A green wall increases the quality of living through natural passive cooling, pleasant breezes smelling of jasmine, and a backdrop for the projected outdoor living area.

MATERIALS AND ASSEMBLIES:

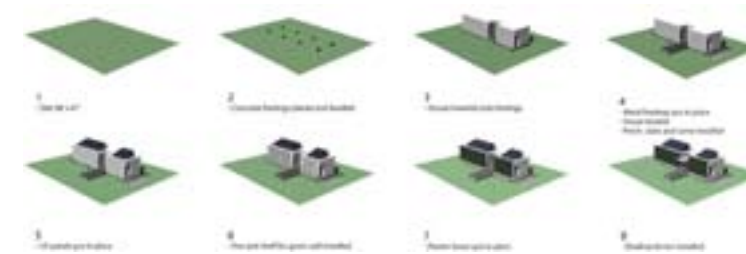
The interior finishes were constrained by the limited budget of the project- making the use of affordable, sustainable, and replaceable materials. The interior flooring consists of durable bamboo while IKEA, ELFA hardware, and do-it-yourself shelving made up much of the millwork/ storage systems.

The exterior walls are clad with galvalume metal siding that is rust resistant and easily maintained. The Trex Decking used on the exterior is a hybrid material consisting of 50% recycled plastic and 50% recycled wood. The shade structure above the "light core" and porch is powder-coated steel for corrosion and rust protection. Non-invasive low irrigation plants grow on the green wall and include jasmine, coral honeysuckle, and tangerine cross vines.

SUSTAINABILITY:

To lower energy consumption, the ZEROW HOUSE first takes advantage of lowering building heating/cooling loads through the second skin 'green wall'. The 'light core' is engineered through solar modeling technology to block up to 75% of direct light from entering the light core.

For energy generation purposes, the photovoltaic array is sized appropriately to the house, producing 4.2kW that can be stored in the power grid for future use (as opposed to battery storage). 30 evacuated tubes act as the Solar Thermal Collectors, and the Hot Water System by Apricus, heats the domestic water.



All Photographs are taken from the Solar Center website, <http://www.solardecathlon.gov>. All other images are property of Rice University.

Eric Goldman & James Benson



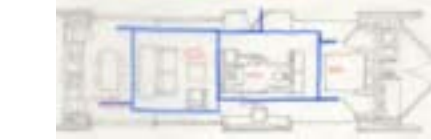
Virginia Tech_ lumenHAUS



Floor Plan



Plan Diagram



Circulation Diagram



Module Diagram



PROJECT DATA:

DESCRIPTION: The LUMENHAUS is a self-described 'modern pavilion.' A sophisticated system of programmable screens, doors, walls, and furniture emphasizes the focus on whole building design, user comfort, and environmental protection.

TYPE: One Bedroom Unit with Full Bathroom, Living and Dining

CONTEXT: Located in Lot 115 on the North Side of Deathlete Way, Washington D.C. during the Solar Decathlon Competition.

ARCHITECT: Virginia Tech Solar Decathlon Team

TOTAL SF: 800 square feet

HOME QUALITIES:

The freestanding bathroom core diverts circulation throughout the house, utilizing screens to blend the interior and exterior into a larger whole. The flexibility of the spaces, walls, and furniture based on a modular design makes for an adaptable environment.

From a functionality standpoint, the Siemens APOGEE Building Control System (BCS) software and web applications allow users to manage all facility systems and equipment from one workstation. The radiant floor heating system by REHAU generates heat evenly and consistently, while the Titus Dynafuser linear slot diffuser with actuators redirect the air to optimize thermal comfort as it relates to the season.

MATERIALS AND ASSEMBLIES:

The interior has a lightweight Barrisol stretched fabric ceiling made from recycled, lead-free co-polymer fabric and the polished HTC Superfloor concrete floor is durable, easily cleaned and doubles as a thermal mass for passive solar strategies. The walls are Structural Insulated Panels (SIPs) that provide superior insulation and structural strength while reducing infiltration, and Aerogel filled polycarbonate panels that give a high insulation value while transmitting a beautiful translucent light.

The whole Automated Eclipsis System (stainless steel sunshade and aerogel filled translucent insulated polycarbonate panel) maximizes conservation of energy and brings the outside to the inside. From an assembly standpoint, the modular design means the whole house is also flexible. Multiple units can be connected or stacked with plug-in stairs and entryways to create two-, three- or four- bedroom houses to adapt to the owners' changing life circumstances.

SUSTAINABILITY:

A three-stage gray water treatment system for water purification and subsequent reuse includes landscape ponds with hydroponic plants. The house employs sliding wall panels to optimize energy use and computer automated controls to allow the house to automatically adapt to changing environmental conditions. 45 grid-tied solar panels – the Sanyo 190 HIT Double Bifacial Photovoltaic Module, simultaneously absorb sunlight from the back face of the panel; a portion of the sunlight passes through the panels, combining with sunlight reflected off the surface below, thus transferring the highest power per square footage to the bifacial solar cells and producing up to 30% more electricity than a one-sided panel.

All Photographs are taken from the Solar Decathlon website, <http://www.solardecathlon.gov/>. All other images are property of the University Team.

Eric Goldman & James Benson



Darmstadt_ Team Deutschland



All Photographs are taken from the Solar Decathlon website, <http://www.solardecathlon.gov/>. All other images are property of the University Team.



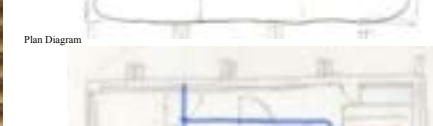
Floor Plan



Plan Diagram



Circulation Diagram



Module Diagram



Module Diagram

PROJECT DATA:

DESCRIPTION: "Made in Germany" is a phrase that applies well to the Solar Decathlon entry from the Technische Universität Darmstadt. The team wanted to present the German way of building, showcasing German technologies and materials in their solar house, including German oak.

TYPE: One Bedroom Unit with Full Bathroom, Living and Dining

CONTEXT: Located in Lot 112 on the South Side of Deathlete Way, Washington D.C. during the Solar Decathlon Competition.

ARCHITECT: Technische Universität Darmstadt Solar Decathlon Team

TOTAL SF: 778 square feet

HOME QUALITIES:

The Darmstadt home combines both high-tech active solar and low-tech passive solar components in a smart operable building envelope of movable photovoltaic shutters. This clever solar shutter system bears more than a passing resemblance to traditional German wooden shutters, only writ large - spanning every exterior surface of house and covered with photovoltaic panels that generate electricity while simultaneously shading the house from the sun.

MATERIALS AND ASSEMBLIES:

The Darmstadt House design is based on a platform system which allows for customization and quick assembly, all made in Germany using German technologies and materials like local German oak. The student team began with an automotive-inspired and uber-German concept: In the 1990's Volkswagen created the platform system for cars, and the student designers wanted to use the same concept of prefabrication and platform design to design an applicable and flexible system. The home's platform system consists of a space for the building technologies, large spaces, and strategically-arranged interiors for floor integration and flexibility.

This platform system allows for innovative furniture and storage solutions which are embedded in the floor. Like something resembling a burrow - the bed, couches and all storage are folded into the floor, saving space in a unique and cozy way.

SUSTAINABILITY:

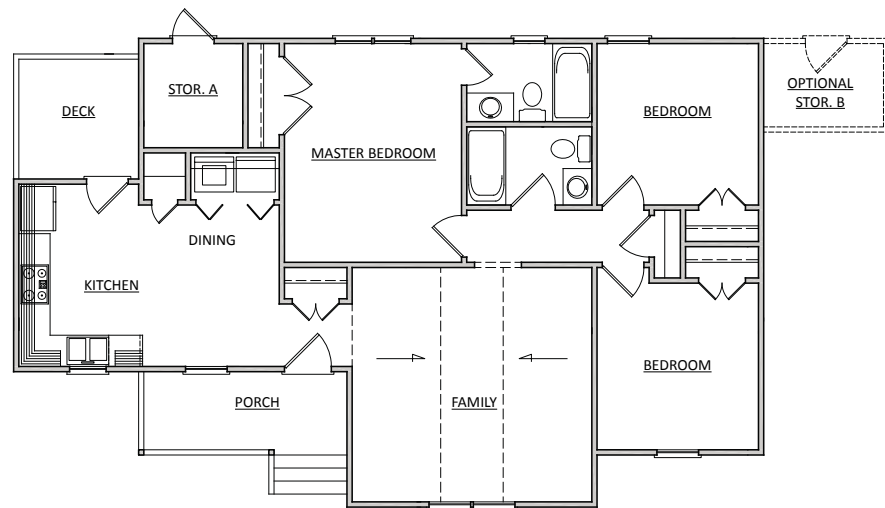
Instead of focusing on the production of massive amounts of energy, the home focuses on keeping cool with passive solar design, requiring a minimum amount of energy to function normally. To achieve this, the building's shell became a central design component. The outer layer consists of oak-louvered frames which, same as the roof, are equipped with photovoltaic panels. This layer both generates electricity and also provides protection from the heat of the sun.

Eric Goldman & James Benson

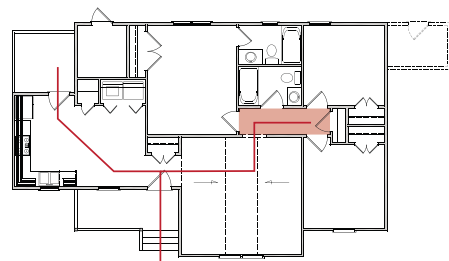
Habitat for Humanity of Wake County Contemporary Models

Habitat for Humanity provides high quality homes that achieve affordability through plan efficiencies, standard materials and assemblies, and volunteer labor. The following plans were analyzed according to the same criteria applied to the national best practices.

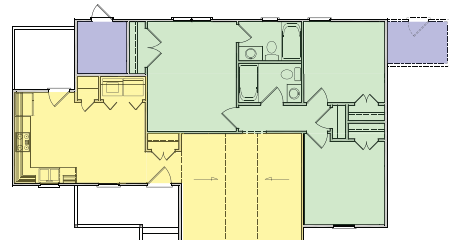
Habitat Plan 1101



FLOOR PLAN
1/4" = 1'-0"



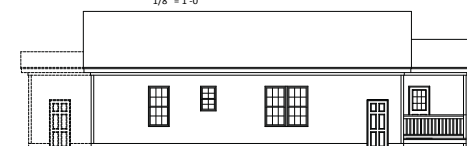
CIRCULATION PLAN
1/8" = 1'-0"



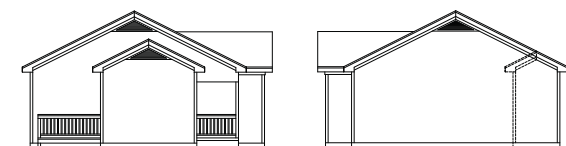
USE OF SPACE
1/8" = 1'-0"



FRONT ELEVATION
1/8" = 1'-0"



REAR ELEVATION
1/8" = 1'-0"



LEFT ELEVATION
1/8" = 1'-0"

RIGHT ELEVATION
1/8" = 1'-0"

PROJECT DATA:

DESCRIPTION:
Three bedroom, two bathroom single family house designed by Habitat for Humanity.

ARCHITECT:
Habitat for Humanity

TOTAL SF: 1101

HOME QUALITIES:

Vaulted ceilings in the living room and 9' ceilings throughout the house give the interior an open feel. The bedrooms are designed as a private section, separated from the public living spaces. An open kitchen with the small dining nook creates an inviting environment. A front porch creates a welcoming entry while the rear deck allows for privacy from the street.

MATERIALS AND ASSEMBLIES:

Using standard construction details and assemblies, all of the Habitat for Humanity houses are designed to be both affordable and easy to build. Standard wood construction on top of either concrete slab foundation or crawl space is used depending on the site. The exteriors may vary from house to house, but typically hardplank siding is used.

SUSTAINABILITY:

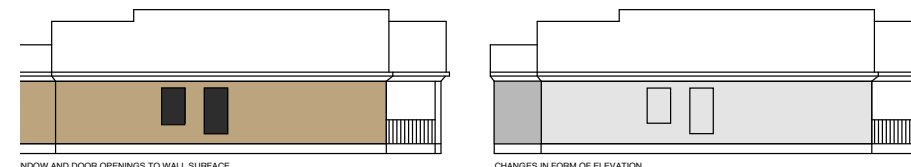
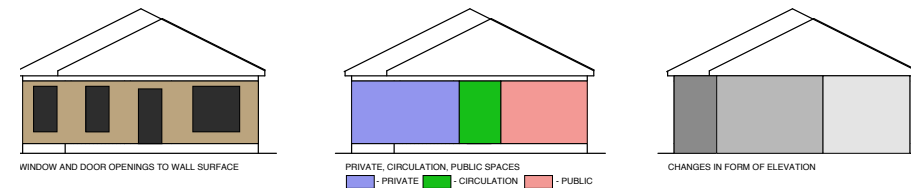
The house implements operable windows for the use of natural ventilation and low-energy fixtures are used on the interior. Without a specific site, it is difficult to implement passive solar strategies because no orientation is certain.

NEGATIVES:

For the most part, the plan is well thought out for a relatively simple, efficient plan. However some wasted space is used for circulation in the bedroom "corridor." Also, the entry is a bit awkward, as the user walks directly into a closet upon opening the front door. The initial storage is well fit into the footprint, but the optional second storage is simply tacked on the exterior.

James Leonard & James Benson

HABITAT HOUSE 1290



SERVED TO SERVICE AREAS
SERVED - SERVICE

PUBLIC TO PRIVATE SPACES
PRIVATE - PUBLIC

BEDROOM, LIVING, CIRCULATION, AUXILIARY SPACES
BEDROOMS - LIVING - AUXILIARY - CIRCULATION

PROJECT DATA

Heated Square Feet 1290
Four Bedroom
Two Bathroom
Living Room, Dining Room, Kitchen
Exterior Attached Storage
Slab or Crawl space
8' Ceiling Typ.

HOME QUALITIES

These Habitat Houses generally feature traditional designs with efficient floor plans and little extraneous circulation. There is approximately 41.5% public space to 58.5% private space, with 7.5% circulation. Standard sized windows are used to facilitate construction and be more cost effective. Flooring in the kitchen and bathrooms is usually vinyl, with carpet and laminate flooring seen in other areas. Undercounter lighting is available in the kitchen and Energy Star appliances are used. The exterior is cementitious siding and features raised panel shutter on the windows. There is a separate masterbath, a front porch, and storage integrated into the building structure, since many developments do not allow secondary storage structures.

MATERIALS and ASSEMBLIES

The efficient and traditional floor plan lends itself to standard construction practices and materials. Standard sized studs and rafters allow for ease of construction by volunteers.

Asphalt shingles over a moderately sloped roof are easy to install and maintain. Interior finishes usually do not include hardwood flooring, which conserves wood resources. All openings to the exterior are meticulously sealed to prevent air leakage.

SUSTAINABLE FEATURES

The efficient and traditional floor plan encourages sustainable by efficient use of materials. Vinyl flooring is used instead of hardwood, conserving natural wood resources. Front porches allow for exterior "rooms" to expand the living space without increasing the heat and air conditioning bills. Energy Star appliances save energy use and costs. Use of standard sized materials reduces modifications and waste. Asphalt shingles reduce heat gain. All houses are heavily insulated and sealed to exterior weather conditions.

Judith Finkner

Habitat for Humanity

Wake County Plan 10-1080-DT



Front Elevation

Scale 1/4"=1'

Specifications:

Square feet - 1080
Bedrooms - 3
Baths - 2

Home Qualities:

The house features a vaulted ceiling with a fan in the living room which makes the small house feel more spacious. Privacy is given by separating private and public with a hall and by buffering between bedrooms with closets and bathrooms.

Plan Efficiency:

The plan is logically laid out with public functions open to each other on the left and private bedrooms and baths to the right. The middle corridor is loaded as much as possible with storage, doorways and laundry.

Materials and Assemblies:

Standard stick built framing materials as well as pre-fabricated trusses were used to make construction easy for contractors and volunteer labor.



Left Elevation

Scale 1/16"=1'



Rear Elevation

Scale 1/16"=1'



Right Elevation

Scale 1/16"=1'



Floor Plan

Scale 1/8"=1'

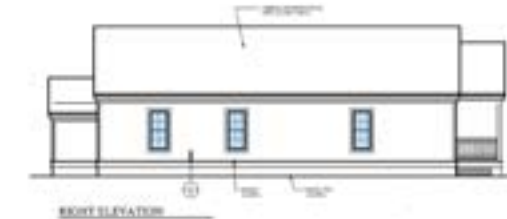


HABITAT PRECEDENT 1285

Jimmy Leonard & Jeff Wilkins



FRONT ELEVATION



RIGHT ELEVATION



REAR ELEVATION



LEFT ELEVATION

GLAZING/OPENING RATIO TO WALL SURFACE AREA

FRONT ELEVATION = 253 SQ/FT
OPENINGS = 66 SQ/FT 26%

RIGHT ELEVATION = 375 SQ/FT
OPENINGS = 36 SQ/FT 9.6%

REAR ELEVATION = 253 SQ/FT
OPENINGS = 24 SQ/FT 9.4%

LEFT ELEVATION = 375 SQ/FT
OPENINGS = 42 SQ/FT 11.2%

TOTAL CONDITIONED
EXTERIOR SURFACE AREA = 1,256 SQ/FT

TOTAL OPENINGS = 168 SQ/FT
=13.3%



PLANS AND ELEVATIONS 1/8" = 1'-0"



- PRIVATE - BEDROOMS AND BATHROOMS
- PUBLIC - LIVING, DINING, KITCHEN
- GENERAL STORAGE
- CIRCULATION AND DOOR SWING AREA

1,284 TOTAL SQ/FT OF
CONDITIONED SPACE

Jennifer Gailey & Brian Casto

James Leonard

Prototypes of Affordable Housing

Some of the national best practices are prototypes that can be adapted to specific sites. The following projects were designed in this spirit, and had a particular focus on home qualities, plan efficiencies, adaptability, materials and assemblies, energy efficiency and performance and sustainable building practices. For some projects, “clients” were created (similar to the Habitat practice of identifying owners before construction) to further define the program and specific qualities of the home prototype.

The Hearth House 2 bedroom–950 square feet

Eric Goldman

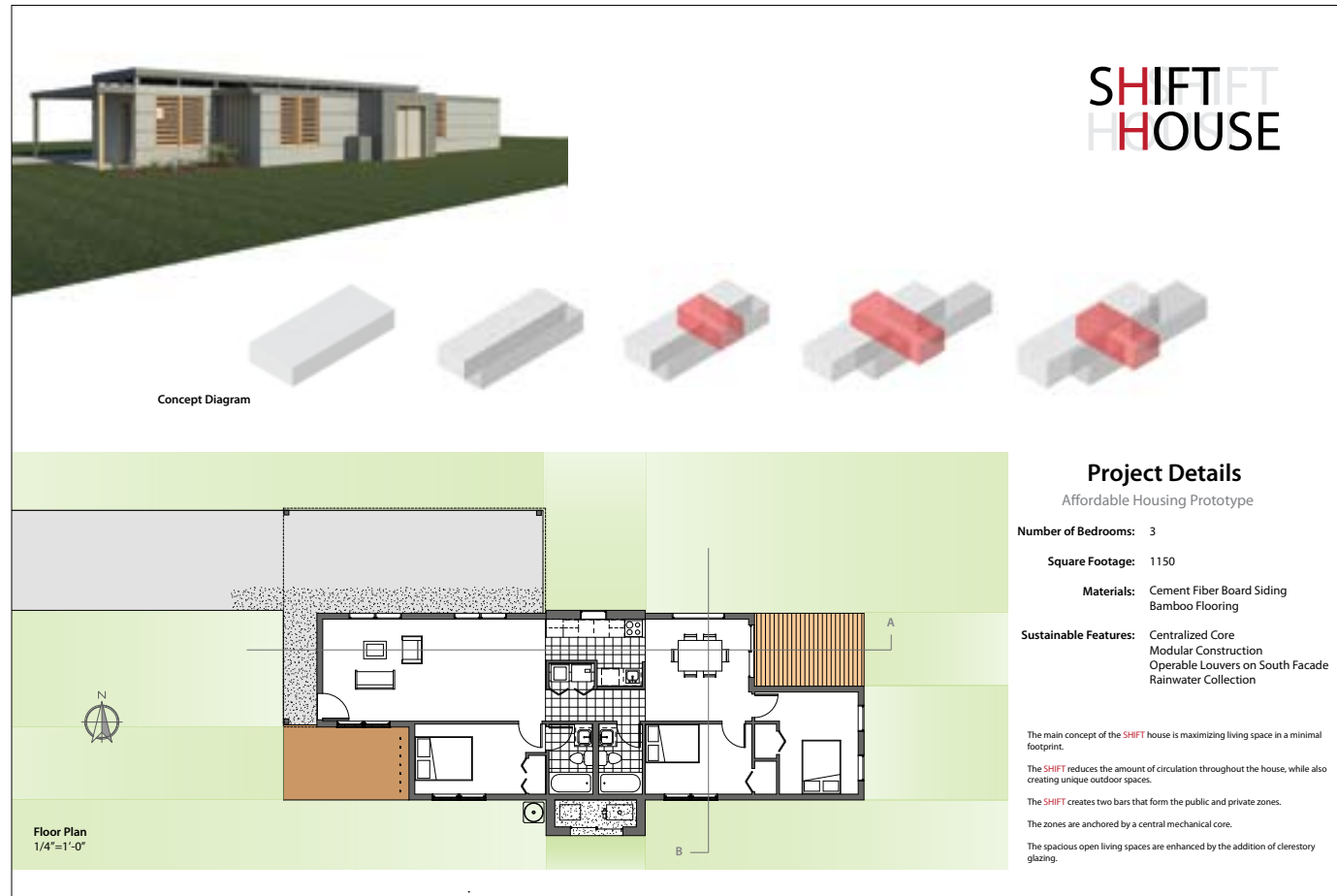
The Hearth House focused on the archetypal hearth as the center of family life. Its efficient plan revolves around the kitchen and is designed according to modules that can be constructed off-site and field assembled. It features passive solar systems to minimize heat gain and a water catchment system.



The Shift House
3 bedroom—1150 square feet

James Benson

The Shift House design was governed by two narrow bars of living space anchored by a central kitchen/bath core. Its efficient plan with minimal circulation space created generous interior spaces that open to the surrounding gardens.



Prototype 0.1

Jimmy Leonard

Prototype 0.1 proposes a multi-phase construction, beginning with a modest unit that would grow over time as the family's financial resources allowed. Its modular planning incorporates in-line framing constructed with readily-available materials. It recognizes that convivial home qualities can be achieved with minimal means.

HOUSING: PROTOTYPE 0.1

THEORY

DENSITY OF HUMAN PATTERN
MINIMAL DWELLING
INFORMAL FAMILY AND HOME GROWTH

EFFICIENCY

16 X 16 MODULE FOOTPRINT
MULTI-PATTERNED SPATIAL EXPERIENCE

HOME QUALITIES

COMPARTMENTALIZED PATTERNS
KINESTHETIC EXPERIENCE > SPATIAL EXPERIENCE
ARCHITECTURE THAT DEVELOPS HABIT

MATERIALS

STICK-BUILT CONSTRUCTION, ADVANCED FRAMING
LOCAL MATERIAL (LOVES AND HOME DEPOT)
PREFAB/FLATPACK APPLICATIONS

SUSTAINABILITY

PASSIVE SYSTEMS IMPLEMENTATION:
VARIABLE DEPENDENT ON SITE AND CLIMATIC CONDITIONS
ACTIVE SYSTEMS IMPLEMENTATION:
BUDGET/SUBSIDY DEPENDENT
16 X 16 MODULE:
LESS CONSTRUCTION WASTE DUE TO ADVANCED FRAMING SYSTEM
AND DESIGNS CENTERED ON MATERIAL SIZES (PLYWOOD, STUDS,
SIPS, ETC)
QUALITY OF MATERIALS:
BUDGET/SUBSIDY DEPENDENT
SOCIAL AND ECONOMIC:
FAMILY GROWS WITH HOME THROUGH PHASING
SHORTER MORTGAGE PERIOD
HUMAN PATTERNS THAT OVERLAP IN FEWER SPACES
GREATER INTIMACY IN THE HOME, GREATER USE OF COMMUNITY
RESOURCES

WALL TYPES

LIVING

EATING

HYGIENIC

STORAGE

MODULES

16 X 16

16 X 32

SINGLE FAMILY

PHASE

VARIATION

MULTIFAMILY

GROWTH TIMELINE: 0-5 YEARS

PLAN: 1/8" = 1'-0"
512 SQ. FT.

NORTH ELEVATION

WEST ELEVATION

SOUTH ELEVATION

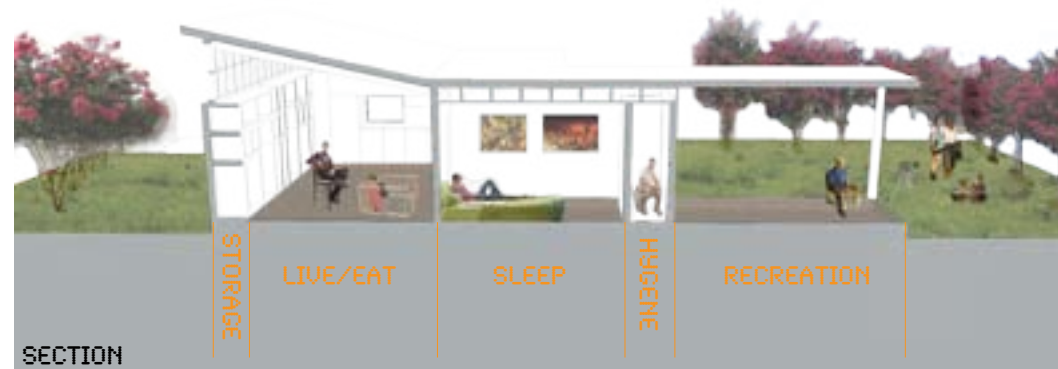
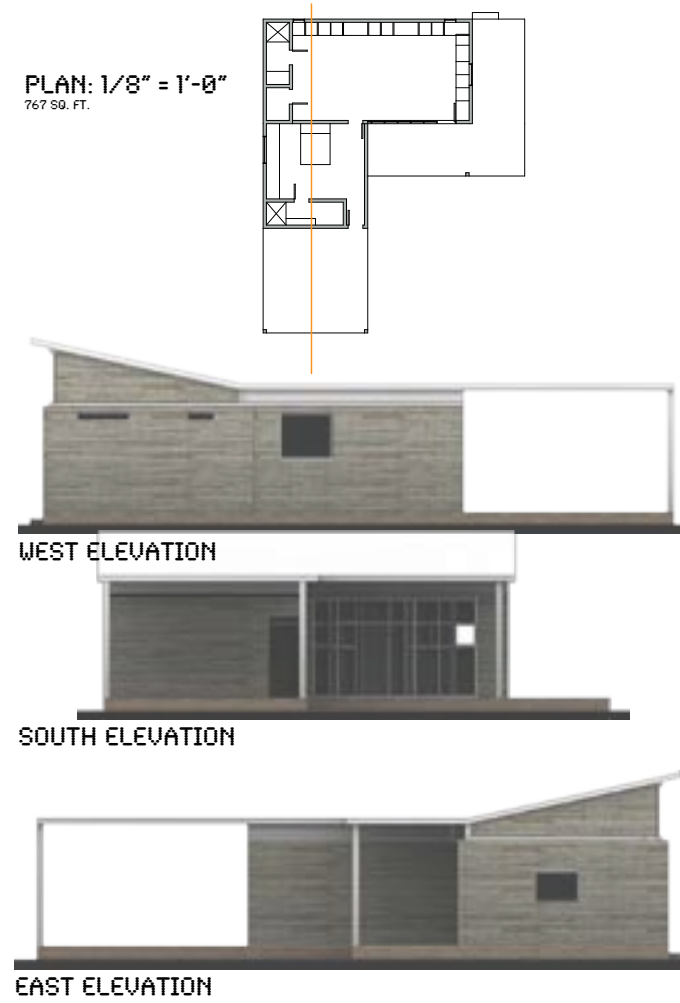
EAST ELEVATION

SECTION

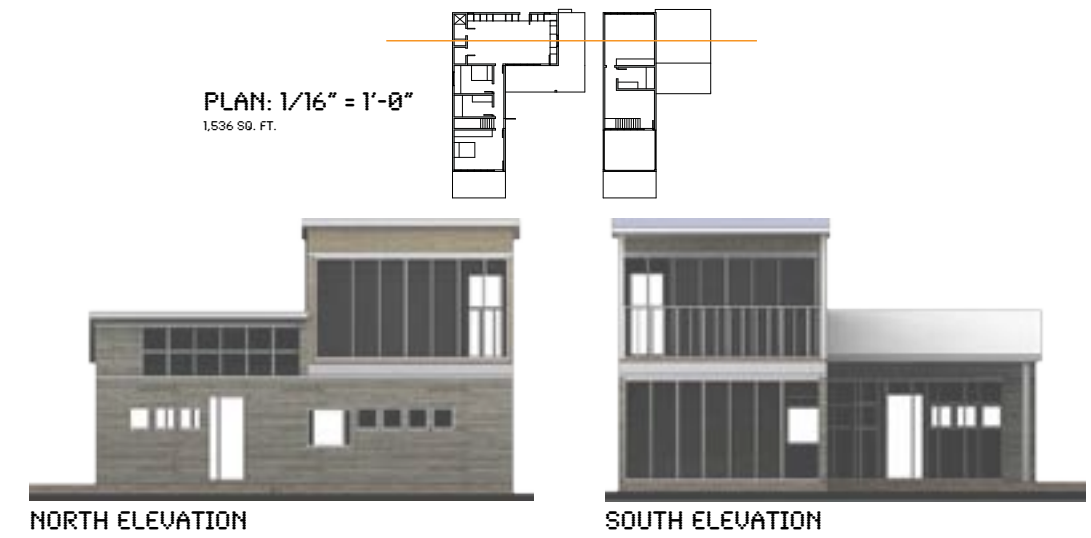
LIVING

LIVE/EAT/SLEEP/RECREATION

GROWTH TIMELINE: 3-8 YEARS



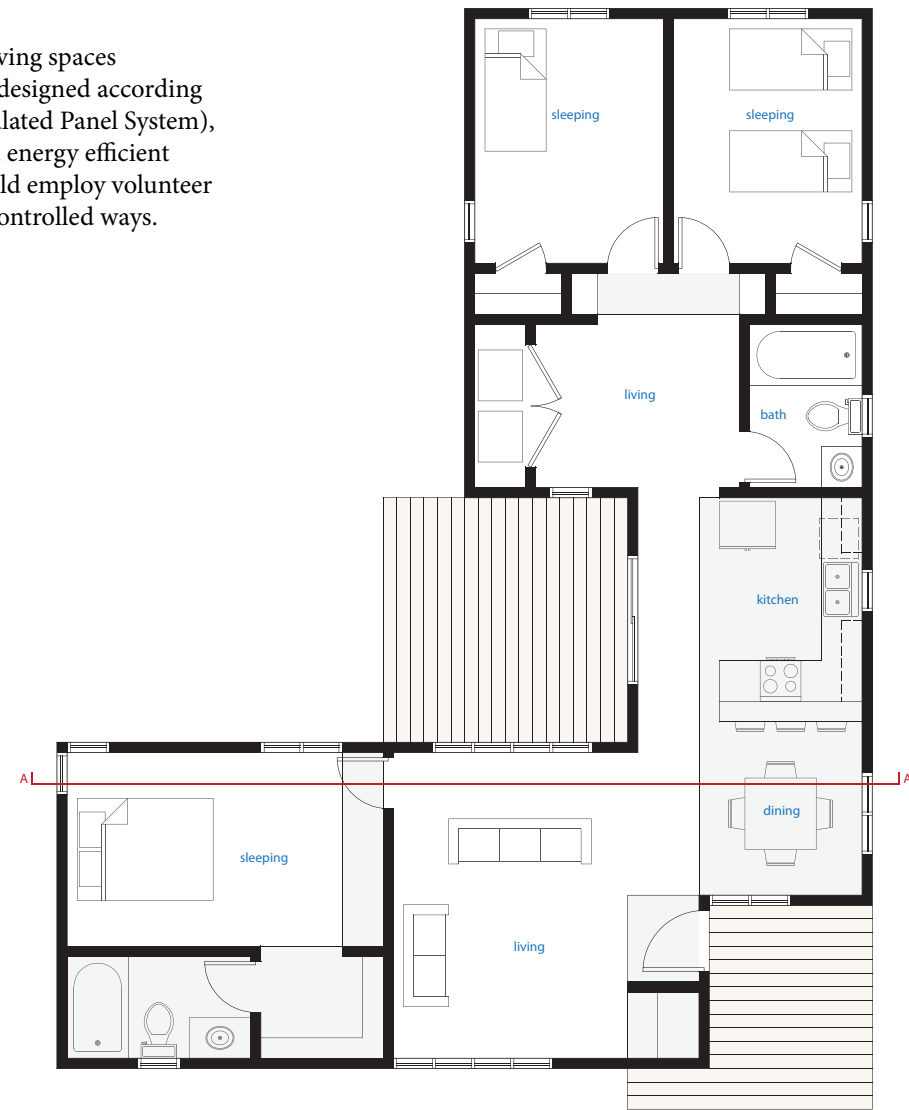
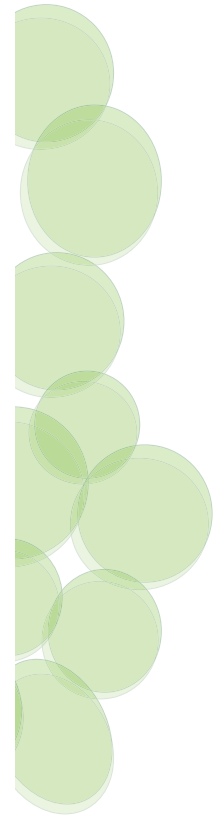
GROWTH TIMELINE: 10+ YEARS



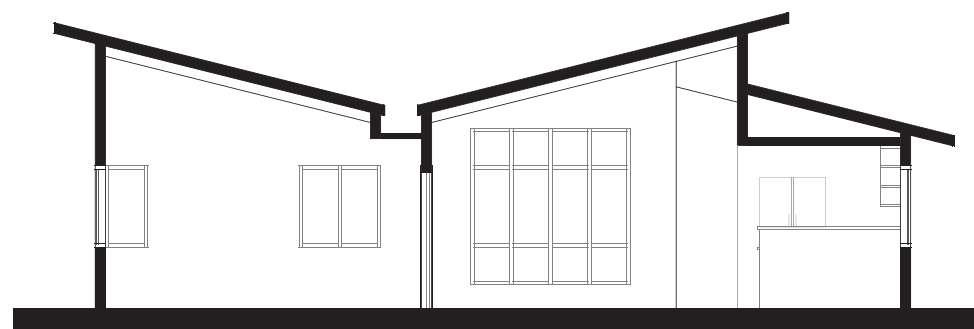
The Flow House
3 bedroom—1200 square feet

Scott Leonard

The Flow House focuses on a variety of living spaces accommodated by an efficient plan. It is designed according to the modules of a SIPS (Structural Insulated Panel System), modular wall system. SIPS are a cost and energy efficient option for future Habitat homes that could employ volunteer and sweat equity labor in more quality-controlled ways.



floor plan
1/4" = 1'-0"



section a-a
1/4" = 1'-0"

SIPS CONSTRUCTION

— Oriented Strand Board (OSB)
— Expanded Polystyrene
— OSB
— Structurally Laminated

SIPS : Structural Insulated Panel System

Shop construction, shipped to site

Assemble panels on poured foundation

Apply exterior cladding and roofing to unify structure

ENTRY

REAR PORCH

LIVING ROOM

CHILDREN'S LIVING ROOM

THE FLOW HOUSE

3 BEDROOM, 2 BATH 1200 SQ FT

FAMILY BIO

The Smith Family consists of four people; two parents and two small children, a boy and a girl. In the immediate future, the Smith's are planning for a third child. Mr. Smith is a purveyor of catfish while Mrs. Smith is a social worker who works mainly from home. The two children are very active, both inside and out.

HOME QUALITIES

A shortened entry porch leads to interior gables throughout the entire house. Higher ceilings help this modest plan to feel large and open. A lowered ceiling over the dining area creates an intimate space for eating. A separated master bedroom/bath from the children's rooms allows parents privacy. A rear porch creates a stage for the enjoyment of the outdoors.

DESIGN THEORY

The driving design ideas that are implemented in the FLOW House include: a public front porch, a family porch, indoor space for children, buildability, and efficiency of space with in the floor plan. In most house plans the only space for the public is the living room, which during gatherings tends to be the realm of the adults. The FLOW House creates a secondary living space solely for use by children. An open visual connection between the living room, dining area, and kitchen creates a spatially rich space.

MATERIALS/SUSTAINABILITY

Through the use of the SIP System, material waste on site is kept to an absolute minimum. Each panel is extremely efficient with an R rating of up to R-30. The split butterfly roof creates an opportunity for rain to be harvested into a rain barrel on the rear of the house. The single pitch roof can be upfitted for rain water harvesting as well. By using SIPS, the exterior can be clad in an infinite number of ways or styles.

The Longacres Community

By Ryan Wallace

The Longacres neighborhood is a first-tier suburb located one-half mile from downtown Raleigh in East Raleigh. It is bounded by busy roads on all four sides: Poole Road on the north; Martin Luther King Jr. Boulevard on the south, Raleigh Boulevard on the west; and Peyton Street on the east. With a current population of approximately 400 residents, the neighborhood has seen little public or private investment over the past few decades. When Habitat for Humanity of Wake County identified Longacres as a potential neighborhood for

revitalization they discovered that the only prior efforts were some neighborhood clean-up efforts facilitated by ACORN (Association of Community Organizations for Reform Now). While the neighborhood is deprived in terms of its built environment, it does have human resources that can assist in revitalization efforts. Engaged neighbors have created community stability and are now working with Habitat to build new homes in their neighborhood.



According to the 2009 American Community Survey the Median Annual Income of the Longacres neighborhood in 2009 was \$38,000, but with over 15% living below the poverty line. The 2000 census documents that the neighborhood is 82% African American, with an average family unit comprising three persons. The housing stock is exclusively single-family, most built in the 1950's and 60's. In 2009 the average house value was \$121,000, with over 60% owner-occupied. However, there have been problems with absentee or negligent landlords contributing to a disproportionate number of dilapidated units. (See the Housing Survey in the Appendix for further information.) Partnering with Habitat for Humanity of Wake County, the city has acquired lots in the neighborhood and today nine are designated for new homes.

At present the neighborhood feels disconnected from the services and amenities that a capital city provides. Hemmed in by several major thoroughfares, the neighborhood has little connection with its surrounding residential neighborhoods. The traffic along its boundary-defining roads is likely the primary cause of this disconnect – Raleigh Boulevard carries 18,000 cars a day; Martin Luther King Jr. 12,000; and Poole Road 7,000. Additionally, many residents do not have cars and must depend on infrequent bus service, biking or walking. Further contributing to its physical isolation are few sidewalks and poorly marked pedestrian crossings, making it difficult or dangerous to access nearby shopping, services and civic institutions. There are no parks within the neighborhood, and while the city owns substantial open land there are no current plans to develop any into community parks.

The following documents the current conditions of the neighborhood and offers modest proposals for its revitalization.

LONGACRES NEIGHBORHOOD: EXISTING CONDITIONS COMMUNITY INVENTORY

The following definitions have been adapted to provide an inventory of the Longacres neighborhood, from the book *Planning to Stay* by William Morrish and Catherine Brown from Milkweed Editions.

ANCHORING INSTITUTIONS

The places where the cultural, educational and social traditions of our communities are centered. The elementary school, the parish church... help structure the social patterns and focus the community life of our neighborhoods.




NEIGHBORHOOD SHOPPING

The places where neighbors purchase the basic goods and services - that support their daily activities. For all the gravitational pulls of downtowns and malls, these services zones survive and contribute to the signature of a neighborhood.




PARKS AND GREEN SPACE

Connect us individually and collectively to the natural environment. These public open spaces allow people of many ages, ethnic origins, and economic circumstances to gather together. The quality, accessibility, and convenience of these features establish a neighborhood's image and character.




HOMES AND GARDENS

Homes and gardens are the spaces where we rear our families, sustain our daily existences, display our identities, and contribute to our neighborhood's image.





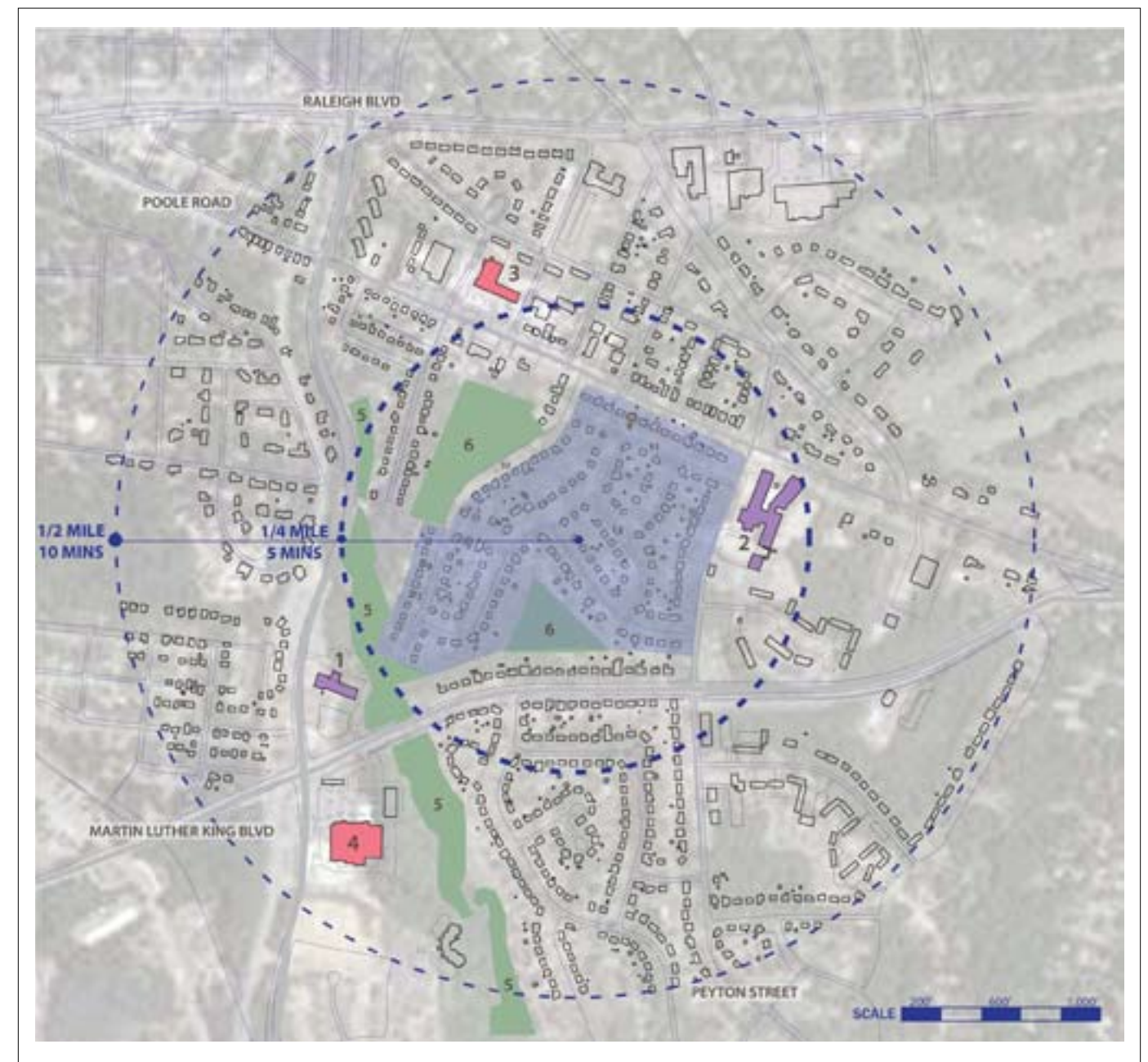
COMMUNITY STREETS

Community streets are public rights-of-way, which unite neighborhoods, provide access for motorists and nonmotorists, and promote neighborhood identity, health, comfort, and safety.





1. Jennie Wilson and Catherine Brown, *Planning to Stay*, Minneapolis, MN: Milkweed Editions, 1994. Pp. 46-51.



LONGACRES NEIGHBORHOOD: PROPOSED CONNECTIONS, PARKS & GREEN SPACES

PROPOSED CONNECTIONS

Longacres neighborhood has several important thresholds which, if there were more clearly defined, could provide visual and physical connections. They include connections to the local elementary school, a community gateway and the neighborhood shopping district. These could be reinforced to more clearly identify the community by means of lighting, pedestrian crossings, plantings, and signage.

- A) These principal gateways to the community act as the 'front doors' to the community. Signage and plantings could be implemented to identify and beautify the neighborhood.
- B) This intersection is an important interface between Longacres, a busy road (Poole) and a neighborhood shopping district. Signage and clearly defined pedestrian crossing could make this connection more safe while providing neighborhood identity.
- C) Poe Elementary is an important anchoring institution for the neighborhood. This connection could be enhanced with signage, landscaping and clearly defined pedestrian crossings.

PARKS AND GREEN SPACE

- 1) There is an existing Capital Area Greenway trail in Apollo Heights. This could be connected by means of city-owned property in Longacres, with proposed links connecting Longacres to the region via trails.
- 2) This open space is owned by the City of Raleigh and presents challenges due to terrain. However, its naturalistic setting could be appropriate for a greenway park including tot lot and other family-oriented programming, serving residents in Longacres as well as from around the region.
- 3) This city-owned open space could become a neighborhood park equivalent to a civic green. Programming might include an open lawn for community sports, picnic areas, community gardens and a dog park.



LONGACRES NEIGHBORHOOD: COMMUNITY STREETS PLAN PROPOSAL

COMMUNITY STREETS

The Longacres neighborhood is a small residential neighborhood in East Raleigh which is surrounded by busy streets and has few public spaces. The streets act as part of the public domain and are important to community identity and value. The proposed street upgrades are based upon the conditions of the neighborhood streets.

Proposed conceptual street section, representing some of the ideas suggested for each of the neighborhood zones. Each contains models for sidewalks, parking, plantings, traffic lanes and street lighting. (from streetsection.com)

A Interior Residential

Streets where the primary use on both sides of the street is residential.
Goal: The focus here is on safety, community identity and neighborly interaction.



B Arterial Frontage

Poole Road is a busy arterial road on the northern boundary of Longacres. It serves as a primary public face for the neighborhood, and provides some basic shopping.
Goal: Beauty, safety and clarity of the boundary between public and private, as well as noise buffering.



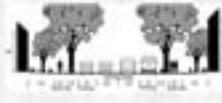
C Neighborhood Park

There are several city-owned properties which could become neighborhood parks.
Goal: A neighborhood park designed to respect private residences by employing clearly defined boundaries, while providing attractive open spaces, and safe access for families walking or biking to the park.



D School Gateway

Peyton Street is an important gateway for the Longacres neighborhood connecting two major thoroughfares, and the neighborhood to Poe Elementary.
Goal: To upgrade the streetscape as a gateway to Longacres; indicator of community identity; emphasis on Poe as an anchoring institution for the neighborhood, and provide sufficient capacity for parents and children several times a day.



E Greenway Park

A naturalistic greenway park could be built along the western boundary of Longacres neighborhood and will feature outdoor programming such as trails.
Goal: The park will connect neighborhood residents to the rest of the region via the Capital Area Greenway. This will be accomplished by providing safe and attractive facilities for local residents and members of the region to interact.



The Longacres Affordable Housing Project

4 Sites–4 Solutions

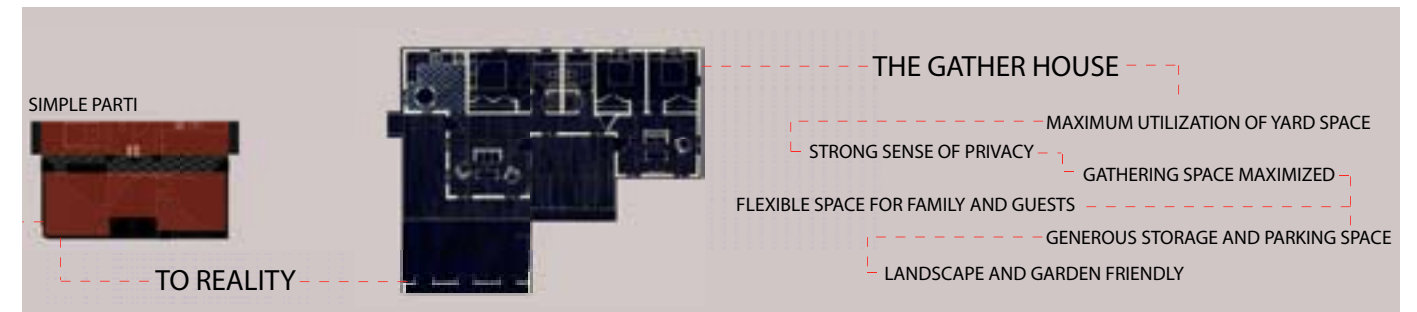
The following projects are set on four sites in the Longacres Community where Habitat for Humanity of Wake County plans to build single family homes. Each had distinguishing characteristics that often become departure points for the student projects.



The Hot Dog Site

515 Parnell Street

Named *The Hot Dog Site* because it is the preferred location for Habitat of Humanity of Wake County community picnics, the site is oriented east-west and gently slopes to the street.



The Gather House 3-4 bedroom-1136 square feet

Matteo Rapellini

The Gather House includes flexible spaces that could be converted to a variety of uses by means of centralized mechanical systems, multifunctional spaces and a system of movable walls. Its compact plan, oriented east-west for energy efficiency, maximizes the living spaces through exterior porches and decks. The surrounding gardens were designed to be planted over time and include a grow wall at the carport.





The Park Site

429 Parnell Street

This significantly sloped site faces city-owned open land that in the future could be a park and connection to the city greenway system. The existing house is slated for demolition.



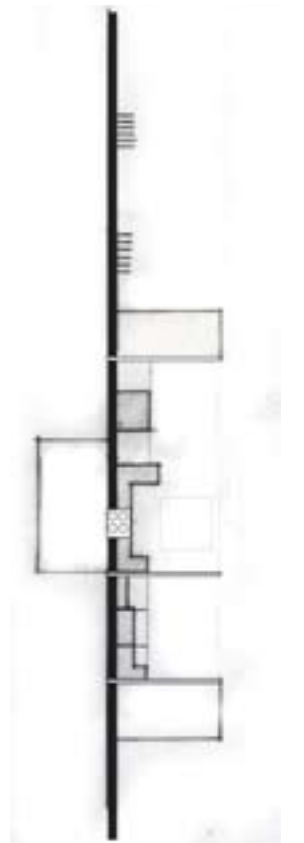
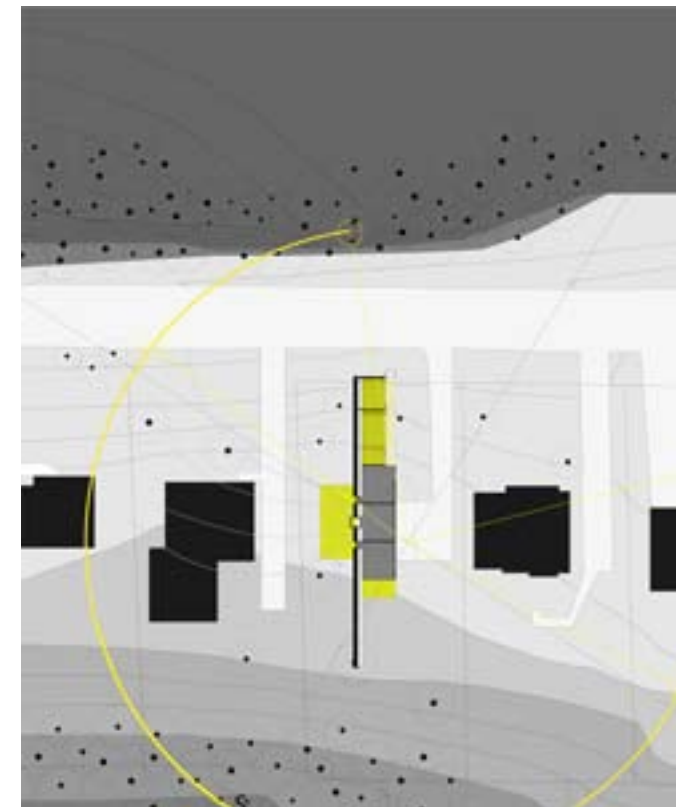
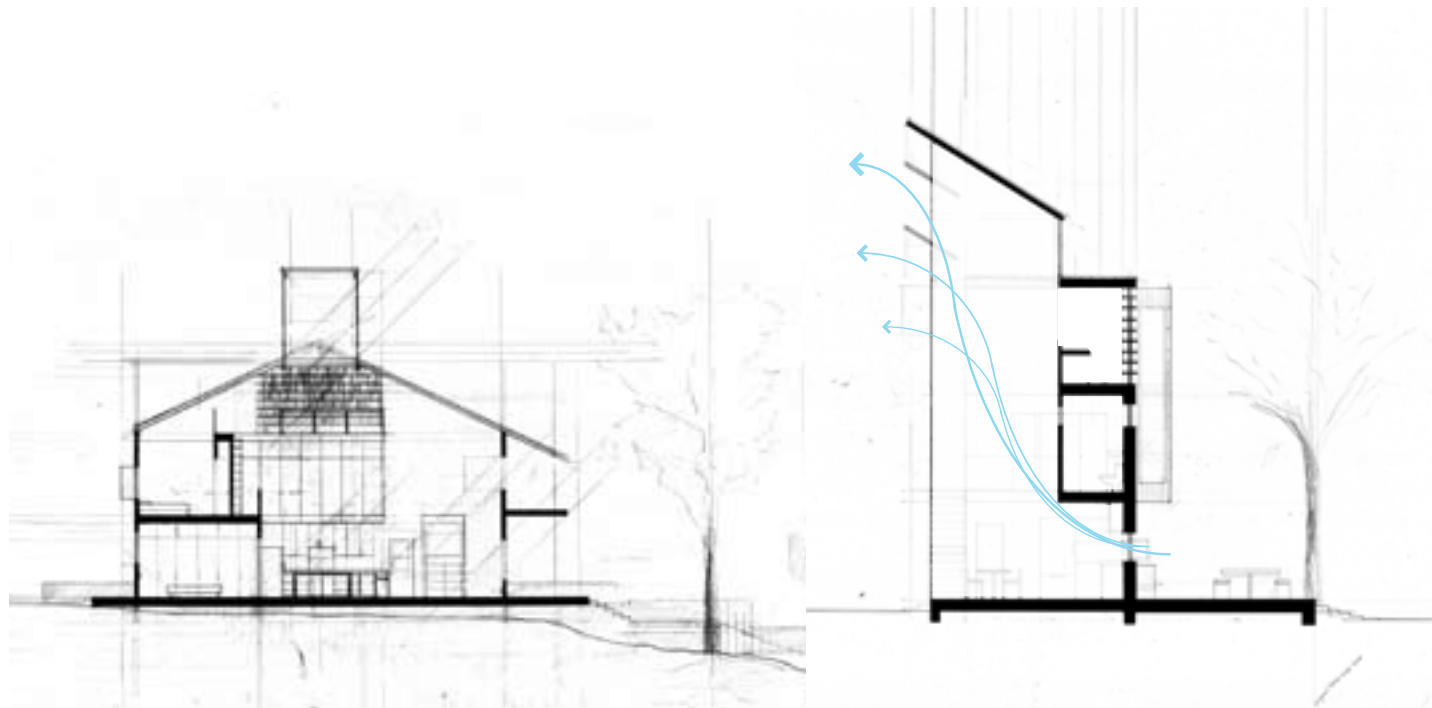
The Windside House

3 bedrooms—1200 square feet

Megan Toma

The Windside House has a particular focus on a sensitive response to the site, home qualities, and the rituals of domestic life. Centered on the family hearth of the kitchen it provides a variety of spaces organized vertically, including a third-story library loft. Porches and windows open to outside gardens and the street. The house is naturally ventilated by a wind tower.





The Gatekeeper Site

414 Lamont

Named *The Gatekeeper Site* because of its location at the intersection of two residential streets, this nearly-flat site is flanked by modest homes set back from the street. The existing house is slated for demolition.

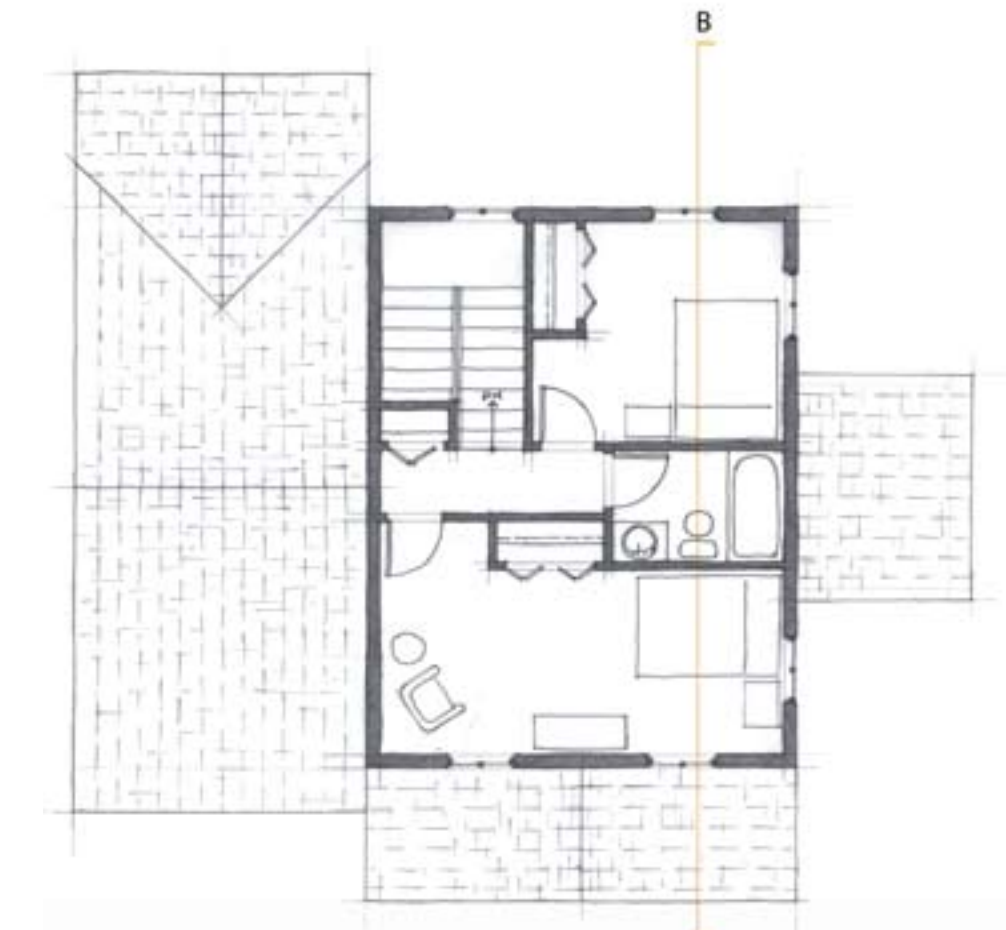


The Gatekeeper House

3 bedroom—1092 square feet

Jennifer Gailey

The Gatekeeper House responds to its public position by proposing a two-story house that symbolizes its watchfulness over the neighborhood. Unlike many homes in the neighborhood, its prominent porch and street-oriented kitchen engage the street and connect the home with its surroundings. Its efficient plan offers a variety of spaces with strategically positioned windows providing views and cross ventilation.



The School Site

428 Peyton Street

This site has the most public profile, sloping up from a major thoroughfare and offering views of Poe Elementary School.



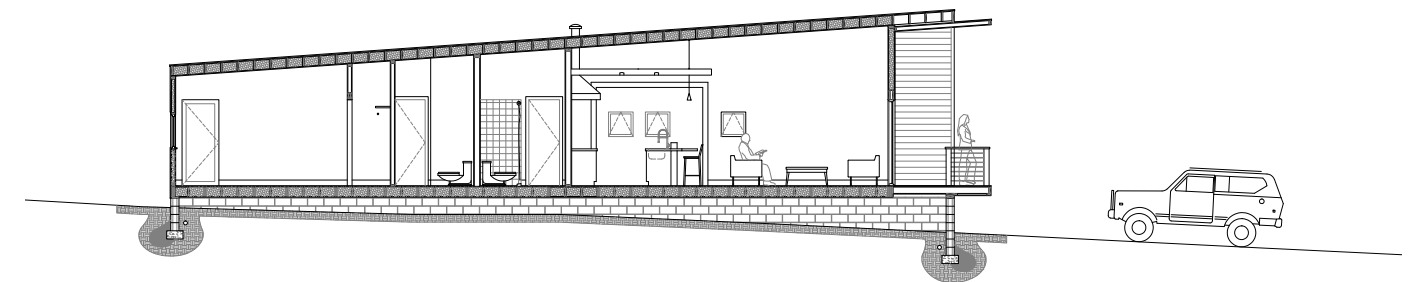
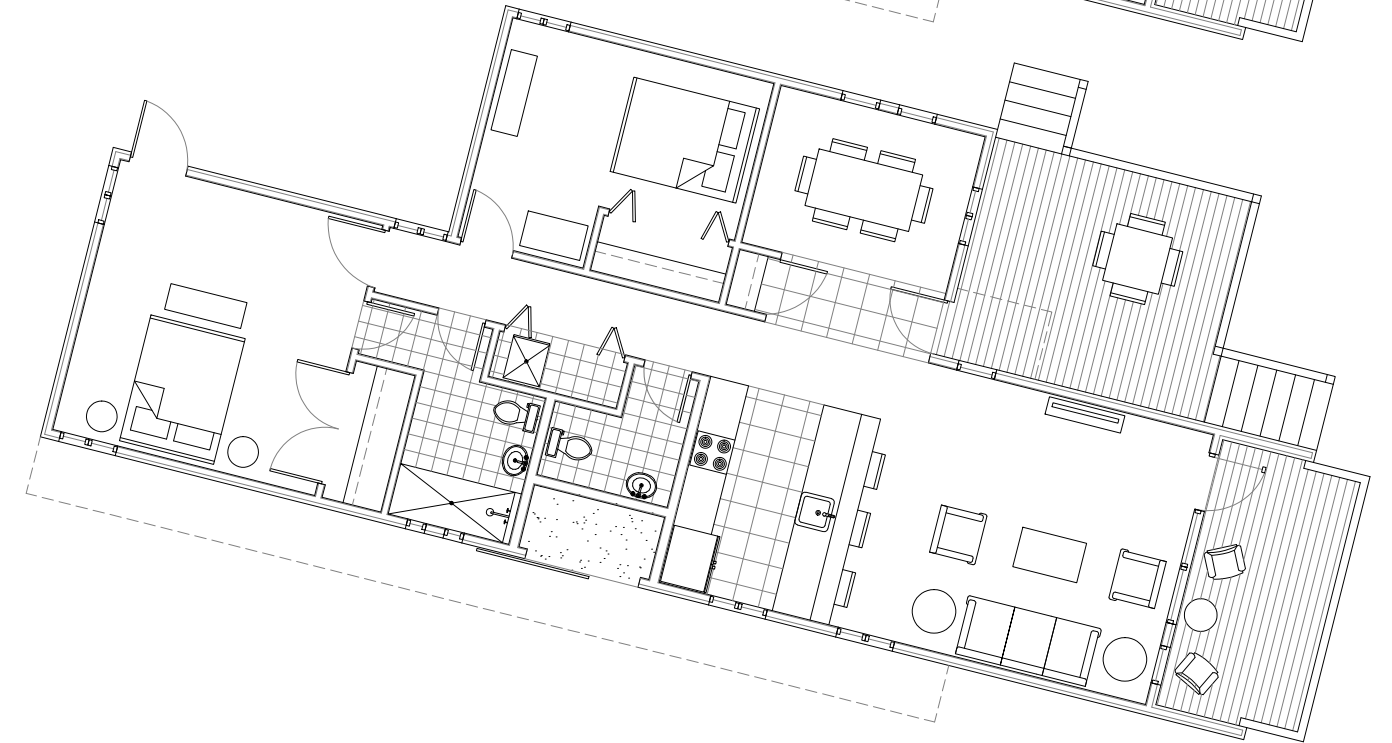
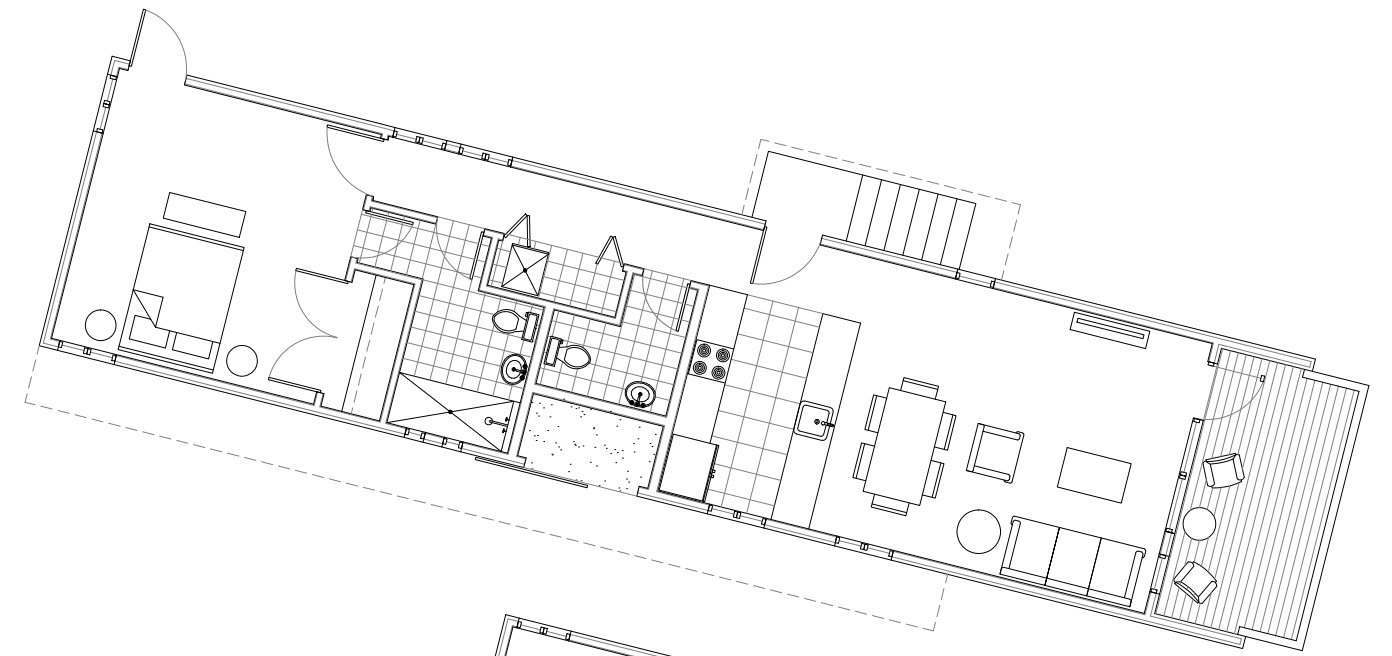
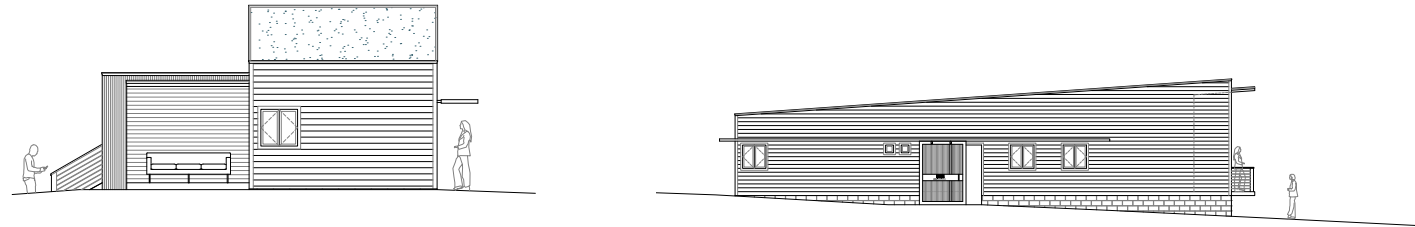
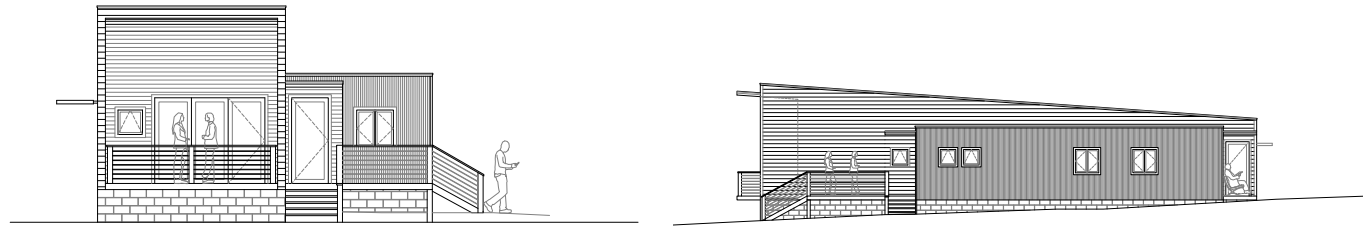
The Adaptable House

1300 square feet—3 bedroom

Jeff Wilkins

The Adaptable House is designed to grow over time, transforming from a one-bedroom with a carport to a three-bedroom unit as family needs change. The narrow plan of the home opens to outdoor spaces including the carport (in the first phase), and incorporates cross-ventilation and daylighting in its sustainability strategy. Its modular planning would facilitate panelized construction while minimizing construction waste.





Appendix

LONGACRES NEIGHBORHOOD HOUSING SURVEY



The purpose of this document is to provide a framework of understanding of the Longacres neighborhood in east Raleigh. The terms used to describe the physical features of the neighborhood have been adapted from *Planning to Stay*, by William Morrish and Catherine Brown.

**AFFORDABLE HOUSING
SPRING 2011- BARRIE**

LONGACRES NEIGHBORHOOD



parnell street

HOUSING AT A GLANCE

- 150 houses in east Raleigh
- roughly 3 persons/household
- built primarily 1950's & 60's
- 100% single-family detached
- residential - 10 zoning
- 60% owner-occupied
- \$121,494 average value
- Habitat for Humanity controls 9 lots in the neighborhood

HOUSING SURVEY



SOUND



MODERATE



DILAPIDATED

LONGACRES NEIGHBORHOOD HOUSING SURVEY



SOUND

502 lansing street



402 peyton street

A unit that appears new or well maintained and structurally intact. There should be straight roof lines. Siding, windows, and doors should be in good repair with good exterior paint condition. Minor repairs stemming from problems such as small areas of peeling paint and/or other maintenance items are allowable under this category.

LONGACRES NEIGHBORHOOD HOUSING SURVEY



MODERATE

2301 nelson street



A unit that shows signs of deferred maintenance, or in need of replacement of one or more major components and other repairs, such as roof replacement, painting, and window repairs.

337 angier street

LONGACRES NEIGHBORHOOD HOUSING SURVEY



DILAPIDATED

500 parnell drive



600 parnell drive

A unit that requires replacement of several major systems and possibly other repairs (e.g. roof structure replacement and re-roofing, as well as painting and window replacement).

A unit suffering from excessive neglect, where the building appears structurally unsound and maintenance is nonexistent, not fit for human habitation in its current condition, may be considered for demolition.

Project Team

Project Director

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Project Partners

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Syretta Hill, Family Support Manager | Habitat for Humanity of Wake County

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Damon Leverett, AIA | Lead Designer, EYP Architecture and Engineering, Washington, DC
David Maurer, AIA | Principal, Tightlines and Maurer Architecture, Raleigh, NC

Guest Critics

Professor Georgia Bizios, Emily Fischbein, Community Development Specialist at Wake County Human Services Housing and Community Revitalization Division, Professor David Hill

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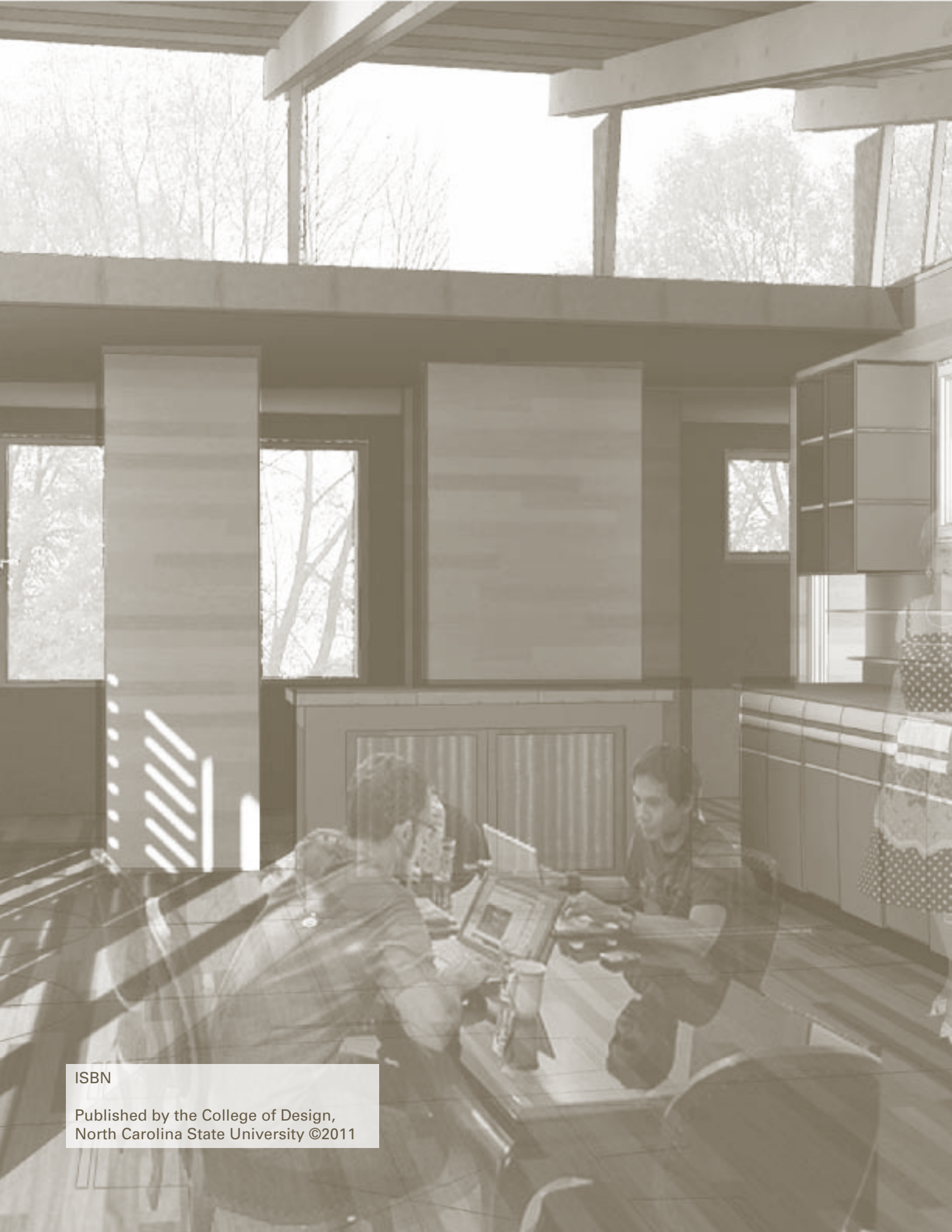
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