



THE CHINQUAPIN SCHOOL FACULTY DUPLEX

Educational and Sustainable Features Summary

A CHINQUAPIN SCHOOL ARCHITECTURE ELECTIVE PROJECT

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INTRODUCTION

David Heinzerling

This project originally stemmed from an introductory sustainable design course that I taught in the spring of 2007. This course provided our students with a real-world application for a broad range of high-school mathematics concepts. After focusing the first half of the semester on basic principles of sustainable design, the students were assigned the task of designing a new “green” faculty duplex—a real-life necessity at the school.

This untraditional approach to a mathematical models course was remarkably successful largely because of the immediate motivation the students felt—aspects of *their* design could eventually end up in the final design of the faculty duplex. The students were also motivated to impress the visiting architects and board members. The students’ enthusiasm toward the project and the concepts of sustainable design left me convinced that we needed to make the idea of a green faculty duplex a reality.

There are many convenient parallels between building design (especially green building design) and science and math curricula. Thus, using the duplex as an on-campus educational tool was a primary design goal. In addition to serving as a model of sustainable building design, the duplex will serve as a data collection resource for science and math classes at Chinquapin, as well as for the larger community. Details of the educational design elements are provided in the last section of this report.

The goal of this booklet and the corresponding presentation by the students is to provide a clear guide to the sustainable features of the new duplex. In some ways, reducing a building to its “green features” misses the idea of judging a building by its success in not only making its residents comfortable and happy, but also in integrating itself into the surrounding landscape and community. Nevertheless, I believe that these features provide a wonderful starting block for a much deeper discussion of the hugely important role buildings play in our society.

As a final note, I’d like to thank everyone involved in making this project a reality. Chinquapin is blessed to have such generous benefactors who believe in the school’s mission and the importance of our on-campus faculty housing. The students, faculty, architects, and contractors have all learned something from this project, and it is the promise of this continued educational component that excites me the most about this building.

Site Plan: Sustainability Features

Drawing: Jonathan Vela
and Luis Navarro

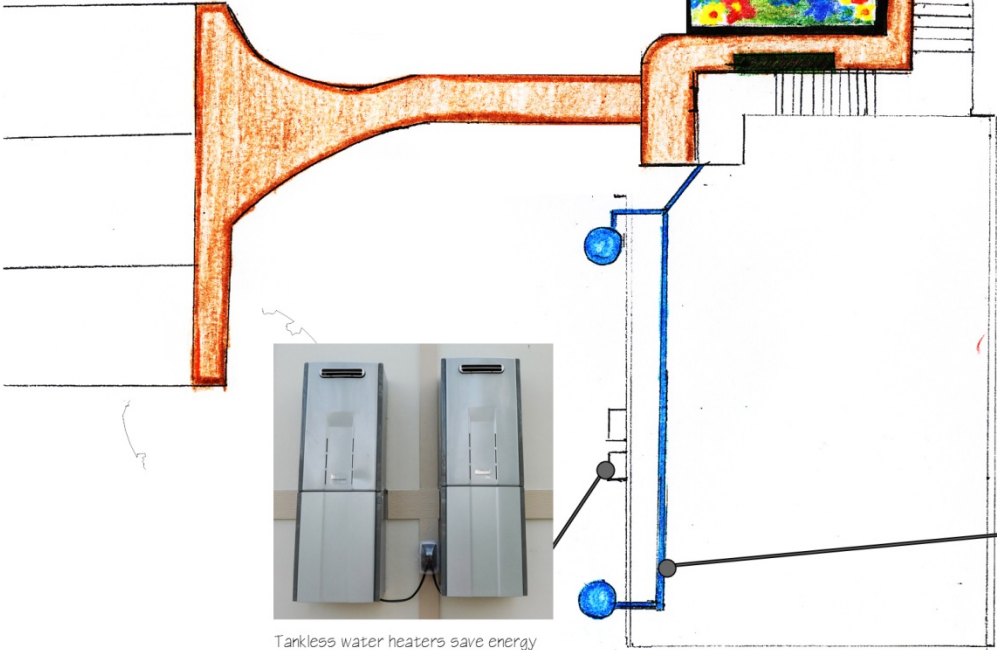
SCALE: 1/16" = 1'0"



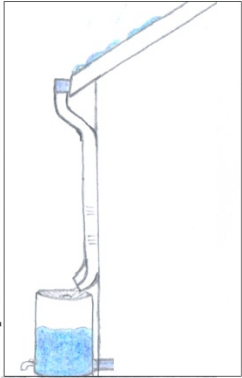
Xeriscaping: plants suited to local climate to minimize water use



Permeable pavement prevents runoff problems. Brick pavers extracted and reused from existing brick sidewalk built by past students and school founders.



Tankless water heaters save energy by providing hot water only when needed.



Rain water collection provides water for irrigation purposes and the potential of a future gray water system.



Unfinished shaft section allows students to see the components of the building system.



Whole house fan at top of clerestory withdraws heat from the house and provides ventilation.



Cellulose insulation made from recycled newsprint., providing minimal air infiltration and a high R-value.



Dual-flush toilet conserves water and bathroom tile contains recycled content.



High efficiency fluorescent lighting and ceiling fans help reduce energy consumption.



Air handler equipped with outside air damper and electronic control unit ensuring proper outside air exchange rates.

West Elevation: Sustainability and Educational Features

Drawing: Claudia Tax

South Elevation: Sustainability Features

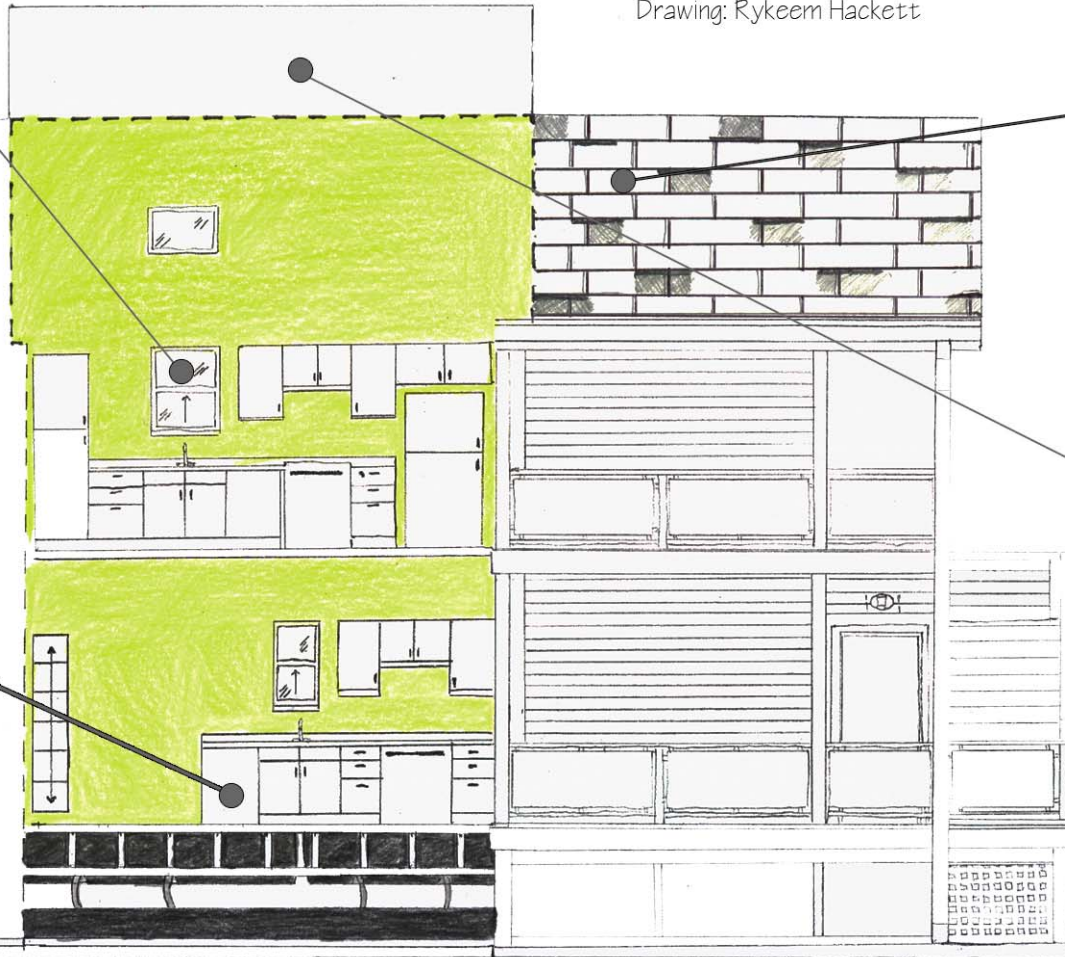
Drawing: Rykeem Hackett



High performance double pane windows with low-e glazing. Window access to ventilation shaft increases natural air-flow and provides natural light.



Energy star appliances help reduce operating costs. Linoleum flooring is a sustainable material and countertops contain recycled content.



Highly reflective shingles help keep house cool.



A 3.5 KW solar panel array will be installed over the summer, donated by Green Mountain Energy.

EDUCATIONAL FEATURES

There are many possibilities for learning from the duplex. Some ideas are included below, but the list is far from exhaustive.

- Resource consumption is monitored around the clock and users will (in the near future) be able to log into a website that provides current energy and water consumption data. This data could be used for projects in AP Statistics, as well as other science and math courses. This type of resource monitoring would also be of interest to local universities as real data describing the efficiency of a green residence.
- Mechanical systems are built in a “transparent” manner so that students can see building systems in action. Additionally, the building could be used for a building science unit in physics with topics ranging from thermodynamics (analyzing insulation efficacy in a hot/humid environment) to Newton’s laws (analyzing structural loads in a hurricane-prone area).
- An effort would be made to use local building materials. Students could calculate the carbon footprint of the materials used to construct the duplex as part of a unit on climate change.
- Low VOC emitting paints were used. In conjunction with the indoor air quality unit in environmental science and with the help of local university research labs, indoor air pollutants could be measured and analyzed as a comparison with other on-campus indoor environments.
- Rainwater is being collected and reused for irrigation of a nearby garden. Teachers could integrate a discussion of rainwater collection into a water cycle/systems module, as well as use the system as a practical example of an engineered system. After studying the concepts and design of the installed rainwater collection system, geometry students could apply their knowledge of area and volume to design their own collection systems for other buildings on campus.
- In conjunction with our mission to produce responsible, worldly citizens, the new duplex will be a model of living sustainably. The faculty members who reside in the duplexes will open their houses to student and community gatherings to promote a lifestyle with a low ecological footprint.