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A Green Community Wellness Center: Expanding the Scope of Design for Health

Abstract | ***Article***

Healthcare facilities use an abundance of toxic materials, consume more energy, use larger quantities of natural resources and produce more waste than most other building types. Despite positive intentions to promote health, a growing body of research shows that healthcare settings are unhealthy for their occupants and collectively one of the largest building types contributing to the destruction of natural ecosystems. In response to these concerns, multiple academic disciplines are collaborating with a nurse-managed health center (the Joseph F. Sullivan Center at Clemson University), city representatives, and green building experts to design a new state-of-the-art green wellness center. This green wellness center will attempt to bridge individual, community, and global health in an effort to expand green design. The multiyear process includes the exploration of the green wellness center during an academic year, the refinement of two design proposals during the following summer, capital fundraising, and building construction. The new facility will eventually serve as a research laboratory to conduct design-based research.

This paper will present both the process and project including the vision, goals, program, green design principles, and the final design proposal for a green wellness center. The overriding architectural goal of the project was to create a physical environment that clearly imbues the center's philosophy of care delivery—one that emphasizes holistic health and health promotion at individual, community, and global levels. To fully serve its inherent health mission at all levels of health consideration, the center aims to employ both green design and green operational strategies.

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Introduction

Healthcare facilities use an abundance of toxic materials, consume more energy, use larger quantities of natural resources, and produce more waste than most other building types. Furthermore, the designs of these settings are often embedded within a static biomedical model, offer limited therapeutic experiences, and are frequently disconnected from the community at large. Despite positive intentions to promote health, a growing body of research shows that healthcare settings are unhealthy for their occupants and are collectively one of the largest building types contributing to the destruction of natural ecosystems.

In response to these issues, this paper presents a collaborative process leading to a design proposal for a green community wellness center that responds to three interdependent health dimensions: individual, community, and global health. During an academic year, faculty from the Architecture + Health program at the Clemson University School of Architecture integrated the planning and designing of the new facility into a variety of courses. The project team involved several academic disciplines (architecture, landscape architecture, nursing, public health, and nutrition), staff from Clemson's nurse-managed health center, city administrators, and local community advocacy groups.

During the fall semester faculty and students from an architectural programming course conducted research on green design, analyzed the local and regional environmental characteristics, and facilitated three work sessions to establish a shared vision and goals for the project. Once the project scope was defined, the Clemson team, alongside nationally recognized green experts, established a series of green design principles during a 1-½ day Green Design Workshop. These principles guided a design studio exploration during the spring semester involving architecture and landscape students. Faculty working with graduate assistants during the summer of 2005 finalized two proposals based on some of the best student ideas. The project is currently in a fund-raising stage and will be built once adequate funding is secured.

This paper is organized in four sections:

1. **The premise for a green wellness center will be proposed within an eco-healthy design approach that integrates individual, community, and global health.**
2. **The proposed scope of the project, goals and site criteria for the green wellness center will be described.**
3. **The final proposals will be presented with a series of therapeutic and green design principles.**
4. **Conclusions and next steps will be summarized.**

Green design affects individual, community, and global health

The three dimensions of health (individual, community, and global) are rarely addressed in an integrated way. This paper attempts to bridge these three health dimensions and expand the definition of green design. The authors believe that green design is inherently therapeutic and healthful, is more patient- and staff-centered, and provides more efficient and effective settings for delivering a broad range of health services. Furthermore, green design—broadly defined—can positively affect health on multiple scales.

Individual health

Individual health is affected by the therapeutic quality of the designed environment and one's immediate surroundings. Within healthcare settings, individual health is influenced by a conflux of factors including: (1) the effective and efficient delivery of health care—

operational considerations that are linked to both the organization culture and the physical design; (2) the healthcare experience—the psychological, social, and cultural issues such as comfort, control, privacy, and social affordances; and (3) environmental quality—the consequences of design decisions such as indoor air quality, toxicity of materials, natural and artificial lighting, and connections to nature.

Evidence suggests connections between the design of the healthcare environment and various outcomes such as patient outcomes, satisfaction, operational efficiency, length of stay, therapeutic outcomes, medical errors, and patient safety (Ulrich and Zimring 2004). Additionally, research highlights the adverse health effects of the designed environment with respect to disturbances in circadian rhythms, seasonal affective disorder, and building-acquired illnesses such as asthma (e.g., Hartman 2004; Pechter, Raleigh, and Davis 2004; Springston 1999). The Environmental Protection Agency (EPA) has defined these consequences as "sick building syndrome" and ranked this problem as one of the top five environmental threats to human health. More than $60 billion dollars per year in medical costs in the United States can be attributed to the poor quality of the interior environment (Zeiher 1996).

Community health
Community health is concerned with issues of "healthy communities" at the local level and influences public health outcomes for those associated with and affected by the facility, through its location within a physical and social context. According to Trevor Hancock, a pioneer in the contemporary healthy community movement, "the major determinants of health are to be found in environmental, social, economic, political, and cultural conditions—and the behaviors they shape—rather than in the provision of health care" (Hancock 1993). This position follows the World Health Organization's definition of health in an effort to expand the traditional biomedical view that has shaped our current healthcare system. Furthermore, there is growing evidence that contemporary building patterns threaten public health (Frumkin 2002; Dannenberg et al. 2003).

There is an obvious need to create healthy communities, particularly in the southeast United States, which has a high incidence of chronic diseases such as cancer, heart disease, asthma, type 2 diabetes, stroke, physical inactivity, and obesity. According to America's Health: State Health Rankings—2005 Edition, southeastern states are at the top of this list . They also claim the largest percentages of people with limited or no access to healthcare services. Clemson, similar to many other small towns, is an appropriate place to explore a new community model designed to promote and restore health.

Global health
It has been widely publicized that the United States is the highest consumer of fossil-fuel energy, a nonrenewable energy source known to damage the earth's natural ecosystems. The U.S. Census Bureau estimates that the U.S. population represents 4.5 percent of world population, yet in 2002 it consumed 24 percent of the world's primary energy source—the highest overall percentage in the world (Energy Information Administration 2003). The designs of buildings and landscapes are major contributors to this trend and resulting ecologically destructive outcomes. Commercial (including healthcare facilities) and residential buildings in the United States account for 36 percent of total primary energy use, 30 percent of greenhouse-gas emissions, 40 percent of raw material use globally (3 billion tons annually), 30 percent of waste output (approximately 2.8 lbs. per person/day), and 12 percent of potable water consumption (U.S. Green Building Council).

Healthcare buildings in particular are the "fourth highest consumer of total energy of all the building types" and second in electricity use per square foot. Lighting alone has been estimated to account for 44 percent of on-site electricity, an aspect that architectural design decisions can affect (Energy Information Administration 1995). While energy is a relatively small percentage of overall healthcare facility operational costs, these costs do not take into account the negative impact that healthcare has on global health. To fully serve the inherent health mission, it is incumbent that healthcare facilities employ design and operational strategies that minimize their overall ecological footprint.

Designing a green community wellness center
Issues and facts
The Joseph F. Sullivan Center, created in 1978, is one of the oldest continuously operating nurse-managed health centers in the United States. It serves a dual function by providing healthcare to populations in medically underserved areas and clinical

experiences to nursing students. Although nurse practitioners are the primary providers, they work with a team of physician collaborators, health educators, lay health advisors, nutritionists, and counselors to help served populations achieve optimum health and well-being. A mobile health van extends services to surrounding areas. As an academic health center, it provides a vehicle for the integration of teaching, research, and service.

The center currently is buried within an academic building on Clemson University's campus and invisible to the community, compromising access for many clients. Furthermore, the location limits community health collaboration in teaching, practice, service, and research. The lack of parking, space constraints, and the intimidating on-campus location limit the center's impact.

Access to health services in the region is a significant issue. The primary service area includes municipalities comprising approximately 21,000 permanent residents and 18,000 students, according to 2000 U.S. Census. These towns sit within a broader three-county service region. They lack affordable preventative, primary, and complementary health services. Available services are fragmented and dispersed, negatively affecting poor minority populations with limited access to healthcare, many of whom are elderly and children. Many of them are medically uninsured and underserved. Clemson is an ideal location as it is centrally located and is the hub for a free regional public-transit system.

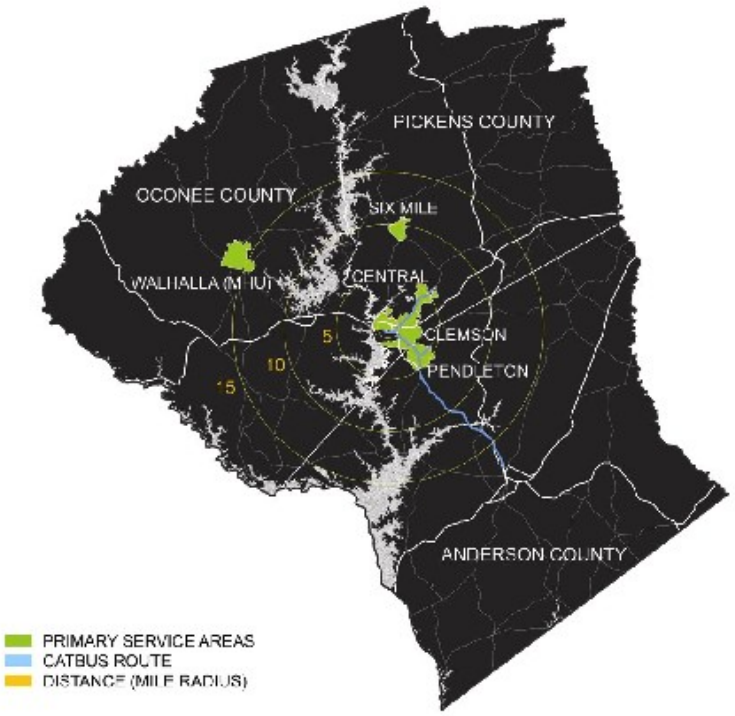

Figure 1. *Sullivan Center service area*

Clemson is situated midway between Atlanta and Charlotte—a region experiencing rapid growth in the form of suburban sprawl that has a large ecological footprint and a strong correlate to unhealthy lifestyles (Frank et al. 2003). These autocentric environments are typically associated with lower environmental quality, poor dietary choices, lower physical activity, and unhealthy lifestyles in general. Regions such as ours can benefit from positive examples of green design and healthier living choices.

Vision and goals
The Sullivan Center's vision is to improve individual, family, and community health by providing a platform for the integration of teaching, research, and service. It also aims to demonstrate how healthcare design can positively affect global health. The project goals are as follows:

- ***Provide high-quality, affordable, and culturally competent healthcare***

- ***Provide enhanced hands-on learning experiences***
- ***Seamlessly integrate learning, public service, clinical practice, and research***
- ***Promote community and environmental health***
- ***Promote interorganization and interdisciplinary collaboration***

Four additional architectural goals helped guide design decisions:

Therapeutic, healthful, green, and sustainable. ***Green design is inherently therapeutic and leads to the restoration, maintenance, and optimization of individual, community, and global health. This may be achieved through reducing or eliminating toxic materials, optimizing indoor air quality, and maximizing connections to nature and daylight. In addition, the facility should embrace "reduce, reuse, recycle" and the "Cradle to Cradle" concept of separating and reprocessing natural and technological waste (McDonough and Braungart 2002).***

Welcoming, comforting, and delightful. ***The center should be physically welcoming and promote comfort for all occupants. It should be easy to find and access, warm and friendly. Staff and students, who spend large amounts of time in the building, should find it a pleasant, safe, and low-stress workplace.***

Operationally efficient and effective. ***Design must support optimal workflow, accommodate state-of-the-art technology, and allow flexible delivery of services. Co-location of offices and departments is important to encourage interdisciplinary interaction and synergy. Ultimately, design should help the organization do more, better, with fewer human and financial resources—optimizing both programs and patient outcomes.***

Accommodating of changing needs. ***The physical infrastructure should be adaptable to rapid advances in technology and emerging healthcare practices to prevent premature building obsolescence (Brand 1994). A state-of-the-art practice, teaching, and research setting must evolve as new services are implemented to keep the Sullivan Center constantly forward-thinking and -acting.***

Program
In 2004 the Sullivan Center had 5,556 client encounters. They anticipate needing space and personnel for 20,000 visits by 2014. The center currently includes space for clinics, counseling, offices, and support. Based on service growth and the addition of new services, program needs are projected at 20,000 gross square feet.

The center aims to emphasize holistic care and health promotion instead of simply managing disease and disability. Therefore, services include teaching healthy lifestyle and living skills by using hands-on and self-directed experiential learning models. Existing services such as preventative screening, immunizations, primary care, and counseling will be expanded. New services will include complementary and alternative therapies, nutrition, physical activity and healthier-lifestyle programs, chronic disease programs, and stress management.

Interior areas
Program spaces are organized into public, clinic, and faculty/staff/student work areas including

- ***Public areas***
  - ***Experiential waiting and reception/check-in***
  - ***Health education and learning areas***
  - ***Demonstration kitchen and healthy cafe***
  - ***Public gathering and meeting areas***
  - ***Community pharmacy***
- ***Clinic areas***
  - ***Clinical exam and treatment areas***
  - ***Complementary care areas***
  - ***Counseling areas***
  - ***Clinical laboratory***
  - ***"Black box" research exam room***
- ***Staff and student work areas***
  - ***Offices***
  - ***Open cubicles***
  - ***Meeting spaces***

Exterior areas

To ensure a strong connection to nature, interior and exterior zones are blurred through transitional outdoor areas:

- ***Gathering and waiting areas***
- ***Cookout area***
- ***Therapeutic viewing gardens***
- ***Activity gardens and spaces for exercise, yoga, meditation, and tai chi***
- ***Demonstration gardens***
- ***Community garden plots***
- ***Community farmers market***
- ***Green parking areas***
- ***Docking station for mobile clinic***

Site selection
Site criteria were established during the Green Workshop to support the project vision and goals. Close proximity to related community resources such as a food bank, free clinic, proposed neighborhood community center, municipal services, and neighborhood-oriented retail outlets were considered to minimize separate trips, conserving both time and fossil fuel consumption.

It was important to set a highly visible "green" example by reusing reclaimed properties, buildings, and their materials. Reclaiming underutilized sites within town rather than building on greenfield sites at the edge of town demonstrates healthful practices at the global, local, and individual levels. There are limited available greenfield sites of adequate size in appropriate locations for the project. However, like many small towns, Clemson does have several underutilized or abandoned commercial properties along major arterials near the center of town.

Two reclaimed sites were ultimately selected for detailed design proposals. One was strategically located within the city, and one was located at the edge of the Clemson campus. Both were selected for their accessibility and visibility in the community, proximity to campus, and ability to accommodate program needs in a therapeutic setting. Both sites had the potential to be improved from an environmental-impact standpoint through green development and design.

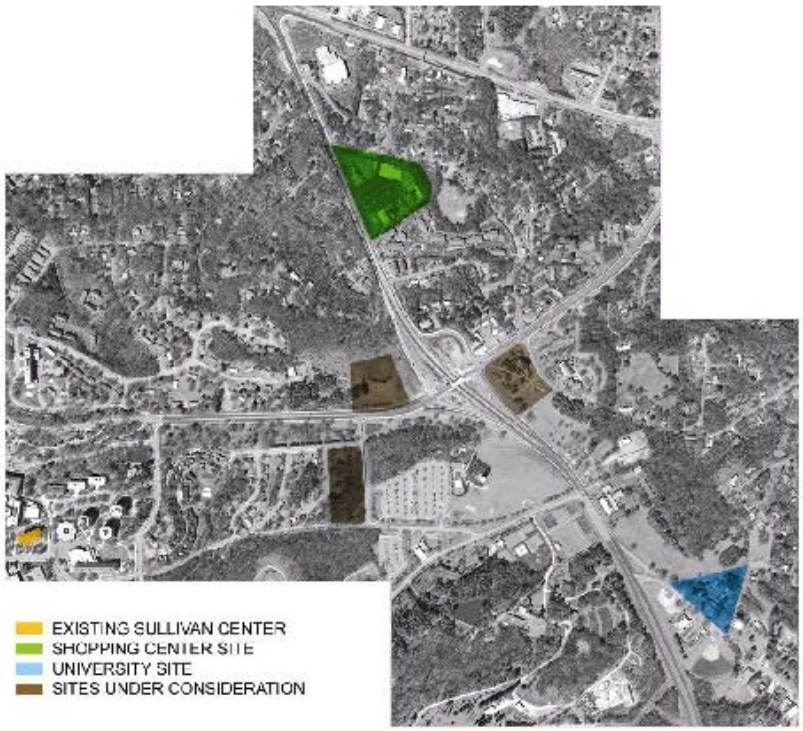

Figure 2. *Site options*

The city site consists of an old and underutilized strip shopping center surrounding a large asphalt parking lot. Most of the site is impervious. A large portion of the shopping center is currently leased to the university and used for remote storage. The leased area was adequate to accommodate the building program and still allow the subtraction of courtyards within the thick footprint. This site held the advantage of being located in the center of the community and within a low-income, medically underserved neighborhood. The site and its structure currently represents the antithesis of green design and health community planning but held the potential for demonstrating how to transform a negative into a model of green design.

The university edge site was located within a half mile of the city site and also met site selection criteria. As with the city site, it is a previously developed and underutilized site. It currently contains a series of abandoned chicken coops and related agricultural structures that cannot be renovated due to contamination from their agricultural past. It was determined that whatever materials were salvageable would be appropriately reused when possible. The site also suffers from having a high-tension power line easement along one side of the roughly triangular property.

Design proposal and principles
The university site was ultimately chosen since it was publicly owned. This reduced the projected overall project costs and eliminated the political and legal complexity of a city-university-private partnership. In some ways this reflects the political and economic difficulty of doing the right thing—from both a green and public-health perspective—under the dominant private development practices and economic growth patterns prevalent today.

The overall design proposal consists of a courtyard building situated with minimal grading on gently sloping terrain. The slope allows placement of staff parking under the building at one end and a grade-level main entry at the other end. The building and disturbed areas were situated to minimize impact on a grove of mature oak trees planted around the abandoned agricultural structures. The patient and visitor parking lot and entry drop-off double as a shaded farmer's market on weekends when the clinic is not in use. The center's mobile clinic is housed in a sheltered carport off the entry court, which is designed to allow it to be used for health screening while parked with an adjacent outdoor waiting area under an arbor roof structure. The courtyard and some roof areas are designed as therapeutic gardens and shaded outdoor waiting and meeting areas. Community garden plots are located within the power line easement where shade trees are prohibited.

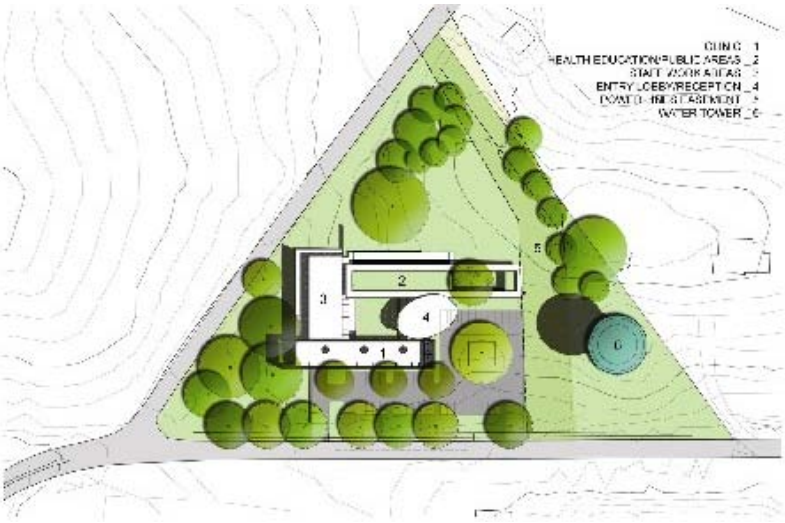

Figure 3. *University site plan*

The central garden courtyard is surrounded by three programmatically and physically distinct wings: a clinic wing, a community meeting/health education wing, and a connecting staff wing. The east side of the courtyard is enclosed with an entry lobby element. This zoning allows the building to collapse in use depending on programmatic

needs during a typical day or week, minimizing conditioning needs accordingly. It also allows for the phased construction of the clinic based on the capital funding stream.

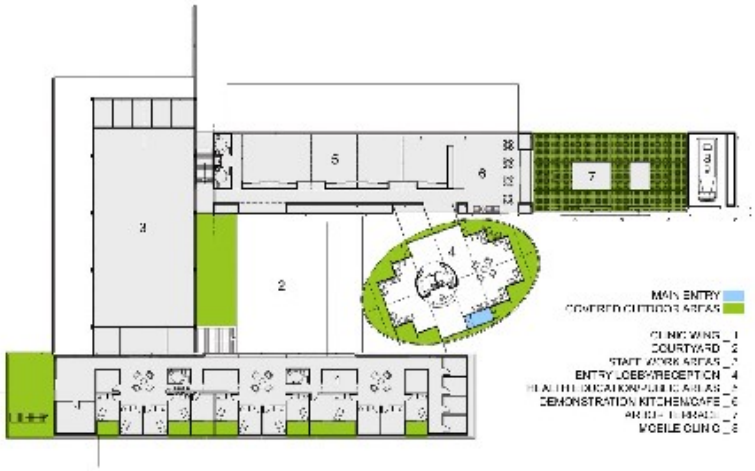

Figure 4. *Floor plan*

The final design proposals were guided by green design principles attempting to address health at global, local, and individual levels. The three principles in this article were selected from a larger pool of design principles identified in the Green Workshop. They focus on the scale of the overall site and building design.

Minimize impervious footprint
The amount of impervious paving typically required to meeting zoning requirements for parking in a commercial development or healthcare facility leads to environmentally insensitive and unhealthy patterns of development. The site is usually tabletopped to create a level plateau. The building is then centrally placed on this plateau and surrounded by impervious parking areas with minimal plantings. Storm water is typically handled by a deep retention pond surrounded by chain link fencing.

Figure 5. *Typical strip development as shown at the shopping center site.*

Storm water runoff and the resulting pollution from buildings and parking areas is concentrated and increased in volume due to large areas of impervious roof and parking surfaces. This reduces localized water quality in the immediate watershed, increases the potential for flash flooding, and limits natural filtering of pollutants through the soil and refreshing of the water table.

Large parking areas surrounding buildings also create heat islands that increase building cooling loads in summer and make outdoor uses even more difficult to tolerate. Conversely at night, parking areas without tree cover continue to radiate stored heat energy after sunset and contribute to light pollution for neighboring residents. Conventional parking lot design creates unpleasant and unsafe places for people both in and out of their cars during our long hot summers and also creates ecologically deprived habitats for wildlife.

The proposed clinic attempts to minimize impervious building/site footprints with staff parking underneath the building and permeable multiuse surface parking and roof areas. These areas are designed to be multifunctional, therapeutic, green, and healthful.

Parking in a park
Patient and visitor parking spaces are surfaced with permeable paving materials. Locally produced recycled paving is used in traffic lanes, handicapped parking spaces, and other high-use parking areas. Islands and perimeter areas are designed and graded as bioswales without curbs, allowing remaining runoff to be distributed throughout the site and percolated back into the water table.

Figure 6. *Shaded parking areas in front and staff parking underneath the building*

Deciduous shade trees are spaced to provide shaded patient and visitor parking during the summer. These shaded parking areas double as spaces for a weekend farmers market, periodic outdoor health fairs, and general community uses. Surface parking and paved areas then have the potential to become pleasant, multiuse, parklike civic spaces for the surrounding community.

Green roofing and rainwater collection
The proposed clinic employs earth-sheltered and planted roof surfaces to improve the performance of the thermal envelope, reduce storm water runoff, and provide productive program spaces. The roof over the staff area is a habitable, therapeutic garden with low-maintenance native plant species. The community meeting wing has a habitable roof terrace for public gatherings, alternative therapies, and demonstration gardens. All roof surfaces are designed to capture and collect storm water. Rainwater is collected in a cistern under the clinic wing at the high point of the site for use in irrigation and a potential grey-water plumbing system.

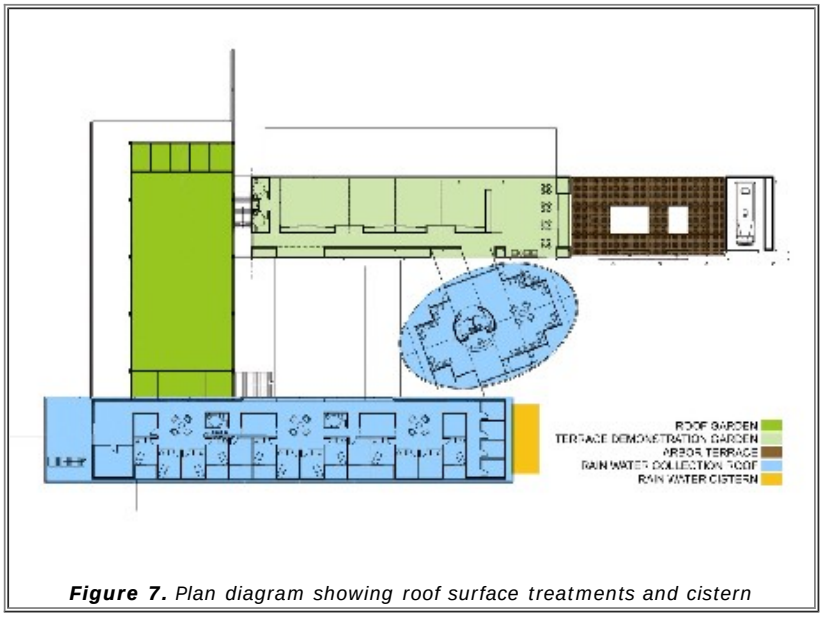

Figure 7. *Plan diagram showing roof surface treatments and cistern*

Employ lights-off or light-soft design strategies
Healthcare settings are typically thick building forms deprived of daylight and connections to nature while being dependent on artificial lighting and mechanical air

conditioning. As a result, they consume more energy than necessary and are potentially less healthy, productive, and effective places for delivering patient care.

Daylighting and visual connections to nature can improve patient and staff satisfaction and the healthcare experience. The proposed design, therefore, uses articulated and perforated building forms to minimize the need for artificial lighting, create better connections to nature, and provide exterior program spaces. It also controls both daylighting and artificial lighting to meet the changing needs of both anticipated and unpredictable uses.

Articulated and perforated building forms
Three distinct strategies for creating a more articulated and perforated building form were employed. The first organized distinct program functions into thin wings optimizing daylighting opportunities for the greatest number of habitable spaces. Second, these wings are wrapped around a central courtyard to maintain functional connections.

Faculty, staff, and student work areas called for a programmatically thicker form to promote an open, collaborative work environment. This area is perforated with roof monitors. Thicker forms demanded by larger programs and critical functional relationships can be effectively perforated with small courtyards, light wells, and clerestory windows as demonstrated in shopping-center proposal below.

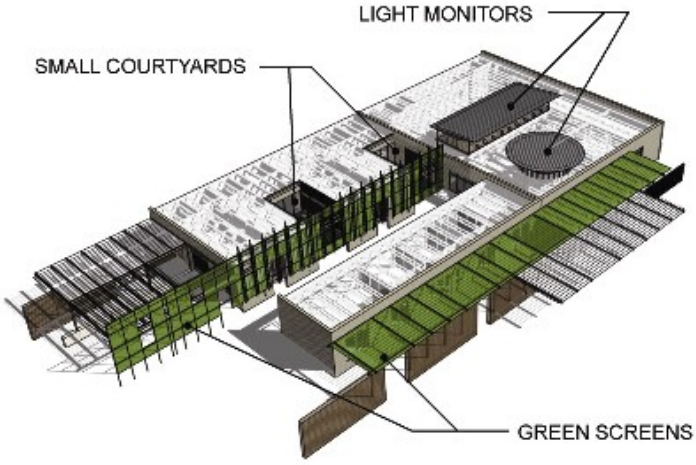

Figure 8. *Plan diagram of shopping-center site*

Controlled natural and artificial lighting
It is critical to balance daylighting needs with the need to minimize heat load in a warm climate. The design proposal employs orientation strategies, screening devices, and aperture design to minimize direct southern and western exposure of glazed elements. "Green" sun-screening elements employing both architectural and deciduous vegetative lattices were used in both vertical and horizontal applications, permitting the penetration of filtered and diffused daylight. Vegetative walls also provide privacy between pubic and private areas.

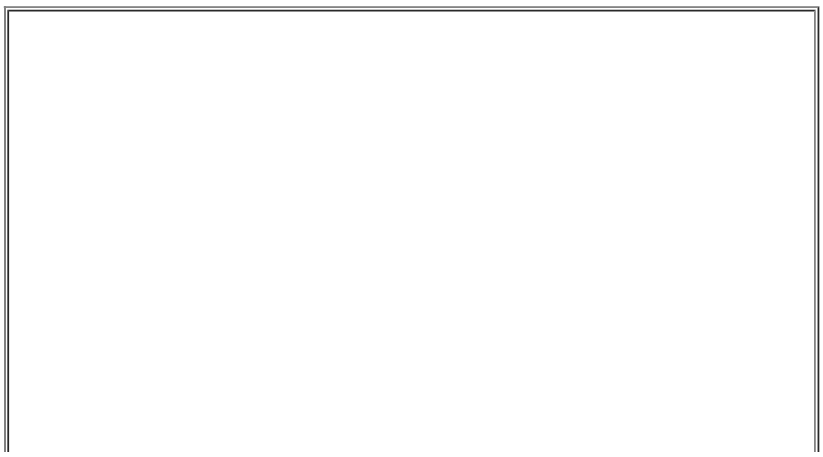

Figure 9. *Green sun screens and wood louvers*

The design anticipates the use of electric lighting controls that give adjustability and control to the building occupants. Occupancy sensor switching will be appropriate in some locations, but variable controls will be necessary in other critical work settings. The goal is to provide the appropriate amount and type of light—and no more—for any given activity or task.

Transitional indoor-outdoor zones
The disconnection between indoor and outdoor spaces in hermetically sealed health facilities discourages healthier and environmentally sound occupancy patterns. It also reinforces the dependence on mechanical conditioning, which in turn contributes significantly to their environmental impact. Some program activities in ambulatory care and wellness settings can occur in less conditioned settings at certain times of the year in many climates and may, in fact, be more appropriate and therapeutic.

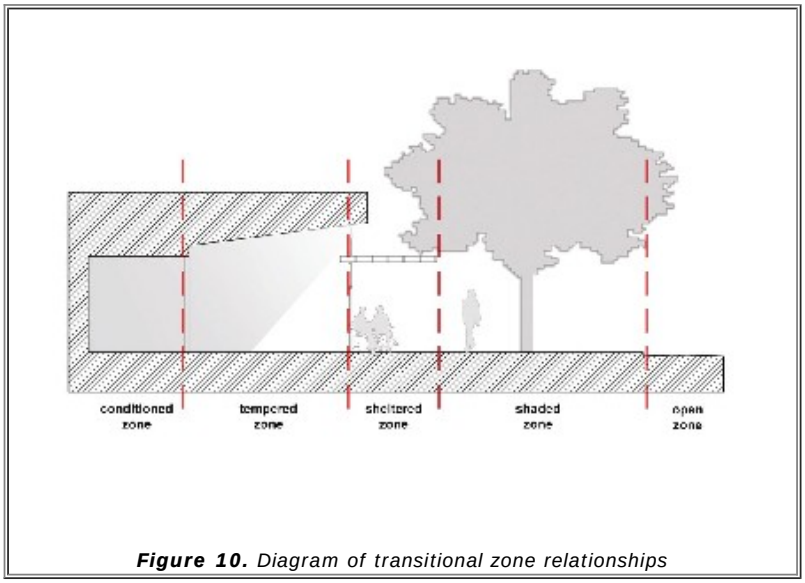

Figure 10. *Diagram of transitional zone relationships*

The proposal provides a series of transitional overlapping indoor-outdoor spaces designed to accommodate program activities in minimally conditioned settings. Each zone is appropriately conditioned for a specific range of program uses. Conditioned spaces are provided for exam and treatment spaces and some support spaces. Tempered spaces are provided with daylight and fresh-air options for circulation areas, waiting, some therapies, and break areas. Sheltered exterior areas located outside exam rooms, waiting areas, and break rooms are protected from the rain and sun. Exterior surfaced areas with natural shading accommodate some waiting and therapies. Each of these spaces in turn is provided with visual and physical links to accessible gardens and

natural vistas. Whenever possible, space adjacencies are organized so that activities and uses can collapse and expand as climatic conditions allow.

Conclusion and next steps
The success of this project will ultimately be a result of its collaborative approach and the interdisciplinary team involved with its planning and design. The vision and goals guided the overall decisions for the project while experts, participating with the team in the Green Design Workshop, helped identify the yardsticks by which the project could be measured from a sustainable design standpoint. The new facility will eventually serve as a research laboratory for design-based research into the relationships between "green" design and other healthcare design objectives such as optimizing health outcomes, operational efficiency, and the accommodation of change. The overriding architectural goal of the project is to create a physical environment clearly is imbued with the center's philosophy of care delivery—one that emphasizes holistic health and health promotion at individual, community, and global levels.

This project can serve as a model for practice-based architectural education in healthcare. Faculty and students have

1. ***Learned the basic tenets of sustainability and applied these ideas to a real-life problem, building upon an evidence-based design approach***
2. ***Experienced a hands-on, interdisciplinary process of how to balance issues related to environmental concerns, community design, health issues, economics, social equity, aesthetics, and code compliance***
3. ***Worked with a client group that knew nothing about "green" and discovered how to communicate ideas to non-design-related disciplines***
4. ***Faced real-life issues such as how to work with multiple disciplines and overcome design language obstacles and how to overcome discipline-specific methods of working. Similarly faculty members have made great strides toward developing a methodology for working to bridge academic and local community design issues together to the mutual benefit of all.***

The next steps for the green wellness center (realization and implementation) will occur following the capital campaign and professional commissioning of the project. The authors will continue to assist with the project as it moves forward.

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