OCCUPANT EVALUATION OF LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED) CERTIFIED HEALTH CENTERS

A Thesis

by

ANOREA MARCHELLE HILL

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2009

Major Subject: Architecture

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Approved by:

Chair of Committee,	Valerian Miranda
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ABSTRACT

Occupant Evaluation of Leadership in Energy and Environmental Design (LEED) Certified Health Centers. (August 2009)

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Chair of Advisory Committee: Dr. Valerian Miranda

Globally, concern for natural resource depletion is growing. The healthcare industry is looking to improve healthcare environments by improving design and using better resources. The U.S. Green Building Council has created the Leadership in Energy and Environmental Design (LEED) standard that gives suggestions on how to best use energy, water, land, materials and provide a comfortable indoor environment. Many health centers have used this standard to build new health facilities. It is important that the LEED standards benefit the environment as well as healthcare staff.

This study presents four case studies of LEED health centers whose medical staff and administrators evaluate the perceivable green building features applied to their facility. All facilities were given the Occupant Evaluation of LEED Certified Health Centers Survey. The Patrick Dollard Discovery Health Center, the Richard J. Lacks Cancer Center, the Angel Harvey Infant Welfare of Chicago, and the Pearland Pediatric centers received overall satisfactory scores from the occupants. Within the case studies variations in satisfaction occurred where LEED points were not received.

There is no evidence that perceivable features used in the design and construction of LEED certified health centers decrease occupant satisfaction.

DEDICATION

This thesis is dedicated to my God who got me through this. It is also dedicated to my family and friends who have encouraged me, and learned LEED so they could critique my paper and presentations better. Thank You and I love you all! ~ knori

ACKNOWLEDGEMENTS

I want to acknowledge everyone who helped me with this project, but there really are too many to name. I thank my parents and sister for your patience and putting up with me as I pursued my dreams of getting a Masters degree, and working and living in the city, all of which has happened in the past 5 years of pursuing this degree. God is Good! This is strange how it has worked out.

I also want to say thank you, to strangers, friends and friends of friends who helped format my paper when I was working and trying to finish the degree in Houston. I've learned so much about myself and my Faith. Truly, I can do all things through Christ who gives me strength.

NOMENCLATURE

ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
CBE	The Center for the Built Environment
GGHC	The Green Guide for Healthcare
IAQ	Indoor Air Quality
IESNA	Illuminating Engineering Society of North America
IEQ	Indoor Environmental Quality
ID	Innovation and Design Process
LEED	Leadership in Energy and Environmental Design
MR	Materials and Resources
POE	Post Occupancy Evaluation
Sqft	Square feet
SS	Sustainable Sites
WE	Water Efficiency
USGBC	United States Green Building Council

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CHAPTER I

INTRODUCTION

Green building is gaining global importance. Evidence of the planet warming up is being traced to carbon dioxide levels in the atmosphere from the burning of fossil fuels. Chlorofluorocarbons (CFCs) and other gases found in buildings and consumer products could be harmful to the ozone layer (Jones, 1998). Globally legislation is prompting designers toward more responsible practices.

Bioclimatic, green or sustainable architecture, are terms used to describe "buildings which are inspired by nature, which have a clear strategy for minimizing environmental depreciation and which encourage a sense of well-being. Issues that must be addressed in bioclimatic design include: energy, health and well-being, and sustainability" (Jones, 1998). Increased day lighting, reduced energy use, and conservation of water are examples of reducing the "environmental footprint" of a building.

Post Occupancy Evaluations, (POEs), of green buildings is an imperative step to promoting green buildings for future construction and renovations. Verifying the quality of green buildings will help justify money spent on green building designs.

This thesis follows the style of *Journal of Architectural and Planning Research.*

Occupant evaluation is a missing component in LEED certification criteria. Post occupancy evaluations are significant in all building types; including healthcare environments. The Healthcare industry is seeking "to reduce toxins and provide healthier healing environments" and quality of care by improving designs (Weller, 2006). Knowledge of occupant feedback from green health centers may influence how aging hospitals are being retrofitted. According to POE expert William Bordass, "Interest in occupant evaluation of green buildings is growing in the UK as well" (Malin, 2007).

There are several organizations dedicated to promoting environmental sustainability for health care facilities. The United States Green Building Council, USGBC, offers LEED, Leadership in Energy and Environmental Design, a green building rating system for institutional and high-rise projects (USGBC, 2006). The Green Guide for Health Care is a "guide specifically customized for buildings where healthcare concerns are dominant" (GGHC, 2007). Hospital for a Healthy Environment, H2E, is a "non-profit organization that provides tools to help health care professionals improve operational efficiency, increase compliance and improve the health of their communities" (H2E, 2007). Health Care without Harm is a "global organization that promotes using safer products, by avoiding the use of mercury and polyvinyl chloride (PVC) plastics" (Health Care Without Harm, 2007).

Only recently have organizations begun to evaluate green buildings. In 2006 the Green Guide published the U.S. 'Top Ten Green Hospitals Awards'. Four green building guides – LEED, H2E, Health Care Without Harm, and the GGHC were used to compare hospital facilities. Using one green building standard would have reduced the number of results and yielded stronger data. The Center for the Built Environment, CBE, at the University of California at Berkeley, California, regularly evaluates office-building occupants by survey, to assess occupant satisfaction. In 2006, twenty-five green office buildings were compared to their database of non-green office buildings.

At this time there is not a comparable evaluation of perceived green features for LEED certified health centers. The purpose of this study is to investigate how building features associated with green health centers are perceived by occupants.

CHAPTER II

LITERATURE REVIEW

The literature review contains issues related to the research question. An overview of significant findings in the topics of sustainability, green building programs and post occupancy evaluation are discussed.

SUSTAINABILITY

According to distinguished architect Tadao Ando, the world has generally shared the common belief that the ultimate and desired direction of society is one that is economy-led and driven by consumption. "Mankind has generated tremendous amounts of power by converting the planet's finite supply of fossil fuels into energy [resulting in] massive volumes of by-products and non-biodegradable chemicals that have [polluted] the air and the seas" (as cited in Jones, 1998). "All over the world we are finally beginning to recognize the threat that pollution in the air, water and ground are posing to civilization" (Jones 1998).

The major impact that building design, construction and management have on national energy consumption began to be widely recognized in the early seventies with the rationing of oil supplies to the West by the OPEC (petroleum exporting) countries. This prompted the search for alternative sources of energy. "A group referred to as the 'drop out' society of the sixties was growing into the 'alternative' society of the seventies.

From this group came the first studies conducted monitoring conditions on Earth; the Green movement was born" (Jones, 1998). Energy conservation began being promoted by governments in the seventies and eighties through a series of recommendations. In Europe, government sponsored research programs were formed into guides, codes of practice and legislation. "In 1987 sustainability was defined in the Brundtland Commission as development that 'meets the needs of the present without compromising the ability of future generations to meet their needs" (Edward, 2003). According to Jones (1998), the Brundtland definition of sustainability requires "coordinated action across all disciplines; politics, economics, design and education, and across all nations; a system of 'trade-offs', whereby every resource that is used must be compensated for; and a time frame for doing this" (Jones, 1998).

By 1990 the Montreal Protocol and other European Union Directives began to phase out the production of CFCs used in connection with air-conditioned, high-energy buildings (Edward, 2003). In 1996, the Intergovernmental Panel for Climate Change confirmed that the planet is warming up as a consequence of rising carbon dioxide levels in the atmosphere caused by the burning of fossil fuels (Jones, 1998).

GREEN BUILDING PROGRAMS USED FOR HEALTHCARE

The United States Green Building Council (USGBC) introduced L.E.E.D. 2.1 (Leadership in Energy and Environmental Design) Green Building Rating System for the assessment of new and large renovations of institutional, commercial, and high-rise residential projects (Nelms et al., 2005). They encourage sustainable building practices through an incentive program in which they label buildings as L.E.E.D. certified, silver, gold or platinum. The rating system structure consists of six categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design. Within each of the categories there are points available for achieving or exceeding the baselines set by the USGBC. LEED has uniform for new construction building types. Calculations are prepared by LEED trained professionals, which show the percentage over a baseline that the building actually saves. "The LEED rating system has been adopted widely in the U.S. by federal agencies, state and local governments and private companies as the standard for sustainable building" (Abbaszadeh, 2006).

Health facilities have begun incorporating green building strategies into their remodels and new construction. Several organizations dedicated to promoting environmental sustainability features in health facilities exist. The Green Guide for Health Care is a "self-certifying metric toolkit of best practices that designers, owners, and operators can use to guide and evaluate their progress towards high performance healing environments" (GGHC, 2007). The resource is based on the USGBC LEED

certification system but is "specifically customized for buildings that are predominately institutional occupancies as defined by the local building code, such as acute care hospitals … where healthcare concerns are dominant" (GGHC, 2007). Hospitals for a Healthy Environment or H2E, is a non-profit organization that provides "education, tools and information about best environmental practices to help health care professionals improve operational efficiency, increase compliance, and improve the health of their communities" (H2E, 2007). Health Care without Harm is a global organization that aims to transform the healthcare industry without compromising patient safety and care. They "create markets and policies for safer products, materials and chemicals in health care…including products that avoid mercury, polyvinyl chloride (PVC) plastic and brominated flame retardants" (Health Care Without Harm, 2007).

Despite the inconsistencies between healthcare focused green building programs, in 2006, the Green Guide published *The Top Ten Green Hospitals Awards* in the U.S. Ten hospitals were chosen over seventy-six candidates according to the standards of USGBC LEED, Green Guide for Healthcare, Hospitals Without Harm, and H2E. The hospitals were measured by categories specified in LEED and in addition to these: procurement, healing gardens, waste reduction after occupancy and the ability to grow food used in the hospital.

BUILDING EVALUATION

As green building types become more frequent, assessing the design intentions is important. A common gauge for measuring the success of a building is by conducting a post-occupancy evaluation or POE. For decades the POE has been used to evaluate the degree to which buildings enable users to fulfill their intended goals. Steve Parshall (1989) of Caudill Rowlett Scott, "CRS, an architecture firm known for 'problem-seeking,' says 'that one of the most overlooked steps involved in realizing a … building program is the evaluation of the final product" (Parshall, 1989). Quantitative information gained from a POE can include factual data on the building design such as space adequacy, construction quality, technical adequacy, energy performance and user satisfaction".

The Center for the Built Environment (CBE) at the Berkeley National Lab in California, regularly conducts post occupancy evaluations of office buildings to evaluate employee satisfaction. The CBE's web-based, occupant indoor environmental quality survey, has a set of core questions used to evaluate the interior environment and occupant satisfaction with indoor environmental quality issues like air quality, thermal comfort, lighting, and acoustics (Zagreus, 2004). The CBE web-based occupant indoor environmental quality survey is used to evaluate the performance of individual buildings as well as systematically compare the performance of groups of buildings. "The survey measures occupant satisfaction and self-reported productivity in nine indoor environmental quality (IEQ) categories: office layout, furnishings, thermal comfort, air

quality, lighting, acoustics, cleaning and maintenance, overall satisfaction with the building and with their workspace" (Huizenga, C. 2006; Abbaszadeh, 2006). By 2003, three L.E.E.D.-rated buildings were surveyed with the occupant indoor environmental quality survey. By 2006 the CBE had evaluated twenty-five green office buildings. Sixteen of the twenty-five green office buildings were officially certified by LEED, the other facilities were proclaimed "green" by their designers. "Using the entire database as a benchmark the comparisons suggest that the green buildings received high marks for air quality in comparison to the benchmark" (Huizenga, Zagreus, Arens, D. Lehrer, 2003).

There is a growing concern with the role of the environment and its influence on the healing process. The more architects are aware of research quantifying the environmental impact of space on the occupants; they are becoming more aware of the vital role they play in creating therapeutic environments. Creating a therapeutic or healing environment is more significant in hospital settings to aid in the well-being of people who are already ill. This makes the interchange of information between the normally segregated disciplines of medicine, architecture, psychology and construction imperative. As clients do more research about the buildings they want to build, more environmental design research, also called 'evidence-based' design, is being incorporated into new construction and renovations. Information in the form of post occupancy evaluations of patients or medical staff have been conducted over the years,

and are slowly changing the way that architects and clients provide for their buildings occupants.

Needs of people

Although more research is available, there is still little known about what consumers really need and want in healthcare. What is known is that architects, healthcare administrators, and patients have different views of what should be priorities in hospital design. Various research projects on the subject of nature within the hospital environment by Ulrich, Cooper-Marcus and Barnes, J. Varni, and many others have resulted in a documentation of the benefits of nature for reducing stress, improving mood, and increasing healthcare satisfaction (Sherman 2005). Sherman says that increasingly in healthcare there has been a paradigm shift from morbidity to mortality in which hospitals strive to cure not only physical conditions but also improve quality of life. These changes are viewed as core investments not only to attract patients, but also to improve these more broadly defined health outcomes. Environmental psychologists have proven that therapeutic environments that reduce stress, enhance social support and increase control while giving privacy improve the health of patients, staff and families. (Mc Cormick 2003). Roger Ulrich conducted a quasi-experimental experiment evaluating the effects of an uncontrollable television in a medical waiting area as a stressor for healthy people waiting to donate blood. It showed that even people who are healthy can experience the negative effects of an environment that they can not control. (McCormick, 2003).

Several studies suggest that what is important to the patient can be related to Maslow's hierarchy of needs. In a review of literature on health care environments and patient outcomes by Delvin and Arneill, (2003), they found seven areas important to patient-centered care: 1) respect for patients' values, preferences and expressed needs, 2) coordination and integration of care, 3) information and education, 4) physical comfort, 5) emotional support, 6) the alleviation of fear and anxiety, 7) involvement of family and friends and 8) ease of transition and continuity of care. Other research lists the relationship of indoor and outdoor space and some environmental factors such as materials, acoustics and lighting as being important. The review of literature also found that people are attracted to healthcare environments that are reassuringly familiar or residential and not institutional (Delvin and Arneill, 2003). The Pinker Institute and The Center for Health Design conducted a multiyear project to delineate environmental elements that are important to consumers and that enable patients and their families to have a positive healthcare experience. There were three phases in the study which included focus groups and interviews with patients, family members, health professionals, designers, and executives to determine what is important in a healthcare environment (Stern, 2003). From the analysis of the data the team arrived at eight dimensions similar to that reported by Delvin and Arniell.

Can the impact of an interior environment be measured using POE?

According to Steve Parshall (1989) of CRS, a firm known for its promotion of architectural programming, one of the most overlooked steps involved in realizing a

health care building program is the evaluation of the final product. The primary gauge that is used for measuring the success is user and client satisfaction and the most common way to evaluate the performance of a facility once it is occupied is a post occupancy evaluation, or POE (Parshall, 1989). There are various methods for performing post occupancy evaluations. According to Parshall (1989) there are five steps in the process of POE: establishing the purpose, collecting and analysis of quantitative information, identifying and examining qualitative information, making an assessment, and stating lessons learned. The quantitative information includes factual data on the building design such as space adequacy, construction quality, technical adequacy, energy performance and some form of user satisfaction. Qualitative information describes the client's goals for the facility and how the designers intended to solve it, also identifying changes that have taken place since occupancy and unresolved issues. Function, form, economy and time, should be considered in the 'lessons learned' conclusion (Parshall and Preiser, 1989).

Post occupancy evaluations (POE) have been defined as examinations of the effectiveness for human users of occupied design environments. POE typically focuses on assessment of client satisfaction and functional 'fit' with a specific space. POE was seen as a logical final step of a cyclical design process, where lessons learned from the occupants about the space in use could be used to both improve the fit of the existing space and be fed back into design research and programming.

The evaluations ask basic questions about the appropriateness of the design for its intended function (Zimmerman and Martin, 2001, Preiser, 1989). The well-known firm CRS published many programming or 'Problem-Seeking' method books, and in the last edition, in 1987, 'facility evaluation' was added as an official last step in the programming process (Parshall, 1989).

Different data gathering techniques can be used such as observation, touring the facility, and interviews either formal or informal, allow for a deeper investigation. Parshall (1989) also suggests that in hospital evaluations staff, physicians and patients are the prime source of information through interviews or surveys.

The Center of the Built Environment (CBE) at the University of California, Berkeley has developed a Web-based survey that is similarly standardized and focuses on the indoor environmental quality of a building. Two benefits of it being Web-based are that it is inexpensive to administer, and it has interactive branching questions that can hone in and diagnose the root of the problems. The survey has a set of core questions used to evaluate the interior quality and occupant satisfaction with indoor environmental quality issues like air quality, thermal comfort, lighting, and acoustics. The branching questions arise when the occupant reports dissatisfaction. Another advantage is that additional modules can be added to the survey that address issues such as interior layout, furnishings, maintenance, safety windows, etc. (Zagreus, 2004).

Harvey Rabinowitz (1989) examines the evolution of, and contemporary activities in, Post-Occupancy Evaluation. He identifies one milestone in POE research by Newman, among dozens in 1970's, where after examining data from one hundred housing projects, crime was linked to housing form and disposition, site design, and circulation. In the 1970's multi-method approaches to POE were used to investigate a comprehensive set of environmental factors, including non-physical factors such as management, not as isolated variables but to assess their relative importance to the users of the facilities. As an accepted method of evaluation, government agencies funded POE projects, like the Werner, Frazier, and Farbstein project for the Federal Bureau of Prisons to continuously evaluate, construct, modify and refine a series of prototype jails (Rabinowitz, 1989).

The National Institute of Corrections wanted to develop a standardized instrument to use in conducting post-occupancy evaluation of jails. The information would be used to benefit facility administrators/ managers, and government correction agencies, who agreed that the most useful and understood data comes from qualitative interviews using open-ended questions; however that would be too expensive and time-consuming. The team used procedures to generate both kinds of data. Observations would be used after the interview was conducted, to give a mix of quantitative and qualitative data (Werner, 1994).

In another study (Sherman et al., 2005), behavioral observations were used in combination with a POE in evaluation of a healing gardens in a pediatric cancer center.

The ages of the patients varied, so a modified questionnaire called the Pediatric Quality of Life Inventory Present Functioning Module was used. The PedsQL^{TM}PFM consists of six visual analogue scales evaluating the level of anxiety, sadness, anger, worry, fatigue, and pain (Sherman et al., 2005).

A study questioning the feasibility of quantifying occupant comfort (Humphrey, 2005) found that positive evaluation of one aspect of the environment does not necessarily cause a positive overall evaluation. The study also found that the different indoor quality aspects tested, warmth, air movement, humidity, light, noise, and air quality were not rated equal among occupants. Approval of the levels of warmth and air quality is more important than the levels of lighting or humidity and the rates can differ for different populations (Humphrey, 2005).

One benefit of POE mentioned by Andreu and Oreszczyn (2004) showed how POE fits into a 'feed forward' design model where architects and designers can make more informed decisions by not repeating mistakes from the past. Wolfgang Preiser (1989) suggests using POE for identifying problems and solutions, improving space utilization and obtaining feedback on building performance. Benefits of POE specifically related to healthcare facilities include testing the application of new ideas before it may be implemented in another facility which is helpful since hospitals are built or renovated in phases. Medical facilities can be a stressful place for patients and staff, therefore

research information about man-environment relationships can be used to fine-tune existing facilities and educate future health clients and designers (Parshall, 1989).

One drawback in measuring satisfaction is that comfort is the result of the dynamic interaction between people and building in a particular social context, not a steady fulfillment of the physiological conditions. Delight can be the result of the body moving towards equilibrium, and not an indication that equilibrium has been achieved (Nicol and Roaf, 2005). For this reason several studies suggest post occupancy evaluations be taken at multiple times to represent different seasons and times of day (Preiser, 1988, 1989, 2005).

Patient rooms

In the literature review of healthcare environments and patient outcomes by Delvin and Arneill, (2003), forty guidelines for a community health center were formulated from an analysis of twenty-five POE's from other health centers in Louisiana. Legible entrances, residential imagery and access to daylight were among the important suggestions regarding the patient rooms. Researches from the field of environmental design suggest that being in a hospital removed from normal freedoms can produce physiological, cognitive, and behavioral consequences that can strongly interfere with patient treatment and recovery. Questionnaires issued to patients in hemodialysis units as part of a study about loss of control (Delvin and Arneill, 2003) asked patients to report on their perceptions of control over four factors in their environment: noise, lighting,

temperature, and privacy. The patients reported little or no control over bright lighting, uncomfortable temperatures, irregular noise levels and lack of privacy which resulted in additional stress to patients who were already experiencing stress related to their illness.

Providing a welcoming environment in patient rooms and a window with a view are especially significant for patients. Studies found that patients recovering from surgery in rooms with a view of nature versus a view of a brick wall had shorter post-operative hospital stays, fewer negative comments from nurses, and took fewer moderate and strong analgesic doses. These studies along with findings suggest that windows may have healing and stress-reducing effects on patients and should be considered in hospital and waiting room design (Delvin and Arneill, 2003, Sherman et al. 2005).

Environmental psychologists also suggest incorporating an element in patient rooms that produces positive feelings, that effortlessly holds interest and creates a 'positive distraction' that can block worrisome thoughts. Studies show that the positive distractions can reduce blood pressure and increase muscle relaxation in as few as five minutes of exposure. The most effective images studied are those of nature elements such as trees, plants and water, happy laughing or caring faces and benign animals such as pets (Delvin and Arneill, 2003).

A study by Raza and Shylaja (1995) showed that there is a concern for indoor air quality being similar to outdoor air quality. The pollutants can be generated from building

materials and furnishing equipment, which can pose adverse health effects. CO2 concentrations are known to rise at night. The study found that certain succulent plants if kept in the patient rooms can remove significant amounts of CO2 from the indoor environment of a hospital.

Measuring sustainability in buildings

According to Wolfgang Preiser (1989) systematic POE's can test the performance concept which uses an objective evaluation method by comparing explicitly stated performance criteria for buildings with the actual performance as measured or perceived by building occupants and evaluators. Preiser also identifies three levels in the post occupancy evaluation process model: indicative, investigative, and diagnostic. Indicative POE's identify major strengths and weaknesses of a particular buildings performance, which usually consists of a walk-through and selected interviews with knowledgeable informants. The investigative POE goes into more depth whereby objective evaluation criteria are explicitly stated. The third, diagnostic POE requires more effort and expense and utilizes sophisticated measurements techniques. Diagnostic evaluations correlate physical environmental measures with subjective occupant response measures, thus providing a higher degree of credibility for the results (Preiser, 1989).

The United States Green Building Council (USGBC) introduced L.E.E.D. 2.1 Leadership in Energy and Environmental Design Green Building Rating System for the

assessment of new and large renovations of institutional, commercial, and high-rise residential projects (Nelms et al., 2005). Well-oriented, high performance windows are a major part of energy efficiency in buildings. However solar heat gain plays a major role in the thermal performance of a building. A study examining the aspects of sustainability, comfort and productivity in relation to windows in the workplace used qualitative interviews of focus groups professionals from construction industry and to determine if this one sustainable measure is counter productive to the other sustainable measures such as thermal performance, increased noise levels, lack of control, privacy, and inadequate lighting that deal with occupant satisfaction (Menzies and Wherrett, 2004).

Views of LEED in hospitals

A major drawback in comparing whole-building energy use is that it does not consider conditions in the building that create more intensive loads than typical, such as longer hours of operation, high process loads (a computer center), or severe climatic conditions (Piette et al, 1995). Qualitative data on patients' experiences that surveys yield are used, in turn, to inform consumers and to foster quality improvement (Stern, 2003). A web-based occupant indoor environmental quality survey is a standardized survey instrument that can be used to evaluate the performance of individual buildings as well as systematically compare the performance of groups of buildings. This survey evolved from an earlier thermal comfort survey by The Center for Built Environment at the University of California, Berkeley. The core questions stay consistent from survey to

survey to maintain data integrity for the purposes of benchmarking and trend analysis. By 2003, three L.E.E.D.-rated buildings were surveyed with the occupant indoor environmental quality survey. Using the entire database (42 other buildings) as a benchmark the comparisons suggest that the green buildings received high marks for air quality in comparison to the benchmark (Huizenga, Zagreus, Arens, D. Lehrer, 2003). Other benefits observed by Bosch and Pearce are that green buildings improve academic performance and student behavior in schools, increase employee satisfaction, productivity, health, and retention, and reduce absenteeism in the workplace (Nelms et al., 2005, Menzies, 2005).

The concept of an environmentally friendly, sustainable building having an impact on the buildings' occupants has been suggested from feedback on other building types such as office buildings and educational facilities. Although the POEs mentioned in this review were not specifically of LEED health centers, the evaluation methods were similar and the qualitative results were quantified in the form of questionnaires. In a post-occupancy evaluation of a new AIDS facility, the Bailey-Boushay House, aimed to evaluate the success of research-supported innovations implemented in the new building to create a patient-oriented health center. The questionnaires addressed general issues, such as building factors, human factors, accessibility, and building image. Focused questions investigated specific room design, efficiency, functionality, and the impact of light, color, sound, and temperature. A combination of client, and staff interviews, behavior mapping, and questionnaires were successful in providing adequate feedback

relevant to the architects, and in providing guidelines for future facilities (Shepley & Wilson, 1999).

LEED CREDIT INTENTIONS

Each LEED credit is written with the intention of creating better interior spaces or to reduce the negative impacts of buildings on the environment. LEED credits are divided into six categories: site, water, energy, materials & resources, indoor air quality, and innovation and design. Most of the credits can not be perceived by occupants. The credits that can be perceived may directly or indirectly affect building occupants. These credits and their intentions are described in greater detail below.

Sustainable sites

The sustainable sites category of LEED offers suggestions to help minimize the impact of a building on the local environment. Development and construction processes are often destructive to local ecology. "Storm water runoff from developed areas can impact water quality in receiving waters, hinder navigation and recreation, and disrupt aquatic life. Selection of an appropriate project location can reduce the need for private automobile use and reduce urban sprawl." (LEED Guide 2.1). The USGBC awards points for locating the project where alternative modes of transportation can be used. Alternative transportation includes the use of a bicycle, commuter rail, a bus system or carpooling to get to work, in contrast to a personal automobile. Perceivable credits under sustainable sites include alternative transportation credits 4.1, 4.2, 4.4.

The first alternative transportation credit, 4.1, public transportation access, intends to reduce pollution and land development impacts from automobile use. It requires the project to be within a half mile of a commuter rail, light rail or subway station or ¼ mile of two or more public or campus bus lines usable by building occupants. The next alternative transportation credit, 4.2, received is the bicycle storage and changing room credit. The credit requires commercial or institutional buildings, to provide secure bicycle storage with convenient changing/ shower facilities within 200 yards of the building for 5% or more of regular building occupants. The other perceivable alternative transportation credit evaluated in this study is credit 4.4, parking capacity, which requires site parking capacity to meet, but not exceed, minimum local zoning requirements, and provide preferred parking for carpools or van pools capable of serving 5% of the building occupants.

The impervious infrastructure used for roadways and parking lots contributes to the erosion and pollution of receiving waters. The exhaust from automobiles pollutes the air and contributes to acid rain. Environmental impacts occur when extracting, refining and transporting crude oil for gasoline production. Reducing private automobile use saves energy to produce crude oil and reduces associated environmental problems with automobile usage. Reducing the size of parking lots or sharing parking with a neighboring facility can reduce the heat island effect. The USGBC believes that people may be willing to use alternative means of transportation such as bicycles, mass transit and carpools if they are convenient and facilities are provided to encourage their use.

The intent of credits 4.1, public transportation access, 4.2, bike storage and changing rooms, and 4.4, parking capacity is to reduce pollution and land development impacts from automobiles.

The intent of the exterior lighting credit 8, light pollution reduction, is to eliminate light trespass from the building to the site, improve night sky access and reduce development impact on nocturnal environments. It is important to minimize project impacts on surrounding areas, by reducing light pollution on the site. The USGBC awards the Light Pollution Reduction credit. The intent is to eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments. The credit requires the project meet or provide lower light levels and uniformity ratios than those recommended by the Illuminating Engineering Society of North American (IESNA) Recommended Practice Manual Lighting for Exterior Environments (RP-33-99) (LEED Guide 2.1, USGBC). Facilities who receive this credit must design exterior lighting such that all exterior luminaries with more than 1000 initial lamp lumens are shielded are all luminaries with more than 3500 initial lamp lumens meet the Full Cutoff IESNA Classification. The maximum candela value of all interior lighting shall fall within the building (not through the windows) and the maximum candela value of all exterior lighting shall fall within the property. Any luminaire within a distance of 2.5 times its mounting height from the property boundary shall have shielding such that no light from that luminaire crosses the property boundary (LEED Guide 2.1, USGBC).

Outdoor lighting is necessary for illuminating connections between buildings and support facilities such as sidewalks, parking lots, roadways and community gathering places. However, light trespass from poorly designed outdoor lighting systems can affect the nocturnal ecosystem on the site, and light pollution limit, night sky access. Another key benefit is better visual comfort and improved visibility. Sensitively designed lighting systems that minimize glare and provide more uniform light at lower levels will help create aesthetically pleasing environments that are safer and secure. To achieve the credit, all unshielded fixtures like flood lights should be eliminated on the project site while addressing safety, security, access, way finding, identification and aesthetics. Where lighting is required for safety, egress or identification down-lighting techniques can be used rather than up-lighting.

The USGBC intends for both the transportation and exterior lighting credits to indirectly affect building occupants.

Water efficiency

In the United States, approximately 340 billion gallons of fresh water are withdrawn per day from rivers, streams and reservoirs to support residential, commercial, industrial, agricultural and recreational activities. Almost 65% of this water is discharged to rivers, streams and other water bodies after use and in some cases, treatment. This accounts for about one-fourth of the nations' total supply of renewable fresh water (LEED Guide 2.1, USGBC).

The water efficiency category of LEED offers suggestions for conserving potable water use in landscape maintenance. Water efficient landscaping credits 1.1, 1.2.can be perceived by building occupants. The intent of these credits is to help conserve potable water in landscape maintenance. The credits indirectly affect building occupants' view of landscaped areas.

The USGBC awards LEED points for using water efficient plumbing fixtures under water efficiency credits 3.1 and 3.2. The intent of these credits is to maximize water efficiency to reduce the burden on municipal water supply and waste water systems. The LEED credits are awarded to buildings that employ water conserving strategies that in aggregate use 20% or 30% less water than the water use baseline calculated for the building excluding irrigation, after meeting the Energy Policy Act of 1992 fixture performance requirements.

The Energy Policy Act of 1992 mandated the use of water-conserving plumbing fixtures to reduce water use in residential, commercial and institutional buildings. In summary the EPAct of 1992 recommend water closets only use 1.6 gallons per flush, urinals 1 gallon per flush, and faucets 2.5 gallons per flush at flowing water pressure of 80 pounds per square inch (psi) (LEED 2.1 Guide, USGBC). Older toilets use 4 to 8 gallons of water per flush. Installing sensors and flow restrictors on water fixtures are strategies used to achieve water efficiency credits 3.1 and 3.2. Water efficiency credits 3.1 and 3.2 indirectly affect the way occupants use plumbing fixtures.

Materials and resources

According to a chart in the LEED 2.1 Guide it is estimated that hospitals use about 20 lbs of solid waste per bed and 2 lbs of solid waste per meal. The USGBC feels that the most effective method for promoting recycling activities is to create convenient opportunities for building occupants to recycle. Recycling reduces the need to extract virgin natural resources. To achieve this credit a well-marked collection and storage areas for recyclables including office paper, newspaper, cardboard, glass, metals and plastics should be designated in the design phase. The location should be a central collection and storage area on a level with easy access for collection vehicles.

The storage and collection of recyclables is a prerequisite for LEED certification under this category. The intent of the credit is to reduce waste generated by building occupants that is hauled to and disposed of in landfills.

The requirements are to provide an easily accessible area that serves the entire building that is dedicated to the separation, collection and storage of materials for recycling at minimum paper, corrugated cardboard, glass, plastics and metals. Occupants can perceive the storage and collection of recyclables credit, if occupants choose to use the recycle bins. This credit indirectly affects building occupants.

Tradeoffs associated with recycling activities are the use of floor space that could be used for something else. Recycling aids such as cardboard balers, aluminum can

crushers and recycling chutes can be noisy and odor can be associated with their use (LEED Guide 2.1, USGBC). The USGBC warns of the importance of addressing possible indoor environmental quality impacts on building occupants due to recycling activities. The activities should be isolated or performed during non-occupant hours to maintain optimal IEQ. (LEED Guide 2.1)

Indoor environmental quality

The indoor environmental quality category of LEED includes issues related to air quality, thermal comfort, adjustment of building features, day-lighting and views that are intended to directly affect building occupants. Perceivable credits under air quality include IEQ prerequisite 1, prerequisite 2, credit 1, 2 and credit 5. Prerequisite 1, minimum indoor air quality performance, intends to prevent indoor air quality problems in buildings, thus contributing to the comfort and well being of occupants. The second IEQ prerequisite, environmental tobacco smoke (ETS) control, intends to prevent exposure of building occupants and systems to ETS. The intent of credit 1, carbon dioxide (CO_2) monitoring, is to provide indoor air quality monitoring to help sustain long-term occupant comfort and well-being. IEQ credit 2, ventilation effectiveness, intends to provide effective delivery and mixing of fresh air to support the safety, comfort and well-being of building occupants. IEQ credit 5, indoor chemical and pollutant source control, intends to avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality. The credits mentioned are

intended to directly affect building occupants by increasing comfort and well-being (USGBC 2.1).

The requirements are to meet the voluntary consensus standard ASHRAE 62-1999 Ventilation for Acceptable Indoor Air Quality, and approved Addenda (ASHRAE 62-2001) using the Ventilation Rate Procedure. Higher ventilation rates are sometimes necessary to optimize IAQ.

Poor indoor air quality has been associated with occupant illnesses. Sources of pollution that are most likely to affect the site should be identified during the design stages. The USGBC requires the installation of fresh air intakes away from possible sources of contamination, at least 25 feet is recommended and 40 feet preferable. Possible sources of contamination include loading areas, building exhaust fans, cooling towers, street traffic, idling cars, standing water, parking garages, sanitary vents, dumpsters, and outside smoking areas.

Prerequisite 2 requires the building owner or responsible party to either submit a letter declaring that the building will be operated under a policy prohibiting smoking or declare and demonstrate smoking rooms are exhausted to the outdoors with no re-circulations of ETS-containing air to the non-smoking area of the buildings. A strong link between Environmental Tobacco Smoke (ETS) or “second hand smoke” and health risks has also been demonstrated. The most effective way to avoid health problems

associated with tobacco smoke is to prohibit smoking in indoor areas. If smoking areas are provided outside the building the USGBC recommends it be located where ETS will not enter the building or ventilation systems and away from concentrations of building occupants or pedestrian traffic. All of the facilities prohibit smoking in or around the immediate building.

The intent of credit 1, carbon dioxide (CO_2) monitoring, is to provide indoor air quality monitoring to help sustain long-term occupant comfort and well-being. The credit requires the installation of a permanent carbon dioxide monitoring system that provides feedback on space ventilation performance in a form that affords operational adjustments is required. ASHRAE 62-2001 provides the CO2 differential for all types of occupancy.

Permanent air monitoring systems enables the detection of air quality problems quickly so that corrective actions can be applied. The differential CO2 level that activates ventilation within each space must be based on occupant activity level and the corresponding metabolic rate (MET) defined in ASHRAE Standard 55-1992, Table 4. MET is the rate of energy production of an individual, which varies depending on activity level (LEED Guide 2.1, USGBC).

IEQ credit 2, ventilation effectiveness, intends to provide effective delivery and mixing of fresh air to support the safety, comfort and well-being of building occupants. The credit requires mechanically ventilated buildings to be designed with a ventilation

system that results in an air change effectiveness greater than or equal to 0.9 as determined by ASHRAE 129-1997.

IEQ credit 5, indoor chemical and pollutant source control, intends to avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality. Requirements for this credit involve minimizing pollutant cross-contamination of regularly occupied areas. The credits mentioned are intended to directly affect building occupants.

IEQ credits 6.1 and 6.2, controllability of systems perimeter spaces and non-perimeter spaces, are intended to provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces. Controllability of systems, credits 6.1 and 6.2, can be perceived by building occupants.

Credit 6.1, controllability of systems perimeter spaces, requires an average of one operable window and one lighting control zone per 200 square feet for all regularly occupied areas within 15 feet of the perimeter wall. Credit 6.2, controllability of systems non-perimeter spaces, requires controls for each individual for airflow, temperature and lighting for at least 50% of the occupants in non-perimeter, regularly occupied spaces. Strategies to comply with either of these credits include operable windows, lighting controls, providing additional thermostats, lighting dimmers, sensors, using an under-floor air system and individual desktop lighting and thermal controls.

Greater thermal comfort may increase occupant performance and reduce complaints (LEED Guide 2.1).

Perceivable IEQ credits that involve thermal comfort are IEQ credit 7.1 and 7.2. The intent of credits 7.1 and 7.2, thermal comfort is to provide a thermally comfortable environment that supports the productivity and well-being of building occupants. These credits are intended to directly affect building occupants.

Credit 7.1 requires compliance with ASHRAE Standard 55-1992, Addenda 1995, for thermal comfort standards including humidity control within established ranges per climate zone. Credit 7.2 requires the installation of a permanent temperature and humidity monitoring system that provides operators control over thermal comfort and humidification and dehumidification systems within the building (LEED 2.1, USGBC).

Perceivable IEQ credits that involve day-lighting and views are credits 8.1 and 8.2. These credits intend to provide a connection between indoor spaces and outdoors through the introduction of daylight and views into regularly occupied spaces. These credits directly affect how building occupants view their space.

IEQ credit 8.1, daylight in 75% of spaces, requires the building to achieve a Daylight Factor of 2% in 75% of all spaces occupied for critical visual tasks. IEQ credit 8.2, views for 90% of spaces, requires a direct line of sight to vision glazing for building

occupants in 90% of all regularly occupied spaces (LEED Guide 2.1, USGBC). Spaces like copy rooms, storage areas, mechanical plant rooms and laundry or low occupancy support areas are excluded from the requirements.

Natural daylight combined with architectural or electronic controls can reduce artificial lighting in a space. Architectural features like shading devices, light shelves, atriums, courtyards, skylights, and window glazing can help with control natural light in buildings. Adjustable blinds and photo-responsive controls for electronic lighting can be used in combination with architectural features to maintain consistent lighting levels and transition to artificial lighting. Problems that need to be addressed with incorporating natural daylight and views are visual privacy, glare, acoustics and control of heat gain.

Innovation and design

The innovation and design category of LEED is to recognize projects for innovative building features and sustainable knowledge. Under this category projects can receive the green housekeeping credit.

The credit is awarded for using green cleaning products for maintaining the facility. The intent of this credit is to protect the health of building occupants and cleaning professionals by using non-toxic cleaning solutions. This credit directly affects building occupants. Table 1 is a summary of the perceivable LEED credits evaluated in this research.

Table 1: Perceivable LEED Credits Evaluated in the Occupant Evaluation of LEED Certified Health Centers Study

Affect	*LEED category*	Credit	Credit Intent
	SUSTAINABLE SITES		
	Transportation		
I	Public transportation access	4.1	Reduce pollution & land development impacts from automobiles.
I	Bicycle storage & changing rooms	4.2	Reduce pollution & land development impacts from automobiles.
I	Parking capacity	4.4	Reduce pollution & land development impacts from single occupancy vehicle use.
	Exterior Lighting		
I	Light pollution reduction	8	Eliminate light trespass from the building and site, improve night sky access, reduce development impact on nocturnal environments
	WATER EFFICIENCY		
	Landscaping		
I	50% Reduction	1.1	Limit or eliminate the use of potable water for landscape irrigation
I	No potable use or no irrigation	1.2	Limit or eliminate the use of potable water for landscape irrigation
	Water Efficient Plumbing Fixtures		
I	20% Reduction	3.1	Maximize water efficiency within buildings to reduce burden on municipal
I	30% Reduction	3.2	water supply and wastewater systems of 20% and/ or 30%.
	MATERIALS AND RESOURCES		
	Recycling		
I	Storage & collection of recyclables	PR 1	Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.
	INDOOR ENVIRONMENTAL QUALITY		
	Indoor Air Quality (IAQ)		
D	Minimum IAQ performance	PR 1	Minimum (IAQ) performance, prevent development of air quality problems in buildings contributing to comfort and well-being of occupants.
D	Environmental tobacco smoke	PR 2	Prevent exposure of building occupants and systems to Environmental tobacco Smoke (ETS).
D	Carbon dioxide (CO_2) monitoring	1	Monitor indoor air quality to help sustain long-term occupant comfort and well-being
D	Ventilation effectiveness	2	Provide effective delivery and mixing of fresh air to supports the safety, comfort and well-being of building occupants
D	Indoor chemical and pollutant source control	5	Avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality.
	Temperature		
D	Ther. comfort (ASHRAE 55-1992)	7.1	Provide a thermally comfortable environment for building occupants.
D	Ther. comfort monitoring system	7.2	Provide a thermally comfortable environment for building occupants.
	Adjustable Systems		
D	Perimeter spaces	6.1	Provide the option of adjusting thermal, ventilation and lighting system control to promote occupant productivity, comfort and well-being.
D	Non-perimeter spaces	6.2	Provide the option of adjusting thermal, ventilation and lighting system control to promote occupant productivity, comfort and well-being.
	Day-Lighting & Views		
D	Daylight in 75% of spaces	8.1	Provide a connection between indoor spaces and outdoors through the introduction of daylight and views into regularly occupied spaces
D	Views in 90% of spaces	8.2	Provide a connection between indoor spaces and outdoors through the introduction of daylight and views into regularly occupied spaces
	INNOVATION AND DESIGN PROCESS		
	Maintenance		
D	Green cleaning	~	Protect the health of building occupants and cleaning professionals by using non-toxic cleaning solutions

Source: USGBCs LEED Guide 2.1

CHAPTER III

PROBLEM STATEMENT

As seen in the literature review the issue of green building is growing in importance. Green building is gaining importance in health care as well. Efforts have been made to evaluate energy savings in green buildings. The Center for the Built Environment at Berkeley has made efforts to evaluate green building features in office buildings. However there is no information on the perception of green building features in health centers.

While green organizations like the USGBC create guidelines to help health care centers reduce their environmental impact, knowledge of how the guidelines affect the occupant remains unknown. The premise is that before LEED certified health centers become standard practice they should be evaluated from the occupants' perspective.

MAIN RESEARCH QUESTION

This research aims to answer the question, when medical employees and administrators evaluate LEED certified health centers they are employed at, what is their level of satisfaction with perceivable green building features that are intended to directly or indirectly affect occupants?

SUB-RESEARCH QUESTIONS

Perceivable LEED green building features can be categorized under topics that lead to the following sub-research questions.

1. What is the level of satisfaction with the transportation options?
2. What is the level of satisfaction with exterior lighting?
3. What is the level of satisfaction water efficient plumbing fixtures?
4. What is the level of satisfaction with the landscape?
5. What is the level of satisfaction with recycle storage bin areas?
6. What is the level of satisfaction with the indoor air quality in the facility?
7. What is the level of satisfaction with adjustable ventilation, lighting and thermal controls?
8. What is the level of satisfaction with issues related to daylight and views?
9. What is the level of satisfaction with temperature and humidity controls in the facility?
10. What is the level of satisfaction with the cleanliness of the facility?

SCOPE AND LIMITATIONS

Only health centers in the U.S. that have received LEED certification before August 10, 2006 were asked to participate in the study. This study does not include patient feedback on the health facilities. This survey does not evaluate every credit required for LEED certification; only those credits that can be perceived by people who work there were assessed.

CHAPTER IV

METHODOLOGY

A multiple case study method is used for this study, because each facility has achieved different LEED credits toward LEED certification. A literal replication logic is employed in this research. Similar results were predicted for each case. Each center is the topic of a case and treated as an individual case study. The survey results are used to draw conclusions for each individual case.

In the book *Case Study Research* Robert Yin illustrates the replication approach to a multiple case study method though a flow chart similar to the one in Figure 1 Flow Chart of Research Method for POE of LEED Health Centers.

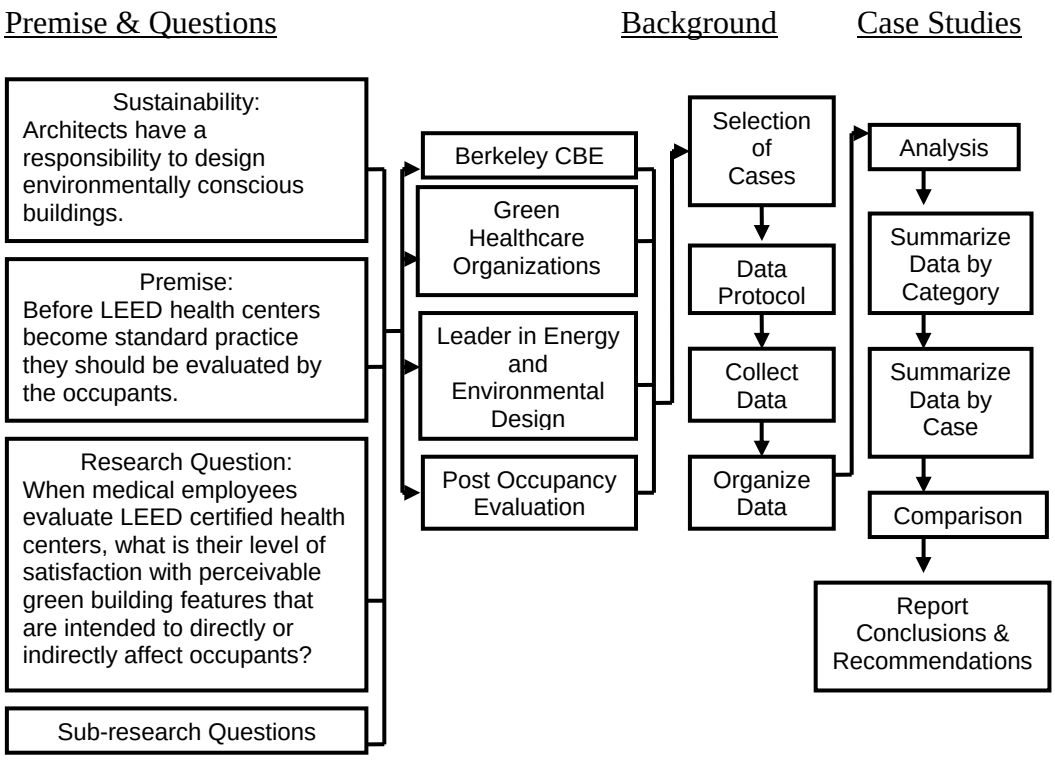


Figure 1: Flow Chart of Research Method for POE of LEED Health Centers

CASE SELECTION

Case studies were selected from the USGBC database of LEED certified buildings. LEED certified hospitals and health clinics. In the summer of 2006 when the study began, there were seven LEED certified health centers in the United States. The criteria for the study included being a hospital or health clinic previously awarded a minimum of LEED certification by the USGBC. There were health projects that were registered with the USGBC at the time the facilities were being selected. USGBC 'registered' projects have not completed the LEED process and have not have been officially awarded the LEED credits. There are also other green building programs that can be used for healthcare projects, only LEED certified buildings were considered for the study.

All of the LEED certified health centers were asked to participate in the study. However three of the health centers were not able to participate in the study because of various reasons. Four LEED certified health centers agreed to participate in this study. Each LEED certified health center is analyzed as a single case study.

DATA PROTOCOL

LEED score cards were identified for each case. The LEED score cards show the points received for the use of the site, water, resources, materials, energy, indoor air quality control and green housekeeping. Of the points received, the study evaluated LEED points that could be perceived by occupants who are not familiar with LEED standards.

A survey was developed to assess the perceivable LEED building features used in the health facilities. A Likert scale was used to assess the level of satisfaction for each sub-research question topic in the survey. Likert developed a scaling method using what he called 'equal-*appearing* intervals'. This involves asking a respondent to rate on a scale how much they agree or disagree with test items. (Lowenthal, 19-22). A forced answer response 1-5, satisfied, somewhat satisfied, somewhat dissatisfied, dissatisfied and not applicable to the facility. The answers are then translated into an ordered number scale and the numbers are added to give an overall score. In this study a dichotomous scale was used to interpret the results.

Questions were used that were one-dimensional; for example something that can be measured either more or less or yes or no. The answers are then translated into an ordered number scale and the numbers are added to give an overall score.

Permission was granted to allow up to fifteen employees from each LEED certified health center take a survey evaluation of their facility.

DATA COLLECTION

A box of fifteen paper surveys and privacy envelopes was sent to the contact at each LEED certified health center. The contact selected fifteen full time employees to take the survey. The respondents were asked to complete the survey, and return it, sealed in the privacy envelope to the health center contact. The subjects may not have been

randomly selected by standard statistical procedure. The contact sent the box of sealed completed surveys back to the Texas A&M department of architecture be analyzed.

DATA ORGANIZATION

After the surveys were collected, the data was organized by case study. Pearland Pediatrics had a response rate of 46%. Thirteen of the fifteen possible satisfaction surveys were used to evaluate the facility. The Infant Welfare Society of Chicago had a response rate of 100%. Fifteen respondents evaluated the facility. The Center for Discovery had a response rate of 32%. Seven of the fifteen possible satisfaction surveys were used to evaluate the facility. The Lacks Cancer Center had a response rate of 48%. Fourteen of the fifteen possible surveys were used to evaluate the facility. The total number of subjects participating in this research is forty-nine.

ANALYSIS

A satisfaction score based on the survey responses was determined for each LEED category. The scores for each feature are added for a total score for each survey. The total score for each survey is calculated resulting in a total score for the facility. The method is be duplicated for each case study. The results are discussed as individual case study reports in Chapter V.

CHAPTER V

CASE STUDY RESULTS

The USGBCs' mission is to promote sustainable practices by influencing aspects of the built environment. The USGBC created the Leader in Energy and Environmental Design, LEED, programs for different types of buildings. LEED NC 2.1, for New Construction and Major Renovations is the type of construction this research will include. LEED NC is divided into six sections that are further subdivided into LEED credits that can be attained. The five of the six sections contain credits that are considered perceivable by building occupants. The credits from the following LEED sections are included in this study: Sustainable Sites, Water Efficiency, Materials and Resources, Indoor Environmental Quality and Innovation and Design Process.

When a building achieves a set number of LEED points the building can become LEED certified, silver, gold or platinum. The buildings that are being evaluated in this study have achieved LEED CERTIFIED status. LEED was originally created for office buildings. The building program has been applied to a variety of building types, recently including health care facilities.

There are obvious distinctions between an office building and a healthcare facility. Following LEED criterion to achieve LEED certification for health centers can be challenging for health facilities. In the spring of 2006 seven LEED certified healthcare

facilities were awarded certification under LEED NC 2 in the United States. Four of them agreed to participate in this study by allowing a maximum of fifteen employees take the Occupant Evaluation of LEED Certified Health Centers survey evaluating their facility. Figure 2 shows that two of the health centers are located in urban areas, and two are located in rural areas.

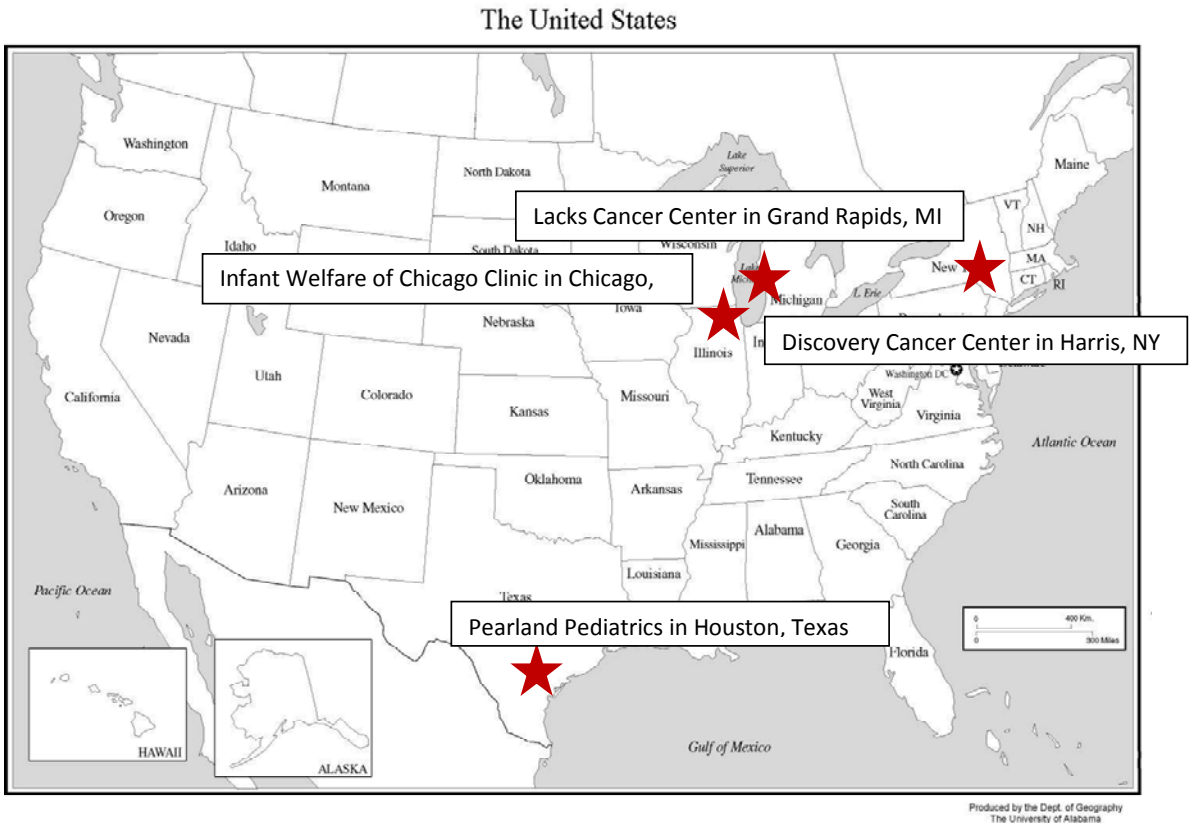


Figure2: United States Map Showing the Locations of the Four LEED Certified Health Centers in This Study

Sources: Map of United States retrieved from the Department of Geography at the University of Alabama

The case studies were selected from the USGBC database of LEED certified healthcare buildings, which included hospitals and clinics. LEED score cards were identified for each facility that agreed to participate. The study only analyzed LEED points that could be perceived by occupants who are not familiar with LEED criterion. Each health facility has achieved different LEED credits toward LEED certification therefore a multiple case study method was used. Literal replication logic was used to analyze the data. The same survey was given to all of the facilities. Although the cases did not receive credits in a particular area they were asked to report about that particular category in their facility. Each center is treated as an individual case study. The survey results were used to draw conclusions for each case resulting in four embedded case studies.

The LEED score cards for each facility are located in front of the corresponding case study; Figure 4, Figure 33, Figure 60 and Figure 87. The LEED score card is a summary of the LEED credits that are available, subdivided into the six major sections previously mentioned. The top right corner of the LEED score card displays the full project name, number, date, version of LEED the project is certified under, and the level of certification awarded by the USGBC.

There are numerous credits offered to achieve LEED status, many of them are available in the building design and construction process. The points that will be evaluated in this

study are those that can be perceived by building occupants who are not familiar with LEED.

The perceivable credits evaluated that the four cases received are shown in Table 2. LEED credits that were not able to detectable to occupants that may be unfamiliar with LEED were excluded from the table. Table 2 is a comparison of which perceivable LEED points were received by the LEED certified health centers evaluated in this study.

The Occupant Evaluation of LEED Certified Health Centers survey was created to ask questions about the direct and indirect affects of perceivable LEED credits and to see if the intentions of the USGBC to improve employee satisfaction and to indirectly influence sustainable habits were realized. Each question in the Occupant Evaluation of LEED Certified Health Centers survey corresponds with a figure showing the respondents evaluation of the aspect.

Table 2: Comparison of Perceivable LEED Points Received by the LEED Certified Health Centers

LEED Certified Health Centers:	PEARLAND PEDIATRICS	LACKS CANCER CENTER	INFANT WELFARE OF CHICAGO	DISCOVERY HEALTH CENTER
SUSTAINABLE SITES				
Transportation 4.1		o	o	
Transportation 4.2	o		o	o
Transportation 4.4	o			o
Exterior Lighting 8.0		o		
WATER EFFICIENCY				
Landscape 1.1	o	o	o	o
Landscape 1.2	o		o	o
Water Use Reduction 3.1		o	o	
Water Use Reduction 3.2		o		
MATERIALS & RESOURES				
Storage & Collection of Recyclables PR 1	o	o	o	o
INDOOR ENVIRONMENTAL QUALITY				
Minimum IAQ Performance PR 1	o	o	o	o
Environmental Tobacco Smoke Control PR 2	o	o	o	o
Carbon Dioxide Monitoring 1	o	o		
Increase Ventilation Effectiveness 2				o
Indoor Chemical & Pollutant Source Control 5	o	o		
Controllability of Systems, Perimeter 6.1				o
Controllability of Systems, Non-Perimeter 6.2				o
Thermal Comfort 7.1	o	o	o	
Thermal Comfort 7.2		o		
Daylight & Views 8.1	o			
Daylight & Views 8.2	o			
INNOVATION & DESIGN PROCESS				
Green Housekeeping	o			o

Figure 3 explains the correlation between the survey question, LEED section, and the responses.

LEED SECTION: *ONE OF THE 6 LEED SECTIONS. This information can be found in the LEED Guide 2.1 found in appendix A.*

Question Section: *This is the topic corresponding with the Occupant Evaluation of LEED Certified Health Centers Survey*.

Survey question: The question for each topic from the *Occupant Evaluation of LEED Certified Health Centers Survey*. Each aspect evaluated for the topic is shown in the left column on alternating rows. The respondents are asked to choose: satisfied, somewhat satisfied, somewhat dissatisfied or dissatisfied for the aspect. In some cases 'not applicable' (N/A) or 'do not adjust' (DNADJ) are options.

Table of Answers: The responses correspond to the survey questions about the aspects of the topics being evaluated. The aspects evaluated for the topic are on the top row of the table.

Sources: LEED Guide 2.1, The Occupant Evaluation of LEED Certified Health Centers Survey and responses from the LEED Certified Health Center respondents.

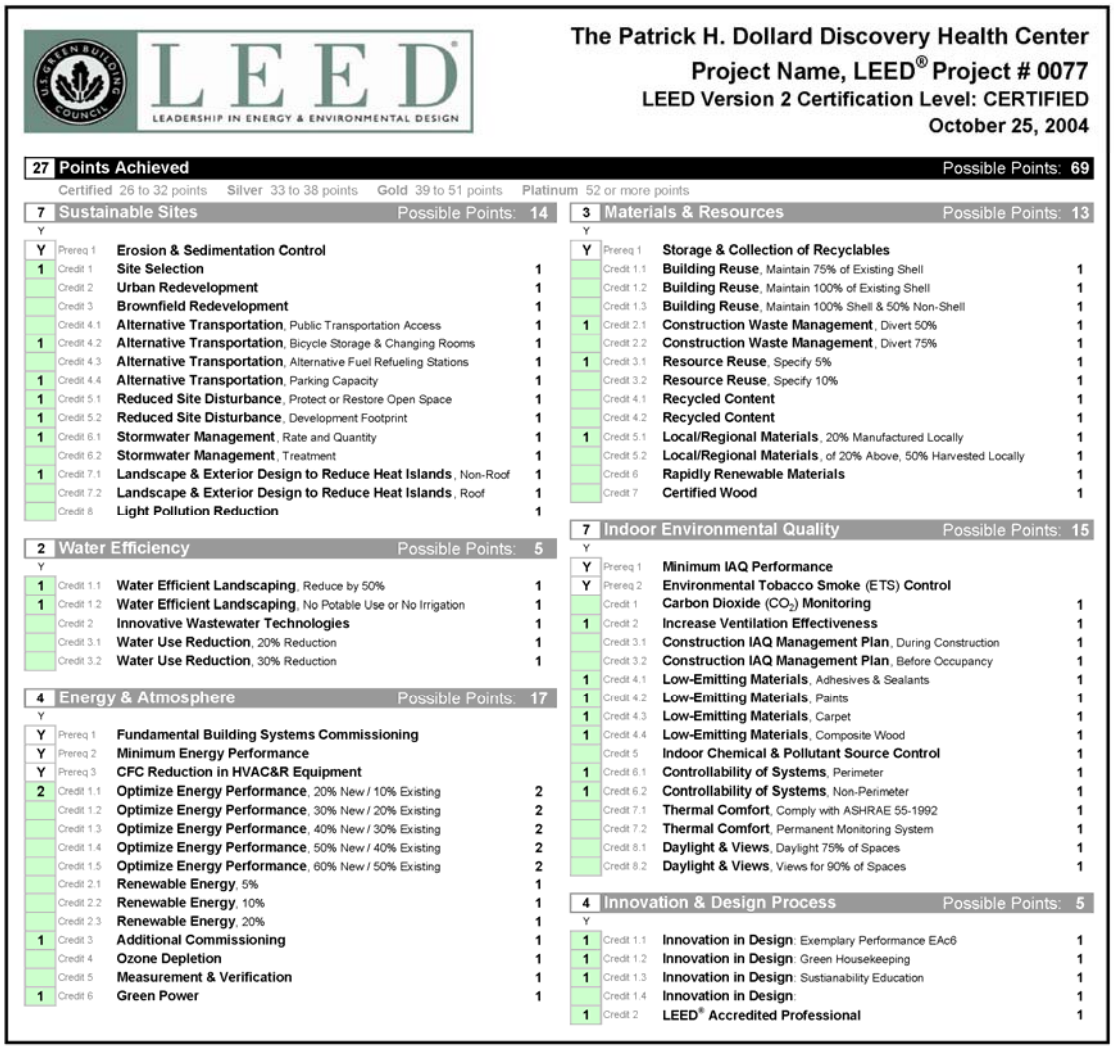
Figure 3: Explanation of Layout and Abbreviations of the Figures Used in Chapter V

Satisfaction with a particular aspect within a topic is represented by a (1), a dissatisfaction is represented by a (-1). The far right column 'R' represents the respondent. In the bottom row, 'Total', satisfaction or dissatisfaction with the aspect is represented with a positive or negative number. The total number in the column is irrelevant. A positive number represents satisfaction while a negative number represents dissatisfaction. The column, '#12 Overall Satisfaction', is the individual results for question #12 in the survey, which asks the overall satisfaction with each topic. The topics in the survey differ from the six LEED categories in the LEED Guide; they are subgroups that cover multiple LEED credits and have simple headings to understand for those who are not familiar with LEED. The column to the far right of the results table in the figures is the 'score for each respondent'. This column can be used to draw conclusions from previous information given by a respondent. For example if respondent R2 marks occasionally using a personal car to get to work in survey question number 3, the response for R2 in the satisfaction with exterior lighting around staff parking areas, survey question 5, will be examined.

The number in the right lower corner of the figure, where the 'total' row and the 'score for each respondent' column meet is the total satisfaction score for the question. Topics that have two questions are added together for a total score for the topic; these scores are combined for a total satisfaction score for the LEED health center. Satisfaction is represented by a (1) dissatisfaction is represented by a (-1). The total scores for the case studies are represented in Figure 32, Figure 59, Figure 86 and Figure 116.

CASE STUDY ONE: THE PARTICK DOLLARD DISCOVERY HEALTH CENTER

The Patrick Dollard Discovery Health Center is one of two suburban LEED certified health centers evaluated in this study. Figure 4 is the LEED score card that shows the LEED credits achieved by the Patrick Dollard Discovery Health Center.



The Patrick H. Dollard Discovery Health Center
Project Name, LEED® Project # 0077
LEED Version 2 Certification Level: CERTIFIED
October 25, 2004

27 Points Achieved — Possible Points: 69

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

7 Sustainable Sites — Possible Points: 14

Y			
Y	Prereq 1	**Erosion & Sedimentation Control**	
1	Credit 1	**Site Selection**	1
	Credit 2	**Urban Redevelopment**	1
	Credit 3	**Brownfield Redevelopment**	1
	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
1	Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
1	Credit 6.1	**Stormwater Management**, Rate and Quantity	1
	Credit 6.2	**Stormwater Management**, Treatment	1
1	Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1
	Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
	Credit 8	**Light Pollution Reduction**	1

2 Water Efficiency — Possible Points: 5

Y			
1	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
	Credit 2	**Innovative Wastewater Technologies**	1
	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
	Credit 3.2	**Water Use Reduction**, 30% Reduction	1

4 Energy & Atmosphere — Possible Points: 17

Y			
Y	Prereq 1	**Fundamental Building Systems Commissioning**	
Y	Prereq 2	**Minimum Energy Performance**	
Y	Prereq 3	**CFC Reduction in HVAC&R Equipment**	
2	Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	2
	Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	2
	Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	2
	Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	2
	Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	2
	Credit 2.1	**Renewable Energy**, 5%	1
	Credit 2.2	**Renewable Energy**, 10%	1
	Credit 2.3	**Renewable Energy**, 20%	1
1	Credit 3	**Additional Commissioning**	1
	Credit 4	**Ozone Depletion**	1
	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

3 Materials & Resources — Possible Points: 13

Y			
Y	Prereq 1	**Storage & Collection of Recyclables**	
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Shell	1
	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	**Construction Waste Management**, Divert 50%	1
	Credit 2.2	**Construction Waste Management**, Divert 75%	1
1	Credit 3.1	**Resource Reuse**, Specify 5%	1
	Credit 3.2	**Resource Reuse**, Specify 10%	1
	Credit 4.1	**Recycled Content**	1
	Credit 4.2	**Recycled Content**	1
1	Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
	Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

7 Indoor Environmental Quality — Possible Points: 15

Y			
Y	Prereq 1	**Minimum IAQ Performance**	
Y	Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	
	Credit 1	**Carbon Dioxide (CO_2) Monitoring**	1
1	Credit 2	**Increase Ventilation Effectiveness**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet	1
1	Credit 4.4	**Low-Emitting Materials**, Composite Wood	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Perimeter	1
1	Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
	Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
	Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

4 Innovation & Design Process — Possible Points: 5

Y			
1	Credit 1.1	**Innovation in Design**: Exemplary Performance EAc6	1
1	Credit 1.2	**Innovation in Design**: Green Housekeeping	1
1	Credit 1.3	**Innovation in Design**: Sustainability Education	1
	Credit 1.4	**Innovation in Design**:	1
1	Credit 2	**LEED® Accredited Professional**	1

Figure 4: The Patrick Dollard Discovery Health Center LEED Score Card

Figure 5 is an image of the facility surrounded by landscape. The Patrick Dollard Discovery Health Center respondents were asked to report their satisfaction with access to public transportation and the landscape at the facility. The results will be discussed later in the case.

Figure 5: The Patrick Dollard Discovery Health Center Case Study Image of Facility and Surrounding Landscape
Source: Guenther, R.

The following information lists general information about the Patrick Dollard Discovery Health Center.

Owner:	The Center for Discovery
Architect:	Guenther 5 Architects PLLC
Building Type:	New Construction, Ambulatory Diagnostic Treatment Facility
Size:	28,000 sqft
Building Location:	Harris, NY
Recognition:	LEED CERTIFI

The exterior image of the Patrick Dollard Discovery Health Center in Figure 6 give an idea of the natural light sources for the interior spaces. The respondents were asked to report their satisfaction with natural light and windows in their space. The results are discussed later in the case.

Figure 6: The Patrick Dollard Discovery Health Center Image of Exterior
Source: Guenther, R.

The Patrick Dollard Discovery Health Center received LEED credit for using green housekeeping materials and methods. Figure 7 and Figure 8 shows the variety of materials; laminate, wood, ceramic, and glass that are maintained using green housekeeping strategies.

Figure 7: The Patrick Dollard Discovery Health Center Multi-level Interior Image Showing Materials Maintained using Green Cleaning Materials
Source: Guenther, R.

Figure 8: The Patrick Dollard Discovery Health Center Interior Image Showing Materials Maintained using Green Cleaning Materials
Source: Guenther, R.

The Patrick H. Dollard Discovery Health Center received a total of twenty-seven LEED points earning the title CERTIFIED green building. Information about which LEED credits were received for the Patrick H. Discovery Health Center refers to Figure 4. The

Occupant Evaluation of LEED Certified Health Center survey was given to fifteen full time employees, at the Patrick H. Dollard Discovery Health Center, seven responded. The Occupant Evaluation of LEED Certified Health Centers survey asks respondents to answer background questions about the respondents that may be relevant to analyzing the responses.

Background information

The first survey question under background information is position held at the Patrick H. Dollard Discovery Health Center. For the purpose of getting a better perspective of building features, such as water efficient sinks, the survey asks respondents to describe themselves as either medical staff or administrator. Architecturally administrative areas may be designed differently than medical staff/ patient or public areas. For example, both medical staff and administrators may use water efficient sinks; but medical staff may use the water efficient sink to fill a cup with water, while administrators may only encounter the sink in a public restroom. As the perceivable features of a LEED health center are discussed, it may be useful to know which perspective the evaluation is from.

Figure 9 shows the perspectives represented for the first case study. Six of the seven respondents are administrators. One respondent chose ‘other’ in the survey. Figure 9 and Figure 10 show the number of administration to medical staff that will be used to evaluate the Patrick H. Dollard Discovery Health Center. There are no medical staff evaluations represented for this case.

LEED SECTION: BACKGROUND INFORMATION

Question Section: Position at Health Center

1. Please choose which position best describes you at this health center.

◯ Administration
◯ Medical Staff
Other (please specify)

R	*Medical Staff*	*Administration*	Other
R1		1	
R2			1
R3		1	
R4		1	
R5		1	
R6		1	
R7		1	
R8			
R9			
R10			
R11			
R12			
R13			
R14			
R15			
Total	**0**	**6**	**1**

Figure 9: The Patrick Dollard Discovery Health Center Job Position at the Facility

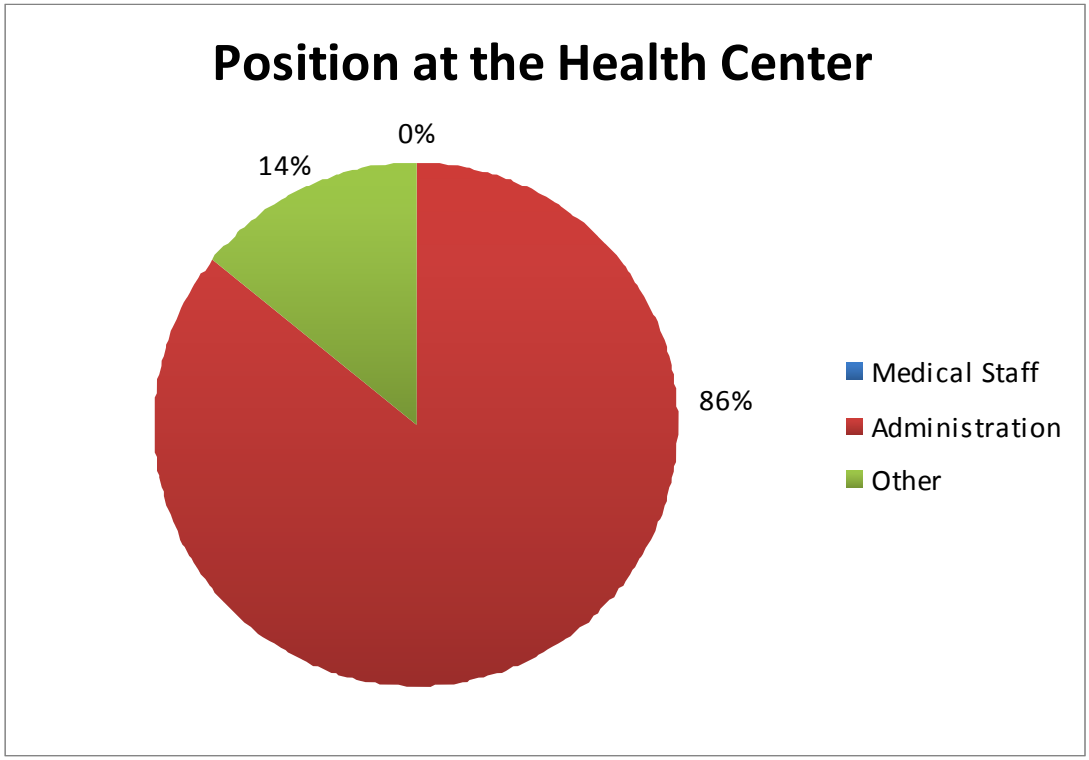


Figure 10: The Patrick Dollard Discovery Health Center Pie Chart of Job Position at the Facility

In the survey respondents are also asked to report the approximate length of time employed at the facility. This question was asked to get an idea of how long the respondents have had a chance to observe the building features that may have been influenced by LEED certification.

As shown in Figure 11 all of the employees that responded to the survey have worked at the Patrick H. Dollard Discovery Health Center for more than one year.

LEED SECTION: BACKGROUND INFORMATION

Question Section: Time Employed at Health Center

2. Approximately how long have you worked at this facility?

- ◯ Less than 6 months
- ◯ 6 months to 1 year
- ◯ More than 1 year

R	*6 months or less*	*1 year*	*more than 1 year*
R1			1
R2			1
R3			1
R4			1
R5			1
R6			1
R7			1
R8			
R9			
R10			
R11			
R12			
R13			
R14			
R15			
Total			**7**

Figure 11: The Patrick Dollard Discovery Health Center Time Employed at the Facility

Transportation

There are four possible transportation credits under the LEED sustainable sites category; three of which are perceivable credits that are being evaluated with the Occupant Evaluation of LEED Certified Health Centers survey. The Patrick H. Dollard Discovery Health Center received two of the possible transportation credits as shown on Figure 4. The Patrick H. Dollard Discovery Health Center received LEED Sustainable Sites credit 4.2, Alternative Transportation: Bicycle Storage and Changing Rooms. The requirement for the credit is to provide secure bicycle storage with convenient changing/shower facilities. This credit indirectly affects occupants. The intention of the LEED transportation credits is to reduce pollution and land development impacts from automobiles (LEED 2.1, USGBC).

The Patrick H. Dollard Discovery Health Center also received LEED Sustainable Sites credit 4.4 Alternative Transportation, Parking Capacity. The requirements for SS credit 4.4 is to meet, not exceed minimum local zoning requirements for parking and provide preferred parking for carpools and vanpools. Details and calculations for this credit can be found in the LEED Guide 2.1 in Appendix A. Impervious parking facilities have a negative impact on the environment because it increases storm water runoff. Reducing the amount of parking does not necessarily reduce the amount of private automobile use. In this case the SS credit 4.4 was received but SS credit 4.1 Alternative Transportation, Public Transportation Access was not received.

A modest parking lot size without access to public transportation indirectly suggests occupants are being persuaded to carpool or vanpool. The question was asked to determine if occupants carpool or vanpool as an occasional mode of transportation.

In Figure 12 respondents show how often they use the following modes of transportation to get to work; primarily and occasionally. In Figure 12, a number (1) in the response table indicates the primary mode of transportation selected by the respondent. The letter 'O' designates which mode of transportation the respondent occasionally uses to get to work. The primary mode of transportation for all of the respondents is a personal car as shown in Figure 13.

Figure 14 shows the occasional modes of transportation used by the respondents and the number of respondents who use the mode. Alternative Transportation: Public Transportation Access was not achieved by the facility, therefore bus/ shuttle, and light-rail options are not available. One respondent reported carpooling as an occasional mode of transportation.

Figure 15 shows the responses to LEED building features influenced by LEED sustainable sites transportation credits. In the Occupant Evaluation of LEED Certified Health Centers survey respondents were asked to mark 'n/a' if they do not use the feature inquired about.

LEED SECTION: SUSTAINABLE SITES

Question Section: Transportation

3. How often do you use the following modes of transportation to get to work?

	Daily	Occasionally	Never
Personal Car	◯	◯	◯
Carpool	◯	◯	◯
Bus/Shuttle	◯	◯	◯
Bicycle	◯	◯	◯
Light-rail	◯	◯	◯
Other	◯	◯	◯

R	Personal Car	Carpool	Bus/ Shuttle	Bicycle	Light-rail	Other
R1	1					
R2	1					
R3	1					
R4	1					
R5	1	0				
R6	1					
R7	1					
R8						
R9						
R10						
R11						
R12						
R13						
R14						
R15						

Figure 12: The Patrick Dollard Discovery Health Center Forms of Transportation to get to Work

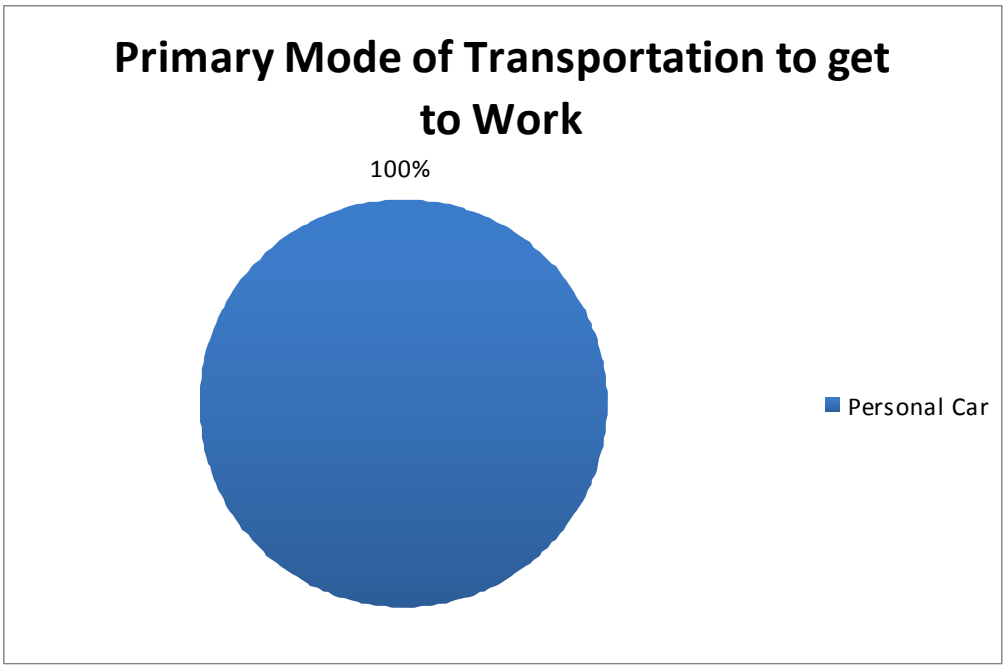


Figure 13: The Patrick Dollard Discovery Health Center Primary Mode of Transportation to get to Work

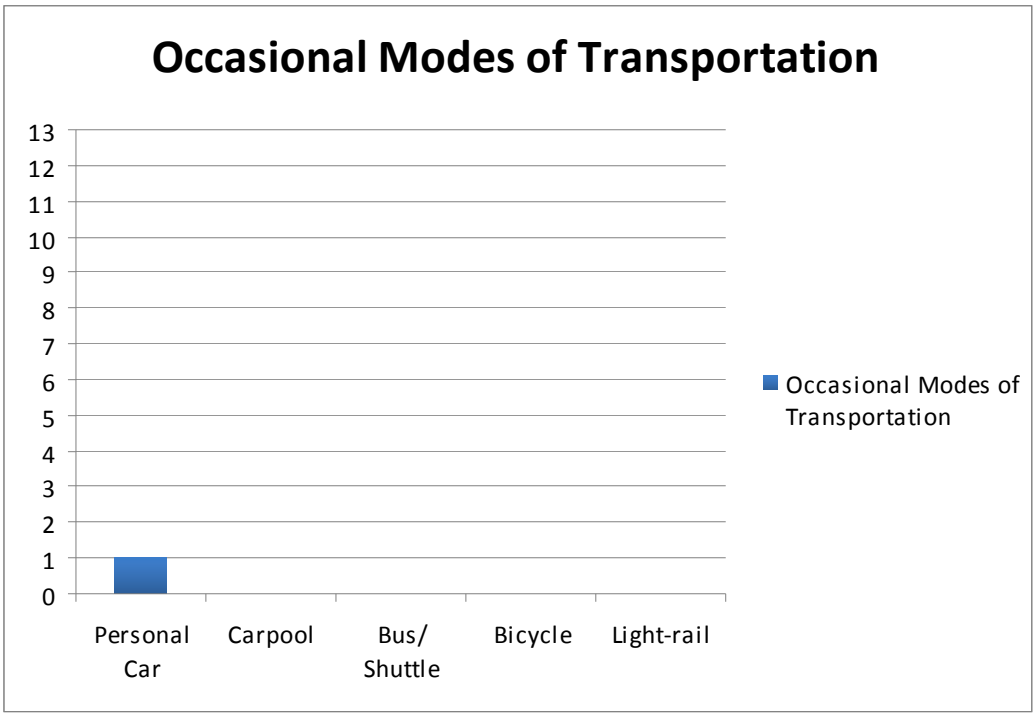


Figure 14: The Patrick Dollard Discovery Health Center Occasional Modes of Transportation to get to Work

LEED SECTION: SUSTAINABLE SITES

Question Section: Transportation

4. What is your satisfaction with the following transportation issues?

(If you do not use the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Amount of Staff Parking	◯	◯	◯	◯	◯
Bike Storage Area	◯	◯	◯	◯	◯
Shower facilities	◯	◯	◯	◯	◯
Access to Public Transportation	◯	◯	◯	◯	◯

R	Staff Parking	Bike Storage	Shower Facilities	Access to Public Transportation	#12 Overall Satisfaction	Score for each Respondent
R1	-1	n/a	n/a	-1	1	***-1***
R2	1	1	n/a	n/a	n/a	***2***
R3	1	1	1	1	n/a	***4***
R4	1	n/a	n/a	n/a	1	***2***
R5	1	n/a	n/a	n/a	1	***2***
R6	1	1	n/a	n/a	1	***3***
R7	1	n/a	n/a	-1	n/a	***0***
R8						***0***
R9						***0***
R10						***0***
R11						***0***
R12						***0***
R13						***0***
R14						***0***
R15						***0***
Total	5	3	1	-1	4	***12***

Figure 15: The Patrick Dollard Discovery Health Centers' Satisfaction with Transportation Issues

The facility received a dissatisfactory score for access to public transportation. Access to public transportation, Sustainable Sites 4.1, is the LEED credit that was not achieved by the Patrick H. Dollard Discovery Health Center. Overall the Patrick H. Dollard Discovery Health Center received a positive score in the aspects of staff parking, bike storage, and overall satisfaction.

Exterior lighting

The Patrick H. Dollard Discovery Health Center did not receive LEED Sustainable Sites credit 8, Light Pollution Reduction, as shown in Figure 4. The four case studies received the same survey whether the facility received the credit or not. If the health center did not receive the Light Pollution Reduction credit, the exterior lights do not have to adhere to the exterior lighting suggestions adopted by the USGBC from IESNA. This question is asked to see safety around the facility is compromised when exterior lighting is reduced at night. For the Patrick H. Dollard Discovery Health Center the bike rack area and parking lot safety at night would be a concern. The responses about these issues are recorded in Figure 16.

Figure 17 shows the respondents' evaluation of exterior lighting issues for the facility. Figure 18 shows the percentage of respondents who feel safe around the facility and night. For survey question #6, if respondents marked 'N/A', it was assumed that they are not at the facility at night.

LEED SECTION: SUSTAINABLE SITES

Question Section: Exterior Lighting

5. Rate your satisfaction with the exterior lighting at night for the following…

(Check N/A box if you are only at the facility during daytime hours)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Facility driveways	◯	◯	◯	◯	◯
Facility entrances	◯	◯	◯	◯	◯
Exterior of the building	◯	◯	◯	◯	◯
staff Parking Area	◯	◯	◯	◯	◯
Walking paths to parking area	◯	◯	◯	◯	◯
Overall safety at night	◯	◯	◯	◯	◯

R	Facility Drive-ways	Facility Entrances	Exterior of Building	Staff Parking Area	Walking Paths to the Parking Area	Overall Safety at Night	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	1	1	1	1	1	1	***7***
R2	1	1	1	1	1	1	1	***7***
R3	1	1	1	1	1	1	1	***7***
R4	1	1	1	1	1	1	1	***7***
R5	1	1	1	1	1	1	1	***7***
R6	1	1	1	1	1	1	1	***7***
R7	1	1	1	1	1	1	1	***7***
R8								
R9								
R10								
R11								
R12								
R13								
R14								
R15								
Total	**7**	**7**	**7**	**7**	**7**	**7**	**7**	***49***

Figure 16: The Patrick Dollard Discovery Health Centers' Satisfaction with Exterior Lighting Issues

LEED SECTION: SUSTAINABLE SITES

Question Section: Exterior Lighting

6. Does the lighting on the exterior of the facility make you feel safe at night? (If you are not at the facility at night check the N/A box)

R	Yes	No	N/A
R1	1		
R2	1		
R3	1		
R4	1		
R5	1		
R6	1		
R7	1		
R8			
R9			
R10			
R11			
R12			
R13			
R14			
R15			
Total	7	0	0

Figure 17: The Patrick Dollard Discovery Health Centers' Satisfaction with Security from Exterior Lighting Around the Facility at Night

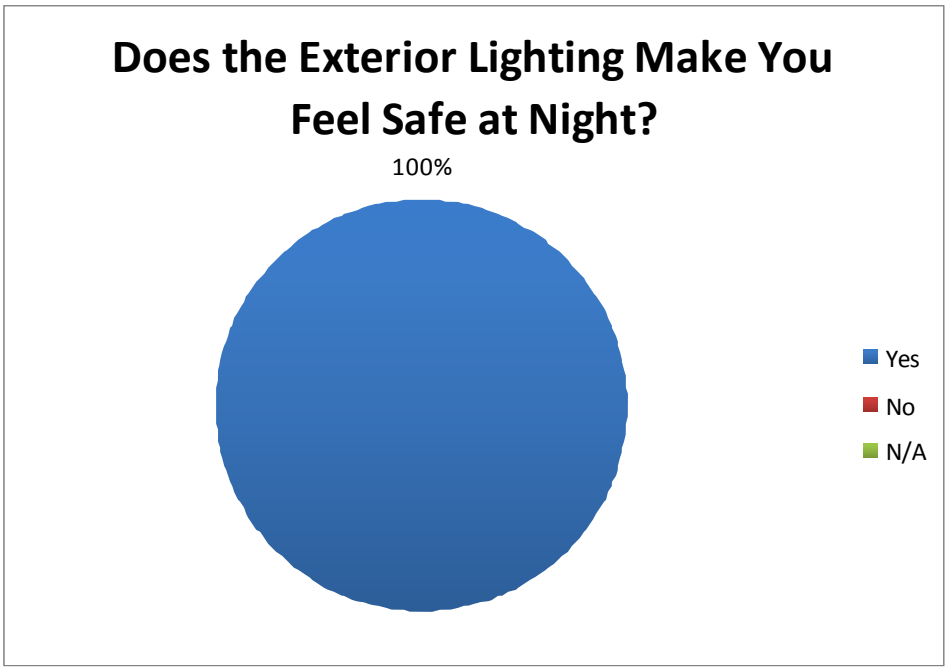


Figure 18: The Patrick Dollard Discovery Health Centers' Satisfaction with Security from Exterior Lighting Around the Facility at Night Pie Chart

Landscaping

There are two possible Water Efficiency Landscaping Credits; Water Efficient Landscaping 1.1 and 1.2. To achieve Water Efficient Landscaping credit 1.1, potable water use for irrigation must be reduced by 50%. Strategies include installing a high-efficiency irrigation system, or harvesting rain water. The Patrick H. Dollard Discovery Health Center received both Water Efficient Landscaping LEED credits 1.1 and 1.2 which means no potable water is used for landscape irrigation. A typical strategy to receive this credit is to use a xeriscape design if no other water re-use, or harvesting program is in place. Xeriscape designs use indigenous vegetation that can be naturally sustained in the soil and weather conditions of the region.

The respondents were asked if there is a landscaped area outside of the facility. Figure 19 shows that all of the respondents are aware of the landscape. Figure 20 shows the percentage of respondents who are aware of the landscape.

The Occupant Evaluation of LEED Certified Health Centers survey asks the respondents to report on landscape issues; health of the plantings and satisfaction with landscape design. Satisfaction with landscape design is subjective. Many landscape designs use plants that are not native to the environment they are being installed into. For example if tropical plants that require a lot of water are installed in a non-tropical region, the tropical plantings will require more than the typical rainfall in the region to sustain it. If there is not a rain-harvesting or other water re-use program in place, many times potable water is used for irrigation. The USGBC encourages facilities to use non-potable water for irrigation purposes. This reduces the burden on the municipal water supply and wastewater systems. Figure 21 shows that the facility received a satisfactory score in issues related to water efficient landscaping.

LEED SECTION: WATER EFFICIENCY

Question Section: Landscape

7. Is there a landscaped area outside the facility?

yes no I do not know

R	Yes	No	I Don't Know
R1	1		
R2	1		
R3	1		
R4	1		
R5	1		
R6	1		
R7	1		
R8			
R9			
R10			
R11			
R12			
R13			
R14			
R15			
Total	7	0	0

Figure 19: The Patrick Dollard Discovery Health Centers' Recognition of the Landscaped Area Outside of the Facility

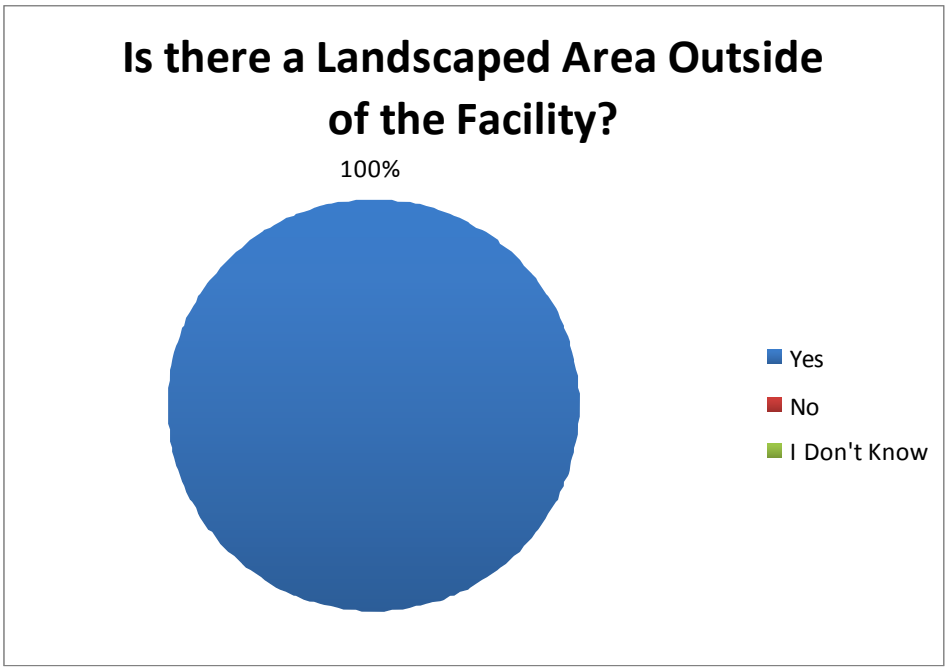


Figure 20: The Patrick Dollard Discovery Health Centers' Recognition of the Landscaped Area Outside of the Facility Pie Chart

LEED SECTION: WATER EFFICIENCY

Question Section: Landscape

8. Rate how satisfied you are with the landscaped area.

(If you do not have one check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Health of Plantings	◯	◯	◯	◯	◯
Satisfaction with landscape design	◯	◯	◯	◯	◯

R	Health of Plantings	Satisfaction with Landscape Design	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	*3*
R2		1	1	*2*
R3	1	1	1	*3*
R4	1	1	1	*3*
R5	1	1	1	*3*
R6		1	1	*2*
R7	1	1	1	*3*
R8				
R9				
R10				
R11				
R12				
R13				
R14				
R15				
Total	5	7	7	*19*

Figure 21: The Patrick Dollard Discovery Health Centers' Satisfaction with the Landscape

IAQ

There are several LEED credits that the indoor air quality question involves. These are found in the LEED Guide 2.1 in appendix A, under the Indoor Environmental Quality, (IEQ) LEED category. Perceivable credits that are evaluated under the indoor air quality topic are IEQ pre-requisites 1, 2, and IEQ credits 1, 2, and 5. Two of the credits, IEQ pre-requisite 1 and IEQ pre-requisite 2 are mandatory for LEED certification; minimum indoor air quality performance and environmental tobacco smoke control. In addition to the pre-requisite IEQ credits the Patrick H. Dollard Discovery Health Center achieved IEQ credit 2, Increase Ventilation Effectiveness. The intent of the credit is to provide for the effective delivery and mixing of fresh air to support the safety, comfort and well-being of building occupants. The IEQ credits evaluated under the topic Indoor Air Quality in the survey directly affect building occupants. Details about how IEQ credit 2 can be achieved can be found in the LEED Guide 2.1 found in Appendix A, pages 253-260.

The Occupant Evaluation of LEED Certified Health Centers survey asks the respondents to evaluate the quality of the indoor air. The responses for stuffy, smoky, exhaust, chemicals, dusty, and pollen have been inverted to show satisfaction and dissatisfaction. Figure 22 reflects a satisfactory score from the occupants.

Controllability of systems

Controllability of Systems, perimeter and non-perimeter are LEED credits categorized under the LEED Indoor Environmental Quality category as credits 6.1 and 6.2. These credits directly affect building occupants. The intent of the LEED credits is to give the option of adjusting thermal, ventilation and lighting system controls to promote occupant comfort and well-being. The survey question was asked to determine if the option to control their environment was given, which, if any controls would be used. Comfort varies from individual to individual, if the option to control or adjust systems were given what would be the level of satisfaction.

The Occupant Evaluation of LEED Certified Health Centers survey asks the respondent to mark ‘n/a’ if the respondent can not adjust. An option is provided on the survey to indicate controls that the respondent ‘does not adjust’. In Figure 23 the response for ‘do not adjust’ is represented as ‘DNADJ’. The Patrick H. Dollard Discovery Health Center received credits 6.1 and 6.2 controllability of systems perimeter and non-perimeter. For the question about ceiling fan and air flow vent adjustment there was one satisfactory response. Overall the Patrick H. Dollard Discovery Health Center was rated satisfactory for the ability to control thermal comfort.

Figure 24 shows satisfaction with the ability to adjust the: light switch, dimmer, window shade or blind, and desk light.

LEED SECTION: INDOOR AIR QUALITY

Question Section: Indoor Air Quality

9. Does the indoor air smell like the following?

	Always	Often	Rarely	Never
Fresh	◯	◯	◯	◯
Stuffy	◯	◯	◯	◯
Smoky	◯	◯	◯	◯
Like Vehicle Exhaust	◯	◯	◯	◯
Like Cleaning Chemicals	◯	◯	◯	◯
Dusty	◯	◯	◯	◯
Like Pollen	◯	◯	◯	◯

R	FRESH	STUFFY	SMOKY	EXHAUST	CHEM-ICALS	DUSTY	POLLEN	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	1						1	***3***
R2	1							1	***2***
R3	1	1						1	***3***
R4	1							1	***2***
R5	1	1						1	***3***
R6	1							1	***2***
R7	1							1	***2***
R8									***0***
R9									***0***
R10									***0***
R11									***0***
R12									***0***
R13									***0***
R14									***0***
R15									***0***
Total	**7**	**3**						**7**	***17***

Figure 22: The Patrick Dollard Discovery Health Centers' Satisfaction with Indoor Air Quality at the Facility

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: *Adjustable Systems* Thermal Comfort

10. Rate your satisfaction with the ability to adjust the following for thermal comfort?

(If you cannot adjust check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Thermostat	◯	◯	◯	◯	◯	◯
Exterior window	◯	◯	◯	◯	◯	◯
Ceiling Fan	◯	◯	◯	◯	◯	◯
Airflow vent	◯	◯	◯	◯	◯	◯

R	Thermostat	Exterior Window	Ceiling Fan	Air Flow Vent	#12 Overall Satisfaction	Score for each Respondent
R1	n/a	1	n/a	n/a	1	***2***
R2	1	1	n/a	DNADJ	1	***3***
R3	DNADJ	1	n/a	DNADJ	n/a	***1***
R4	DNADJ	1	n/a	DNADJ	1	***2***
R5	1	1	1	1	1	***5***
R6	1	1	n/a	n/a	1	***3***
R7	n/a	1	n/a	n/a	1	***2***
R8						
R9						
R10						
R11						
R12						
R13						
R14						
R15						
Total	**3**	**7**	**1**	**1**	**6**	***18***

Figure 23: The Patrick Dollard Discovery Health Centers' Satisfaction with Adjustable Systems Control for Thermal Comfort

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: *Adjustable Systems* Control of Lighting

11. Rate your satisfaction with the ability to adjust the following to control lighting. (If you cannot adjust check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Light switch	⬭	⬭	⬭	⬭	⬭	⬭
Light dimmer	⬭	⬭	⬭	⬭	⬭	⬭
Window blind/shade	⬭	⬭	⬭	⬭	⬭	⬭
Desk light	⬭	⬭	⬭	⬭	⬭	⬭

R	Light Switch	Light Dimmer	Window Blind/ Shade	Desk Light	#12 Overall Satisfaction	Score for each Respondent
R1	1	n/a	1	n/a	1	***3***
R2	1	n/a	1	1	1	***4***
R3	1	n/a	n/a	1	1	***3***
R4	1	1	1	n/a	1	***4***
R5	1	1	1	1	1	***5***
R6	1				1	***2***
R7	1	n/a	1	1	1	***4***
R8						
R9						
R10						
R11						
R12						
R13						
R14						
R15						
Total	**7**	**2**	**5**	**4**	**7**	***25***

Figure 24: The Patrick Dollard Discovery Health Centers' Satisfaction with Adjustable Systems Control for Lighting

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Thermal Comfort

12. Rate your satisfaction with the following temperature related issues with your space.

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
Humidity	⬭	⬭	⬭	⬭
Temperature in your space	⬭	⬭	⬭	⬭

R	Humidity	Temperature in your Space	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	*3*
R2	1	1	1	*3*
R3	1	1	1	*3*
R4	1	1	1	*3*
R5	1	1	1	*3*
R6	1	1	1	*3*
R7	1	1	1	*3*
R8				
R9				
R10				
R11				
R12				
R13				
R14				
R15				
Total	7	7	7	*21*

Figure 25: The Patrick Dollard Discovery Health Centers' Satisfaction with Thermal Comfort Issues

Thermal comfort

The Occupant Evaluation of LEED Certified Health Centers survey asks the respondents to evaluate Indoor Environmental Quality credits 7.1 and 7.2 Thermal Comfort for the facilities who received one or both credits. The Patrick H. Dollard Discovery Health Center did not receive thermal comfort credits however the respondents did receive the same survey as facilities who did receive the credit. The satisfactory responses for Thermal Comfort can be found on Figure 25.

Water efficient plumbing fixtures

LEED Water Efficiency category credits 3.1 and 3.2 Water Use Reduction are evaluated in The Occupant Evaluation of LEED Certified Health Centers survey. The Patrick H. Dollard Discovery Health Center did not receive these credits as shown in Figure 4. Figure 26 and Figure 27 show their evaluations of the facility with the water efficiency topic. The facility received a satisfactory score from the occupants for water efficient plumbing fixtures.

LEED SECTION: WATER EFFICIENCY

Question Section: Water Efficient Sinks

13. Rate your satisfaction with the following sink features that are used at the facility.

(If you do not have the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Sink faucets	⬭	⬭	⬭	⬭	⬭
Automatic sensors	⬭	⬭	⬭	⬭	⬭
Push/twist timed faucets	⬭	⬭	⬭	⬭	⬭

R	Sink Faucets	Automatic Sensors	Push/ Twist Timed Faucets	#12 Overall Satisfaction	Score for each Respondent
R1	1	n/a	n/a	1	***2***
R2	1	n/a	1	n/a	***2***
R3	1	n/a	n/a	1	***2***
R4	1	n/a	n/a	1	***2***
R5	1	1	1	1	***4***
R6	1	n/a	n/a	1	***2***
R7	1	n/a	n/a	1	***2***
R8					
R9					
R10					
R11					
R12					
R13					
R14					
R15					
Total	**7**	**1**	**2**	**6**	***16***

Figure 26: The Patrick Dollard Discovery Health Centers' Satisfaction with Water Efficient Sinks

LEED SECTION: WATER EFFICIENCY

Question Section: Toilets & Urinals

14. Rate your satisfaction with the toilet features used in the facility.

(If you do not have, or do not use the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Low flow toilets	◯	◯	◯	◯	◯
Automatic sensors	◯	◯	◯	◯	◯
Dual flush buttons	◯	◯	◯	◯	◯
Waterless urinals	◯	◯	◯	◯	◯

R	Low Flow Toilets	Auto-matic Sensors	Dual Flush Buttons	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	n/a	n/a	1	***2***
R2	1	n/a	n/a	n/a	***1***
R3	1	n/a	n/a	1	***2***
R4				1	***1***
R5	1	1	1	1	***4***
R6	1	n/a	n/a	1	***2***
R7	1	n/a	n/a	1	***2***
R8					
R9					
R10					
R11					
R12					
R13					
R14					
R15					
Total	**6**	**1**	**1**	**6**	***14***

R	Water-less Urinals	#12 Overall Satis-faction	Score for each Respon-dent
R1	n/a	n/a	***0***
R2	n/a	n/a	***0***
R3		1	***1***
R4		1	***1***
R5	1	n/a	***1***
R6	n/a	n/a	***0***
R7	n/a	n/a	***0***
R8			
R9			
R10			
R11			
R12			
R13			
R14			
R15			
Total	**1**	**2**	***3***

Figure 27: The Patrick Dollard Discovery Health Centers' Satisfaction with Water Efficient Toilets and Waterless Urinals

Materials and resources

Under the LEED category Materials and Resources a pre-requisite for LEED certification is pre-requisite 1, Storage and Collection of Recyclables. This credit is intended to reduce waste generated by building occupants that is hauled to and disposed of in landfills. The credit indirectly affects building occupants. The USGBC requirements for this credit can be found in the LEED Guide 2.1 in appendix A. The Occupant Evaluation of LEED Certified Health Centers survey asks the respondent to rate their satisfaction with the recycle storage bins at their facility. This question was asked to see how many respondents use the storage bin; also to see if the respondents were satisfied with the issues related to recycle storage bins. If the respondent does not use the recycle bins they were asked to mark 'n/a'.

According to Figure 28, the respondents are satisfied with the recycling bin issues; location, convenience, and cleanliness, at the facility.

Green cleaning materials

A LEED Innovation and Design credit, Green Housekeeping, was achieved by some of the health facilities. This is a non-standard credit. Credit for green housekeeping is awarded by the USGBC for facilities who apply for the credit under the sixth LEED category; innovation and design. The credit means the facility pledges to use housekeeping products that are environmentally friendly. This credit indirectly affects building occupants. The intention of this credit is to protect the health of building

occupants and cleaning professionals by using non-toxic cleaning solutions. The question was asked to gauge occupant satisfaction with the results from using green housekeeping products. Four of the seven respondents marked ‘n/a’ for maintenance questions.

Figure 29 displays the results of maintenance issues; floor, fixture, wall cleanliness and odor of products. Overall the Patrick H. Dollard Discovery Health Center was rated satisfactory for all maintenance issues.

Daylight and views

The Patrick H. Dollard Discovery Health Center did not receive day light and view credits. Overall the center was rated satisfactory for both daylight and views questions and issues. The results for daylight and views are reflected in Figure 30. The results for potential issues involving daylight and view issues can be found on Figure 31.

LEED SECTION: MATERIALS & RESOURCES

Question Section: Recycling

15. Rate your satisfaction with the following aspects of the recycle storage bins at your facility.

(If you do not use the recycle bins check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Location	◯	◯	◯	◯	◯
Convenience	◯	◯	◯	◯	◯
Cleanliness	◯	◯	◯	◯	◯

R	Location	Convenience	Cleanliness	#12 Overall Satisfaction	Score for each Respondent
R1				n/a	***0***
R2	1	1	1	1	***4***
R3	1	1	1	1	***4***
R4	1	1	1	1	***4***
R5	n/a	n/a	n/a	n/a	***0***
R6	n/a	n/a	n/a	1	***1***
R7	n/a	n/a	n/a	-1	***-1***
R8					
R9					
R10					
R11					
R12					
R13					
R14					
R15					
Total	**3**	**3**	**3**	**3**	***12***

Figure 28: The Patrick Dollard Discovery Health Centers' Satisfaction with Recycling Issues

LEED SECTION: INNOVATION & DESIGN PROCESS

Question Section: Maintenance

16. Rate your satisfaction with the following maintenance issues.

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
Floor cleanliness	◯	◯	◯	◯
Fixture cleanliness (sinks and toilets)	◯	◯	◯	◯
Wall cleanliness	◯	◯	◯	◯
Odor of the cleaning products	◯	◯	◯	◯

R	Floor Cleanliness	Fixture Cleanliness (sinks and toilets)	Wall Cleanliness	Odor of Products	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	1	***5***
R2	1	1	1	1	1	***5***
R3	1	1	1	1	1	***5***
R4	1	1	1	1	1	***5***
R5	1	1	1	1	1	***5***
R6	1	1	1	1	1	***5***
R7	1	1	1	1	1	***5***
R8						
R9						
R10						
R11						
R12						
R13						
R14						
R15						
Total	**7**	**7**	**7**	**7**	**7**	***35***

Figure 29: The Patrick Dollard Discovery Health Centers' Satisfaction with Maintenance Issues

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Daylight & Views

17. Rate your satisfaction with the natural daylight issues in your space.

(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Exterior windows	◯	◯	◯	◯	◯
Daylight from the window	◯	◯	◯	◯	◯
Daylight from other sources	◯	◯	◯	◯	◯
View Outside	◯	◯	◯	◯	◯

R	Exterior Window	Daylight from Window	Daylight from other sources	View Outside	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	1	5
R2	1	1	1	1	1	5
R3	1	1		1	1	4
R4	1	1		1	1	4
R5	1	1	1	1	1	5
R6	1	1	1	1	1	5
R7	1	1	1	1	1	5
R8						
R9						
R10						
R11						
R12						
R13						
R14						
R15						
Total	7	7	5	7	7	33

Figure 30: The Patrick Dollard Discovery Health Centers' Satisfaction with Day-lighting and Views

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Daylight & Views

18. Rate your satisfaction with issues indirectly related to exterior windows in your space.

(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Acoustics	◯	◯	◯	◯	◯
Privacy	◯	◯	◯	◯	◯
Glare	◯	◯	◯	◯	◯

R	Acoustics	Privacy	Glare	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	***4***
R2	1	1	1	1	***4***
R3	1	1	1	1	***4***
R4	1	1	1	1	***4***
R5	1	1	1	1	***4***
R6	1	1	1	1	***4***
R7	1	1	1	1	***4***
R8					
R9					
R10					
R11					
R12					
R13					
R14					
R15					
Total	**7**	**7**	**7**	**7**	***28***

Figure 31: The Patrick Dollard Discovery Health Centers' Satisfaction with Day-lighting and View Issues

Overall score

Figure 32 shows the Patrick H. Dollard Discovery Health Center dissatisfaction with public transportation access. The facility did not receive SS credit 4.1, public transportation access. Images of the facility show it surrounded by trees and natural landscape, access to public transportation may have been a trade off.

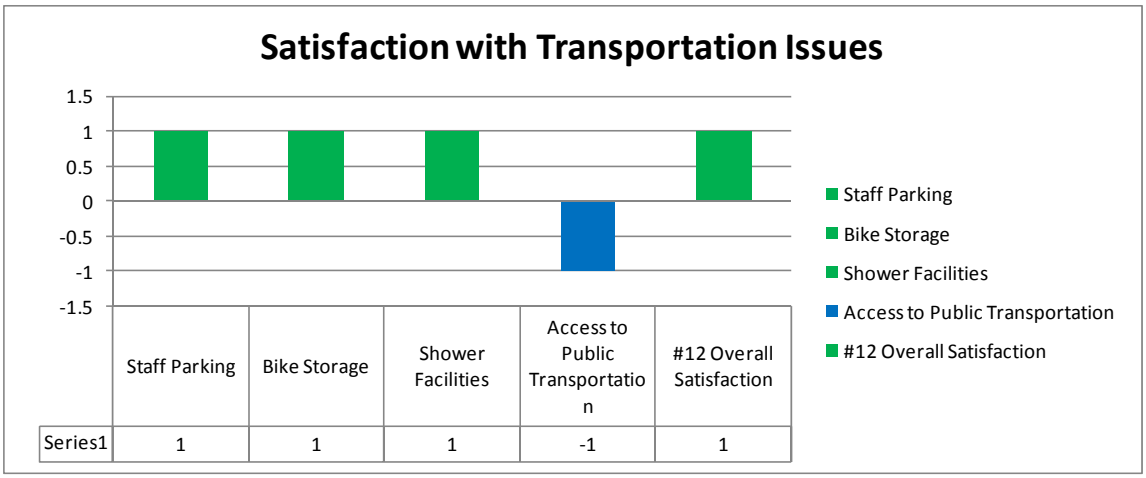


Figure 32: The Patrick Dollard Discovery Health Centers' Dissatisfaction with Transportation Issues

The overall satisfaction score for the Patrick H. Dollard Discovery Health Center is calculated by adding the total scores for each perceivable LEED topic; transportation, exterior lighting, landscaping, water efficient plumbing fixtures, recycling, indoor air quality, temperature, adjustable systems, maintenance, day-lighting and views. The total score for each LEED topic is converted to either a positive or negative score.

The Patrick H. Dollard Discovery Health Center was rated satisfactory in every LEED topic. Table 3 reflects the perceivable LEED points evaluated in this study and the overall satisfaction score in the categories where LEED points were received; (1) for satisfactory and (–1) for dissatisfied. All facilities received the same survey that asked the respondents to evaluate their facility on building aspects influenced by LEED certification whether the facility received the LEED credit or not. The categories where LEED credit was not received are gray in Table 3.

The final survey question number 13 thanks the respondent for their participation and asks for additional comments. One respondent took the opportunity to express their concerns about perceivable building features influenced by LEED certification. Comments made by the respondents about the Patrick H. Dollard Discovery Health Center for survey question 13, can be found in Appendix C.

Table 3: Discovery Health Center Overall Score for Perceivable LEED Building Features

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
	SUSTAINABLE SITES			
	Transportation			1
I	public transportation access	4.1		
I	bicycle storage & changing rooms	4.2		
I	parking capacity	4.4		
	Exterior Lighting			
I	light pollution reduction	8		
	WATER EFFICIENCY			
	Landscaping			1
I	50% reduction	1.1		
I	no potable use or no irrigation	1.2		
	Water Efficient Plumbing Fixtures			
I	20% reduction	3.1		
I	30% reduction	3.2		

Table3: Cont'd

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
		MATERIALS AND RESOURCES		
	Recycling			1
I	storage & collection of recyclables	PR 1		
		INDOOR ENVIRONMENTAL QUALITY		
	Indoor Air Quality (IAQ)			1
D	minimum IAQ performance	PR 1		
D	environmental tobacco smoke	PR 2		
D	carbon dioxide (CO_2) monitoring	1		
D	ventilation effectiveness	2		
D	indoor chemical and pollutant source control	5		
	Adjustable Systems			1
D	perimeter spaces	6.1		
D	non-perimeter spaces	6.2		

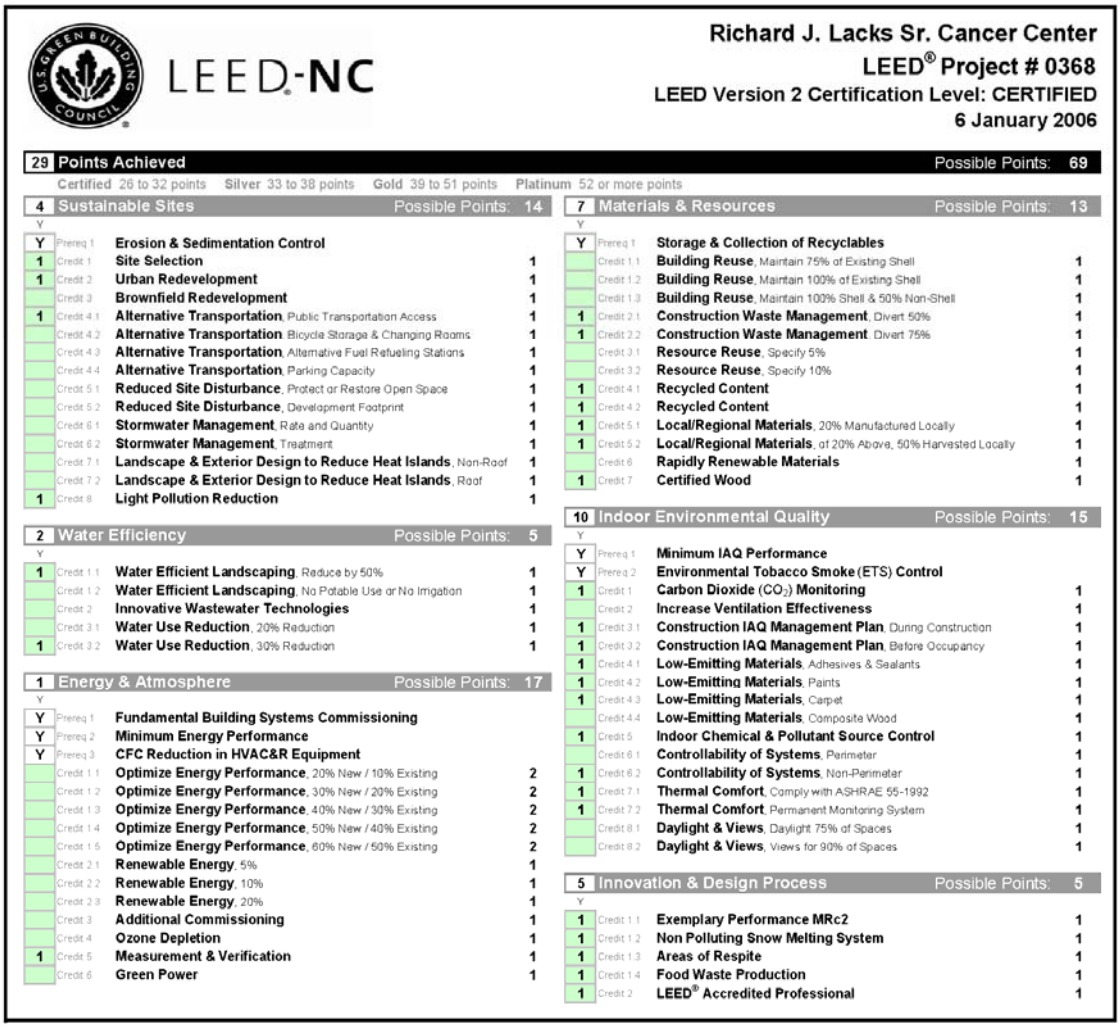
Table3: Cont'd

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
		INDOOR ENVIRONMENTAL QUALITY		
	Temperature			
D	thermal comfort (ASHRAE 55-1992)	7.1		
D	thermal comfort monitoring system	7.2		
	Day-Lighting & Views			
D	daylight in 75% of spaces	8.1		
D	views in 90% of spaces	8.2		
		INNOVATION AND DESIGN PROCESS		
	Maintenance			1
D	green cleaning	~		

Sources: USGBCs LEED Guide 2.1
Occupant Evaluation of LEED Certified Health Centers Thesis

CASE STUDY TWO: RICHARD J. LACKS CANCER CENTER

The Richard J. Lacks Cancer Center is one of two LEED certified health centers in this research located in a metropolitan area. Figure 33 is the LEED score card for the Richard J. Lacks Sr. Cancer Center that shows the LEED credits received by the center.



LEED-NC

Richard J. Lacks Sr. Cancer Center
LEED® Project # 0368
LEED Version 2 Certification Level: CERTIFIED
6 January 2006

29 Points Achieved — Possible Points: 69

Certified 26 to 32 points | Silver 33 to 38 points | Gold 39 to 51 points | Platinum 52 or more points

4 Sustainable Sites — Possible Points: 14

Y			
Y	Prereq 1	Erosion & Sedimentation Control	
1	Credit 1	Site Selection	1
1	Credit 2	Urban Redevelopment	1
	Credit 3	Brownfield Redevelopment	1
1	Credit 4.1	Alternative Transportation, Public Transportation Access	1
	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	1
	Credit 4.4	Alternative Transportation, Parking Capacity	1
	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
	Credit 6.1	Stormwater Management, Rate and Quantity	1
	Credit 6.2	Stormwater Management, Treatment	1
	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1	Credit 8	Light Pollution Reduction	1

2 Water Efficiency — Possible Points: 5

Y			
1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
	Credit 3.1	Water Use Reduction, 20% Reduction	1
1	Credit 3.2	Water Use Reduction, 30% Reduction	1

1 Energy & Atmosphere — Possible Points: 17

Y			
Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
	Credit 1.1	Optimize Energy Performance, 20% New / 10% Existing	2
	Credit 1.2	Optimize Energy Performance, 30% New / 20% Existing	2
	Credit 1.3	Optimize Energy Performance, 40% New / 30% Existing	2
	Credit 1.4	Optimize Energy Performance, 50% New / 40% Existing	2
	Credit 1.5	Optimize Energy Performance, 60% New / 50% Existing	2
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 20%	1
	Credit 3	Additional Commissioning	1
	Credit 4	Ozone Depletion	1
1	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

7 Materials & Resources — Possible Points: 13

Y			
Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2	Building Reuse, Maintain 100% of Existing Shell	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50%	1
1	Credit 2.2	Construction Waste Management, Divert 75%	1
	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content	1
1	Credit 4.2	Recycled Content	1
1	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
1	Credit 7	Certified Wood	1

10 Indoor Environmental Quality — Possible Points: 15

Y			
Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1	Credit 1	Carbon Dioxide (CO_2) Monitoring	1
	Credit 2	Increase Ventilation Effectiveness	1
1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
1	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints	1
1	Credit 4.3	Low-Emitting Materials, Carpet	1
	Credit 4.4	Low-Emitting Materials, Composite Wood	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
	Credit 6.1	Controllability of Systems, Perimeter	1
1	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

5 Innovation & Design Process — Possible Points: 5

Y			
1	Credit 1.1	Exemplary Performance MRc2	1
1	Credit 1.2	Non Polluting Snow Melting System	1
1	Credit 1.3	Areas of Respite	1
1	Credit 1.4	Food Waste Production	1
1	Credit 2	LEED® Accredited Professional	1

Figure 33: The Richard J. Lacks Cancer Center LEED Score Card

Figure 34 shows an exterior image of the facility and landscaping around the building perimeter. Figure 35 shows an image of the interior corridor that gives an idea of the natural light from the windows and the types of materials used in the facility.

Figure 34: Richard J. Lacks Cancer Center Exterior Image of the Facility
Source: Stevens Advertising; Trinity Design; Brian Kelly Photography

The information below is a list of general information about the Richard J. Lacks Cancer Center.

Owner:	St. Mary's Health Care
Architect:	Trinity Design (now HKS Architects)
Building Type:	New Construction
Size:	170,000 sqft
Building Location:	Grand Rapids, MI
Recognition:	LEED CERTIFIED

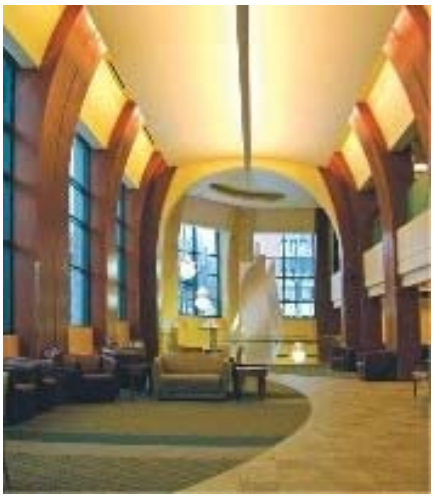


Figure 35: Richard J. Lacks Cancer Center Interior Image
Source: Stevens Advertising; Trinity Design; Brian Kelly Photography

The Richard J. Lacks Cancer Center received a total of thirty LEED points earning the title CERTIFIED green building. The Occupant Evaluation of LEED Certified Health Center survey was given to fifteen full time employees, at the Lacks Cancer Center, fourteen responded. The answers are anonymous; however the survey does ask respondents to give background information about the respondents that may be relevant to analyzing the responses.

Background information

Under the background information section, the first question asks the position held by the respondent at the Lacks Cancer Center. For the purpose of getting a better perspective of building features, such as water efficient sinks, the survey asks respondents to describe themselves as either medical staff or administrator.

Architecturally administrative areas may be designed differently than medical staff/ patient or public areas. For example, both medical staff and administrators may use water efficient sinks. Medical staff may use the water efficient sensor sink to fill a cup with water, while administrators may only use the sink in a public restroom. As the perceivable features of a LEED health center are discussed, it may be useful to know which perspective the evaluation is from.

Figure 36 shows the perspectives represented for case two. Eight medical staff and six administrators participated in the occupant evaluation of the Richard J. Lacks Cancer Center. Figure 37 shows the percentage of administration to medical staff represented. Administrators make up 43% of the responses that will be used to evaluate the Richard J. Lacks Cancer Center.

In the survey respondents are asked to report the approximate length of time employed at the facility. This question was asked to get an idea of how long the respondents have had a chance to observe the building features that may have been influenced by LEED certification.

As shown in Figure 38 the majority of employees have worked at the Richard J. Lacks Cancer Center for more than one year. Two of the fourteen respondents have worked at the facility for six months or less.

LEED SECTION: BACKGROUND INFORMATION

Question Section: Position at Health Center

1. Please choose which position best describes you at this health center.

◯ Administration
◯ Medical Staff
Other (please specify)

R	*Medical Staff*	*Administration*	*Other*
R1	1		
R2		1	
R3		1	
R4		1	
R5	1		
R6		1	
R7	1		
R8	1		
R9	1		
R10	1		
R11	1		
R12		1	
R13	1		
R14		1	
R15			
Total	**8**	**6**	**0**

Figure 36: Richard J. Lacks Cancer Center Job Position at the Facility

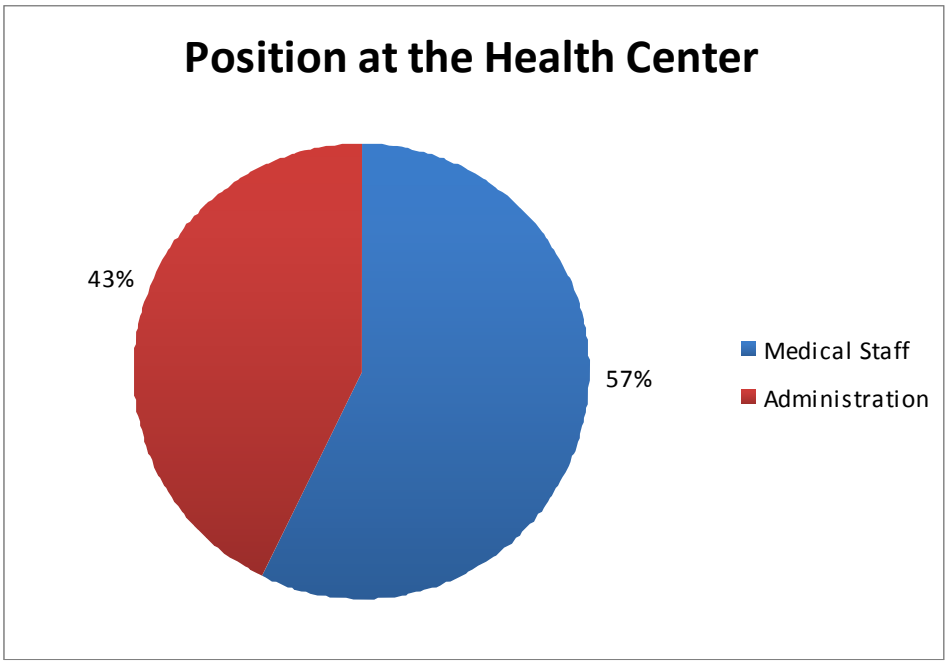


Figure 37: Richard J. Lacks Cancer Center Pie Chart of Job Position at the Facility

LEED SECTION: BACKGROUND INFORMATION

Question Section: Time Employed at Health Center

2. Approximately how long have you worked at this facility?

◯ Less than 6 months
◯ 6 months to 1 year
◯ More than 1 year

R	*6 months or less*	*1 year*	*more than 1 year*
R1			1
R2	1		
R3			1
R4			1
R5			1
R6			1
R7			1
R8			1
R9			1
R10			1
R11			1
R12			1
R13	1		
R14			1
R15			
Total	**2**		**12**

Figure 38: Richard J. Lacks Cancer Center Time Employed at the Facility

Transportation

The Richard J. Lacks Cancer Center received LEED sustainable sites credit 4.1, Alternative Transportation: Public Transportation Access. The requirement for the credit is to locate the project within a ½ mile of a commuter rail, light rail, or subway station or within ¼ mile of two or more public or campus bus lines usable by building occupants (LEED Guide 2.1, USGBC). The Richard J. Lacks Cancer Center is located in Grand Rapids, Michigan as seen in Figure 2. This credit indirectly affects building occupants. The intention of the LEED transportation credits is to reduce pollution and land development impacts from automobiles (LEED 2.1, USGBC).

The survey question was asked to determine if access to public transportation were an option would the primary or occasional mode of transportation be altered. In Figure 39 respondents show how often they use the following modes of transportation, primarily and occasionally. In Figure 39, a number (1) in the response table indicates the primary mode of transportation selected by the respondent. The letter 'O' designates which mode of transportation the respondent occasionally uses to get to work. The primary mode of transportation for all of the respondents is a personal car as shown in Figure 40. Figure 41 shows the occasional modes of transportation used by the respondents and the number of respondents who use the mode. Two of the fourteen respondents occasionally use the bus or shuttle to get to work. One respondent reported carpooling and one reported riding a bike to get to work, as an occasional mode of transportation.

LEED SECTION: SUSTAINABLE SITES

Question Section: Transportation

3. How often do you use the following modes of transportation to get to work?

	Daily	Occasionally	Never
Personal Car	◯	◯	◯
Carpool	◯	◯	◯
Bus/Shuttle	◯	◯	◯
Bicycle	◯	◯	◯
Light-rail	◯	◯	◯
Other	◯	◯	◯

R	Personal Car	Carpool	Bus/ Shuttle	Bicycle	Light-rail	Other
R1	1		O	O		
R2	1					
R3	1					
R4	1					
R5	1		O			
R6	1					
R7	1					
R8	1					
R9	1					
R10	1					
R11	1					
R12	1	O				
R13	1					
R14	1					

Figure 39: Richard J. Lacks Cancer Center Forms of Transportation to get to Work

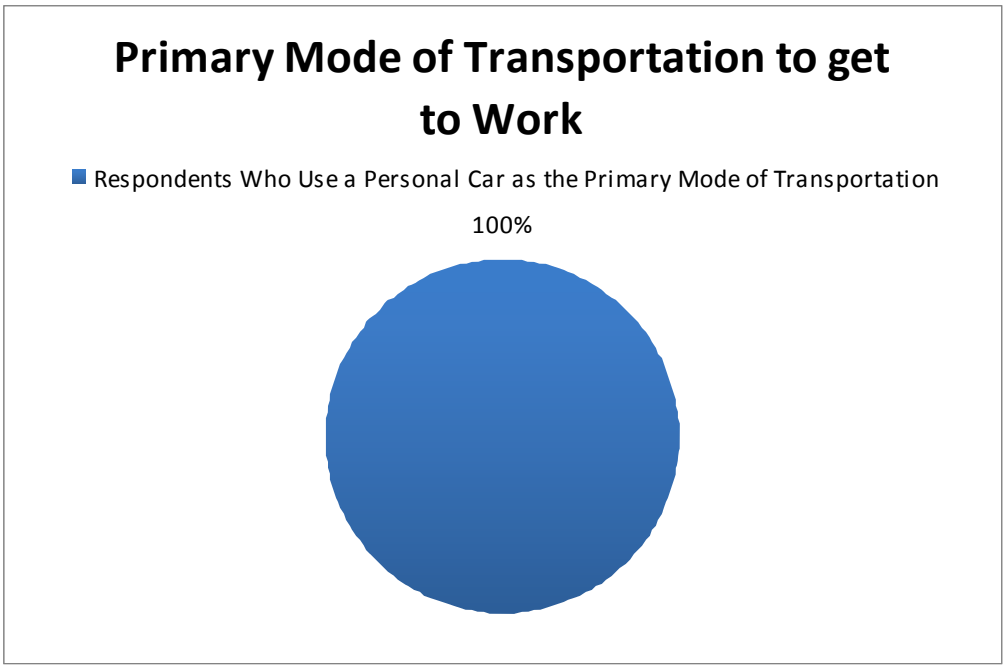


Figure 40: Richard J. Lacks Cancer Center Primary Mode of Transportation to get to Work

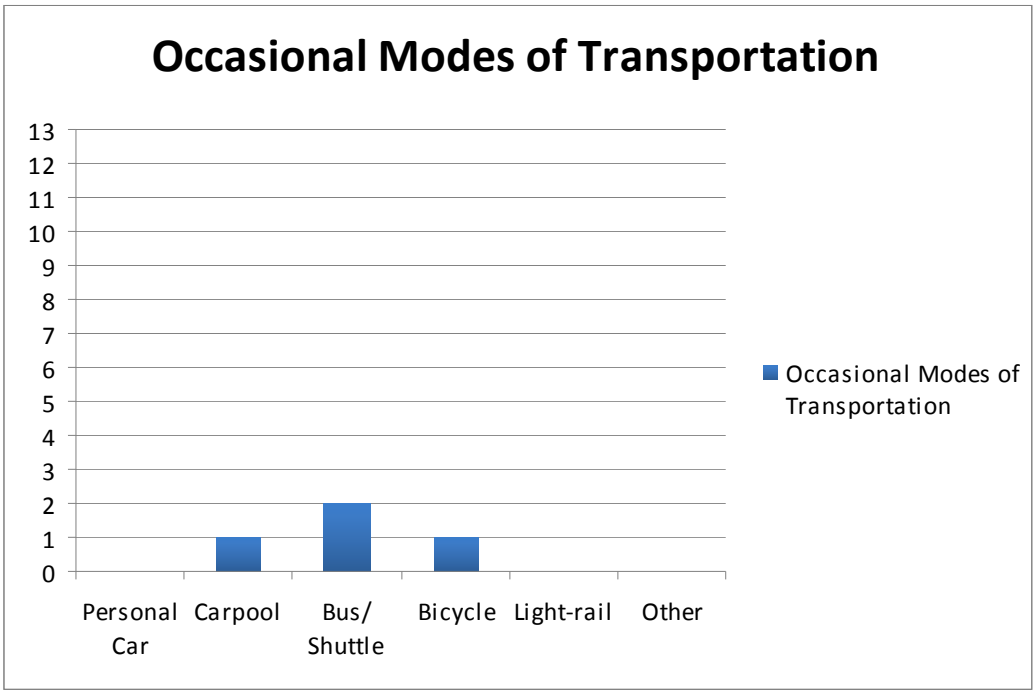


Figure 41: Richard J. Lacks Cancer Center Occasional Modes of Transportation to get to Work

LEED SECTION: SUSTAINABLE SITES

Question Section: Transportation

4. What is your satisfaction with the following transportation issues?

(If you do not use the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Amount of Staff Parking	◯	◯	◯	◯	◯
Bike Storage Area	◯	◯	◯	◯	◯
Shower facilities	◯	◯	◯	◯	◯
Access to Public Transportation	◯	◯	◯	◯	◯

R	Staff Parking	Bike Storage	Shower Facilities	Access to Public Transportation	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	n/a	1	1	***4***
R2	1	n/a	n/a	n/a	1	***2***
R3	1				n/a	***1***
R4	n/a	n/a	n/a	n/a	n/a	***0***
R5	1	1			1	***3***
R6	-1	n/a	-1	n/a	-1	***-3***
R7	1	n/a	n/a	n/a	n/a	***1***
R8	1	n/a	n/a	n/a	n/a	***1***
R9	1	n/a	n/a	n/a	1	***2***
R10	1	n/a	n/a	n/a	n/a	***1***
R11	-1	n/a	n/a	n/a	1	***0***
R12	1	n/a	1	-1	-1	***0***
R13	1	n/a	n/a	n/a	n/a	***1***
R14	1				1	***2***
Total	**9**	**2**	**0**	**0**	**4**	***15***

Figure 42: Richard J. Lacks Cancer Centers' Satisfaction with Transportation Issues

The Occupant Evaluation of LEED Certified Health Center survey asks about transportation issues; amount of staff parking, bike storage area, shower facilities and access to public transportation. Access to public transportation is a LEED credit that was achieved by the Richard J. Lacks Cancer Center. Figure 42 shows the responses to LEED building features influenced by LEED sustainable sites transportation credits. In the Occupant Evaluation of LEED Certified Health Centers survey respondents were asked to mark 'n/a' if they do not use the feature inquired about. One respondent marked 'n/a' for staff parking. Overall the Richard J. Lacks Cancer Center received a positive score in the aspects of staff parking, bike storage, and overall satisfaction. Two people responded to the shower facilities and access to public transportation credits. In both responses the answers cancelled the other one so no satisfaction score was obtained for both the shower facility and access to public transportation.

Exterior lighting

The Richard J. Lacks Cancer Center was the only center of the four cases to receive the LEED Sustainable Sites Credit 8: Light Pollution Reduction. To achieve Sustainable Sites Credit 8, the facility is required to meet or provide lower light levels than those recommended by the Illuminating Engineering Society of North America (IESNA) (LEED Guide 2.1, Appendix A). More information about the details of the credit can be found in the LEED Guide 2.1 Appendix A pages 69-78.

Light Pollution Reduction credit 8, indirectly affects building occupants. The USGBC intention for this LEED credit is to eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments. (LEED Guide 2.1)

The exterior lighting is only noticed at night or dusk. Some healthcare facilities are open 24 hours a day, and medical staff may work night shifts only. Navigating to the appropriate entrance at a health center can be daunting in the daytime. Patients and visitors may not be familiar with the facility therefore way finding in nocturnal hours is important. Clear, well-lit signage may be helpful when trying to find parking, and health center entrances.

Questions about exterior lighting issues are asked to determine satisfaction with lighting on paths to parking and alternative transportation access points. The USGBC

encourages building employees to use alternate methods of transportation such as bikes, or public transportation. It can be assumed that patients may use these features as well. The survey asks respondents to evaluate the exterior lighting around the building where public bus stops and bike racks are located to see if respondents feel their safety is compromised.

The survey question asks the respondent to mark ‘n/a’ if they are not at the facility at night. Overall the Richard J. Lacks Cancer Center received a satisfactory rating in each of the exterior lighting aspects. Of the fourteen respondents two marked ‘n/a’ to all of the exterior light issue questions as shown in Figure 43. Four of the ten total responses for satisfaction with walking paths to the parking area marked dissatisfaction. Two respondents helped the score of satisfaction with walking paths receive a satisfactory score.

The Occupant Evaluation of LEED Certified Health Center asks the question ‘does the lighting on the exterior of the building make you feel safe or not?’ Figure 44 shows that half of the fourteen possible responses reported yes, they feel safe at night; while five marked ‘n/a’ meaning they are not at the facility at night. Two of the respondents marked ‘no’ for feeling safe at night. Figure 45 shows that more than half of the respondents feel safe around the Richard J. Lacks Cancer Center at night.

LEED SECTION: SUSTAINABLE SITES

Question Section: Exterior Lighting

5. Rate your satisfaction with the exterior lighting at night for the following…

(Check N/A box if you are only at the facility during daytime hours)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Facility driveways	◯	◯	◯	◯	◯
Facility entrances	◯	◯	◯	◯	◯
Exterior of the building	◯	◯	◯	◯	◯
staff Parking Area	◯	◯	◯	◯	◯
Walking paths to parking area	◯	◯	◯	◯	◯
Overall safety at night	◯	◯	◯	◯	◯

R	Facility Drive-ways	Facility Entrances	Exterior of Building	Staff Parking Area	Walking Paths to the Parking Area	Overall Safety at Night	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	1	1	1	1	1	1	***7***
R2								***0***
R3	1	1	1	1	n/a	n/a	1	***5***
R4			1	-1	-1	-1	n/a	***-2***
R5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	***0***
R6	1	1	1	1	1	1	1	***7***
R7	1	1	1	1	1	1	1	***7***
R8	1	1	n/a	1	1	1	1	***6***
R9	1	1	1	1	1	1	1	***7***
R10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	***0***
R11	1	1	1	-1	-1	-1	-1	***-1***
R12	1	1	1	1	1	1	1	***7***
R13	1	1	1	1	-1	1	1	***5***
R14	1	1	1	1	-1	1	1	***5***
R15								***0***
Total	**10**	**10**	**10**	**7**	**2**	**6**	**8**	***53***

Figure 43: Richard J. Lacks Cancer Centers' Satisfaction with Exterior Lighting Issues

LEED SECTION: SUSTAINABLE SITES

Question Section: Exterior Lighting

6. Does the lighting on the exterior of the facility make you feel safe at night? (If you are not at the facility at night check the N/A box)

R	Yes	No	N/A
R1	1		
R2			1
R3			1
R4		1	
R5			1
R6	1		
R7	1		
R8	1		
R9	1		
R10			n/a
R11		1	
R12	1		
R13			1
R14	1		
Total	**7**	**2**	**4**

Figure 44: Richard J. Lacks Cancer Centers' Satisfaction with Security from Exterior Lighting Around the Facility at Night

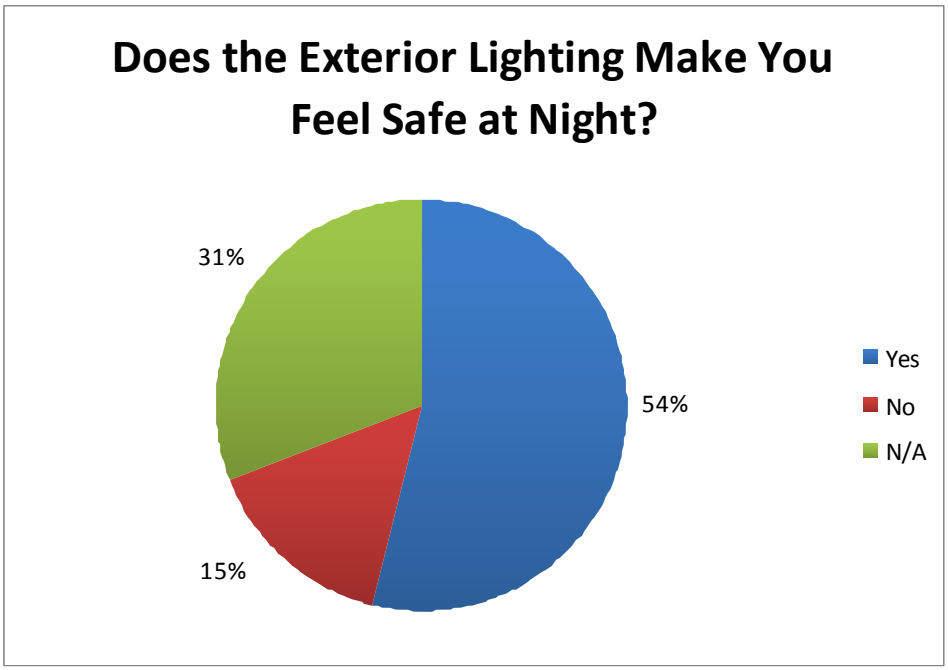


Figure 45: Richard J. Lacks Cancer Centers' Satisfaction with Security from Exterior Lighting Around the Facility at Night Pie Chart

Landscaping

The Richard J. Lacks Cancer Center received one of the two possible Water Efficiency Landscaping Credits. To achieve Water Efficient Landscaping credit 1.1, potable water use for irrigation must be reduced by 50%. Strategies include installing a high-efficiency irrigation system, or harvesting rain water. Some of the facilities received both Water Efficient Landscaping LEED credits, 1.1 and 1.2, which means no potable water for irrigation is used for the landscape. A typical strategy to receive this credit is to employ a xeriscape design if no other water re-use, or harvesting program is in place.

Xeriscape design use local vegetation that can be naturally sustained in the soil and weather conditions of the area.

The respondents were asked if there is a landscaped area outside of the facility. Figure 46 shows that most of the respondents recognize the landscaped area outside of the building. One of the respondents marked 'I don't know', another respondent marked 'no' for recognizing a landscape outside of the facility. Table 47 shows that 86% of the respondents recognized the landscaped area in front of the facility.

The Occupant Evaluation of LEED Certified Health Centers survey asks the respondents to report on landscape issues; health of the planting and satisfaction with landscape design. Satisfaction with landscape design is subjective. Many landscape designs use plants that are not native to the environment they are being installed into. For example tropical plants installed in a non-tropical region will require more than the amount of rainfall in that region to sustain them. Many times potable water, from aquifers or that is processed and drinkable for humans, is used for irrigation. The USGBC encourages facilities to use non-potable water for irrigation purposes. The facility received a satisfactory score in both issues related to water efficient landscaping as shown in Figure 48.

LEED SECTION: WATER EFFICIENCY

Question Section: Landscape

7. Is there a landscaped area outside the facility?

R	Yes	No	I Don't Know
R1	1		
R2	1		
R3	1		
R4			1
R5	1		
R6		1	
R7	1		
R8	1		
R9	1		
R10	1		
R11	1		
R12	1		
R13	1		
R14	1		
Total	12	1	1

Figure 46: Richard J. Lacks Cancer Centers' Recognition of the Landscaped Area Outside of the Facility

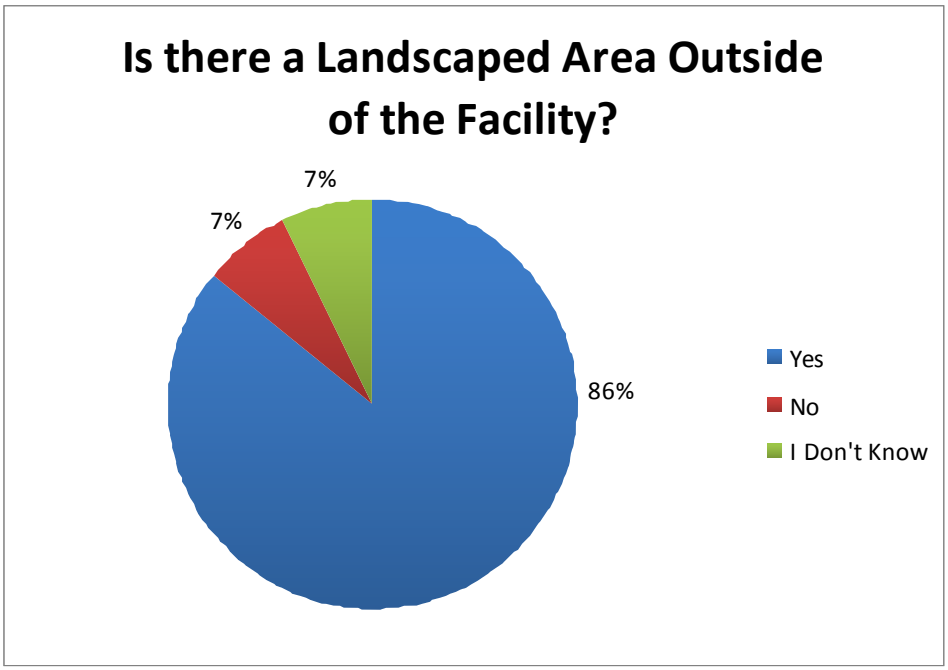


Figure 47: Richard J. Lacks Cancer Centers' Recognition of the Landscaped Area Outside of the Facility Pie Chart

LEED SECTION: WATER EFFICIENCY

Question Section: Landscape

8. Rate how satisfied you are with the landscaped area.

(If you do not have one check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Health of Plantings	⬭	⬭	⬭	⬭	⬭
Satisfaction with landscape design	⬭	⬭	⬭	⬭	⬭

R	Health of Plantings	Satisfaction with Landscape Design	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	***3***
R2	1	1	1	***3***
R3	1	1	1	***3***
R4	1	1	n/a	***2***
R5	1	-1	-1	***-1***
R6	n/a	n/a	n/a	***0***
R7	1	1	1	***3***
R8	1	1	1	***3***
R9	1	1	1	***3***
R10	1	1	1	***3***
R11	1	1	1	***3***
R12	1	1	1	***3***
R13	1	1	1	***3***
R14	1	1	1	***3***
R15				
Total	**13**	**11**	**10**	***34***

Figure 48: Richard J. Lacks Cancer Centers' Satisfaction with the Landscape

IAQ

There are several LEED credits that the indoor air quality question involves. These are found in the LEED Guide 2.1 in appendix A, under the Indoor Environmental Quality, (IEQ) LEED category. Perceivable IEQ credits directly affect building occupants. The intentions for these credits vary and can be found in the LEED 2.1 Guide in Appendix A. Two of the credits, IEQ pre-requisite 1 and IEQ pre-requisite 2 are mandatory for LEED certification; minimum indoor air quality performance and environmental tobacco smoke control. In addition to the pre-requisites under LEED section indoor environmental quality, the Richard J. Lacks Cancer Center received IEQ credit 1, Carbon Dioxide Monitoring. To fulfill the requirements for this credit a permanent carbon dioxide monitoring system that provides feed back on space ventilation performance in a form that affords operational adjustments must be installed (LEED Guide 2.1, Appendix A).

The Richard J. Lacks Cancer Center also achieved IEQ credit 5, Indoor Chemical and Pollutant Source Control in addition to the IEQ pre-requisites. The requirements for this credit include incorporating permanent entryway systems (grills, grates, etc.) to capture dirt and particulates from entering the building at all high volume entryways, providing deck to deck partitions with separate outside exhaust where chemicals, like cleaning materials are used, and providing drains for appropriate disposal of liquid waste where water and chemical concentrate mixing occurs (LEED Guide 2.1, USGBC). The Occupant Evaluation of LEED Certified Health Centers survey asks the respondents to evaluate the quality of the indoor air. The responses for stuffy, smoky, exhaust,

chemicals, dusty, and pollen have been inverted to show satisfaction and dissatisfaction. Figure 49 reflects a satisfactory score from the occupants.

Controllability of systems

Controllability of Systems, perimeter and non-perimeter are LEED credits categorized under the LEED Indoor Environmental Quality category as credits 6.1 and 6.2. These credits directly affect building occupants. The intent of the LEED credits is to give the option of adjusting thermal, ventilation and lighting system controls to promote occupant comfort and well-being. Although many facilities received different credits as shown in Table 2, the same survey was given to all of the cases evaluated in this study. The survey question was asked to determine if the option to control their environment was given which, if any, controls would be used.

The Occupant Evaluation of LEED Certified Health Centers survey asks the respondent to mark ‘n/a’ if the respondent can not adjust. An option is provided on the survey to indicate controls that the respondent ‘does not adjust’. In Figure 50 the response for ‘do not adjust’ is represented as ‘DNADJ’. The Richard J. Lacks Cancer Center received credit 6.2 controllability of systems non-perimeter. The Richard J. Lacks Cancer Center received a satisfactory rating with the ability to adjust the thermostat; five respondents did report dissatisfaction, while eight respondents made the rating satisfactory. The ability to adjust an exterior window was rated satisfactory by four respondents, while four other respondents marked ‘DNADJ’ and six respondents marked ‘n/a’. For the

ceiling fan and air flow vent controls there was no score. Overall the Richard J. Lacks Cancer Center was rated satisfactory for the ability to control thermal comfort.

Figure 51 shows satisfaction with the ability to adjust the: light switch, dimmer, window shade or blind, and desk light.

Thermal comfort

Under the LEED Indoor Environmental Quality category, two Thermal Comfort credits are available, 7.1 Comply with ASHRAE 55-1992 and 7.2 Permanent Monitoring System. The details of the credits can be found in the LEED Guide 2.1 in appendix A. The thermal comfort credits directly affect building occupants. The intention of the thermal comfort credits is to provide a thermally comfortable environment for occupants. The Occupant Evaluation of LEED Certified Health Centers survey asked the respondents to report their satisfaction with humidity and the temperature in their space.

The Richard J. Lacks Cancer Center received both Thermal Comfort credits 7.1 and 7.2. Figure 52 shows the responses for thermal comfort. The facility received a satisfactory rating for humidity and temperature in your space aspect. Overall the Richard J. Lacks Cancer Center received a satisfactory rating for thermal comfort.

LEED SECTION: INDOOR AIR QUALITY

Question Section: Indoor Air Quality

9. Does the indoor air smell like the following?

	Always	Often	Rarely	Never
Fresh	◯	◯	◯	◯
Stuffy	◯	◯	◯	◯
Smoky	◯	◯	◯	◯
Like Vehicle Exhaust	◯	◯	◯	◯
Like Cleaning Chemicals	◯	◯	◯	◯
Dusty	◯	◯	◯	◯
Like Pollen	◯	◯	◯	◯

R	FRESH	STUFFY	SMOKY	EXHAUST	CHEM-ICALS	DUSTY	POLLEN	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	1	1	1	1	1	1	1	***8***
R2	1	1	1	1	1	1	1	1	***8***
R3	1	1	1	1	1	1	1	1	***8***
R4	1	1	1	1	1	1	1	n/a	***7***
R5	1	1	1	1	1	1	1	1	***8***
R6	1	1	1	1	1	1	1	1	***8***
R7	1	1	1	1	1	1	1	1	***8***
R8	1	1	1	1	1	1	1	1	***8***
R9	1	1	1	1	1	1	1	1	***8***
R10	1	1	1	1	1	1	1	1	***8***
R11	1	1	1	1	1	1	1	1	***8***
R12	1	1	1	1	1	1	1	1	***8***
R13	1	1	1	1	1	1	1	1	***8***
R14	1							1	***2***
R15									***0***
Total	**14**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	***105***

Figure 49: Richard J. Lacks Cancer Centers' Satisfaction with Indoor Air Quality at the Facility

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: *Adjustable Systems* Thermal Comfort

10. Rate your satisfaction with the ability to adjust the following for thermal comfort?

(If you cannot adjust check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Thermostat	◯	◯	◯	◯	◯	◯
Exterior window	◯	◯	◯	◯	◯	◯
Ceiling Fan	◯	◯	◯	◯	◯	◯
Airflow vent	◯	◯	◯	◯	◯	◯

R	Thermostat	Exterior Window	Ceiling Fan	Air Flow Vent	#12 Overall Satisfaction	Score for each Respondent
R1	-1	1	n/a		1	***1***
R2	DNADJ	DNADJ	DNADJ	DNADJ	1	***1***
R3	-1	n/a	n/a	n/a	1	***0***
R4	-1	n/a	n/a	dnadj	n/a	***-1***
R5	1	dnadj	n/a	n/a	1	***2***
R6	1	n/a	n/a	dnadj	1	***2***
R7	-1	n/a	n/a	dnadj	1	***0***
R8	1	n/a	n/a	n/a	1	***2***
R9	1	1	n/a	n/a	1	***3***
R10	-1	1	n/a	n/a	1	***1***
R11	1	dnadj	dnadj	dnadj	1	***2***
R12	1	n/a	n/a	n/a	1	***2***
R13	1	dnadj	dnadj	dnadj	1	***2***
R14	1	1	n/a	n/a	1	***3***
R15						***0***
Total	**3**	**4**			**13**	***20***

Figure 50: Richard J. Lacks Cancer Centers' Satisfaction with Adjustable Systems Control for Thermal Comfort

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: *Adjustable Systems* Control of Lighting

11. Rate your satisfaction with the ability to adjust the following to control lighting. (If you cannot adjust check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Light switch	⬭	⬭	⬭	⬭	⬭	⬭
Light dimmer	⬭	⬭	⬭	⬭	⬭	⬭
Window blind/shade	⬭	⬭	⬭	⬭	⬭	⬭
Desk light	⬭	⬭	⬭	⬭	⬭	⬭

R	Light Switch	Light Dimmer	Window Blind/ Shade	Desk Light	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	1	***5***
R2	n/a	n/a	n/a	n/a	n/a	***0***
R3	1	1	n/a	n/a	1	***3***
R4	1	1	n/a	1	n/a	***3***
R5	dnadj	dnadj	1	1	1	***3***
R6	1	1	1	1	1	***5***
R7	1	1	1	1	1	***5***
R8	1	1	n/a	-1	1	***2***
R9	1	1	1	1	1	***5***
R10	1	1	1	1	1	***5***
R11	1	dnadj	1	n/a	1	***3***
R12	1	1	1	n/a	1	***4***
R13	1	dnadj	dnadj	1	1	***3***
R14	1	1	n/a	1	1	***4***
R15						***0***
Total	**12**	**10**	**8**	**8**	**12**	***50***

Figure 51: Richard J. Lacks Cancer Centers' Satisfaction with Adjustable Systems Control for Lighting

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Thermal Comfort

12. Rate your satisfaction with the following temperature related issues with your space.

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
Humidity	⬭	⬭	⬭	⬭
Temperature in your space	⬭	⬭	⬭	⬭

R	Humidity	Temperature in your Space	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	***3***
R2	1	-1	1	***1***
R3	1	-1	1	***1***
R4	-1	-1	-1	***-3***
R5	1	1	1	***3***
R6	-1	1	1	***1***
R7	1	1	1	***3***
R8	1	1	1	***3***
R9	1	1	1	***3***
R10	1	-1	-1	***-1***
R11	1	-1	-1	***-1***
R12	1	1	1	***3***
R13	1	1	1	***3***
R14	1	1	1	***3***
R15				***0***
Total	**10**	**4**	**8**	***22***

Figure 52: Richard J. Lacks Cancer Centers' Satisfaction with Thermal Comfort Issues

Water efficient plumbing

In the LEED Water Efficiency category the two Water Use Reduction credits 3.1, 20% reduction and 3.2, 30% reduction, are considered perceivable credits that indirectly affect building occupants. The intention of these credits was to maximize water efficiency in buildings to reduce the burden on the municipal water supply and wastewater systems (LEED Guide 2.1, USGBC).

The Occupant Evaluation of LEED Certified Health Centers survey asked the respondents to rate their satisfaction with sink and toilet building features influenced by USGBC suggestions in the LEED credits Water Efficiency 3.1 and 3.2. The question was asked in the survey to determine if there was a preference among medical staff and administrators for a certain water efficient fixture. The water efficient fixtures all have disadvantages over the traditional sink and toilet fixtures. Respondents were asked to rate their satisfaction with the common types of water efficient sinks, toilet and urinal fixtures. All of the facilities examined in the case studies may have used different strategies to achieve these credits. If the respondent does not have the feature they are asked to mark ‘n/a’ for the feature.

The results for the water efficient sink fixtures are displayed in Figure 53. Eight of the fourteen respondents recorded ‘n/a’ to the use of ‘push/ twist timed faucets’.

Overall the respondents reported satisfaction with the water efficient sink fixtures used in the Richard J. Lacks Cancer Center.

The results for satisfaction with toilet fixtures and waterless urinals are displayed in Figure 54. The facility received satisfactory score by the respondents for water efficient toilets.

The Occupant Evaluation of LEED Certified Health Centers survey does not ask whether the gender of the respondent. The demographic of men responses to women is unknown. It is assumed that a female respondent would either skip or mark ‘n/a’ for the response on waterless urinal use. The results for satisfaction with waterless urinals are also displayed in Figure 54. The Richard J. Lacks Cancer Center received 3 positive evaluations for waterless urinal usage.

LEED SECTION: WATER EFFICIENCY

Question Section: Water Efficient Sinks

13. Rate your satisfaction with the following sink features that are used at the facility.

(If you do not have the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Sink faucets	◯	◯	◯	◯	◯
Automatic sensors	◯	◯	◯	◯	◯
Push/twist timed faucets	◯	◯	◯	◯	◯

R	Sink Faucets	Automatic Sensors	Push/ Twist Timed Faucets	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	***4***
R2	n/a	n/a	n/a	1	***1***
R3	n/a	1	n/a	1	***2***
R4	1	1	1	1	***4***
R5	1	1	n/a	1	***3***
R6	-1	-1	n/a	-1	***-3***
R7	1	1	1	1	***4***
R8	1	-1	n/a	-1	***-1***
R9	1	1	1	1	***4***
R10	1	1	n/a	1	***3***
R11	1	-1	1	1	***2***
R12	1	1	n/a	1	***3***
R13	1	1	1	1	***4***
R14	1	1	n/a	1	***3***
R15					***0***
Total	**10**	**7**	**6**	**10**	***33***

Figure 53: Richard J. Lacks Cancer Centers' Satisfaction with Water Efficient Sinks

LEED SECTION: WATER EFFICIENCY

Question Section: Toilets & Urinals

14. Rate your satisfaction with the toilet features used in the facility.

(If you do not have, or do not use the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Low flow toilets	◯	◯	◯	◯	◯
Automatic sensors	◯	◯	◯	◯	◯
Dual flush buttons	◯	◯	◯	◯	◯
Waterless urinals	◯	◯	◯	◯	◯

R	Low Flow Toilets	Auto-matic Sensors	Dual Flush Buttons	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	1	1	1	4
R2	1	1	1	1	4
R3	1	1	n/a	1	3
R4	1	1	n/a	1	3
R5	n/a	-1	n/a	1	0
R6	n/a	1	n/a	1	2
R7		1	1	1	3
R8	-1	-1	-1	-1	-4
R9	1	1	1	1	4
R10	1	1	1	1	4
R11	1	-1	1	1	2
R12	1	1	1	1	4
R13	1	1	1	1	4
R14	1	-1	n/a	1	1
R15					0
Total	9	6	7	12	34

R	Water-less Urinals	#12 Overall Satis-faction	Score for each Respon-dent
R1			0
R2		n/a	0
R3		n/a	0
R4		n/a	0
R5	n/a	n/a	0
R6	1	1	2
R7	n/a	1	1
R8	n/a	n/a	0
R9	n/a	n/a	0
R10	1	1	2
R11	1	n/a	1
R12	n/a	n/a	0
R13	n/a	n/a	0
R14	n/a	n/a	0
R15			0
Total	3	3	6

Figure 54: Richard J. Lacks Cancer Centers' Satisfaction with Water Efficient Toilets and Waterless Urinals

Materials and resources

Under the LEED category Materials and Resources a pre-requisite for LEED certification is pre-requisite 1, Storage and Collection of Recyclables. This credit is intended to reduce waste generated by building occupants that is hauled to and disposed of in landfills. The credit indirectly affects building occupants. The USGBC requirements for this credit can be found in the LEED Guide 2.1 in appendix A. The Occupant Evaluation of LEED Certified Health Centers survey asks the respondent to rate their satisfaction with the recycle storage bins at their facility. This question was asked to see how many respondents use the storage bin; also to see if the respondents were satisfied with the issues related to recycle storage bins. If the respondent does not use the recycle bins they were asked to mark 'n/a'.

According to Figure 55, the respondents are satisfied with the recycling bin issues; location, convenience, and cleanliness, at the facility.

Green housekeeping

A LEED Innovation and Design credit, Green Housekeeping, was achieved by some of the health facilities. This credit was not received by the Richard J. Lacks Cancer Center. The respondents were given the same survey as a facility who did receive the credit. Figure 56 displays the results of maintenance issues; floor, fixture, wall cleanliness and odor of products. Overall the Richard J. Lacks Cancer Center was rated satisfactory for all maintenance issues.

LEED SECTION: MATERIALS & RESOURCES

Question Section: Recycling

15. Rate your satisfaction with the following aspects of the recycle storage bins at your facility.

(If you do not use the recycle bins check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Location	◯	◯	◯	◯	◯
Convenience	◯	◯	◯	◯	◯
Cleanliness	◯	◯	◯	◯	◯

R	Location	Convenience	Cleanliness	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	***4***
R2	1	1	1	1	***4***
R3	n/a	n/a	n/a	n/a	***0***
R4	n/a	n/a	n/a	1	***1***
R5	1	1	1	1	***4***
R6	1	1	1	1	***4***
R7	-1	-1	-1	-1	***-4***
R8	1	1	1	1	***4***
R9	1	1	1	1	***4***
R10	1	1	1	1	***4***
R11	n/a	n/a	n/a	n/a	***0***
R12	1	1	1	1	***4***
R13	1	1	1	1	***4***
R14	1	1	1	1	***4***
R15					***0***
Total	**9**	**9**	**9**	**10**	***37***

Figure 55: Richard J. Lacks Cancer Centers' Satisfaction with Recycling Issues

LEED SECTION: INNOVATION & DESIGN PROCESS

Question Section: Maintenance

16. Rate your satisfaction with the following maintenance issues.

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
Floor cleanliness	◯	◯	◯	◯
Fixture cleanliness (sinks and toilets)	◯	◯	◯	◯
Wall cleanliness	◯	◯	◯	◯
Odor of the cleaning products	◯	◯	◯	◯

R	Floor Cleanliness	Fixture Cleanliness (sinks and toilets)	Wall Cleanliness	Odor of Products	#12 Overall Satisfaction	Score for each Respondent
R1	-1	1	1	1	1	***3***
R2	1	1	1	1	1	***5***
R3	1	1			1	***3***
R4	1	1	1	1	1	***5***
R5	1	1	1	1	1	***5***
R6	1	1	1	1	1	***5***
R7	1	1	1	1	1	***5***
R8	1	1	1	1	1	***5***
R9	1	1	1	1	1	***5***
R10	1				1	***2***
R11	1	1	1	1	1	***5***
R12	1	1	1	1	1	***5***
R13	1	1	1	1	1	***5***
R14	1	1	1	1	1	***5***
R15						
Total	**12**	**13**	**12**	**12**	**14**	***63***

Figure 56: Richard J. Lacks Cancer Centers' Satisfaction with Maintenance Issues

Daylight and views

Categorized under the LEED category Indoor Environmental Quality two credits for Daylight and Views, 8.1 and 8.2 are offered. Daylight and View credit 8.1 Daylight in 75% of Spaces, and 8.2 Views for 90% of spaces directly affect building occupants. The Richard J. Lacks Cancer Center did not receive day light and view credits. Overall the center was rated satisfactory for both daylight and views questions and issues. The results for daylight and views are reflected in Figure 57 the results for potential issues involving daylight and view issues can be found on Figure 58.

Overall score

Figure 59 shows respondents dissatisfaction with access to public transportation. Lack of use does not mean lack dissatisfaction. The Richard J. Lacks Cancer Center received LEED credit for public transportation access, SS credit 4.1. The figure shows a lack of representation for access to public transportation. The two satisfactory responses for the access to public transportation were cancelled by two dissatisfactory responses resulting in a 0 score. As seen in Figure 41, two respondents reported using a bus/ shuttle as an occasional mode of transportation. Also Figure 40 shows that the primary mode of transportation for the respondents is a personal car.

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Daylight & Views

17. Rate your satisfaction with the natural daylight issues in your space.

(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Exterior windows	◯	◯	◯	◯	◯
Daylight from the window	◯	◯	◯	◯	◯
Daylight from other sources	◯	◯	◯	◯	◯
View Outside	◯	◯	◯	◯	◯

R	Exterior Window	Daylight from Window	Daylight from other sources	View Outside	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	n/a	1	1	***4***
R2	1	1	1	1	1	***5***
R3	n/a	n/a	n/a	n/a	n/a	***0***
R4	n/a	n/a	n/a	n/a	n/a	***0***
R5	n/a	n/a	n/a	n/a	1	***1***
R6	1	1	1	-1	-1	***1***
R7	1	1	1	1	1	***5***
R8	n/a	n/a	n/a	n/a	-1	***-1***
R9	1	1	1	1	1	***5***
R10	1	1	n/a	-1	1	***2***
R11	1	1	1	1	-1	***3***
R12	1	1	n/a	1	1	***4***
R13	1	1	1	1	1	***5***
R14	1	n/a	n/a	n/a	1	***2***
R15						
Total	**10**	**9**	**6**	**5**	**6**	***36***

Figure 57: Richard J. Lacks Cancer Centers' Satisfaction with Day-lighting and Views

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Daylight & Views

18. Rate your satisfaction with issues indirectly related to exterior windows in your space.

(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Acoustics	◯	◯	◯	◯	◯
Privacy	◯	◯	◯	◯	◯
Glare	◯	◯	◯	◯	◯

R	Acoustics	Privacy	Glare	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	***4***
R2	1	1	1	1	***4***
R3	n/a	n/a	n/a	n/a	***0***
R4	n/a	n/a	n/a	n/a	***0***
R5	n/a	n/a	n/a	1	***1***
R6	1	1	1	-1	***2***
R7	1	1	1	1	***4***
R8	n/a	n/a	n/a	n/a	***0***
R9	1	1	1	1	***4***
R10	1	1	1	1	***4***
R11	1	1	1	n/a	***3***
R12	1	1	1	1	***4***
R13	1	1	1	1	***4***
R14	n/a	n/a	n/a	n/a	***0***
R15					
Total	**9**	**9**	**9**	**7**	***34***

Figure 58: Richard J. Lacks Cancer Centers' Satisfaction with Day-lighting and View Issues

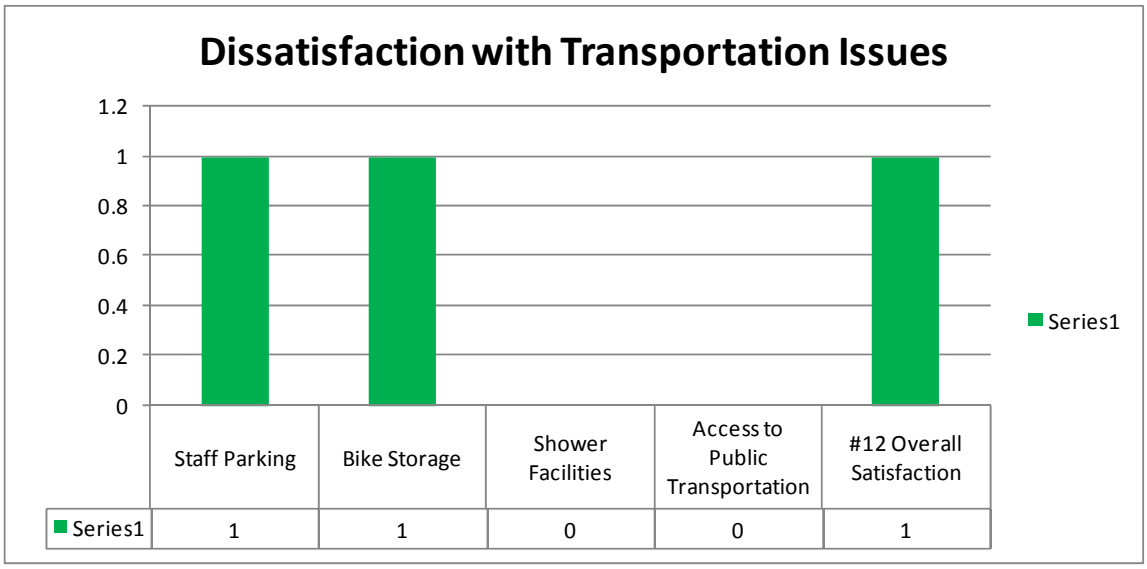


Figure 59: Richard J. Lacks Cancer Centers' Dissatisfaction with Transportation Issues

The overall satisfaction score for the Richard J. Lacks Cancer Center is calculated by adding the total scores for each perceivable LEED topic; transportation, exterior lighting, landscaping, water efficient plumbing fixtures, recycling, indoor air quality, temperature, adjustable systems, maintenance, day-lighting and views. The total score for each LEED topic is converted to either a positive or negative score. The Richard J. Lacks Cancer Center was rated satisfactory in all of the LEED topics.

Table 4 reflects the perceivable LEED points evaluated in this study and the overall satisfaction score in the categories where LEED points were received; (1) for satisfactory and (–1) for dissatisfied. All facilities received the same survey that asked

the respondents to evaluate their facility on building aspects influenced by LEED certification whether the facility received the LEED credit or not. The categories where LEED credit was not received are gray in Table 4.

Question number 13, in the survey thanks the respondent for their participation and asks for additional comments. Some respondents took the opportunity to express their concerns about perceivable building features influenced by LEED certification. The comments made by the respondents about the Richard J. Lacks Cancer Center can be found in Appendix C.

Table 4: Richard J. Lacks Cancer Center Overall Score for Perceivable LEED Building Features

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
	SUSTAINABLE SITES			
	Transportation			1
I	public transportation access	4.1		
I	bicycle storage & changing rooms	4.2		
I	parking capacity	4.4		
	Exterior Lighting			
I	light pollution reduction	8		
	WATER EFFICIENCY			
	Landscaping			1
I	50% reduction	1.1		
I	no potable use or no irrigation	1.2		
	Water Efficient Plumbing Fixtures			
I	20% reduction	3.1		
I	30% reduction	3.2		

Table 4: Cont'd

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
		MATERIALS AND RESOURCES		
	Recycling			1
I	storage & collection of recyclables	PR 1		
		INDOOR ENVIRONMENTAL QUALITY		
	Indoor Air Quality (IAQ)			1
D	minimum IAQ performance	PR 1		
D	environmental tobacco smoke	PR 2		
D	carbon dioxide (CO_2) monitoring	1		
D	ventilation effectiveness	2		
D	indoor chemical and pollutant source control	5		
	Adjustable Systems			
D	perimeter spaces	6.1		
D	non-perimeter spaces	6.2		

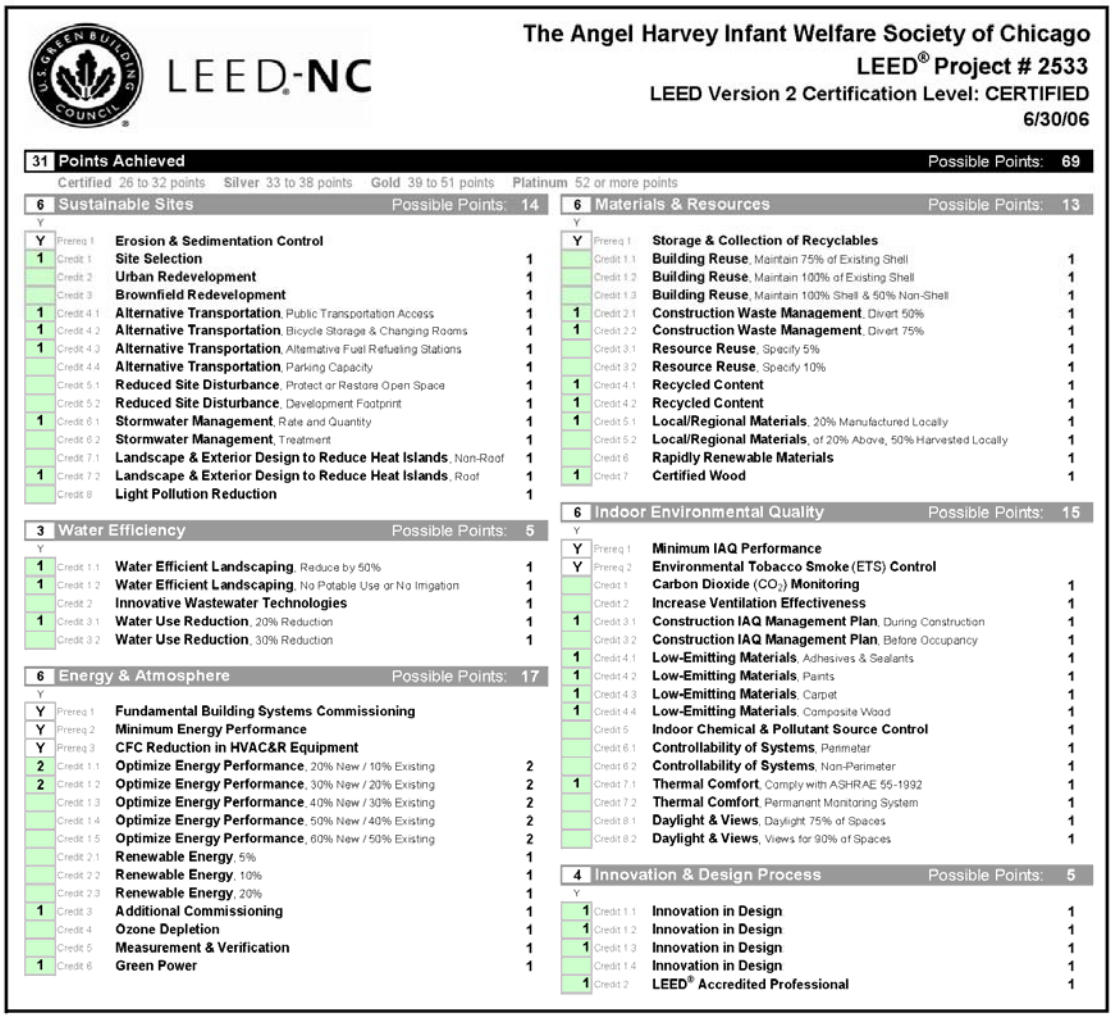
Table 4: Cont'd

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
		INDOOR ENVIRONMENTAL QUALITY		
	Temperature			1
D	thermal comfort (ASHRAE 55-1992)	7.1		
D	thermal comfort monitoring system	7.2		
	Day-Lighting & Views			
D	daylight in 75% of spaces	8.1		
D	views in 90% of spaces	8.2		
		INNOVATION AND DESIGN PROCESS		
	Maintenance			
D	green cleaning	~		

Sources: USGBCs LEED Guide 2.1
Occupant Evaluation of LEED Certified Health Centers Thesis

CASE STUDY THREE: ANGEL HARVEY INFANT WELFARE SOCIETY OF CHICAGO

Figure 60 is the Angel Harvey Infant Welfare Society of Chicago LEED score card which shows the LEED credits that were received for the facility.



LEED-NC

The Angel Harvey Infant Welfare Society of Chicago
LEED® Project # 2533
LEED Version 2 Certification Level: CERTIFIED
6/30/06

31 Points Achieved — Possible Points: 69

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

6 Sustainable Sites — Possible Points: 14

Y	Prereq 1	Erosion & Sedimentation Control	
1	Credit 1	Site Selection	1
	Credit 2	Urban Redevelopment	1
	Credit 3	Brownfield Redevelopment	1
1	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
1	Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	1
	Credit 4.4	Alternative Transportation, Parking Capacity	1
	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
1	Credit 6.1	Stormwater Management, Rate and Quantity	1
	Credit 6.2	Stormwater Management, Treatment	1
	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
	Credit 8	Light Pollution Reduction	1

3 Water Efficiency — Possible Points: 5

1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 20% Reduction	1
	Credit 3.2	Water Use Reduction, 30% Reduction	1

6 Energy & Atmosphere — Possible Points: 17

Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
2	Credit 1.1	Optimize Energy Performance, 20% New / 10% Existing	2
2	Credit 1.2	Optimize Energy Performance, 30% New / 20% Existing	2
	Credit 1.3	Optimize Energy Performance, 40% New / 30% Existing	2
	Credit 1.4	Optimize Energy Performance, 50% New / 40% Existing	2
	Credit 1.5	Optimize Energy Performance, 60% New / 50% Existing	2
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 20%	1
1	Credit 3	Additional Commissioning	1
	Credit 4	Ozone Depletion	1
	Credit 5	Measurement & Verification	1
1	Credit 6	Green Power	1

6 Materials & Resources — Possible Points: 13

Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2	Building Reuse, Maintain 100% of Existing Shell	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50%	1
1	Credit 2.2	Construction Waste Management, Divert 75%	1
	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content	1
1	Credit 4.2	Recycled Content	1
1	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
1	Credit 7	Certified Wood	1

6 Indoor Environmental Quality — Possible Points: 15

Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	Credit 1	Carbon Dioxide (CO_2) Monitoring	1
	Credit 2	Increase Ventilation Effectiveness	1
1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints	1
1	Credit 4.3	Low-Emitting Materials, Carpet	1
1	Credit 4.4	Low-Emitting Materials, Composite Wood	1
	Credit 5	Indoor Chemical & Pollutant Source Control	1
	Credit 6.1	Controllability of Systems, Perimeter	1
	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

4 Innovation & Design Process — Possible Points: 5

1	Credit 1.1	Innovation in Design	1
1	Credit 1.2	Innovation in Design	1
1	Credit 1.3	Innovation in Design	1
	Credit 1.4	Innovation in Design	1
1	Credit 2	LEED® Accredited Professional	1

Figure 60: The Angel Harvey Infant Welfare Society of Chicago (IWC) LEED Score Card

The Angel Harvey Infant Welfare Society of Chicago is the second case study located in a metropolitan area. Figure 61 shows an exterior image of the Angel Harvey Infant Welfare Society of Chicago. Figure 62 is another exterior image facility where the issues like staff parking and landscape can be seen. These issues and the respondents' level of satisfaction are discussed later in the chapter.

Figure 61: The IWC Case Study Exterior Image
Source: Greenbean

The following is a list of general information about the Infant Welfare Society of Chicago Center.

Owner:	Infant Welfare Society of Chicago
Architect:	SMNG-A Architects
Building Type:	New Construction clinic
Size:	40,000 sqft
Building Location:	Chicago, IL
Recognition:	LEED CERTIFIED

Figure 62: The IWC Exterior Image of Parking Lot
Source: Henneman

The Angel Harvey Infant Welfare Society of Chicago health center received a total of thirty-one LEED points earning the title CERTIFIED green building. The Occupant Evaluation of LEED Certified Health Centers survey was given to fifteen full time employees, at the Angel Harvey Infant Welfare Society of Chicago health center, fifteen responded. The survey responses are anonymous; however the survey does ask

respondents to give background information about the respondents that may be relevant to analyzing the results.

Background information

The first survey question under the heading background information asks their position held at the Angel Harvey Infant Welfare Society of Chicago. For the purpose of getting a better perspective of building features, such as water efficient sinks, the survey asks respondents to describe themselves as either medical staff or administrator. Architecturally administrative areas may be designed differently than medical staff/ patient or public areas. For example, both medical staff and administrators may use water efficient sinks; medical staff may use the water efficient sensor sink to fill a cup with water, while administrators may only encounter the sink in a public restroom. As the perceivable features of a LEED health center are discussed, it may be useful to know which perspective the evaluation is from.

Figure 63 shows the perspectives represented for case three. Four medical staff and eleven administrators participated in the occupant evaluation of the Angel Harvey Infant Welfare Society of Chicago. Figure 64 shows the percentage of respondents who are administrators and those who are medical staff.

LEED SECTION: BACKGROUND INFORMATION

Question Section: Position at Health Center

1. Please choose which position best describes you at this health center.

◯ Administration
◯ Medical Staff
Other (please specify)

R	*Medical Staff*	*Administration*
R1		1
R2		1
R3		1
R4		1
R5		1
R6		1
R7		1
R8		1
R9		1
R10		1
R11	1	
R12	1	
R13	1	
R14	1	
R15		1
Total	**4**	**11**

Figure 63: IWC Center Job Position at the Facility

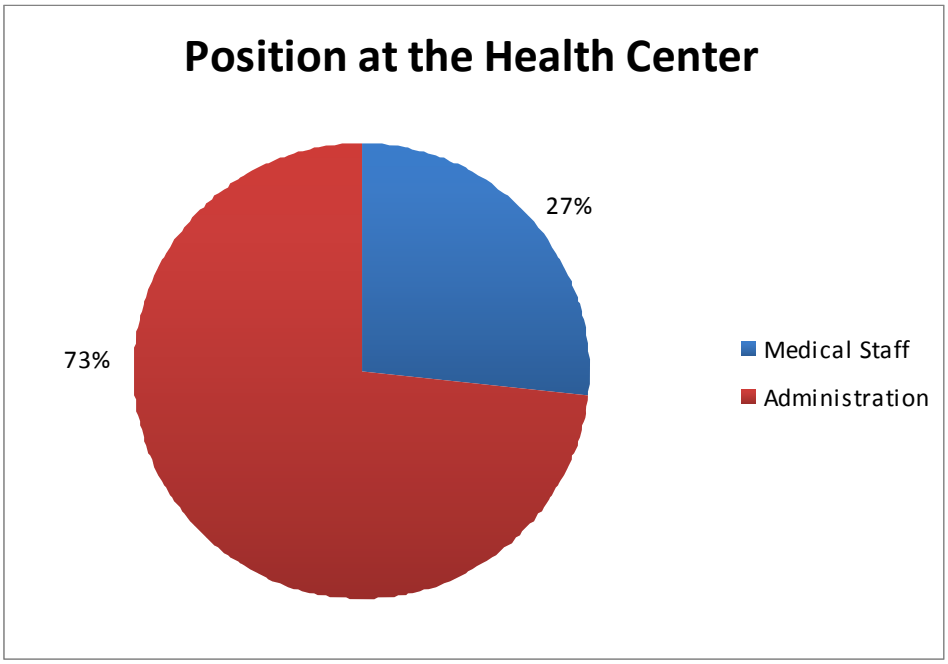


Figure 64: IWC Center Pie Chart of Job Position at the Facility

LEED SECTION: BACKGROUND INFORMATION

Question Section: Time Employed at Health Center

2. Approximately how long have you worked at this facility?

◯ Less than 6 months
◯ 6 months to 1 year
◯ More than 1 year

R	*6 months or less*	*1 year*	*more than 1 year*
R1		1	
R2			1
R3			1
R4			1
R5			1
R6			1
R7			1
R8	1		
R9			1
R10			1
R11			1
R12			1
R13			1
R14			1
R15			1
Total	**1**	**1**	**13**

Figure 65: IWC Center Time Employed at the Facility

In the survey respondents are asked to report the approximate length of time employed at the facility. This question was asked to get an idea of how long the respondents have had time to observe the building features that may have been influenced by LEED certification.

As shown in Figure 65 the majority of employees have worked at the Angel Harvey Infant Welfare Society of Chicago for more than one year. One of the respondents has worked at the facility for six months or less and one respondent has worked there for approximately one year.

Transportation

The Angel Harvey Infant Welfare Society of Chicago received three of the four alternative transportation credits offered under the LEED Sustainable Sites category as shown in Figure 60. Two of the credits the center received are considered perceivable and will be evaluated in this research. The Angel Harvey Infant Welfare Society of Chicago received LEED sustainable sites credit 4.1, Alternative Transportation: Public Transportation Access. The requirement for the credit is to locate the project within a ½ mile of a commuter rail, light rail, or subway station or within ¼ mile of two or more public or campus bus lines usable by building occupants (LEED Guide 2.1, USGBC).

The Angel Harvey Infant Welfare Society of Chicago also received LEED sustainable sites credit 4.2, Alternative Transportation: Bicycle Storage and Changing Rooms. The

requirement for the credit is to provide secure bicycle storage with convenient changing/shower facilities. Both credits were intended to indirectly affect occupants. The intention of the LEED transportation credits is to reduce pollution and land development impacts from automobiles (LEED Guide 2.1, USGBC).

The survey questions about transportation were asked to determine if access to public transportation were an option, would the building occupants primary or occasional mode of transportation be altered. In Figure 66 respondents show how often they use the following modes of transportation to get to work. In Figure 66 a number (1) in the response table indicates the primary mode of transportation selected by the respondent. The letter 'O' designates which mode of transportation the respondent occasionally uses to get to work.

The primary mode of transportation for most of the respondents is a personal car as shown in Figure 67. Figure 68 shows the occasional modes of transportation used by the respondents to get to work and the number of respondents who use the form of transportation. Incorporating the LEED suggestions offered under the alternative transportation credit seem to be successful in this case compared to the other cases. The occupants who responded to the survey utilize every alternative mode of transportation occasionally. One respondent reported occasionally using a bicycle to get to work. In the Angel Harvey Infant Welfare Society of Chicago special considerations were given

to encourage bicycling by achieving LEED sustainable sites credit 4.2, which requires changing rooms and showers.

The Occupant Evaluation of LEED Certified Health Centers survey asks about transportation issues; amount of staff parking, bike storage area, shower facilities and access to public transportation. Figure 69 shows occupant responses to perceivable LEED building features influenced by LEED Sustainable Sites transportation credits. In the Occupant Evaluation of LEED Certified Health Centers survey respondents were asked to mark ‘n/a’ if they do not use the feature inquired about. Overall the facility received a satisfactory score for transportation issues; however respondents reported dissatisfaction with staff parking.

LEED SECTION: SUSTAINABLE SITES

Question Section: Transportation

3. How often do you use the following modes of transportation to get to work?

	Daily	Occasionally	Never
Personal Car	◯	◯	◯
Carpool	◯	◯	◯
Bus/Shuttle	◯	◯	◯
Bicycle	◯	◯	◯
Light-rail	◯	◯	◯
Other	◯	◯	◯

R	Personal Car	Carpool	Bus/ Shuttle	Bicycle	Light-rail	Other
R1	1		0		0	0
R2		0			0	
R3	1					
R4	1					
R5	1	0				
R6	1	0	0		0	
R7	1					
R8	1					
R9	1					
R10	1				0	
R11	1	0	0		0	
R12	1					
R13	0			0	0	
R14	0		0		0	
R15	1					

Figure 66: IWC Center Forms of Transportation to get to Work

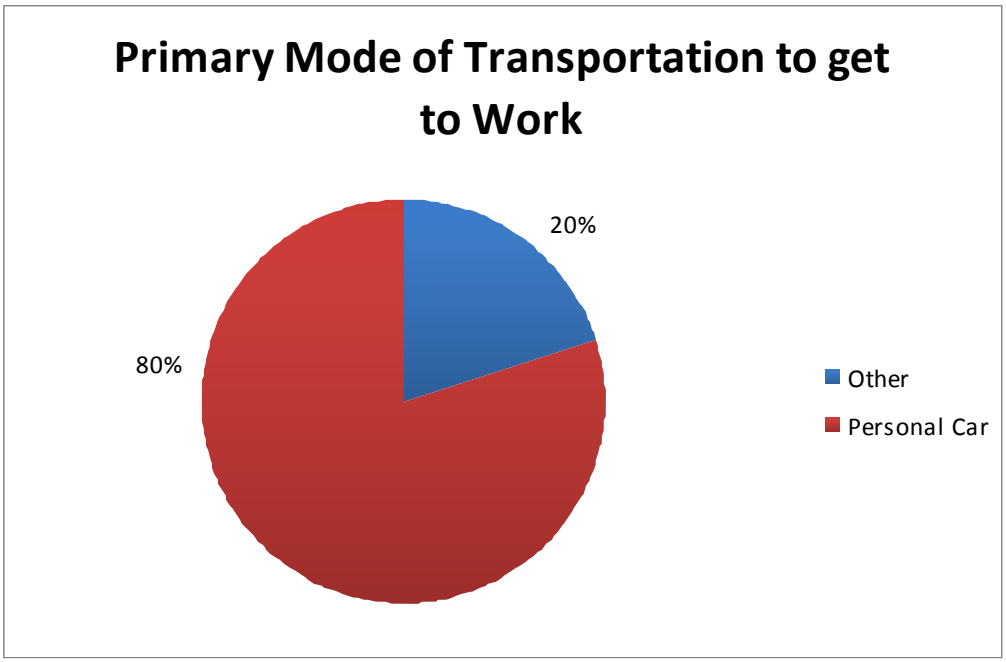


Figure 67: IWC Center Primary Mode of Transportation to get to Work

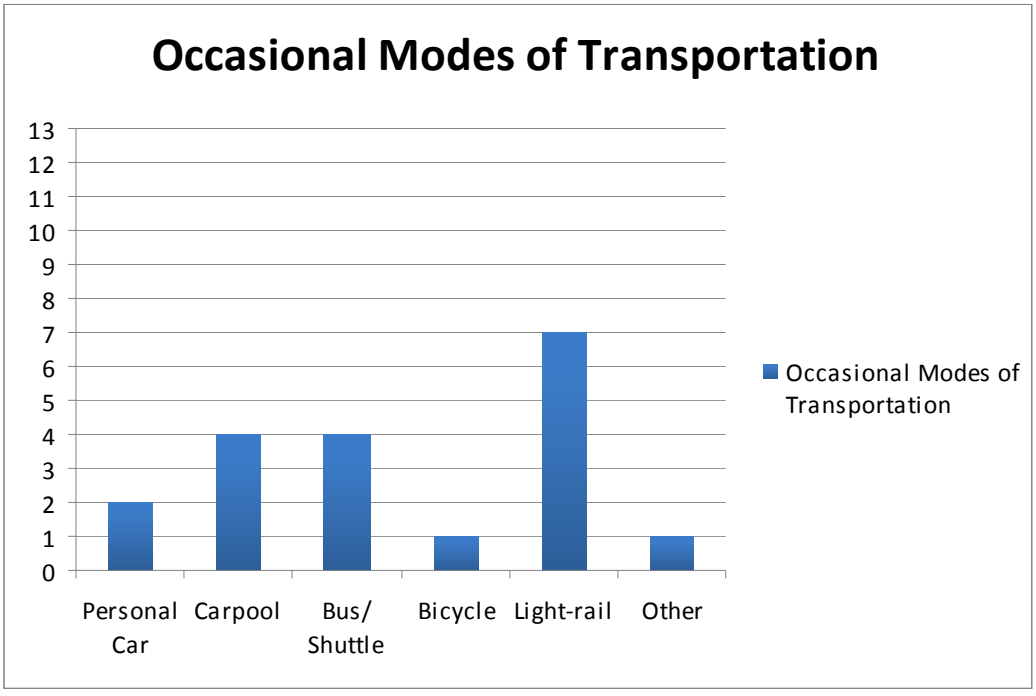


Figure 68: IWC Center Occasional Modes of Transportation to get to Work

LEED SECTION: SUSTAINABLE SITES

Question Section: Transportation

4. What is your satisfaction with the following transportation issues?

(If you do not use the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Amount of Staff Parking	◯	◯	◯	◯	◯
Bike Storage Area	◯	◯	◯	◯	◯
Shower facilities	◯	◯	◯	◯	◯
Access to Public Transportation	◯	◯	◯	◯	◯

R	Staff Parking	Bike Storage	Shower Facilities	Access to Public Transportation	#12 Overall Satisfaction	Score for each Respondent
R1	1	n/a	n/a	-1	1	***1***
R2	-1	1	1	1	1	***3***
R3	-1				1	***0***
R4		1	1	1	1	***4***
R5						***0***
R6	1		1	1	1	***4***
R7						***0***
R8	-1					***-1***
R9	-1		1		-1	***-1***
R10	-1			-1		***-2***
R11	1			1	1	***3***
R12	1		1		1	***3***
R13	-1	1		1	1	***2***
R14	-1	1		1	1	***2***
R15	-1					***-1***
Total	**-4**	**4**	**5**	**4**	**8**	***17***

Figure 69: IWC Centers' Satisfaction with Transportation Issues

Exterior lighting

The Angel Harvey Infant Welfare Society of Chicago did not receive LEED Sustainable Sites credit 8, Light Pollution Reduction as shown in Figure 60. The four case studies received the same survey whether the facility received the credit or not. Figures 70 and Figure 71 show the respondents evaluation of exterior lighting and issues for the facility. Figure 72 shows the percentage of respondents who feel safe around the facility and night and those who responded ‘n/a’ to the question meaning that they are not at the facility at night.

LEED SECTION: SUSTAINABLE SITES

Question Section: Exterior Lighting

5. Rate your satisfaction with the exterior lighting at night for the following…

(Check N/A box if you are only at the facility during daytime hours)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Facility driveways	◯	◯	◯	◯	◯
Facility entrances	◯	◯	◯	◯	◯
Exterior of the building	◯	◯	◯	◯	◯
staff Parking Area	◯	◯	◯	◯	◯
Walking paths to parking area	◯	◯	◯	◯	◯
Overall safety at night	◯	◯	◯	◯	◯

R	Facility Drive-ways	Facility Entrances	Exterior of Building	Staff Parking Area	Walking Paths to the Parking Area	Overall Safety at Night	#12 Overall Satis-faction	Score for each Respon-dent
R1		n/a						***0***
R2	1	1	1	1	1	1	1	***7***
R3	1	1	1	1	1	1	1	***7***
R4	1	1	1	n/a	1	1	1	***6***
R5						1	1	***2***
R6	1	1	1	1	1		1	***6***
R7								***0***
R8	1	1	1		-1	1	n/a	***3***
R9	-1	-1	-1	-1	-1	-1	-1	***-7***
R10	1	1	1	-1	1	-1	-1	***1***
R11	1	1	1	1	1	1	1	***7***
R12	1	1	1	n/a	1	1	1	***6***
R13	1	1	1	-1	1	1	1	***5***
R14	n/a	1	1	1	n/a	1	1	***5***
R15	1	1	1	1	1	1	n/a	***6***
Total	**9**	**10**	**10**	**3**	**7**	**8**	**7**	***54***

Figure 70: IWC Centers' Satisfaction with Exterior Lighting Issues

LEED SECTION: SUSTAINABLE SITES

Question Section: Exterior Lighting

6. Does the lighting on the exterior of the facility make you feel safe at night? (If you are not at the facility at night check the N/A box)

R	Yes	No	N/A
R1			1
R2	1		
R3	1		
R4	1		
R5	1		
R6			1
R7			1
R8			1
R9		1	
R10	1		
R11	1		
R12			1
R13	1		
R14		1	
R15			1
Total	7	2	6

Figure 71: IWC Centers' Satisfaction with Security from Exterior Lighting Around the Facility at Night

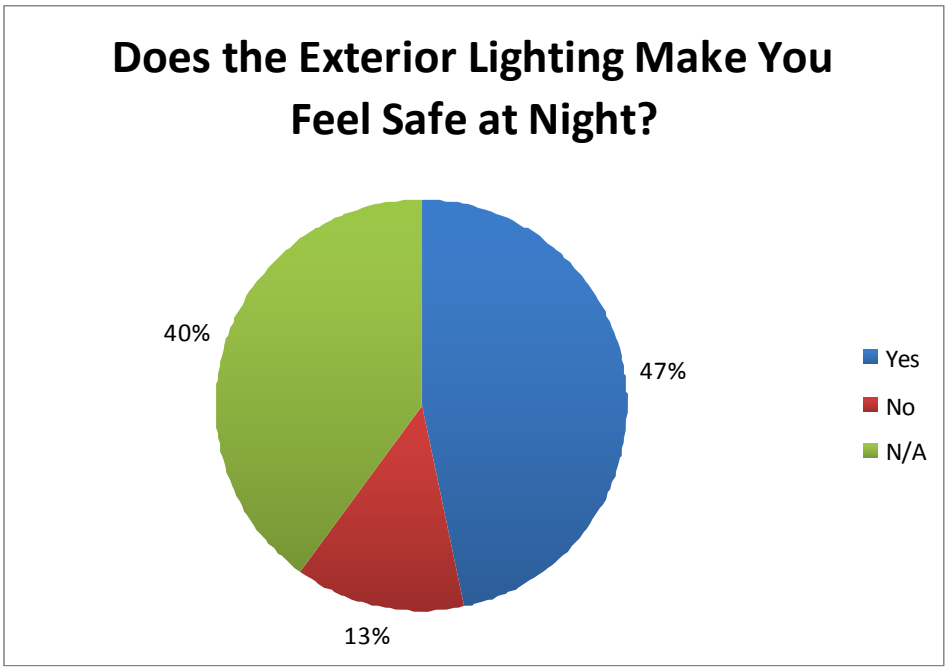


Figure 72: IWC Centers' Satisfaction with Security from Exterior Lighting Around the Facility at Night Pie Chart

Landscaping

The Angel Harvey Infant Welfare Society of Chicago received both of the two possible Water Efficiency Landscaping Credits. To achieve Water Efficient Landscaping credit 1.1, potable water use for irrigation must be reduced by 50%. Strategies include installing a high-efficiency irrigation system, or harvesting rain water. Receiving both Water Efficient Landscaping LEED credits 1.1 and 1.2 means no potable water is used for irrigation for the landscape. A typical strategy to receive this credit is to employ a xeriscape design if no other water re-use, or harvesting program is in place. Xeriscape design use local vegetation that can be naturally sustained in the soil and weather conditions of the area.

Respondents are asked if there is a landscaped area outside of the facility. Figure 73 shows that all of the respondents are aware of the landscape. Figure 74 shows that 100% of respondents are aware of the landscape.

The Occupant Evaluation of LEED Certified Health Centers survey asks the respondents to report on landscape issues; health of the planting and satisfaction with landscape design. Satisfaction with landscape design is subjective. Many landscape designs use plants that are not native to the environment they are being installed into. For example tropical plants require a lot of water, and require more than the natural rainfall in a non-tropical region to sustain it.

Many times potable water, or water that is from aquifers or that is processed and drinkable for humans, is used for irrigation. The USGBC encourages facilities to use non-potable water for irrigation purposes. As shown in Figure 75, the facility received a satisfactory score in issues related to water efficient landscaping.

LEED SECTION: WATER EFFICIENCY

Question Section: Landscape

7. Is there a landscaped area outside the facility?

R	Yes	No	I Don't Know
R1	1		
R2	1		
R3	1		
R4	1		
R5	1		
R6	1		
R7	1		
R8	1		
R9	1		
R10	1		
R11	1		
R12	1		
R13	1		
R14	1		
R15	1		
Total	15	0	0

Figure 73: IWC Centers' Recognition of the Landscaped Area Outside of the Facility

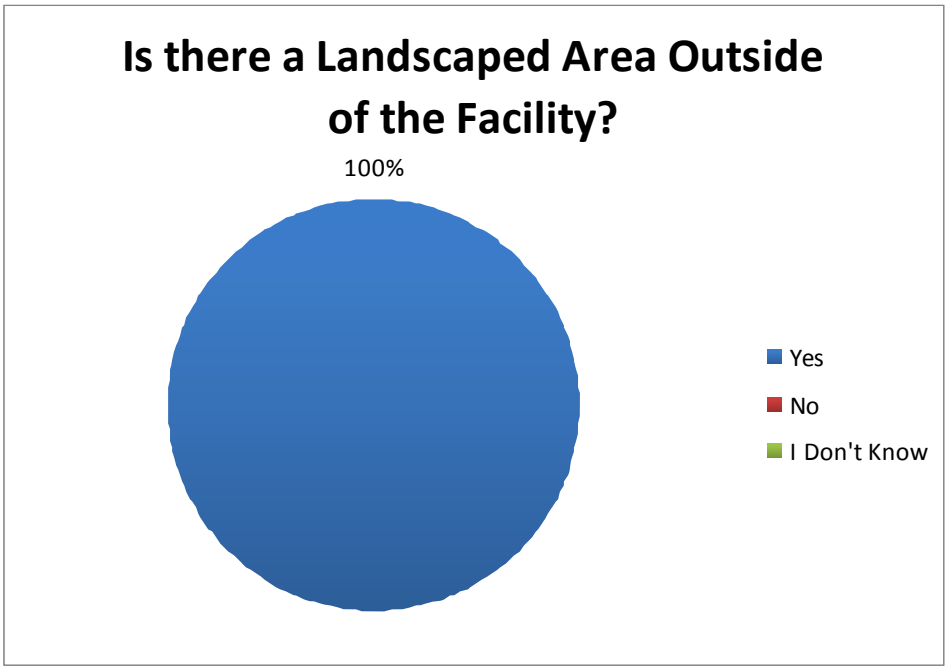


Figure 74: IWC Centers' Recognition of the Landscaped Area Outside of the Facility Pie Chart

LEED SECTION: WATER EFFICIENCY

Question Section: Landscape

8. Rate how satisfied you are with the landscaped area.

(If you do not have one check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Health of Plantings	⬭	⬭	⬭	⬭	⬭
Satisfaction with landscape design	⬭	⬭	⬭	⬭	⬭

R	Health of Plantings	Satisfaction with Landscape Design	#12 Overall Satisfaction	Score for each Respondent
R1	-1	-1	-1	***-3***
R2	1	1	1	***3***
R3	1	1	1	***3***
R4	1	1	1	***3***
R5	1		1	***2***
R6	1	1	1	***3***
R7	1	1		***2***
R8	-1	-1	-1	***-3***
R9	1	1	1	***3***
R10	1	-1		***0***
R11	1	1	1	***3***
R12	1	1	1	***3***
R13	1	1	1	***3***
R14	1	1	1	***3***
R15	1	1	1	***3***
Total	**11**	**8**	**9**	***28***

Figure 75: IWC Centers' Satisfaction with the Landscape

IAQ

There are several LEED credits that the indoor air quality question involves. These are found in the LEED Guide 2.1 in Appendix A, under the Indoor Environmental Quality, (IEQ) LEED category. Two of the credits, IEQ pre-requisite 1 and IEQ pre-requisite 2 are mandatory for LEED certification; minimum indoor air quality performance and environmental tobacco smoke control. The Angel Harvey Infant Welfare Society of Chicago did not receive the other perceivable IEQ credits grouped under indoor air quality. The Occupant Evaluation of LEED Certified Health Centers survey asks the respondents to evaluate the quality of the indoor air. The responses for stuffy, smoky, exhaust, chemicals, dusty, and pollen have been inverted to show satisfaction and dissatisfaction. Figure 76 reflects a dissatisfactory score from the occupants.

Before discussing indoor air quality for the Angel Harvey Infant Welfare Society of Chicago it is fair to note the location of the center as shown in Figure 2. Also shown in

the images of the health center, Figure 61 and 62, the location is on a city street corner of Chicago. The Lacks Cancer Center is also located in a densely populated, urban area but as shown in Figure 33, other indoor air quality credits were received, IEQ credits 1 and 5. Details about the requirements of IEQ credits 1 and 5 can be found in the LEED Guide 2.1.

Controllability of systems

Controllability of Systems, perimeter and non-perimeter are LEED credits categorized under the LEED Indoor Environmental Quality category as credits 6.1 and 6.2. The Angel Harvey Infant Welfare Society of Chicago did not receive these credits. The same survey was administered to all of the facilities whether the credit was received or not. Figure 77 and Figure 78 show the responses for the ability to control building systems for personal comfort. Despite a dissatisfactory rating for exterior window control in Figure 77, overall The Angel Harvey Infant Welfare Society of Chicago was rated satisfactory for lighting control.

LEED SECTION: INDOOR AIR QUALITY

Question Section: Indoor Air Quality

9. Does the indoor air smell like the following?

	Always	Often	Rarely	Never
Fresh	◯	◯	◯	◯
Stuffy	◯	◯	◯	◯
Smoky	◯	◯	◯	◯
Like Vehicle Exhaust	◯	◯	◯	◯
Like Cleaning Chemicals	◯	◯	◯	◯
Dusty	◯	◯	◯	◯
Like Pollen	◯	◯	◯	◯

R	FRESH	STUFFY	SMOKY	EXHAUST	CHEM-ICALS	DUSTY	POLLEN	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	-1			-1			1	***0***
R2	1							1	***2***
R3	1		-1					1	***1***
R4	1				-1			1	***1***
R5	1					-1	-1	1	***0***
R6	1							1	***2***
R7	1							1	***2***
R8	1	-1			-1	-1	-1	1	***-2***
R9	1	-1						1	***1***
R10	1								***1***
R11	1	-1			-1			1	***0***
R12	1				-1			1	***1***
R13	1	-1	-1	-1	-1	-1		1	***-3***
R14	1	-1						-1	***-1***
R15	1							-1	***0***
Total	**15**	**-6**	**-2**	**-1**	**-6**	**-3**	**-2**	**10**	***5***

Figure 76: IWC Centers' Satisfaction with Indoor Air Quality at the Facility

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: *Adjustable Systems* Thermal Comfort

10. Rate your satisfaction with the ability to adjust the following for thermal comfort?

(If you cannot adjust check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Thermostat	◯	◯	◯	◯	◯	◯
Exterior window	◯	◯	◯	◯	◯	◯
Ceiling Fan	◯	◯	◯	◯	◯	◯
Airflow vent	◯	◯	◯	◯	◯	◯

R	Thermostat	Exterior Window	Ceiling Fan	Air Flow Vent	#12 Overall Satisfaction	Score for each Respondent
R1	DNADJ	n/a	n/a	DNADJ	1	***1***
R2	1	n/a	n/a	n/a	1	***2***
R3	1	n/a	n/a	n/a	1	***2***
R4	1				1	***2***
R5	n/a	n/a	n/a	n/a	n/a	***0***
R6	1	n/a	n/a	DNADJ	1	***2***
R7						***0***
R8						***0***
R9	1	n/a	n/a	1	1	***3***
R10	-1	-1				***-2***
R11	1	1	n/a	1	-1	***2***
R12	1	1	1	1	1	***5***
R13	n/a	-1	n/a	n/a	n/a	***-1***
R14	-1	-1	n/a	DNADJ	-1	***-3***
R15	n/a	n/a	n/a	n/a	n/a	***0***
Total	**5**	**-1**	**1**	**3**	**5**	***13***

Figure 77: IWC Centers' Satisfaction with Adjustable Systems Control for Thermal Comfort

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: *Adjustable Systems* Control of Lighting

11. Rate your satisfaction with the ability to adjust the following to control lighting. (If you cannot adjust check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Light switch	⬭	⬭	⬭	⬭	⬭	⬭
Light dimmer	⬭	⬭	⬭	⬭	⬭	⬭
Window blind/shade	⬭	⬭	⬭	⬭	⬭	⬭
Desk light	⬭	⬭	⬭	⬭	⬭	⬭

R	Light Switch	Light Dimmer	Window Blind/ Shade	Desk Light	#12 Overall Satisfaction	Score for each Respondent
R1	-1	DNADJ	1	-1	-1	***-2***
R2	1	1	1	n/a	1	***4***
R3	1	1	1	1	1	***5***
R4	1	n/a	1	n/a	1	***3***
R5	1	n/a	n/a	n/a	1	***2***
R6	1	DNADJ	n/a	1	1	***3***
R7	1	n/a	1	n/a	1	***3***
R8	1	1	1	1	1	***5***
R9	1	-1	-1		1	***0***
R10	1	1	1	1		***4***
R11	1	n/a	1	1	1	***4***
R12	1	n/a	1	1	1	***4***
R13	1	n/a	n/a		1	***2***
R14	-1	n/a	1	1	-1	***0***
R15	n/a	n/a	n/a	n/a	n/a	***0***
Total	**10**	**3**	**9**	**6**	**9**	***37***

Figure 78: IWC Centers' Satisfaction with Adjustable Systems Control for Lighting

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Thermal Comfort

12. Rate your satisfaction with the following temperature related issues with your space.

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
Humidity	⬭	⬭	⬭	⬭
Temperature in your space	⬭	⬭	⬭	⬭

R	Humidity	Temperature in your Space	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	***3***
R2	1	1	1	***3***
R3	1	1	1	***3***
R4	1	1	1	***3***
R5	1	1	1	***3***
R6	1	1	1	***3***
R7	1	1	1	***3***
R8	1	1	1	***3***
R9	1	1	1	***3***
R10	1	1		***2***
R11	1	1	-1	***1***
R12	1	1	1	***3***
R13	1	-1	-1	***-1***
R14	1	-1	-1	***-1***
R15	1	1	n/a	***2***
Total	**15**	**11**	**7**	***33***

Figure 79: IWC Centers' Satisfaction with Thermal Comfort Issues

Thermal comfort

Under the LEED Indoor Environmental Quality category, two Thermal Comfort credits are available, 7.1 Comply with ASHRAE 55-1992 and 7.2 Permanent Monitoring System. The details of the credits can be found in the LEED Guide 2.1. The thermal comfort credits directly affect building occupants. The intention of the thermal comfort credits is to provide a thermally comfortable environment for occupants. The Occupant Evaluation of LEED Certified Health Centers survey asked the respondents to report their satisfaction with humidity and the temperature in their space.

The Angel Harvey Infant Welfare Society of Chicago received one of the Thermal Comfort credits 7.1. Figure 79 shows the responses for thermal comfort. The facility received a satisfactory rating for humidity and temperature in your space aspect. Overall the Angel Harvey Infant Welfare Society of Chicago received a satisfactory rating for thermal comfort.

Water efficient plumbing

In the LEED Water Efficiency category the two Water Use Reduction credits 3.1 20% reduction and 3.2 30% reduction are considered perceivable credits that indirectly affect building occupants. The intention of these credits was to maximize water efficiency in buildings to reduce the burden on the municipal water supply and wastewater systems. (LEED Guide 2.1, USGBC) The Occupant Evaluation of LEED Certified Health Centers survey asked the respondents to rate their satisfaction with sink and toilet

building features influenced by USGBC suggestions in the LEED credits Water Efficiency 3.1 and 3.2. The question was asked in the survey to determine if there was a preference among medical staff and administrators for a certain water efficient fixture. The water efficient fixtures all have advantages and disadvantages over the traditional sink and toilet fixtures. The Angel Harvey Infant Welfare Society of Chicago received LEED Water Efficiency credit 1.1 Water Use Reduction, 20% Reduction. Respondents were asked to rate their satisfaction with the common types of water efficient sinks, toilet and urinal fixtures. All of the facilities examined in the case studies may have used different strategies to achieve these credits. If the respondent does not have the feature they are asked to mark 'n/a' for the feature.

The results for the water efficient sink fixtures are displayed in Figure 80. Overall the respondents reported satisfaction with the water efficient sink fixtures used in the Angel Harvey Infant Welfare Society of Chicago. The results for satisfaction with toilet fixtures are displayed in Figure 81. The facility received a satisfactory score by the respondents for water efficient toilets.

The Occupant Evaluation of LEED Certified Health Centers survey does not ask the gender of the respondent. The demographic of men responses to women is unknown. It is assumed that a female respondent would either skip or mark 'n/a' for the response on waterless urinal use. There was not much data for satisfaction with waterless urinals. The results are also displayed in Figure 81.

LEED SECTION: WATER EFFICIENCY

Question Section: Water Efficient Sinks

13. Rate your satisfaction with the following sink features that are used at the facility.

(If you do not have the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Sink faucets	⬭	⬭	⬭	⬭	⬭
Automatic sensors	⬭	⬭	⬭	⬭	⬭
Push/twist timed faucets	⬭	⬭	⬭	⬭	⬭

R	Sink Faucets	Automatic Sensors	Push/ Twist Timed Faucets	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	***4***
R2	1	n/a	1	1	***3***
R3	1	n/a	1	1	***3***
R4	1	1	1	1	***4***
R5	1	1	1	1	***4***
R6	1	1	n/a	1	***3***
R7	1		1	1	***3***
R8	1	1	1	1	***4***
R9	1	1	-1	1	***2***
R10	1	1	1		***3***
R11	1		1	1	***3***
R12	1	n/a	n/a	1	***2***
R13	1	1	1	1	***4***
R14	-1	n/a	-1	-1	***-3***
R15	1	1	1	n/a	***3***
Total	**13**	**9**	**9**	**11**	***42***

Figure 80: IWC Centers' Satisfaction with Water Efficient Sinks

LEED SECTION: WATER EFFICIENCY

Question Section: Toilets & Urinals

14. Rate your satisfaction with the toilet features used in the facility.

(If you do not have, or do not use the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Low flow toilets	⬭	⬭	⬭	⬭	⬭
Automatic sensors	⬭	⬭	⬭	⬭	⬭
Dual flush buttons	⬭	⬭	⬭	⬭	⬭
Waterless urinals	⬭	⬭	⬭	⬭	⬭

R	Low Flow Toilets	Auto-matic Sensors	Dual Flush Buttons	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	n/a	n/a	1	***2***
R2	1	n/a	n/a	1	***2***
R3	n/a	n/a	n/a	n/a	***0***
R4	n/a	n/a	n/a	1	***1***
R5	1	1	n/a	1	***3***
R6	1	n/a	n/a	1	***2***
R7	1			1	***2***
R8	1	1	n/a	1	***3***
R9	1	n/a	n/a	1	***2***
R10	1				***1***
R11	n/a	n/a	1	1	***2***
R12	n/a	n/a	1	1	***2***
R13	n/a	n/a	n/a	n/a	***0***
R14	1	-1	n/a	n/a	***0***
R15	1	n/a	n/a	n/a	***1***
Total	**10**	**1**	**2**	**10**	***23***

R	Water-less Urinals	#12 Overall Satis-faction	Score for each Respon-dent
R1	n/a	n/a	***0***
R2	n/a	n/a	***0***
R3	n/a	n/a	***0***
R4	n/a	n/a	***0***
R5	n/a	n/a	***0***
R6	n/a	n/a	***0***
R7	n/a	n/a	***0***
R8	n/a	n/a	***0***
R9	n/a	n/a	***0***
R10	n/a	n/a	***0***
R11	n/a	n/a	***0***
R12		1	***1***
R13	n/a	n/a	***0***
R14	n/a	n/a	***0***
R15	n/a	n/a	***0***
Total		**1**	***1***

Figure 81: IWC Centers' Satisfaction with Water Efficient Toilets and Waterless Urinals

Materials and resources

Under the LEED category Materials and Resources a pre-requisite for LEED certification is pre-requisite 1, Storage and Collection of Recyclables. This credit is intended to reduce waste generated by building occupants that is hauled to and disposed of in landfills. The credit indirectly affects building occupants. The USGBC requirements for this credit can be found in the LEED Guide 2.1 in appendix A. The Occupant Evaluation of LEED Certified Health Centers survey asks the respondent to rate their satisfaction with the recycle storage bins at their facility. This question was asked to see how many respondents use the storage bin; also to see if the respondents were satisfied with the issues related to recycle storage bins. If the respondent does not use the recycle bins they were asked to mark 'n/a'.

According to Figure 82, the respondents are satisfied with the recycling bin issues; location, convenience, and cleanliness, at the facility.

Green housekeeping

A LEED Innovation and Design credit, Green Housekeeping, was achieved by some of the health facilities. The Angel Harvey Infant Welfare Society of Chicago did not receive this credit. The respondents were given the same survey as a facility who did receive the credit. Figure 83 displays the results of maintenance issues; floor, fixture, wall cleanliness and odor of products. Overall the Angel Harvey Infant Welfare Society of Chicago was rated satisfactory for all maintenance issues.

LEED SECTION: MATERIALS & RESOURCES

Question Section: Recycling

15. Rate your satisfaction with the following aspects of the recycle storage bins at your facility.

(If you do not use the recycle bins check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Location	◯	◯	◯	◯	◯
Convenience	◯	◯	◯	◯	◯
Cleanliness	◯	◯	◯	◯	◯

R	Location	Convenience	Cleanliness	#12 Overall Satisfaction	Score for each Respondent
R1	n/a	n/a	n/a	n/a	***0***
R2	1	1	1	1	***4***
R3	n/a	n/a	n/a	n/a	***0***
R4	1	1	1	1	***4***
R5	n/a	n/a	n/a	n/a	***0***
R6	1	1	1	1	***4***
R7	1	1	1	1	***4***
R8	1	1	1	1	***4***
R9	n/a	n/a	n/a	n/a	***0***
R10	n/a	n/a	n/a	-1	***-1***
R11	n/a	n/a	n/a	-1	***-1***
R12	1	1	1	n/a	***3***
R13	n/a	n/a	n/a	n/a	***0***
R14	n/a	n/a	n/a	n/a	***0***
R15					***0***
Total	**6**	**6**	**6**	**3**	***21***

Figure 82: IWC Centers' Satisfaction with Recycling Issues

LEED SECTION: INNOVATION & DESIGN PROCESS

Question Section: Maintenance

16. Rate your satisfaction with the following maintenance issues.

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
Floor cleanliness	◯	◯	◯	◯
Fixture cleanliness (sinks and toilets)	◯	◯	◯	◯
Wall cleanliness	◯	◯	◯	◯
Odor of the cleaning products	◯	◯	◯	◯

R	Floor Cleanliness	Fixture Cleanliness (sinks and toilets)	Wall Cleanliness	Odor of Products	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	1	***5***
R2	1	1	1	1	1	***5***
R3	1	1	1	1	1	***5***
R4	1	1	1	1	1	***5***
R5	1	1	1	1	1	***5***
R6	1	1	1	1	1	***5***
R7	1	1	1	1	1	***5***
R8	1	1	1	1	1	***5***
R9	1	1	1	1	1	***5***
R10	1	-1	1	1	1	***3***
R11	1	1	1	1	1	***5***
R12					1	***1***
R13	1	1	1	1	1	***5***
R14	-1	1	1	1	1	***3***
R15	1	1	1	1	1	***5***
Total	**12**	**12**	**14**	**14**	**15**	***67***

Figure 83: IWC Centers' Satisfaction with Maintenance Issues

Daylight and views

The Angel Harvey Infant Welfare Society of Chicago did not receive day-light and view credits. Overall the center was rated satisfactory for both daylight and views questions and issues. The results for daylight and views are reflected in Figure 84. The results for potential issues involving daylight and view issues can be found on Figure 85.

Overall score

Figure 86 shows the different aspects of indoor air quality that respondents are dissatisfied with. The survey question asked the respondents to identify the types of smells that are present in the air. IWC only received the LEED pre-requisites for mandatory for LEED certification that are related to indoor air quality.

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Daylight & Views

17. Rate your satisfaction with the natural daylight issues in your space.

(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Exterior windows	◯	◯	◯	◯	◯
Daylight from the window	◯	◯	◯	◯	◯
Daylight from other sources	◯	◯	◯	◯	◯
View Outside	◯	◯	◯	◯	◯

R	Exterior Window	Daylight from Window	Daylight from other sources	View Outside	#12 Overall Satisfaction	Score for each Respondent
R1	n/a	n/a	n/a	n/a	1	***1***
R2	1	1	1	1	1	***5***
R3	1	1	1	1	1	***5***
R4	1	1	1	1	1	***5***
R5	n/a	n/a	n/a	n/a	1	***1***
R6	1	1	1	1	1	***5***
R7	1	1		1	1	***4***
R8	1	1	n/a	1	1	***4***
R9	n/a	1	1	1	1	***4***
R10	1	1	1	1	1	***5***
R11	1	1	1	1	1	***5***
R12					1	***1***
R13	1	-1	n/a	-1	1	***0***
R14	1	-1	n/a	1	1	***2***
R15	1	1	1	1	1	***5***
Total	**11**	**8**	**8**	**10**	**15**	***52***

Figure 84: IWC Centers' Satisfaction with Day-lighting and Views

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Daylight & Views

18. Rate your satisfaction with issues indirectly related to exterior windows in your space.

(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Acoustics	◯	◯	◯	◯	◯
Privacy	◯	◯	◯	◯	◯
Glare	◯	◯	◯	◯	◯

R	Acoustics	Privacy	Glare	#12 Overall Satisfaction	Score for each Respondent
R1				1	***1***
R2	1	1	1	1	***4***
R3	1	1	1	1	***4***
R4	1	1	1	1	***4***
R5	n/a	n/a	n/a	n/a	***0***
R6	1	1	1	1	***4***
R7	1	1	1	1	***4***
R8	1	-1	1	1	***2***
R9	n/a	n/a	n/a	1	***1***
R10	1	1	1	1	***4***
R11	1	1	1	1	***4***
R12				1	***1***
R13	1	1	-1	1	***2***
R14	-1	1	-1	1	***0***
R15	1	1	1	1	***4***
Total	**9**	**9**	**7**	**14**	***39***

Figure 85: IWC Centers' Satisfaction with Day-lighting and Views Issues

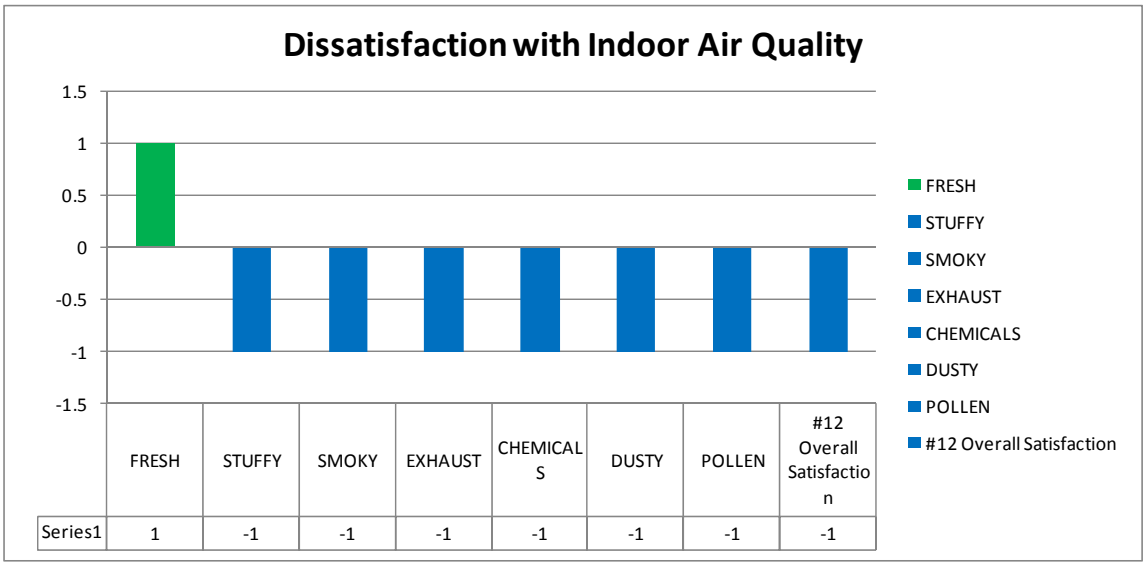


Figure 86: IWC Centers' Dissatisfaction with Indoor Air Quality

The overall satisfaction score for the Angel Harvey Infant Welfare Society of Chicago is calculated by adding the total scores for each perceivable LEED topic; transportation, exterior lighting, landscaping, water efficient plumbing fixtures, recycling, indoor air quality, temperature, adjustable systems, maintenance, day-lighting and views. The total score for each LEED topic is converted to either a positive or negative score.

The Angel Harvey Infant Welfare Society of Chicago was rated satisfactory in every LEED topic except indoor air quality. Table 5 reflects the perceivable LEED points evaluated in this study and the overall satisfaction score in the categories where LEED points were received; (1) for satisfactory and (–1) for dissatisfied. All facilities received the same survey that asked the respondents to evaluate their facility on building aspects

influenced by LEED certification whether the facility received the LEED credit or not. The categories where LEED credit was not received are gray in Table 5.

The final survey question number 13 thanks the respondent for their participation and asks for additional comments. Comments made by the respondents about the IWC facility for survey question 13, can be found in Appendix C.

Table 5: IWC Overall Score for Perceivable LEED Building Features

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
	SUSTAINABLE SITES			
	Transportation			1
I	public transportation access	4.1		
I	bicycle storage & changing rooms	4.2		
I	parking capacity	4.4		
	Exterior Lighting			
I	light pollution reduction	8		
	WATER EFFICIENCY			
	Landscaping			1
I	50% reduction	1.1		
I	no potable use or no irrigation	1.2		
	Water Efficient Plumbing Fixtures			1
I	20% reduction	3.1		
I	30% reduction	3.2		

Table 5: Cont'd

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
	MATERIALS AND RESOURCES			
	Recycling			1
I	storage & collection of recyclables	PR 1		
	INDOOR ENVIRONMENTAL QUALITY			
	Indoor Air Quality (IAQ)		-1	
D	minimum IAQ performance	PR 1		
D	environmental tobacco smoke	PR 2		
D	carbon dioxide (CO_2) monitoring	1		
D	ventilation effectiveness	2		
D	indoor chemical and pollutant source control	5		
	Adjustable Systems			
D	perimeter spaces	6.1		
D	non-perimeter spaces	6.2		

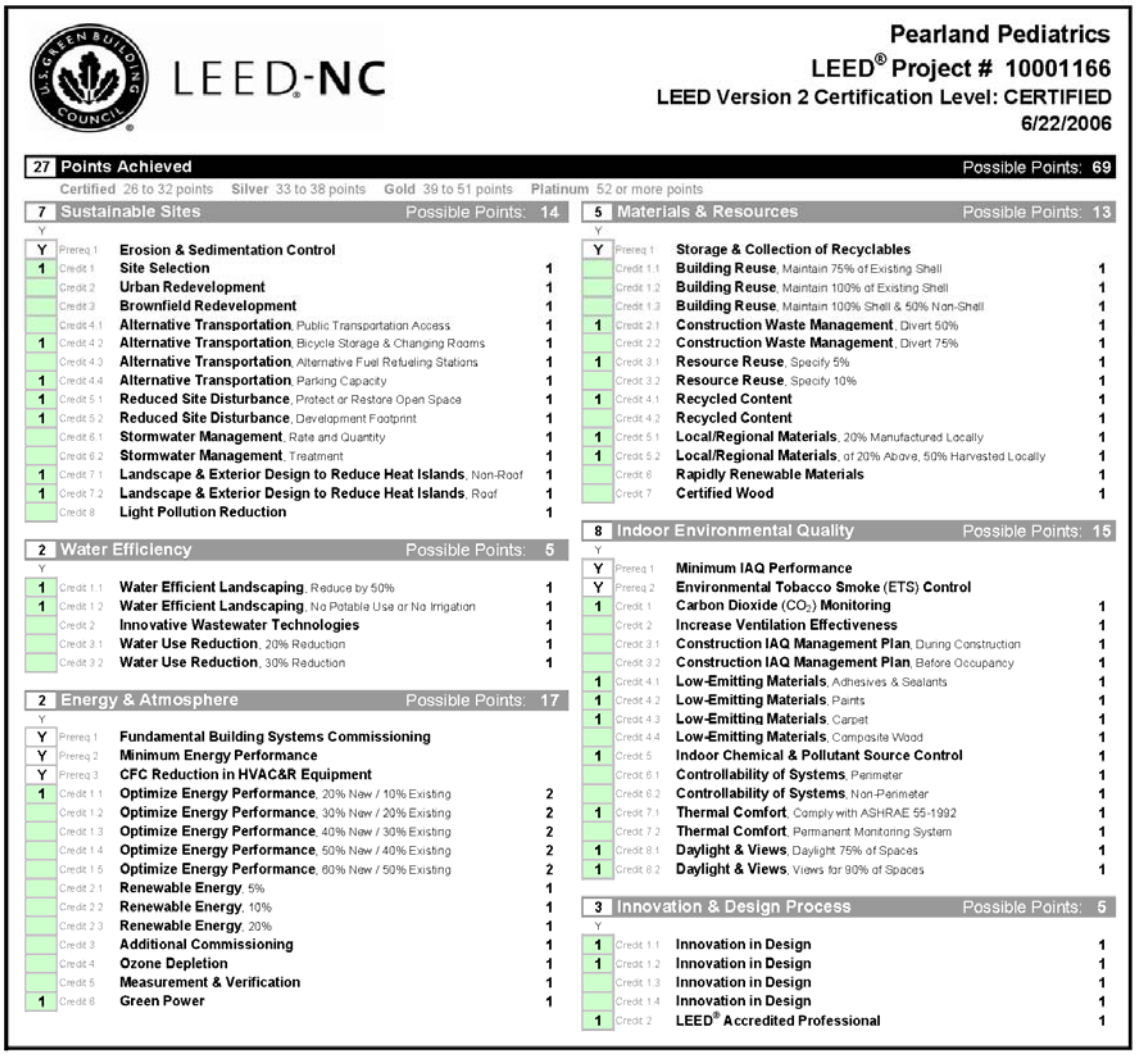
Table 5: Cont'd

Affect	LEED category	Credit	Dissat.	Satisfied
	INDOOR ENVIRONMENTAL QUALITY			
	Temperature			1
D	thermal comfort (ASHRAE 55-1992)	7.1		
D	thermal comfort monitoring system	7.2		
	Day-Lighting & Views			
D	daylight in 75% of spaces	8.1		
D	views in 90% of spaces	8.2		
	INNOVATION AND DESIGN PROCESS			
	Maintenance			
D	green cleaning	~		

Sources: USGBCs LEED Guide 2.1
Occupant Evaluation of LEED Certified Health Centers Thesis

CASE STUDY FOUR: PEARLAND PEDIATRICS

Pearland Pediatrics is located in a suburban area of Houston, Texas. It is the second case study located in a suburban area. Figure 87 is the Pearland Pediatrics LEED score card which shows the LEED credits that were received by the facility.



Pearland Pediatrics
LEED® Project # 10001166
LEED Version 2 Certification Level: CERTIFIED
6/22/2006

27 Points Achieved — Possible Points: 69

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

7 Sustainable Sites — Possible Points: 14

Y			
Y	Prereq 1	Erosion & Sedimentation Control	
1	Credit 1	Site Selection	1
	Credit 2	Urban Redevelopment	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	1
1	Credit 4.4	Alternative Transportation, Parking Capacity	1
1	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
1	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
	Credit 6.1	Stormwater Management, Rate and Quantity	1
	Credit 6.2	Stormwater Management, Treatment	1
1	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
	Credit 8	Light Pollution Reduction	1

2 Water Efficiency — Possible Points: 5

Y			
1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
	Credit 3.1	Water Use Reduction, 20% Reduction	1
	Credit 3.2	Water Use Reduction, 30% Reduction	1

2 Energy & Atmosphere — Possible Points: 17

Y			
Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
1	Credit 1.1	Optimize Energy Performance, 20% New / 10% Existing	2
	Credit 1.2	Optimize Energy Performance, 30% New / 20% Existing	2
	Credit 1.3	Optimize Energy Performance, 40% New / 30% Existing	2
	Credit 1.4	Optimize Energy Performance, 50% New / 40% Existing	2
	Credit 1.5	Optimize Energy Performance, 60% New / 50% Existing	2
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 20%	1
	Credit 3	Additional Commissioning	1
	Credit 4	Ozone Depletion	1
	Credit 5	Measurement & Verification	1
1	Credit 6	Green Power	1

5 Materials & Resources — Possible Points: 13

Y			
Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2	Building Reuse, Maintain 100% of Existing Shell	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50%	1
	Credit 2.2	Construction Waste Management, Divert 75%	1
1	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content	1
	Credit 4.2	Recycled Content	1
1	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

8 Indoor Environmental Quality — Possible Points: 15

Y			
Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1	Credit 1	Carbon Dioxide (CO_2) Monitoring	1
	Credit 2	Increase Ventilation Effectiveness	1
	Credit 3.1	Construction IAQ Management Plan, During Construction	1
	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints	1
1	Credit 4.3	Low-Emitting Materials, Carpet	1
	Credit 4.4	Low-Emitting Materials, Composite Wood	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
	Credit 6.1	Controllability of Systems, Perimeter	1
	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
1	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

3 Innovation & Design Process — Possible Points: 5

Y			
1	Credit 1.1	Innovation in Design	1
1	Credit 1.2	Innovation in Design	1
	Credit 1.3	Innovation in Design	1
	Credit 1.4	Innovation in Design	1
1	Credit 2	LEED® Accredited Professional	1

Figure 87: Pearland Pediatrics LEED Score Card

Figure 88 shows an exterior image of the clinic and the surrounding landscaped areas. Pearland Pediatrics received the water efficiency landscaping credits 1.1 and 1.2. References to the landscaped area around the facility will be mentioned later in the chapter.

Figure 88: Pearland Pediatrics Case Study Exterior Image
Source: Haggard, J. (2007)

The following is a list of general information about the Pearland Pediatrics facility.

Owner:	Pearland Pediatrics
Architect:	Browne Penland McGregor Stephens Architects
Building Type:	New Construction Pediatric facility
Size:	10,388 sqft
Building Location:	Pearland, TX
Recognition:	LEED CERTIFIED

Figure 89 shows an interior image of the Pearland Pediatrics waiting area. The facility received LEED credit for green housekeeping. This image shows the variety of surface finishes and materials that are maintained using green cleaning solutions.

Figure 89: Pearland Pediatrics Interior Image
Source: Haggard J. Photography

Figure 90 is an interior image of the entrance of Pearland Pediatrics. The image shows the interplay of natural and artificial light in the space. The survey asks the respondents to comment on their satisfaction with the acoustics in their space. Figure 90 also shows the amount of noise reflecting materials used in the space.

Figure 90: Pearland Pediatrics Interior Image of Materials Cleaned Using Green Cleaning Procedures and Potential Acoustic and Thermal Issues Mentioned by Occupant Responses to Survey Question 13

Source: Pearland Economic Development Corporation

Pearland Pediatrics is the only case in this research that received indoor environmental quality daylight and view credits 8.1 and 8.2. Figure 91 is an exterior image which shows the amount of glazing and potential daylight into the space. Figure 91 also shows the use of external shading devices to avoid overheating the interior.

Figure 92 shows a floor plan view of the space. Many of the patient rooms and public spaces are located on the perimeter of the building in rooms with windows.

Figure 91: Pearland Pediatrics Exterior Image of windows and external shading devices
Source: Haggard J. Photography

Figure 92: Pearland Pediatrics Floor Plan View of Perimeter/ Public Spaces with Potential View Through Window
Source: Haggard J. Photography

The Pearland Pediatrics facility received a total of twenty-seven LEED points earning the title CERTIFIED green building. The Occupant Evaluation of LEED Certified Health Centers survey was given to fifteen full time employees, at the Pearland Pediatrics, thirteen responded. The answers are anonymous; however the survey does ask respondents to give background information about the respondents that may be relevant to analyzing the responses.

Background information

The first survey question under background information is position held at the Pearland Pediatrics. For the purpose of getting a better perspective of building features, such as water efficient sinks, the survey asks respondents to describe themselves as either medical staff or administrator. Architecturally administrative areas may be designed differently than medical staff/ patient or public areas. For example, both medical staff and administrators may use water efficient sinks; medical staff may use the water efficient sensor sink to fill a cup with water, while administrators may only encounter the sink in a public restroom. As the perceivable features of a LEED health center are discussed, it may be useful to know which perspective the evaluation is from.

Figure 93 shows the perspectives represented for the fourth case study. Five medical staff and eight administrators participated in the occupant evaluation of the Pearland Pediatrics.

Figure 94 shows the percentage of administration and medical staff that will be used to evaluate Pearland Pediatric

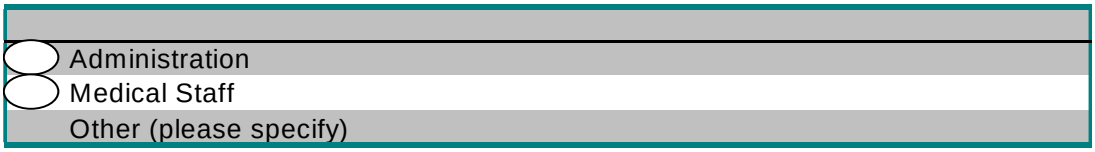
In the survey respondents are asked to report the approximate length of time employed at the facility. This question was asked to get an idea of how long the respondents have had time to observe the building features that may have been influenced by LEED certification.

As shown in Figure 95, eleven of the employees that responded to the survey have worked at Pearland Pediatrics for more than one year. One of the respondents has worked at the facility for six months or less and one respondent has worked there approximately one year.

LEED SECTION: BACKGROUND INFORMATION

Question Section: Position at Health Center

1. Please choose which position best describes you at this health center.



R	*Medical Staff*	*Administration*
R1	1	
R2		1
R3		1
R4		1
R5	1	
R6		1
R7	1	
R8		1
R9		1
R10	1	
R11	1	
R12		1
R13		1
R14		
R15		
Total	**5**	**8**

Figure 93: Pearland Pediatrics Job Position at the Facility

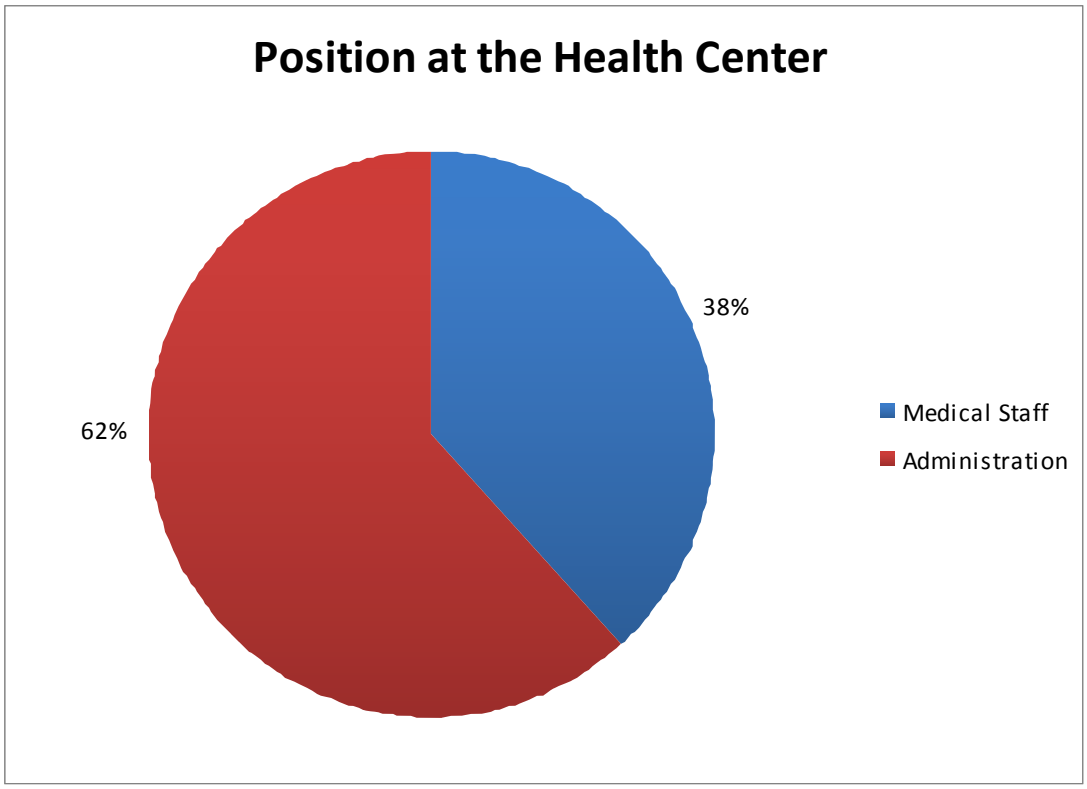


Figure 94: Pearland Pediatrics Pie Chart of Job Position at the Facility

LEED SECTION: BACKGROUND INFORMATION

Question Section: Time Employed at Health Center

2. Approximately how long have you worked at this facility?

- ◯ Less than 6 months
- ◯ 6 months to 1 year
- ◯ More than 1 year

R	*6 months or less*	*1 year*	*more than 1 year*
R1			*1*
R2			*1*
R3			*1*
R4			*1*
R5			*1*
R6			*1*
R7			*1*
R8			*1*
R9			*1*
R10			*1*
R11	1		
R12		1	
R13			*1*
R14			
R15			
Total	**1**	**1**	***11***

Figure 95: Pearland Pediatrics Time Employed at the Facility

Transportation

There are four possible transportation credits under the LEED sustainable sites category; three of which are perceivable credits that are being evaluated with the Occupant Evaluation of LEED Certified Health Centers survey. Pearland Pediatrics received two of the perceivable transportation credits as shown on Figure 87. Pearland Pediatrics received LEED Sustainable Sites credit 4.2, Alternative Transportation: Bicycle Storage and Changing Rooms. The requirement for the credit is to provide secure bicycle storage with convenient changing/shower facilities. This credit was intended to indirectly affect occupants. The intention of the LEED transportation credits is to reduce pollution and land development impacts from automobiles (LEED 2.1, USGBC).

Pearland Pediatrics also received LEED Sustainable Sites credit 4.4 Alternative Transportation, Parking Capacity. The requirements for SS credit 4.4 is to meet, not exceed minimum local zoning requirements for parking and provide preferred parking for carpools and vanpools. Details and calculations for this credit can be found in the LEED Guide 2.1.

Impervious parking has a negative impact on the environment because it increases storm water runoff. Restricting the parking capacity does not necessarily reduce the amount of private automobile use. In this case the SS credit 4.4 was received but SS credit 4.1 Alternative Transportation, Public Transportation Access was not received. A modest parking lot size without access to public transportation indirectly suggests occupants are

being persuaded to carpool or vanpool. The survey question was asked to determine if occupants carpool or vanpool as an occasional mode of transportation.

In Figure 96 respondents show how often they use the following modes of transportation to get to work; primarily and occasionally. In Figure 96, a number (1) in the response table indicates the primary mode of transportation selected by the respondent. The letter 'O' designates which mode of transportation the respondent occasionally uses to get to work. The primary mode of transportation for all of the respondents is a personal car as shown in Figure 97. Figure 98 shows the occasional modes used by the respondents to get to work and the number of respondents who use them. One of the thirteen respondents reported carpooling as an occasional mode of transportation.

Figure 99 shows the responses to LEED building features influenced by LEED sustainable sites transportation credits. In the Occupant Evaluation of LEED Certified Health Centers survey respondents were asked to mark 'n/a' if they do not use the feature inquired about. The facility received a dissatisfactory score for access to public transportation. Access to public transportation is the LEED credit that was not achieved by Pearland Pediatrics. Overall the Pearland Pediatrics received a positive score in the aspects of staff parking, bike storage, shower facilities and overall satisfaction.

LEED SECTION: SUSTAINABLE SITES

Question Section: Transportation

3. How often do you use the following modes of transportation to get to work?

	Daily	Occasionally	Never
Personal Car	◯	◯	◯
Carpool	◯	◯	◯
Bus/Shuttle	◯	◯	◯
Bicycle	◯	◯	◯
Light-rail	◯	◯	◯
Other	◯	◯	◯

R	Personal Car	Carpool	Bus/ Shuttle	Bicycle	Light-rail	Other
R1	1		O		O	WALK
R2	1					
R3	1					
R4	1					
R5	1					
R6	1					
R7	1			O		
R8	1					
R9	1	O				
R10	1					
R11	1					
R12	1					
R13	1					

Figure 96: Pearland Pediatrics Forms of Transportation to get to Work

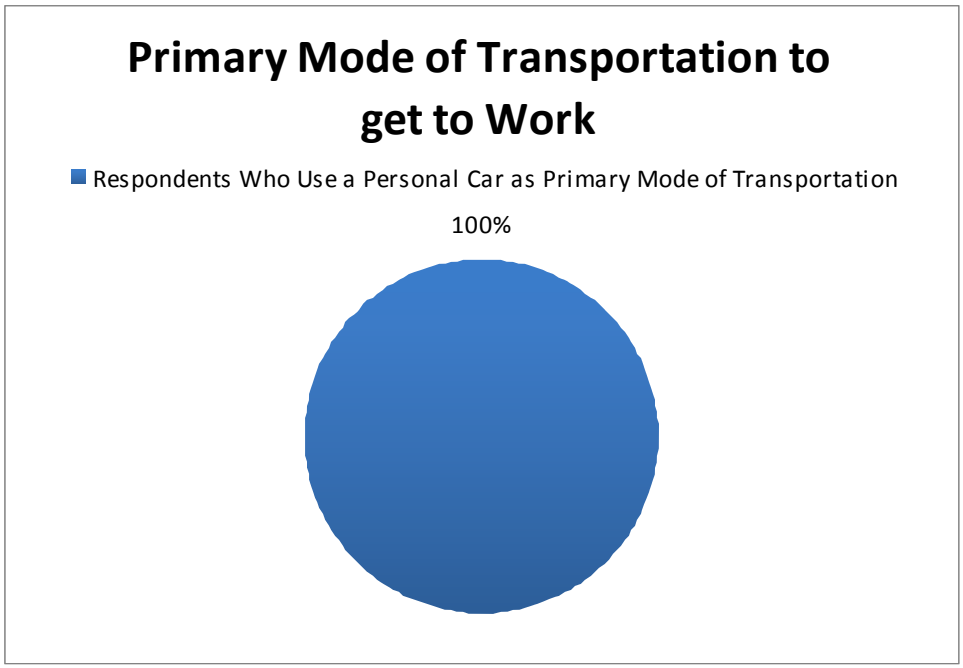


Figure 97: Pearland Pediatrics Primary Mode of Transportation to get to Work

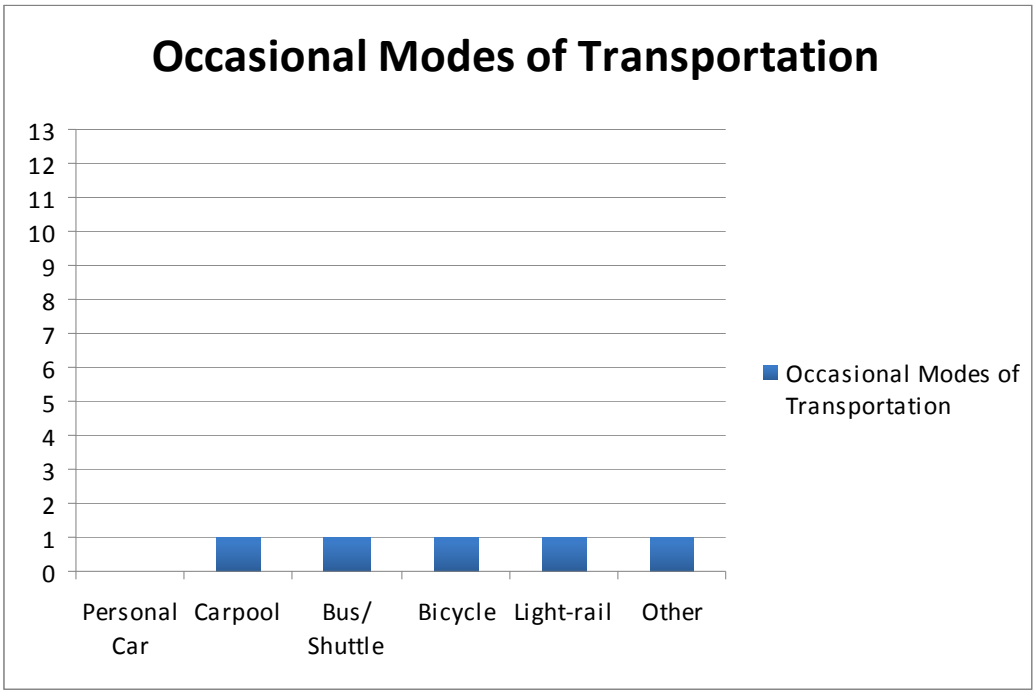


Figure 98: Pearland Pediatrics Occasional Modes of Transportation to get to Work

LEED SECTION: SUSTAINABLE SITES

Question Section: Transportation

4. What is your satisfaction with the following transportation issues?

(If you do not use the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Amount of Staff Parking	◯	◯	◯	◯	◯
Bike Storage Area	◯	◯	◯	◯	◯
Shower facilities	◯	◯	◯	◯	◯
Access to Public Transportation	◯	◯	◯	◯	◯

R	Staff Parking	Bike Storage	Shower Facilities	Access to Public Transportation	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	-1	1	***3***
R2	1	n/a	n/a	n/a	n/a	***1***
R3	1	n/a	n/a	n/a	1	***2***
R4	1	n/a	n/a	n/a	1	***2***
R5	1	n/a	n/a	n/a	1	***2***
R6	1	n/a	1	n/a	n/a	***2***
R7	1	1	1	-1	1	***3***
R8	1	n/a	-1	n/a	1	***1***
R9	-1	n/a	1	-1	-1	***-2***
R10	-1	1	1	n/a	1	***2***
R11	1	n/a	n/a	n/a	n/a	***1***
R12	1	n/a	n/a	n/a		***1***
R13	1	n/a	n/a	n/a	n/a	***1***
Total	**9**	**3**	**4**	**-3**	**6**	***19***

Figure 99: Pearland Pediatrics Satisfaction with Transportation Issues

Exterior lighting

Pearland Pediatrics did not receive LEED Sustainable Sites credit 8, Light Pollution Reduction as shown in Figure 87, the Pearland Pediatrics LEED score card. The four case studies received the same survey whether the facility received the credit or not. Figures 100 and 101 show the respondents evaluation of exterior lighting and issues for the facility.

Figure 102 shows the percentage of respondents who feel safe around the facility and night. Selecting the response ‘n/a’ to survey question number six was interpreted, as the respondent is not at the facility at night.

LEED SECTION: SUSTAINABLE SITES

Question Section: Exterior Lighting

5. Rate your satisfaction with the exterior lighting at night for the following…

(Check N/A box if you are only at the facility during daytime hours)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Facility driveways	◯	◯	◯	◯	◯
Facility entrances	◯	◯	◯	◯	◯
Exterior of the building	◯	◯	◯	◯	◯
staff Parking Area	◯	◯	◯	◯	◯
Walking paths to parking area	◯	◯	◯	◯	◯
Overall safety at night	◯	◯	◯	◯	◯

R	Facility Drive-ways	Facility Entrances	Exterior of Building	Staff Parking Area	Walking Paths to the Parking Area	Overall Safety at Night	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	1	1	1	1	1	1	***7***
R2	1	1	1	1	1	1	1	***7***
R3	-1	1	1	1	1		1	***4***
R4	1	1	1	1	n/a	1	1	***6***
R5	1	1	1	1	1	1	1	***7***
R6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	***0***
R7	1	1	1	1	1	1	1	***7***
R8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	***0***
R9	-1	1	1	-1	1	-1	1	***1***
R10	-1	1	1	-1	-1	1	1	***1***
R11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	***0***
R12	1	1	1	1		-1	-1	***2***
R13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	***0***
Total	**3**	**9**	**9**	**5**	**5**	**4**	**7**	***42***

Figure 100: Pearland Pediatrics Satisfaction with Exterior Lighting Issues

LEED SECTION: SUSTAINABLE SITES

Question Section: Exterior Lighting

6. Does the lighting on the exterior of the facility make you feel safe at night? (If you are not at the facility at night check the N/A box)

R	Yes	No	N/A
R1	1		
R2	1		
R3			1
R4	1		
R5	1		
R6			1
R7	1		
R8			1
R9		1	
R10	1		
R11			1
R12		1	
R13			1
Total	6	2	5

Figure 101: Pearland Pediatrics Satisfaction with Security from Exterior Lighting Around the Facility at Night

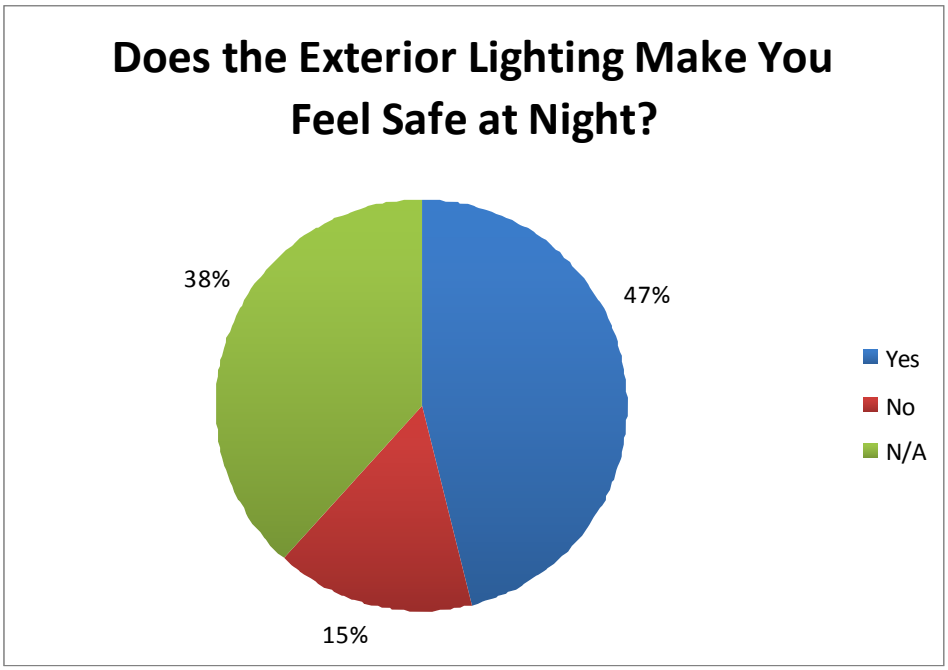


Figure 102: Pearland Pediatrics Satisfaction with Security from Exterior Lighting Around the Facility at Night Pie Chart

Landscaping

There are two possible Water Efficiency Landscaping Credits: Water Efficient Landscaping 1.1 and 1.2. To achieve Water Efficient Landscaping credit 1.1, potable water use for irrigation must be reduced by 50%. Strategies include installing a high-efficiency irrigation system, or harvesting rain water. Pearland Pediatrics received both Water Efficient Landscaping LEED credits 1.1 and 1.2, which means no potable water for irrigation is used for the landscape. A typical strategy to receive this credit is to employ a xeriscape design if no other water re-use, or harvesting program is in place.

Xeriscape designs use indigenous vegetation that can be naturally sustained in the soil and weather conditions of the area.

Respondents are asked if there is a landscaped area outside of the facility. Figure 103 shows that all of the respondents are aware of the landscape. Figure 104 shows the percentage of respondents who recognize the landscaped area outside of the facility.

The Occupant Evaluation of LEED Certified Health Centers survey asks the respondents to report on landscape issues; health of the planting and satisfaction with landscape design. Satisfaction with landscape design is subjective. Many landscape designs use plants that are not native to the environment they are being installed into. For example tropical plants require a lot of water, and require more than the natural rainfall in a non-tropical region to sustain it.

Many times potable water, or water that is from aquifers or that is processed and drinkable for humans, is used for irrigation. The USGBC considers potable water a finite resource and encourages facilities to use non-potable water for irrigation purposes. Figure 105 shows that the facility received a satisfactory score in issues related to water efficient landscaping.

LEED SECTION: WATER EFFICIENCY

Question Section: Landscape

7. Is there a landscaped area outside the facility?

R	Yes	No	I Don't Know
R1	1		
R2	1		
R3	1		
R4	1		
R5	1		
R6	1		
R7	1		
R8	1		
R9	1		
R10	1		
R11	1		
R12	1		
R13	1		
Total	13	0	0

Figure 103: Pearland Pediatrics Recognition of the Landscaped Area Outside of the Facility

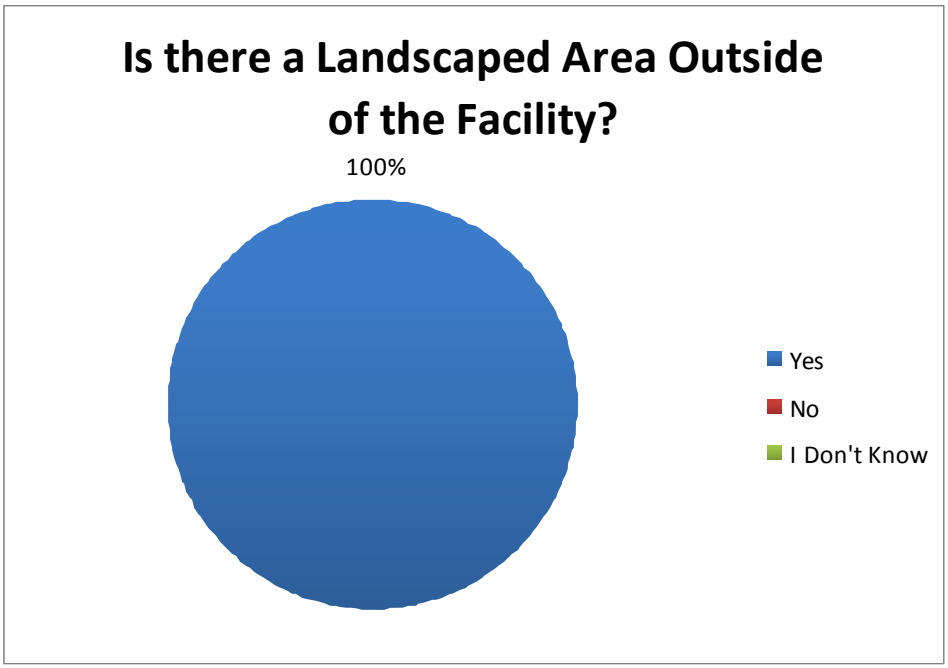


Figure 104: Pearland Pediatrics Recognition of the Landscaped Area Outside of the Facility Pie Chart

LEED SECTION: WATER EFFICIENCY

Question Section: Landscape

8. Rate how satisfied you are with the landscaped area.

(If you do not have one check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Health of Plantings	⬭	⬭	⬭	⬭	⬭
Satisfaction with landscape design	⬭	⬭	⬭	⬭	⬭

R	Health of Plantings	Satisfaction with Landscape Design	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	***3***
R2	1	1	1	***3***
R3	1	1	1	***3***
R4	1	1	1	***3***
R5	1	1	1	***3***
R6	1	1	1	***3***
R7	1	1	1	***3***
R8	1	1	1	***3***
R9	1	-1	-1	***-1***
R10	-1	-1	1	***-1***
R11	1	1	-1	***1***
R12	-1	-1	-1	***-3***
R13	1	1	1	***3***
TOTAL	**9**	**7**	**7**	***23***

Figure 105: Pearland Pediatrics Satisfaction with the Landscape

IAQ

There are several LEED credits that the indoor air quality question involves. These are found in the LEED Guide 2.1 in appendix A, under the Indoor Environmental Quality, (IEQ) LEED category. Perceivable IEQ credits directly affect building occupants. The intentions for these credits vary and can be found in the LEED 2.1 Guide. Two of the credits, IEQ pre-requisite 1 and IEQ pre-requisite 2 are mandatory for LEED certification; minimum indoor air quality performance and environmental tobacco smoke control. In addition to the pre-requisites under the LEED section indoor environmental quality, Pearland Pediatrics received IEQ credit 1, Carbon Dioxide Monitoring. To fulfill the requirements for this credit a permanent carbon dioxide monitoring system that provides feed back on space ventilation performance in a form that affords operational adjustments must be installed.

Pearland Pediatrics also achieved IEQ credit 5, Indoor Chemical and Pollutant Source Control. The requirements for this credit include incorporating permanent entryway systems (grills, grates, etc.) to capture dirt and particulates from entering the building at all high volume entryways, providing deck to deck partitions with separate outside exhaust where chemicals, like cleaning materials are used, and providing drains for appropriate disposal of liquid waste where water and chemical concentrate mixing occurs (LEED Guide 2.1, USGBC). The Occupant Evaluation of LEED Certified Health Centers survey asks the respondents to evaluate the quality of the indoor air. The responses for stuffy, smoky, exhaust, chemicals, dusty, and pollen have been inverted to

show satisfaction and dissatisfaction. Figure 106 reflects an overall satisfactory score from the occupants. The respondents' score showed dissatisfaction with the aspect of 'stuffiness' in the facility.

Controllability of systems

Controllability of Systems, perimeter and non-perimeter are LEED credits categorized under the LEED Indoor Environmental Quality category as credits 6.1 and 6.2. Pearland Pediatrics did not receive these credits. The same survey was administered to all of the facilities whether the credit was received or not. Figure 107 and 108 show the responses for the ability to control building systems for personal comfort.

Figure 107 shows dissatisfaction with the ability to adjust systems for thermal comfort. There was no data for satisfaction with an exterior window and ceiling fan. The data received for exterior window was cancelled out; two responded satisfied and two responded with dissatisfaction. The respondent showed dissatisfaction with the ability to adjust air flow vents. Pearland Pediatrics received the IEQ daylight and views credit as seen in Figure 87.

Figure 108, shows a tied score for the ability to use a dimmer for light adjustment. Overall the respondents showed satisfaction with the ability to adjust for lighting needs.

LEED SECTION: INDOOR AIR QUALITY

Question Section: Indoor Air Quality

9. Does the indoor air smell like the following?

	Always	Often	Rarely	Never
Fresh	◯	◯	◯	◯
Stuffy	◯	◯	◯	◯
Smoky	◯	◯	◯	◯
Like Vehicle Exhaust	◯	◯	◯	◯
Like Cleaning Chemicals	◯	◯	◯	◯
Dusty	◯	◯	◯	◯
Like Pollen	◯	◯	◯	◯

R	FRESH	STUFFY	SMOKY	EXHAUST	CHEM-ICALS	DUSTY	POLLEN	#12 Overall Satis-faction	Score for each Respon-dent
R1	1	-1	1	1	1	1	1	1	***6***
R2	1	-1	1	1	1	1	1	1	***6***
R3	1	1	1	1	1	1	1	1	***8***
R4	1	1	1	1	1	1	1	1	***8***
R5	1	1	1	1	1	1	1	1	***8***
R6	1	-1	1	1	1	1	1	1	***6***
R7	1	1	1	1	1	1	1	1	***8***
R8	1	-1	1	1	1	1	1	1	***6***
R9	-1	-1	1	1	1	-1	1	-1	***0***
R10	1	-1	1	1	1	1	1	-1	***4***
R11	1	1	1	1	1	1	1	1	***8***
R12	-1	-1	1	1	1	1	1	-1	***2***
R13	1	-1	1	1	1	1	1	-1	***4***
Total	**9**	**-3**	**13**	**13**	**13**	**11**	**13**	**5**	***74***

Figure 106: Pearland Pediatrics Satisfaction with Indoor Air Quality at the Facility

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: *Adjustable Systems* Thermal Comfort

10. Rate your satisfaction with the ability to adjust the following for thermal comfort?

(If you cannot adjust check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Thermostat	◯	◯	◯	◯	◯	◯
Exterior window	◯	◯	◯	◯	◯	◯
Ceiling Fan	◯	◯	◯	◯	◯	◯
Airflow vent	◯	◯	◯	◯	◯	◯

R	Thermostat	Exterior Window	Ceiling Fan	Air Flow Vent	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	n/a	-1	1	***2***
R2	-1	n/a	n/a	n/a	-1	***-2***
R3	-1	n/a	n/a	n/a	1	***0***
R4	DNADJ	n/a	n/a	n/a	1	***1***
R5	1	1	n/a	DNADJ	1	***3***
R6	DNADJ	n/a	n/a	n/a	-1	***-1***
R7	1	DNADJ	n/a	DNADJ	1	***2***
R8	1	n/a	n/a	n/a	1	***2***
R9	-1	-1	n/a	-1	-1	***-4***
R10	-1	n/a	n/a	n/a	-1	***-2***
R11	1	n/a	n/a	DNADJ	-1	***0***
R12	-1				-1	***-2***
R13	1	-1		-1	-1	***-2***
Total	**1**	**0**	**0**	**-3**	**-1**	***-3***

Figure 107: Pearland Pediatrics Satisfaction with Adjustable Systems Control for Thermal Comfort

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: *Adjustable Systems* Control of Lighting

11. Rate your satisfaction with the ability to adjust the following to control lighting. (If you cannot adjust check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Light switch	⬭	⬭	⬭	⬭	⬭	⬭
Light dimmer	⬭	⬭	⬭	⬭	⬭	⬭
Window blind/shade	⬭	⬭	⬭	⬭	⬭	⬭
Desk light	⬭	⬭	⬭	⬭	⬭	⬭

R	Light Switch	Light Dimmer	Window Blind/ Shade	Desk Light	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	1	***5***
R2	1	n/a	1	1	-1	***2***
R3	1	n/a	n/a	n/a	1	***2***
R4	DNADJ	DNADJ	1	n/a	1	***2***
R5	1	n/a	1	1	1	***4***
R6	1	n/a	n/a	n/a	n	***1***
R7	1	1	DNADJ	n/a	1	***3***
R8	1	n/a	-1	n/a	1	***1***
R9	-1	-1	n/a	-1	-1	***-4***
R10	1	n/a	n/a	1	1	***3***
R11	1	n/a	DNADJ	n/a	1	***2***
R12	-1	n/a	n/a	n/a	-1	***-2***
R13	1	-1	n/a	-1	-1	***-2***
Total	**8**	**0**	**3**	**2**	**4**	***17***

Figure 108: Pearland Pediatrics Satisfaction with Adjustable Systems Control for Lighting

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Thermal Comfort

12. Rate your satisfaction with the following temperature related issues with your space.

	Satisfied	*Somewhat Satisfied*	*Somewhat Dissatisfied*	*Dissatisfied*
Humidity	⬭	⬭	⬭	⬭
Temperature in your space	⬭	⬭	⬭	⬭

R	*Humidity*	*Temperature in your Space*	*#12 Overall Satisfaction*	*Score for each Respondent*
R1	-1	1	1	***1***
R2	-1	1	1	***1***
R3	1	1	1	***3***
R4	1	1	1	***3***
R5	1	1	1	***3***
R6	1	-1	n/a	***0***
R7	1	1	1	***3***
R8	-1	-1	1	***-1***
R9	-1	-1	-1	***-3***
R10	1	-1	-1	***-1***
R11	1	1	1	***3***
R12	-1	-1	-1	***-3***
R13	-1	1	-1	***-1***
Total	**1**	**3**	**4**	***8***

Figure 109: Pearland Pediatrics Satisfaction with Thermal Comfort Issues

Thermal Comfort

Under the LEED Indoor Environmental Quality category, two Thermal Comfort credits are available, 7.1 Comply with ASHRAE 55-1992 and 7.2 Permanent Monitoring System. The details of the credits can be found in the LEED Guide 2.1 in appendix A. The thermal comfort credits directly affect building occupants. The intention of the thermal comfort credits is to provide a thermally comfortable environment for occupants. The Occupant Evaluation of LEED Certified Health Centers survey asked the respondents to report their satisfaction with humidity and the temperature in their space.

Pearland Pediatrics received one of the Thermal Comfort credits 7.1. Figure 109 shows the responses for thermal comfort. The facility received a satisfactory rating for 'humidity and temperature in your space' aspect. Almost half of the respondents reported dissatisfaction with humidity. The aspect received a satisfactory score. This may be related to dissatisfaction reported in indoor air quality topic with 'stuffiness' in Figure 106. Overall Pearland Pediatrics received a satisfactory rating for thermal comfort.

Water Efficiency

LEED Water Efficiency category credits 3.1 and 3.2 Water Use Reduction are evaluated in The Occupant Evaluation of LEED Certified Health Centers survey. Pearland Pediatrics did not receive these credits as shown in Figure 87. Figure 110 and Figure 111 show evaluations of the facility with the water efficiency topic. Figure 110 shows respondents dissatisfaction with sinks with automatic sensors and push/twist timed faucets. Overall Pearland Pediatrics was rated satisfactory with water efficient sinks, toilets and urinals.

LEED SECTION: WATER EFFICIENCY

Question Section: Water Efficient Sinks

13. Rate your satisfaction with the following sink features that are used at the facility.

(If you do not have the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Sink faucets	◯	◯	◯	◯	◯
Automatic sensors	◯	◯	◯	◯	◯
Push/twist timed faucets	◯	◯	◯	◯	◯

R	Sink Faucets	Automatic Sensors	Push/ Twist Timed Faucets	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	n/a	1	***3***
R2	-1	-1	-1	-1	***-4***
R3	1	-1	n/a	1	***1***
R4	1	1	n/a	1	***3***
R5	1	1	n/a	1	***3***
R6	1	n/a	n/a	1	***2***
R7	1	-1	-1	1	***0***
R8	1	-1	n/a	-1	***-1***
R9	-1	-1	n/a	1	***-1***
R10	-1	-1	n/a	n/a	***-2***
R11	1	1	n/a	1	***3***
R12	-1	-1	n/a	-1	***-3***
R13	1	-1	n/a	-1	***-1***
Total	**5**	**-4**	**-2**	**4**	***3***

Figure 110: Pearland Pediatrics Satisfaction with Water Efficient Sinks

LEED SECTION: WATER EFFICIENCY

Question Section: Toilets & Urinals

14. Rate your satisfaction with the toilet features used in the facility.

(If you do not have, or do not use the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Low flow toilets	◯	◯	◯	◯	◯
Automatic sensors	◯	◯	◯	◯	◯
Dual flush buttons	◯	◯	◯	◯	◯
Waterless urinals	◯	◯	◯	◯	◯

R	Low Flow Toilets	Automatic Sensors	Dual Flush Buttons	#12 Overall Satisfaction	Score for each Respondent
R1	1	n/a	1	1	***3***
R2	-1	-1	-1	-1	***-4***
R3	1	n/a	1	1	***3***
R4	1	n/a	1	1	***3***
R5	1	n/a	1	1	***3***
R6	1	n/a	1	1	***3***
R7	1	n/a	n/a	1	***2***
R8	-1	n/a	-1	-1	***-3***
R9	-1	n/a	-1	-1	***-3***
R10	-1	n/a	-1	n/a	***-2***
R11	-1	n/a	n/a	1	***0***
R12	1	n/a	1	1	***3***
R13	-1	n/a	-1	-1	***-3***
Total	**1**	**-1**	**1**	**4**	***5***

Figure 111: Pearland Pediatrics Satisfaction with Water Efficient Toilets and Waterless Urinals

Materials and resources

Under the LEED category Materials and Resources a mandatory credit for LEED certification is pre-requisite 1, Storage and Collection of Recyclables. This credit is intended to reduce waste generated by building occupants that is hauled to and disposed of in landfills. The credit indirectly affects building occupants. The USGBC requirements for this credit can be found in the LEED Guide 2.1. The Occupant Evaluation of LEED Certified Health Centers survey asks the respondent to rate their satisfaction with the recycle storage bins at their facility. This question was asked to see how many respondents use the storage bin; also to see if the respondents were satisfied with the issues related to recycle storage bins. If the respondent does not use the recycle bins they were asked to mark ‘n/a’.

According to Figure 112 the respondents are satisfied with the recycling bin issues; location, convenience, and cleanliness, at the facility. Six of the ten who responded marked ‘n/a’ (that they did not use the recycle bins) for this set of questions. Pearland Pediatrics received a satisfactory rating for the recycling.

Green Housekeeping

A LEED Innovation and Design credit, Green Housekeeping, was achieved by some of the health facilities. This is a non-standard credit. Credit for green housekeeping is awarded by the USGBC for facilities who apply for the credit under the sixth LEED category; innovation and design. The credit means the facility pledges to use housekeeping products that are environmentally friendly. This credit indirectly affects building occupants. The intention of this credit is to protect the health of building occupants and cleaning professionals by using non-toxic cleaning solutions. The question was asked to gauge occupant satisfaction with the results from using green housekeeping products.

Figure 113 displays the results of maintenance issues; floor, fixture, wall cleanliness and odor of products. Overall Pearland Pediatrics was rated satisfactory for most maintenance issues. The respondents recorded dissatisfaction with wall cleanliness.

LEED SECTION: MATERIALS & RESOURCES

Question Section: Recycling

15. Rate your satisfaction with the following aspects of the recycle storage bins at your facility.

(If you do not use the recycle bins check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Location	◯	◯	◯	◯	◯
Convenience	◯	◯	◯	◯	◯
Cleanliness	◯	◯	◯	◯	◯

R	Location	Convenience	Cleanliness	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	***4***
R2	n/a	n/a	n/a	n/a	
R3	n/a	n/a	n/a	1	***1***
R4	n/a	n/a	n/a	n/a	
R5	1	1	1	1	***4***
R6	n/a	n/a	n/a	1	***1***
R7	1	1	1	1	***4***
R8	n/a	n/a	n/a	n/a	
R9	-1	n/a	n/a	-1	***-2***
R10	n/a	n/a	n/a	n/a	
R11					
R12					
R13					
Total	**2**	**3**	**3**	**4**	***12***

Figure 112: Pearland Pediatrics Satisfaction with Recycling Issues

LEED SECTION: INNOVATION & DESIGN PROCESS

Question Section: Maintenance

16. Rate your satisfaction with the following maintenance issues.

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
Floor cleanliness	◯	◯	◯	◯
Fixture cleanliness (sinks and toilets)	◯	◯	◯	◯
Wall cleanliness	◯	◯	◯	◯
Odor of the cleaning products	◯	◯	◯	◯

R	Floor Cleanliness	Fixture Cleanliness (sinks and toilets)	Wall Cleanliness	Odor of Products	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	-1	1	1	***3***
R2	1	1	-1	1	1	***3***
R3	1	1	1	1	1	***5***
R4	1	1	1	1	1	***5***
R5	1	1	-1	1	1	***3***
R6	-1	-1	-1	1	-1	***-3***
R7	-1	1	1	1	1	***3***
R8	1	-1	-1	-1	1	***-1***
R9	-1	1	1	1	1	***3***
R10	1	1	-1	1	-1	***1***
R11	1	1	1	1	1	***5***
R12	1	1	-1	1	-1	***1***
R13	1	-1	-1	-1	-1	***-3***
Total	**7**	**7**	**-3**	**9**	**5**	***25***

Figure 113: Pearland Pediatrics Satisfaction with Maintenance Issues

Daylight and views

Pearland Pediatrics received the daylight and view credits. To receive Indoor Environmental Quality credits 8.1 Daylight and Views Daylight in 75% of spaces the facility must achieve a minimum daylight Factor of 2% (excluding all direct sunlight penetration) in 75% of all space occupied for critical visual tasks. The intentions for these credits are to provide the building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building (LEED Guide 2.1, USGBC). To receive Indoor Environmental Quality credits 8.1 Daylight and Views, Views for 90% of Spaces a direct line of sight to vision glazing for building occupants in 90% of all regularly occupied spaces must be achieved. Details and design strategies for IEQ Daylight and Views credits 8.1 and 8.2 refer to the LEED Guide 2.1.

Overall the center was rated satisfactory for both daylight and views questions and issues. The results for daylight and views are reflected in Figure 114. In the figure the question (?) mark for respondent 11, for exterior window, daylight from window, and daylight from other sources, is to designate where the respondent marked both satisfaction and dissatisfaction with the aspects of daylight and views.

The results for potential issues involving daylight and view issues can be found on Figure 115. Twelve respondents evaluated Pearland Pediatrics on acoustics and privacy. The score was divided between satisfaction and dissatisfaction for both aspects;

therefore there is not enough data to draw a conclusion for acoustics or privacy concerning daylight and views. Respondents reported satisfaction with glare. Overall Pearland Pediatrics was rated satisfactory for the introduction of daylight and views in the facility.

Overall score

Figure 116 shows the respondents dissatisfaction with adjustable systems: thermal comfort. Pearland Pediatrics did not receive IEQ 6.1, 6.2: Controllability of Systems LEED credits, however the facility did receive LEED credit 7.1 Thermal Comfort. For the exterior window aspect of the ability to adjust for thermal comfort question, two respondents answered with satisfaction and two with dissatisfaction. There is no score recorded for this aspect because the negative responses cancelled the satisfactory responses.

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Daylight & Views

17. Rate your satisfaction with the natural daylight issues in your space.

(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Exterior windows	◯	◯	◯	◯	◯
Daylight from the window	◯	◯	◯	◯	◯
Daylight from other sources	◯	◯	◯	◯	◯
View Outside	◯	◯	◯	◯	◯

R	Exterior Window	Daylight from Window	Daylight from other sources	View Outside	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	1	***5***
R2	1	1	1	1	1	***5***
R3	1	1	1	1	1	***5***
R4	1	1	1	1	1	***5***
R5	1	1	1	1	1	***5***
R6	1	1	1	1	1	***5***
R7	1	1	1	1	1	***5***
R8	-1	1	-1	1	1	***1***
R9	1	1	1	1	1	***5***
R10	-1	1		1	1	***2***
R11				-1	1	***0***
R12	1	1	1	-1	-1	***1***
R13			-1		-1	***-2***
Total	**7**	**11**	**7**	**8**	**9**	***42***

Figure 114: Pearland Pediatrics Satisfaction with Day-lighting and Views

LEED SECTION: INDOOR ENVIRONMENTAL QUALITY

Question Section: Daylight & Views

18. Rate your satisfaction with issues indirectly related to exterior windows in your space.

(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Acoustics	◯	◯	◯	◯	◯
Privacy	◯	◯	◯	◯	◯
Glare	◯	◯	◯	◯	◯

R	Acoustics	Privacy	Glare	#12 Overall Satisfaction	Score for each Respondent
R1	1	1	1	1	***4***
R2	-1	-1	1	1	***0***
R3	1	1	1	1	***4***
R4	1	1	-1	1	***2***
R5	1	-1	1	1	***2***
R6	-1	1	1	1	***2***
R7	1	1	1	1	***4***
R8	-1	-1	1	-1	***-2***
R9	1	1	1	-1	***2***
R10	-1	-1	-1	1	***-2***
R11	-1	-1	1	1	***0***
R12	-1	-1	-1	-1	***-4***
R13				-1	***-1***
Total	**0**	**0**	**6**	**5**	***11***

Figure 115: Pearland Pediatrics Satisfaction with Day-lighting and View Issues

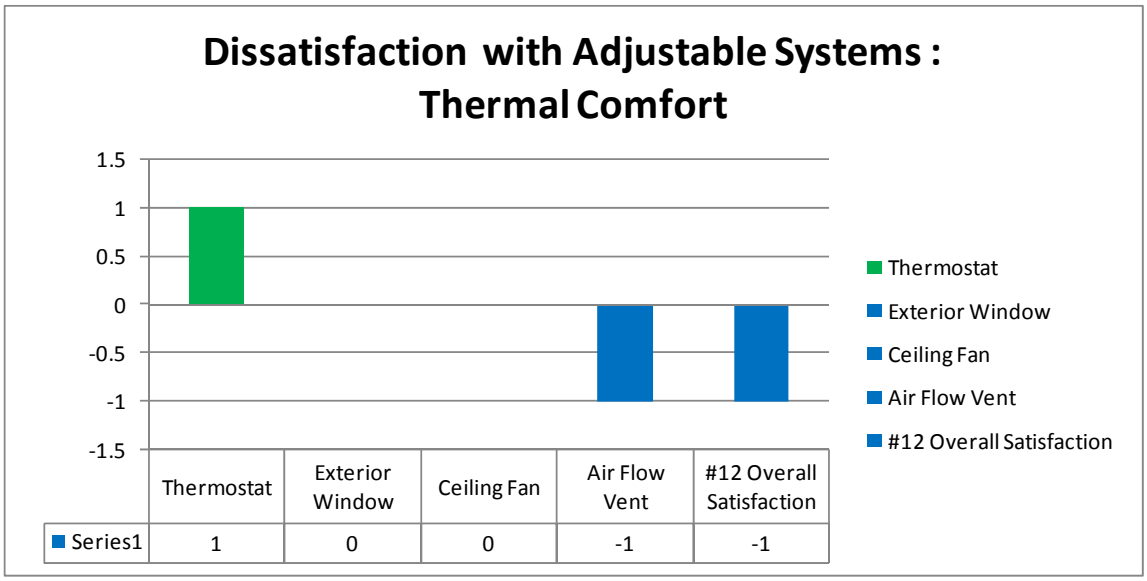


Figure 116: Pearland Pediatrics Dissatisfaction with Adjustable Systems: Thermal Comfort

The overall satisfaction score for the Pearland Pediatrics is calculated by adding the total scores for each perceivable LEED topic; transportation, exterior lighting, landscaping, water efficient plumbing fixtures, recycling, indoor air quality, temperature, adjustable systems, maintenance, day-lighting and views. The total score for each LEED topic is converted to either a positive or negative score.

Overall Pearland Pediatrics received a satisfactory rating by the medical staff and administrators employed at the facility. Table 6 reflects the perceivable LEED points evaluated in this study and the overall satisfaction score in the categories where LEED points were received; (1) for satisfactory and (–1) for dissatisfied. All facilities received the same survey that asked the respondents to evaluate their facility on building aspects

influenced by LEED certification whether the facility received the LEED credit or not. The categories where LEED credit was not received are gray in Table 6.

The final survey question number 13 thanks the respondent for their participation and asks for additional comments. Seven respondents took the opportunity to express their concerns about perceivable building features influenced by LEED certification. Comments made by the respondents about the Pearland Pediatric facility for survey question 13, can be found in Appendix C.

Table 6: Pearland Pediatrics Overall Score for Perceivable LEED Building Features

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
	SUSTAINABLE SITES			
	Transportation			1
I	public transportation access	4.1		
I	bicycle storage & changing rooms	4.2		
I	parking capacity	4.4		
	Exterior Lighting			
I	light pollution reduction	8		
	WATER EFFICIENCY			
	Landscaping			1
I	50% reduction	1.1		
I	no potable use or no irrigation	1.2		
	Water Efficient Plumbing Fixtures			
I	20% reduction	3.1		
I	30% reduction	3.2		

Table 6: Cont'd

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
		MATERIALS AND RESOURCES		
	Recycling			1
I	storage & collection of recyclables	PR 1		
		INDOOR ENVIRONMENTAL QUALITY		
	Indoor Air Quality (IAQ)			1
D	minimum IAQ performance	PR 1		
D	environmental tobacco smoke	PR 2		
D	carbon dioxide (CO_2) monitoring	1		
D	ventilation effectiveness	2		
D	indoor chemical and pollutant source control	5		
	Adjustable Systems			
D	perimeter spaces	6.1		
D	non-perimeter spaces	6.2		

Table 6: Cont'd

Affect	*LEED category*	*Credit*	*Dissat.*	*Satisfied*
		INDOOR ENVIRONMENTAL QUALITY		
	Temperature			1
D	thermal comfort (ASHRAE 55-1992)	7.1		
D	thermal comfort monitoring system	7.2		
	Day-Lighting & Views			1
D	daylight in 75% of spaces	8.1		
D	views in 90% of spaces	8.2		
		INNOVATION AND DESIGN PROCESS		
	Maintenance			1
D	green cleaning	~		

Sources: USGBCs LEED Guide 2.1
Occupant Evaluation of LEED Certified Health Centers Thesis

Table 7 summarizes the overall satisfaction score and LEED points received by each LEED certified health center in this study. The LEED credits are listed under the category they refer to in the survey. The LEED credits that were received by the facility are in bold type.

Table 7: Comparison of Overall Satisfaction and Perceivable LEED Points Received by the LEED Certified Health Centers

S = Satisfaction D = Dissatisfaction

LEED CATEGORIES	DISCOVERY HEALTH CENTER
TRANSPORTATION	**S**
Transportation 4.1	
Transportation 4.2	
Transportation 4.4	
EXTERIOR LIGHTING	**S**
Exterior Lighting 8.0	
LANDSCAPE	**S**
Landscape 1.1	
Landscape 1.2	
RECYCLING	**S**
Storage & Collection of Recyclables	
WATER EFFICIENCY	**S**
Water Use Reduction 3.1	
Water Use Reduction 3.2	
INDOOR AIR QUALITY	**S**
Minimum IAQ Performance PR 1	
Environmental Tobacco Smoke Control PR 2	
Carbon Dioxide Monitoring 1	
Increase Ventilation Effectiveness 2	
Indoor Chemical & Pollutant Source Control 5	
ADJUSTABLE SYSTEMS	**S**
Controllability of Systems, Perimeter 6.1	
Controllability of Systems, Non-Perimeter 6.2	
TEMPERATURE	**S**
Thermal Comfort 7.1	
Thermal Comfort 7.2	
DAYLIGHT & VIEWS	**S**
Daylight & Views 8.1	
Daylight & Views 8.2	
GREEN HOUSEKEEPING	**S**
Green Housekeeping	

LEED CATEGORIES	PEARLAND PEDIATRICS
TRANSPORTATION	**S**
Transportation 4.1	
Transportation 4.2	
Transportation 4.4	
EXTERIOR LIGHTING	**S**
Exterior Lighting 8.0	
LANDSCAPE	**S**
Landscape 1.1	
Landscape 1.2	
RECYCLING	**S**
Storage & Collection of Recyclables	
WATER EFFICIENCY	**S**
Water Use Reduction 3.1	
Water Use Reduction 3.2	
INDOOR AIR QUALITY	**S**
Minimum IAQ Performance PR 1	
Environmental Tobacco Smoke Control PR 2	
Carbon Dioxide Monitoring 1	
Increase Ventilation Effectiveness 2	
Indoor Chemical & Pollutant Source Control 5	
ADJUSTABLE SYSTEMS	**S**
Controllability of Systems, Perimeter 6.1	
Controllability of Systems, Non-Perimeter 6.2	
TEMPERATURE	**D**
Thermal Comfort 7.1	
Thermal Comfort 7.2	
DAYLIGHT & VIEWS	**S**
Daylight & Views 8.1	
Daylight & Views 8.2	
GREEN HOUSEKEEPING	**S**
Green Housekeeping	

Table 7: Cont'd

S = Satisfaction D = Dissatisfaction

LEED CATEGORIES	LACKS CANCER CENTER
TRANSPORTATION	S
Transportation 4.1	
Transportation 4.2	
Transportation 4.4	
EXTERIOR LIGHTING	S
Exterior Lighting 8.0	
LANDSCAPE	S
Landscape 1.1	
Landscape 1.2	
RECYCLING	S
Storage & Collection of Recyclables	
WATER EFFICIENCY	S
Water Use Reduction 3.1	
Water Use Reduction 3.2	
INDOOR AIR QUALITY	S
Minimum IAQ Performance PR 1	
Environmental Tobacco Smoke Control PR 2	
Carbon Dioxide Monitoring 1	
Increase Ventilation Effectiveness 2	
Indoor Chemical & Pollutant Source Control 5	
ADJUSTABLE SYSTEMS	S
Controllability of Systems, Perimeter 6.1	
Controllability of Systems, Non-Perimeter 6.2	
TEMPERATURE	S
Thermal Comfort 7.1	
Thermal Comfort 7.2	
DAYLIGHT & VIEWS	S
Daylight & Views 8.1	
Daylight & Views 8.2	
GREEN HOUSEKEEPING	S
Green Housekeeping	

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LEED CATEGORIES	INFANT WELFARE SOCIETY OF CHICAGO
TRANSPORTATION	S
Transportation 4.1	
Transportation 4.2	
Transportation 4.4	
EXTERIOR LIGHTING	S
Exterior Lighting 8.0	
LANDSCAPE	S
Landscape 1.1	
Landscape 1.2	
RECYCLING	S
Storage & Collection of Recyclables	
WATER EFFICIENCY	S
Water Use Reduction 3.1	
Water Use Reduction 3.2	
INDOOR AIR QUALITY	D
Minimum IAQ Performance PR 1	
Environmental Tobacco Smoke Control PR 2	
Carbon Dioxide Monitoring 1	
Increase Ventilation Effectiveness 2	
Indoor Chemical & Pollutant Source Control 5	
ADJUSTABLE SYSTEMS	S
Controllability of Systems, Perimeter 6.1	
Controllability of Systems, Non-Perimeter 6.2	
TEMPERATURE	S
Thermal Comfort 7.1	
Thermal Comfort 7.2	
DAYLIGHT & VIEWS	S
Daylight & Views 8.1	
Daylight & Views 8.2	
GREEN HOUSEKEEPING	S
Green Housekeeping	

CHAPTER VI

ANALYSIS OF DATA

As shown in Table 2, all of the cases in this study received different LEED credits. Each case represented is distinct enough to be considered a pioneer in the way they achieved the LEED certification. Pearland Pediatrics is a pioneer for achieving both daylight & view credits IEQ 8.1 and 8.2. The Richard J. Lacks Cancer Center was the only case to receive both IEQ thermal comfort credits 7.1 and 7.2 and WE water use reduction credits 3.1 and 3.2. The Angel Harvey Infant Welfare Society of Chicago received the most success with alternative transportation. The Patrick Dollard Discovery Health Center was the only facility to receive both IEQ controllability of systems credits 6.1 and 6.2.

ANSWERS TO SUB-RESEARCH QUESTIONS

This research began with the premise that before LEED certified health centers become standard practice they should be evaluated from the building occupants' perspective. A survey was developed to help answer the main research question, when medical employees and administrators evaluate the LEED certified health centers they are employed at, what is their level of satisfaction with perceivable green building features that are intended to directly or indirectly affect occupants? To answer the main research question several sub-research questions related to the perceivable aspects of LEED certification need to be answered first. The data gathered and discussed in Chapter V

will be used to draw conclusions to answer the ten sub-research questions evaluated in the Occupant Evaluation of LEED Certified Health Centers Study.

Questions were asked in the Occupant Evaluation of LEED Certified Health Centers survey to answer the sub-research question, what is the level of satisfaction with transportation options? Perceivable points for transportation include alternative transportation credits: 4.1, 4.2 and 4.4 as shown in Table 1. None of the four cases evaluated received all of the perceivable transportation credits as shown in Table 2. The respondents for each case reported overall satisfaction with the transportation options at their facility.

As shown in Table 2 two of the cases, Pearland Pediatrics and the Patrick Dollard Discovery Health Center, received sustainable sites transportation credit 4.4, parking capacity. Under this credit the USGBC suggests providing preferred parking for carpools or vanpools capable of serving 5% of the building occupants. In three of the case studies only one respondent reported occasionally carpooling to work. This can be seen in Figure 12, Figure 39 and Figure 96. Four of the fifteen respondents reported occasionally carpooling to work at the Infant Welfare of Chicago as seen in Figure 66.

According to Table 2, the Richard J. Lacks Cancer Center and the Infant Welfare of Chicago received sustainable sites transportation credit 4.1: public transportation access. Patrick Dollard Discovery Health Center and Pearland Pediatrics, who did not receive

credit SS 4.1 marked dissatisfaction with access to transportation aspect in the survey, as shown in Figure 15 and Figure 99. The IWC received a satisfactory score for the access to public transportation as shown in Figure 69. IWC also received the most success with the occupants using various forms of transportation to get to work in Figure 66. Nine of the eleven respondents for the question, satisfaction with access to public transportation, marked 'n/a' for the Richard J. Lacks Cancer Center who did receive the LEED credit. The two respondents who answered the question had opposing views. There is no satisfaction score for the access to transportation LEED credit as seen in Figure 42.

Table 2 shows that Pearland Pediatrics and the Patrick Dollard Discovery Health Center received SS transportation credit 4.4; reduce parking capacity. These two cases represented the two suburban case studies. All of the cases rated their facility satisfaction with staff parking as satisfactory except, the IWC. The results can be seen in Figure 15, Figure 42, Figure 69 and Figure 99. Overall the respondents from the cases are satisfied with transportation options.

Questions were asked in the Occupant Evaluation of LEED Certified Health Centers survey to answer the sub-research question, what is the level of satisfaction with exterior lighting? Sustainable sites exterior lighting reduction credit 8 was received by one of the four case studies, the Richard J. Lacks Cancer Center. The respondents from all LEED certified health centers reported satisfaction with the exterior lighting for their facility.

In the Occupant Evaluation of LEED Certified Health Centers survey respondents were asked to report their satisfaction with water efficient landscapes, and plant healthiness. This question pertains to LEED WE credits 1.1 and 1.2 for landscape. The respondents from the LEED certified health centers reported overall satisfaction with water efficient landscapes.

Research questions were developed in the survey to answer the sub-research question, what is the level of satisfaction with the indoor air quality in the facility? Several IEQ credits contribute to indoor air quality. Pre-requisites for IEQ are: minimum IAQ performance and environmental tobacco smoke control. In addition to the pre-requisite indoor air quality credits; IEQ credit 1, carbon dioxide monitoring, and credit 5, indoor chemical and pollutant source control. Both Pearland Pediatrics and the Richard J. Lacks Cancer Center receive credits 1 and 5 in addition to IEQ pre-requisites. The Patrick Dollard Discovery Health Center received IEQ credit 2, increased ventilation. Pearland Pediatrics, Patrick Dollard Discovery Health Center and Richard J. Lacks Cancer Center received a satisfactory score for overall indoor air quality. The IWC received a dissatisfactory score for indoor air quality.

Survey questions were asked to answer the sub-research question what is the level of satisfaction with adjustable ventilation, lighting and thermal controls? According to Table 2 the Patrick Dollard Discovery Health Center was the only case who received

IEQ credit 6.1 and 6.2, controllability of systems, perimeter and non-perimeter spaces. All of the facilities were rated satisfactory for these categories.

In the Occupant Evaluation of LEED Certified Health Centers survey respondents were asked to rate their satisfaction with the temperature and humidity controls in the facility. Thermal comfort credits include IEQ credits 7.1 and 7.2. Table 2 shows that Richard J. Lacks Cancer Center was the only case who received both thermal comfort credits. Pearland Pediatrics and IWC achieved thermal comfort credit 7.1, while the Patrick Dollard Discovery Health Center did not receive the credits. Pearland Pediatrics almost made a dissatisfactory score for the humidity aspect of thermal comfort shown in Figure 109. Overall the facilities received a satisfactory rating for thermal comfort.

The survey asked questions to determine the level of satisfaction with water efficient plumbing fixtures. Water efficient fixtures deal with water efficiency credits 3.1 and 3.2. According to Table 2 the Richard J. Lacks Cancer Center is the only facility to receive the credits. The occupants rated their facilities satisfactory in the use of water efficient fixtures. Pearland Pediatrics marked dissatisfaction with automatic sensor and push/timed faucets.

Although incorporating a recycling program is a required part of LEED certification, questions were asked in the survey to answer the sub-research question, what is the level of satisfaction with recycle storage bin areas? The pre-requisite is mandatory under the

materials and resources category of LEED. All of the facilities received a satisfactory score for recycling.

Green housekeeping is a credit that was pursued by two of the cases in this study, Pearland Pediatrics and the Patrick Dollard Discovery Health Center. The option is categorized under the LEED category Innovation and Design because it is not a required by the USGBC. Questions were asked in the survey to determine the level of satisfaction with the cleanliness of the facility. All of the respondents in the case studies expressed satisfaction with the overall cleanliness of their facility.

Questions were asked in the survey to answer the sub-research question, what is the level of satisfaction with issues related to daylight and views? IEQ daylight and view credits; 8.1 and 8.2 was achieved by one of the cases in this study, Pearland Pediatrics. Survey respondents at the Richard J. Lacks Cancer Center, Patrick Dollard Discovery Health Center and IWC health centers reported satisfaction for issues related to daylight and views. Pearland Pediatrics also had an overall positive score for daylight and views, however dissatisfaction for acoustics and privacy is expressed in Figure 114 and Figure 115.

ANSWER TO MAIN RESEARCH QUESTION

The answer to the main research question, when medical employees and administrators evaluate LEED certified health certified health centers they are employed at, what is

their level of satisfaction with perceivable green building features that are intended to directly or indirectly affect occupants, is answered by viewing the responses to the sub-questions. Each facility reported satisfaction with the perceivable aspects of their LEED certified health center. Medical employees and administrators reported satisfaction with the perceivable LEED features that are intended to directly or indirectly affect building occupants.

SUBURBAN LEED HEALTH CENTERS

The credits that the centers received depended on a variety of other variables, none of which were consistent enough to draw equal comparisons across all four case studies. Certain LEED credits lend themselves to be obtained depending on whether the facility is located in a metropolitan or suburban area. Two of the case studies in this research were located in suburban areas while the other two are located in metropolitan areas. As shown in Figure 2, Pearland Pediatrics is located in Pearland, Texas and The Patrick Dollard Discovery Health Center is located in Harris, New York.

Similarities were found in the way that the designers addressed the suburban environment and LEED points that they accomplished. When addressing transportation, public transportation access is limited in suburban areas and was not achieved by either suburban health center. Respondents from both facilities expressed dissatisfaction with transportation access. Both of the health centers received SS alternative transportation credits 4.2 and 4.4. Although biking to work may be an option, most occupants arrive

primarily by car as shown in Figure 12 and Figure 96. Figure 96 shows that one respondent from Pearland Pediatrics reports to occasionally using a bike to get to work.

For suburban areas, land is not at a premium which may make attaining water efficiency, water efficient landscaping credits easier to achieve. In a metropolitan area, space for a tree or water harvesting system to achieve LEED credit 1.2, no potable water use for landscape irrigation, may cost additional parking spaces or building space. Both suburban health centers received water efficient landscaping credits 1.1 and 1.2.

Mandatory LEED credits MR pre-requisite 1, recycling, IEQ pre-requisites 1, minimum IAQ performance, and 2, environmental tobacco smoke control were achieved by both health centers. In addition to IEQ pre-requisites that affect indoor air quality, Pearland Pediatrics received IEQ credit 5, indoor chemical and pollutant source control. The Patrick Dollard Discovery Health Center achieved IEQ credit 2, increase ventilation effectiveness, in addition to the IAQ pre-requisites. Typically the air quality in a suburban area is a better quality than that of a metropolitan area. Respondents rated the overall indoor air quality of the facilities satisfactory. Pearland Pediatrics responses for indoor air quality revealed temperature and humidity issues that may be linked to its geographic location as seen in Figure 2. Respondents of the Patrick Dollard Discovery Health Center marked ‘stuffy’ as a quality of the interior air as seen in Figure 22.

The Patrick Dollard Discovery Health Center was successful in being the only case to implement IEQ credits 6.1 and 6.2, controllability of systems perimeter, and non-perimeter. The satisfaction response is seen in Figure 23 and Figure 24.

Pearland Pediatrics was the only case to receive IEQ daylight and view credits 8.1 and 8.2. Overall the facility received a satisfactory score for daylight and view issues; however acoustics and privacy were seen as problematic by respondents as shown in Figure 114 and Figure 115.

Both health centers received LEED credit for green housekeeping categorized under the innovation and design process category of LEED. The intent of the credit is to protect the health of building occupants and cleaning professionals by using non-toxic cleaning solutions. Both facilities were rated satisfactory with maintenance issues by the respondents. Pearland Pediatrics expressed concern over wall cleanliness as seen in Figure 113.

METROPOLITAN LEED HEALTH CENTERS

The other two case studies in this research are located in metropolitan areas as seen in Figure 2. The Infant Welfare Society of Chicago is located in Chicago, Illinois and the Richard J. Lacks Cancer Center is located in Grand Rapids, Michigan. Like the suburban cases, these cases approached LEED certification and the issues of being in a metropolitan environment in a similar way.

Both facilities received the SS alternative transportation credit 4.1; public transportation access. As seen in Figure 39, two of the fourteen respondents for the Richard J. Lacks Cancer Center report occasionally using a bus or shuttle to get to work. At the IWC seven of the fifteen respondents reported occasionally using the light-rail, bus or shuttle to get to work. Primary and occasional methods of transportation for IWC can be seen in Figure 66. The IWC also received SS alternative transportation credit 4.2, bike storage and changing rooms. Figure 66 shows that one respondent reported occasionally riding a bike to get to IWC.

Richard J. Lacks Cancer Center was the only case study to receive SS exterior lighting credit 8. The credit was received well by respondents as seen in Figure 43 and Figure 44. Richard J. Lacks Cancer Center and IWC received WE water efficient landscaping credits 1.1 while Richard J. Lacks Cancer Center also received WE credit 1.2.

Perceivable pre-requisites were achieved by both facilities MR pre-requisite 1, recycling, IEQ pre-requisite 1, minimum IAQ performance and pre-requisite 2 environmental tobacco smoke control.

Indoor air quality issues in metropolitan areas are more prevalent because of the increase in population. Richard J. Lacks Cancer Center received additional indoor air quality LEED credits; IEQ credit 1, carbon dioxide monitoring and credit 5, indoor chemical

and pollutant source control. Figure 49 shows respondent satisfaction to the indoor air quality at the Richard J. Lacks Cancer Center.

IWC took a different approach to indoor air quality by achieving only the LEED indoor environmental quality pre-requisites 1 and 2. IWC was the only case that did not receive extra credits regarding indoor air quality. Figure 76 reflects occupant dissatisfaction to the indoor air quality of the IWC.

Both health centers addressed thermal comfort by achieving IEQ credit 7.1, while the Richard J. Lacks Cancer Center also received credit 7.2.

SUMMARY OF WRITTEN COMMENTS FROM OCCUPANTS FROM SURVEY QUESTION #13

Patrick Dollard Discovery Health Center

One respondent from the Patrick Dollard Discovery Health Center responded with written comments concerning issues evaluated in the study. Written comments can be found in Appendix C. Figure 117 expresses concern for the exterior lighting. The Patrick Dollard Discovery Health Center did not receive sustainable sites: light pollution reduction, credit 8. The respondent feels the back of the parking lot lacks sufficient lighting to for safety at night.

Patrick Dollard Discovery Health Center did receive both water efficiency landscaping credits 1.1 and 1.2. A common way to attain both water efficient landscaping credits is to employ a xeriscape design. Figure 117 suggests the exterior plantings around the entrance be removed because of the poor health of the plantings.

The respondent also points out in Figure 117 that there were no recycling storage bins in the facility that they were aware of.

Richard J. Lacks Cancer Center

Written comments from the respondents about the Richard J. Lacks Cancer Center can be found in Appendix C. In Figure 118 the respondent asks for more recycling bin options other than paper. The materials and resources pre-requisite suggest that five recycle bins are set in a prominent location. In Figure 120 the respondent praises the aesthetics of the interior environment. The respondent in Figure 120 expressed frustration over automatic sinks not turning on when prompted. Richard J. Lacks Cancer Center received both water use reduction credits 3.1 and 3.2. Water efficient plumbing fixtures are often used to achieve the water use reduction credits and can be perceived by building occupants. In the medical profession, concern was raised about medical staff often multi-tasking and whether or not water efficient faucets would restrict their ability to multi-task.

Figure 120 expresses that the interior temperature is inconsistent. Richard J. Lacks Cancer Center received IEQ controllability of systems: perimeter credit 6.2 and both IEQ thermal comfort credits 7.1 and 7.2. The survey did not ask occupants to report where they were located in the interior or perimeter of the building, which would determine if they may have access to temperature controls for facilities who received IEQ credit 6.1 and 6.2.

IWC

One of the respondents responded in the written comments section of the survey about increasing staff and community awareness of sustainability issues, and their role as a health care provider. Written comments for IWC can be found in Appendix C.

Pearland Pediatrics

Pearland Pediatrics written comments from the occupants include some of the issues evaluated in the study. Written comments can be found in Appendix C.

The overall satisfaction score for water efficient sinks used in the facility did not receive a score because the score was tied. A dissatisfactory score was given for both automatic sensor and push/twist faucets. Figure 125 comments on the sink sensors getting stuck and turning on and off by themselves. Figure 129 mentions that the water efficient faucets are not strong enough to sufficiently clean dishes.

Several occupants commented about the facility being too hot or too cold. The comments blame the inconsistent temperature on the sun coming inside large windows; others refer to thermostat control. Pearland Pediatrics was the only case who received indoor environment quality daylight and view credits 8.1 and 8.2. They also received one of the thermal comfort credits 7.1. However they did not receive IEQ controllability of systems credits 6.1 and 6.2, which could allow more control of temperature in perimeter and non-perimeter zones. There are too many other variables to draw conclusions about the cause of indoor temperature fluctuation as it relates to perceivable LEED credits received by Pearland Pediatrics.

Many of the respondents commented about the windows at the facility. Figure 125 mentions glare as a problem. Figure 126 mentions noise, as problematic in public areas and lack of privacy on the interior. Figure 123 mentions the need for more acoustic control in the waiting area. Overall the facility received a satisfactory rating for the daylight and view category, however in the category of acoustics and privacy there was a tie in satisfaction and dissatisfaction. Figure 127 mentions how rain can be heard through the windows or lack of acoustics and impairs work and testing.

Figure 126 comments that water efficient toilets are not conducive for pediatric practice because children often use too much toilet tissue, which makes the system, back up.

Pearland Pediatrics received water efficiency landscape reduction credits 1.1 and 1.2. Figure 127 mentions the satisfaction the healthy plantings in the landscape. Recycling, or lack of, is mentioned consistently in the comments for all of the facilities.

DESIGN CONSIDERATIONS

When designing LEED health centers it is imperative to consider external variables of the environment. For example Pearland Pediatrics is located in hot and humid climate. To achieve IEQ credits 8.1 and 8.2, the windows are aesthetically pleasing and add to the indoor environment but provisions must be made from external shading, glare, and privacy. For Pearland Pediatrics a design strategy would be using other building materials with noise absorbing qualities such as carpet and tile.

Another example of an external concern that influences design is the quality of air in metropolitan areas. Indoor air quality must be addressed in metropolitan facilities. In the comparison of Richard J. Lacks Cancer Center and IWC; indoor air quality focused LEED credits are perceivable by building occupants.

IWC is the only case that did not receive indoor air quality LEED credits in addition to the IEQ pre-requisites that affect indoor air quality. The dissatisfaction with the indoor air quality for IWC may be linked to the absence of the additional indoor air quality LEED credits.

CHAPTER VII

CONCLUSIONS

RECOMMENDATIONS AND COMMENTS

Being that the world must embrace sustainable practices these findings are significant in that they disprove previous thoughts that green building features may impair the functional and aesthetic qualities of a health facility. This research shows that LEED building features prescribed by the USGBC rating system, by medical staff and administration, are perceived as satisfactory when employed in health care environments.

It seems that indirectly encouraging the general public towards 'green practices' begins with good design. Premeditated site consideration, for facilities who offered such features as alternative transportation, the various modes of transportation were utilized by building occupants. For facilities like the Patrick Dollard Discovery Health Center who offered occupants control of lighting and/or thermal systems, respondents reported using these features and rating them satisfactory in the building evaluation.

Incorporating design practices suggested by LEED for superior indoor air quality pay off in occupant satisfaction. As shown in the Richard J. Lacks Cancer Center, occupants are aware of the indoor air quality. The Richard J. Lacks Cancer Center received a satisfactory score for indoor air quality as they achieved perceivable credits IEQ credit 1

and 5 in comparison to the IWC dissatisfactory score. The IWC achieved the minimum LEED pre-requisites for indoor air quality.

Overall the information learned in this study can be used to provide feedback to architects and designers to help improve the design of other LEED health facilities. As the need for more sustainable practices becomes more evident with time, and discoveries of new diseases that stem from non-sustainable buildings or design practices are realized, a more sustainable future is a necessity for the architectural industry.

Arguably, the health care industry is obligated to incorporate building designs that increase comfort for those whose health is compromised and for the individuals who work with them.

The purpose of this study was to provide a greater understanding of how green features associated with LEED facilities affect occupants who use the space. The results of these four case studies are similar. The overall occupant response with perceivable building features influenced by LEED is satisfactory.

The results from this research show that applying LEED standards prescribed by the USGBC to healthcare facilities does not result in any noticeable dissatisfaction from building occupants.

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APPENDIX A

USGBC LEED GUIDE NC 2.1

SS Transportation ……. 31 – 40

SS Exterior Lighting…….……..... 69 – 77

WE Landscape……..…….…….81 – 89

WE Plumbing Fixture…….……..99 – 107

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IEQ Indoor Air Quality……...241 – 258

IEQ Maintenance……...…….279 – 281

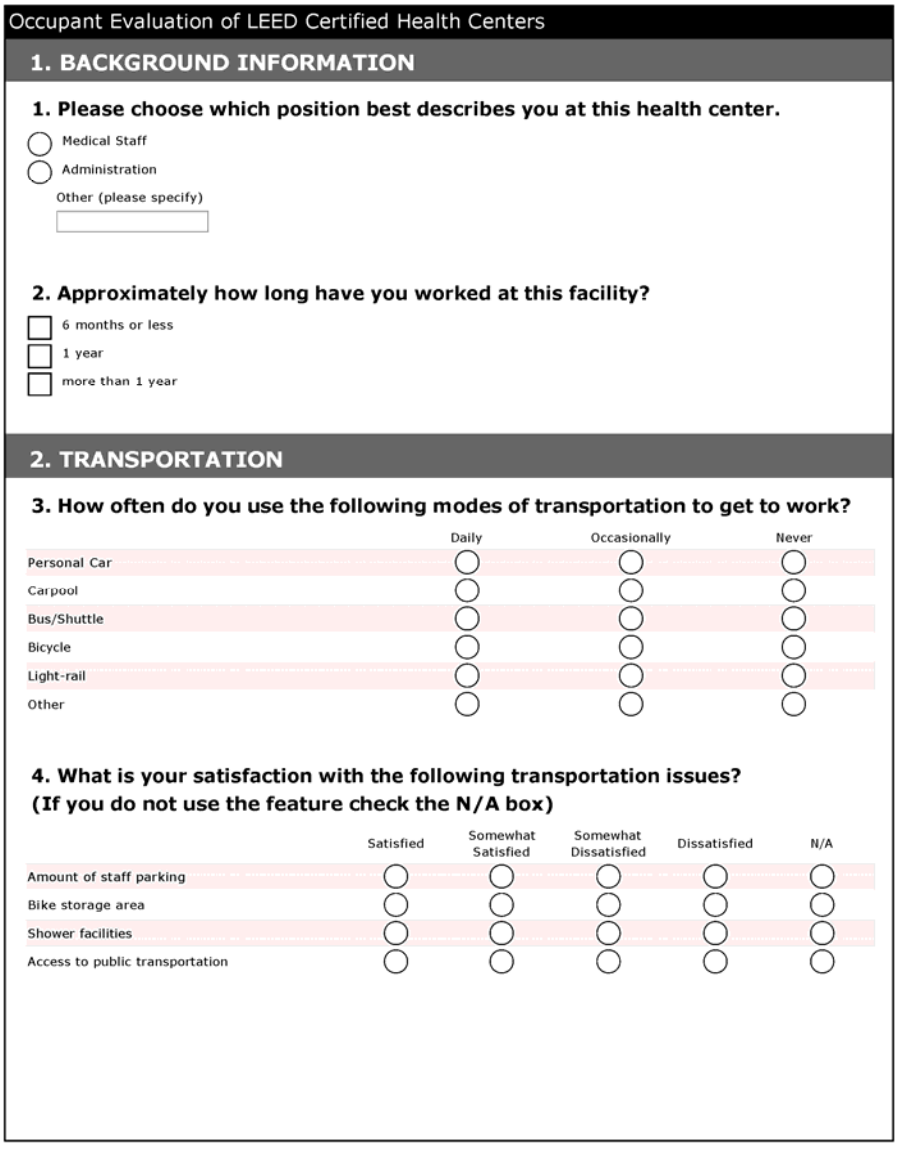
IEQ Controllability of Systems….....283 – 291

IEQ Thermal Comfort…….....293 – 295

ID Green Housekeeping…….313 – 31

APPENDIX B

THE OCCUPANT EVALUATION OF LEED CERTIFIED HEALTH CENTERS SURVEY



Occupant Evaluation of LEED Certified Health Centers

1. BACKGROUND INFORMATION

1. Please choose which position best describes you at this health center.

- ◯ Medical Staff
- ◯ Administration
- Other (please specify)

2. Approximately how long have you worked at this facility?

- ☐ 6 months or less
- ☐ 1 year
- ☐ more than 1 year

2. TRANSPORTATION

3. How often do you use the following modes of transportation to get to work?

	Daily	Occasionally	Never
Personal Car	◯	◯	◯
Carpool	◯	◯	◯
Bus/Shuttle	◯	◯	◯
Bicycle	◯	◯	◯
Light-rail	◯	◯	◯
Other	◯	◯	◯

4. What is your satisfaction with the following transportation issues? (If you do not use the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Amount of staff parking	◯	◯	◯	◯	◯
Bike storage area	◯	◯	◯	◯	◯
Shower facilities	◯	◯	◯	◯	◯
Access to public transportation	◯	◯	◯	◯	◯

Page 1

Occupant Evaluation of LEED Certified Health Centers

3. EXTERIOR LIGHTING

5. Rate your satisfaction with the exterior lighting at night for the following... (Check N/A if you are only at the facility during daytime hours.)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Facility driveways	◯	◯	◯	◯	◯
Facility entrances	◯	◯	◯	◯	◯
Exterior of the building	◯	◯	◯	◯	◯
Staff parking area	◯	◯	◯	◯	◯
Walking paths to parking area	◯	◯	◯	◯	◯
Overall safety at night	◯	◯	◯	◯	◯

6. Does the lighting on the exterior of the facility make you feel safe at night? (If you are not at the facility at night check the N/A box.)

◯ yes ◯ no ◯ N/A

4. LANDSCAPE

7. Is there a landscaped area outside of the facility?

◯ yes ◯ no ◯ I do not know

8. Rate how satisfied you are with the landscaped area. (If you do not have one check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Health of the plantings	◯	◯	◯	◯	◯
Satisfaction with landscape design	◯	◯	◯	◯	◯

Occupant Evaluation of LEED Certified Health Centers

5. INDOOR AIR QUALITY

9. Does the indoor air smell like the following?

	Always	Often	Rarely	Never
Fresh	◯	◯	◯	◯
Stuffy	◯	◯	◯	◯
Smoky	◯	◯	◯	◯
Like Vehicle Exhaust	◯	◯	◯	◯
Like Cleaning Chemicals	◯	◯	◯	◯
Dusty	◯	◯	◯	◯
Like Pollen	◯	◯	◯	◯

6. ADJUSTABLE SYSTEMS

10. Rate your satisfaction with the ability to adjust the following for thermal comfort?
(If you can not adjust check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Thermostat	◯	◯	◯	◯	◯	◯
Exterior window	◯	◯	◯	◯	◯	◯
Ceiling fan	◯	◯	◯	◯	◯	◯
Air flow vent	◯	◯	◯	◯	◯	◯

11. Rate your satisfaction with the ability to adjust the following to control lighting?
(If you can not adjust check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	I do not adjust	N/A
Light switch	◯	◯	◯	◯	◯	◯
Light dimmer	◯	◯	◯	◯	◯	◯
Window blind/ shade	◯	◯	◯	◯	◯	◯
Desk light	◯	◯	◯	◯	◯	◯

Occupant Evaluation of LEED Certified Health Centers

7. TEMPERATURE

12. Rate your satisfaction with the following temperature related issues with your space.

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
Humidity	◯	◯	◯	◯
Temperature in your space	◯	◯	◯	◯

8. WATER EFFICIENCY

13. Rate your satisfaction with the following sink features that are used at the facility.
(If you do not have the feature check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Sink faucets	◯	◯	◯	◯	◯
Automatic sensors	◯	◯	◯	◯	◯
Push/twist timed faucets	◯	◯	◯	◯	◯

14. Rate your satisfaction with the toilet features used in the facility.
(If you do not have, or do not use the feature check the N/A box.)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Low flow toilets	◯	◯	◯	◯	◯
Automatic sensors	◯	◯	◯	◯	◯
Dual flush buttons	◯	◯	◯	◯	◯
Waterless urinals	◯	◯	◯	◯	◯

9. RECYCLING

15. Rate your satisfaction with the following aspects of the recycle storage bins at your facility.
(If you do not use the recycle bins check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Location	◯	◯	◯	◯	◯
Convenience	◯	◯	◯	◯	◯
Cleanliness	◯	◯	◯	◯	◯

Occupant Evaluation of LEED Certified Health Centers

10. MAINTENANCE

16. Rate your satisfaction with the following maintenance issues.

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
Floor cleanliness	◯	◯	◯	◯
Fixture cleanliness (sinks and toilets)	◯	◯	◯	◯
Wall cleanliness	◯	◯	◯	◯
odor of products	◯	◯	◯	◯

11. DAYLIGHT & VIEWS

17. Rate your satisfaction with natural daylight issues in your space.
(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Exterior window	◯	◯	◯	◯	◯
Daylight from window	◯	◯	◯	◯	◯
Daylight from other sources	◯	◯	◯	◯	◯
View outside	◯	◯	◯	◯	◯

18. Rate your satisfaction with issues indirectly related to exterior windows in your space.
(If you do not have an exterior window check the N/A box)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Acoustics	◯	◯	◯	◯	◯
Privacy	◯	◯	◯	◯	◯
Glare	◯	◯	◯	◯	◯

Occupant Evaluation of LEED Certified Health Centers

12. OVERALL QUALITY OF FACILITY

Please give an overall rating for the main building features in your facility.

19. Rate your overall satisfaction with the following...
(If you do not have, or use the feature check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Transportation	◯	◯	◯	◯	◯
Exterior Lighting at Night	◯	◯	◯	◯	◯
Landscaped Garden Plantings	◯	◯	◯	◯	◯
Indoor Air Quality	◯	◯	◯	◯	◯
Ability to Control Temperature	◯	◯	◯	◯	◯
Ability to Control Lighting	◯	◯	◯	◯	◯

20. Rate your overall satisfaction with the following...
(If you do not have, or use the feature check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Thermal Comfort	◯	◯	◯	◯	◯
Water Efficient Sinks	◯	◯	◯	◯	◯
Water Efficient Toilets	◯	◯	◯	◯	◯
Water Efficient Urinals	◯	◯	◯	◯	◯

21. Rate your overall satisfaction with the following...
(If you do not have, or use the feature check N/A)

	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied	N/A
Cleanliness of Facility	◯	◯	◯	◯	◯
Amount of Natural Daylight	◯	◯	◯	◯	◯
View Outside of Window	◯	◯	◯	◯	◯
Recycling Bins	◯	◯	◯	◯	◯

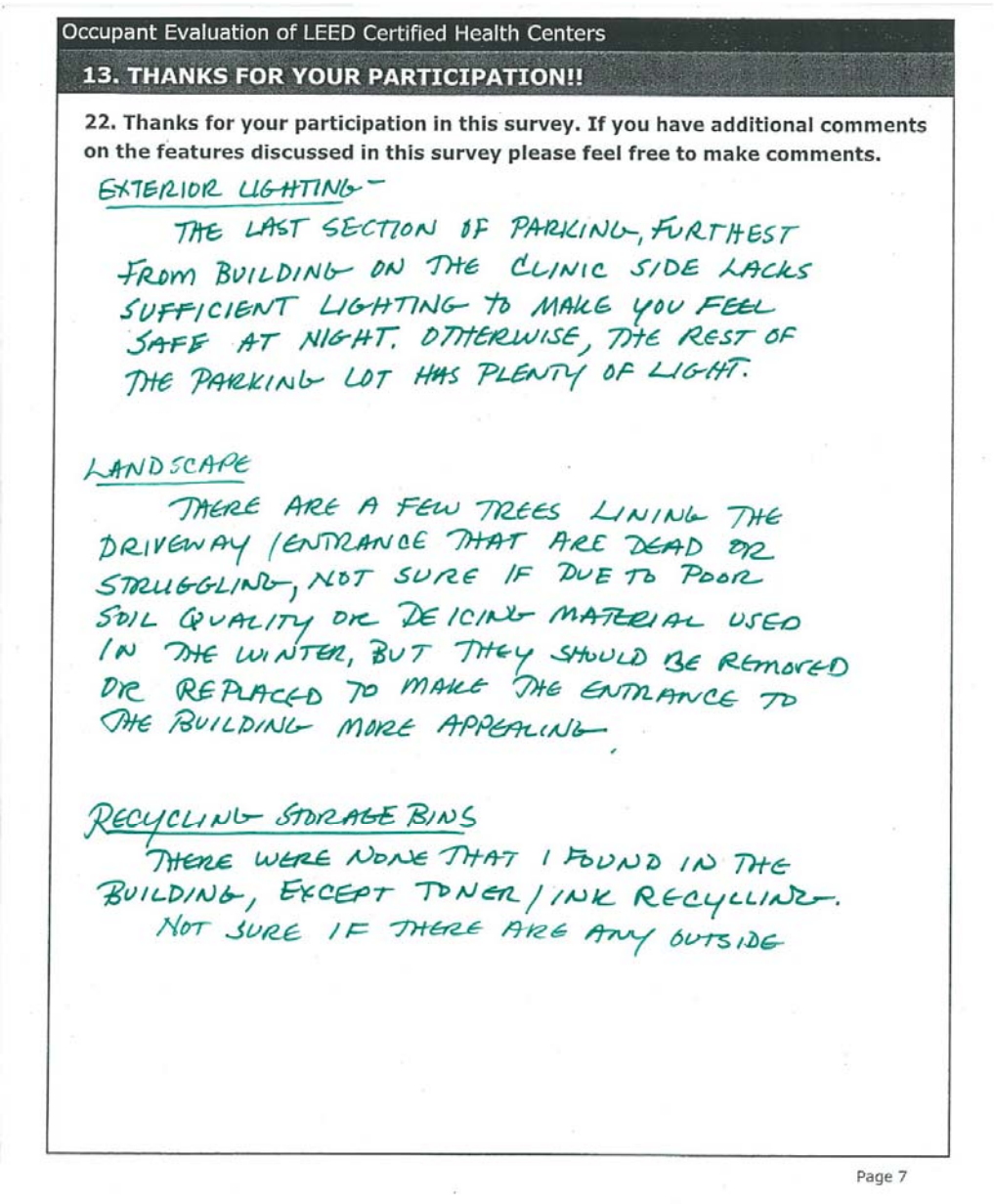
Occupant Evaluation of LEED Certified Health Centers

13. THANKS FOR YOUR PARTICIPATION!!

22. Thanks for your participation in this survey. If you have additional comments on the features discussed in this survey please feel free to make comments.

APPENDIX C

WRITTEN RESPONSES FROM OCCUPANTS ON SURVEY QUESTION #13



Occupant Evaluation of LEED Certified Health Centers

13. THANKS FOR YOUR PARTICIPATION!!

22. Thanks for your participation in this survey. If you have additional comments on the features discussed in this survey please feel free to make comments.

EXTERIOR LIGHTING –

THE LAST SECTION OF PARKING, FURTHEST FROM BUILDING ON THE CLINIC SIDE LACKS SUFFICIENT LIGHTING TO MAKE YOU FEEL SAFE AT NIGHT. OTHERWISE, THE REST OF THE PARKING LOT HAS PLENTY OF LIGHT.

LANDSCAPE

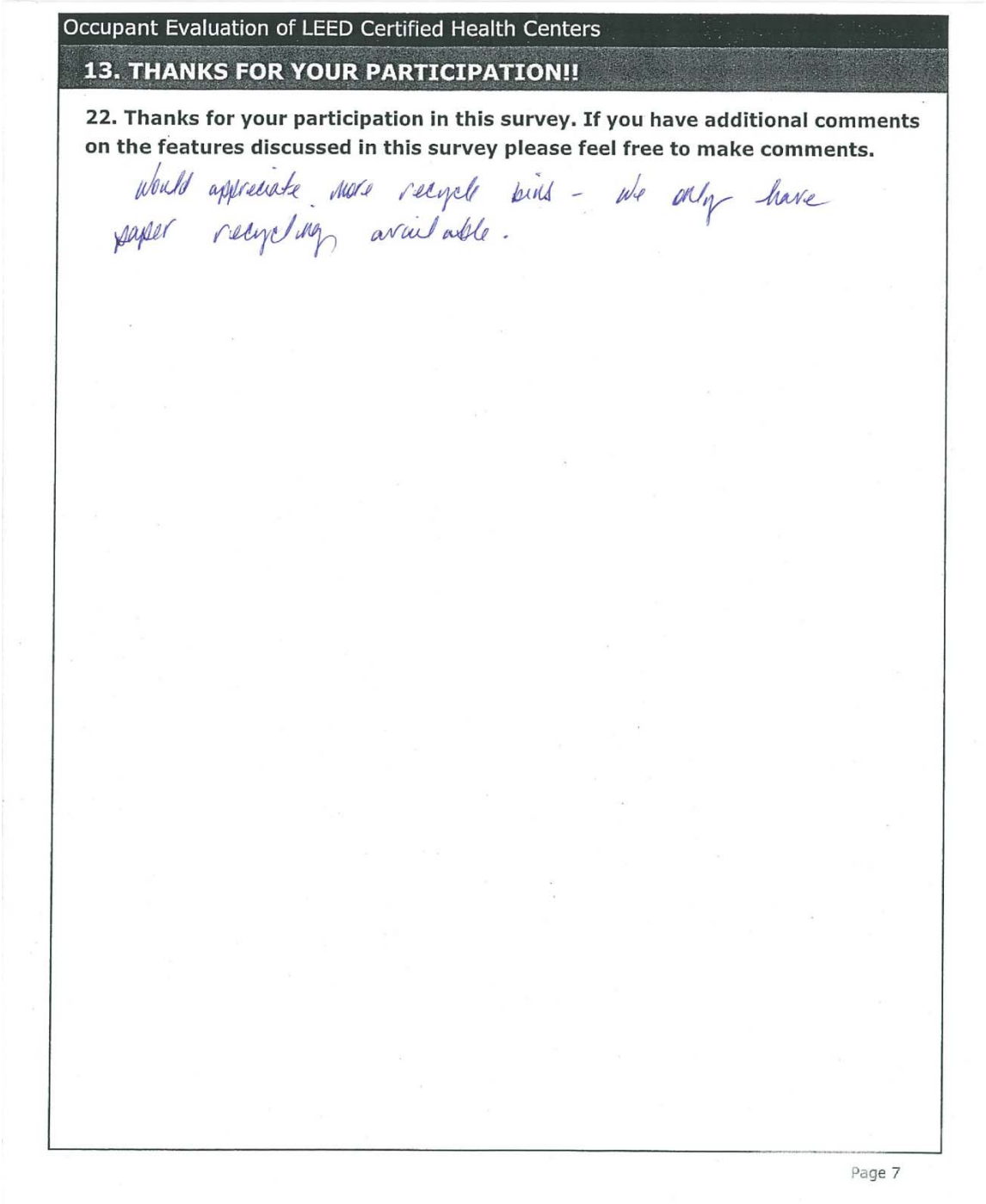
THERE ARE A FEW TREES LINING THE DRIVEWAY / ENTRANCE THAT ARE DEAD OR STRUGGLING, NOT SURE IF DUE TO POOR SOIL QUALITY OR DE ICING MATERIAL USED IN THE WINTER, BUT THEY SHOULD BE REMOVED OR REPLACED TO MAKE THE ENTRANCE TO THE BUILDING MORE APPEALING.

RECYCLING STORAGE BINS

THERE WERE NONE THAT I FOUND IN THE BUILDING, EXCEPT TONER / INK RECYCLING. NOT SURE IF THERE ARE ANY OUTSIDE

Page 7

Figure 117: The Patrick Dollard Discovery Health Center Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

13. THANKS FOR YOUR PARTICIPATION!!

22. Thanks for your participation in this survey. If you have additional comments on the features discussed in this survey please feel free to make comments.

would appreciate more recycle bins - we only have paper recycling available.

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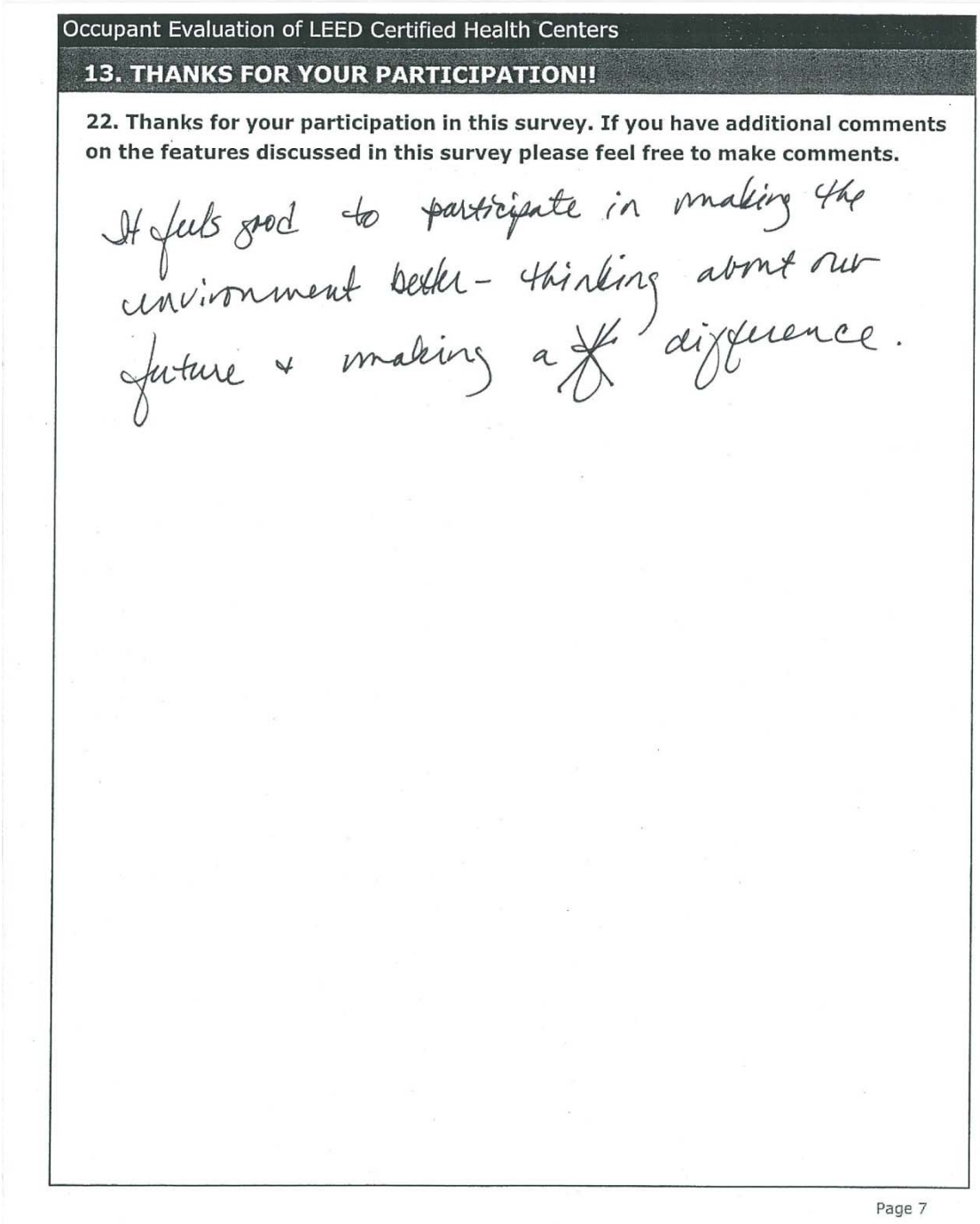
Figure 118: The Richard J. Lacks Cancer Center Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

13. THANKS FOR YOUR PARTICIPATION!!

22. Thanks for your participation in this survey. If you have additional comments on the features discussed in this survey please feel free to make comments.

It feels good to participate in making the environment better - thinking about our future & making a difference.

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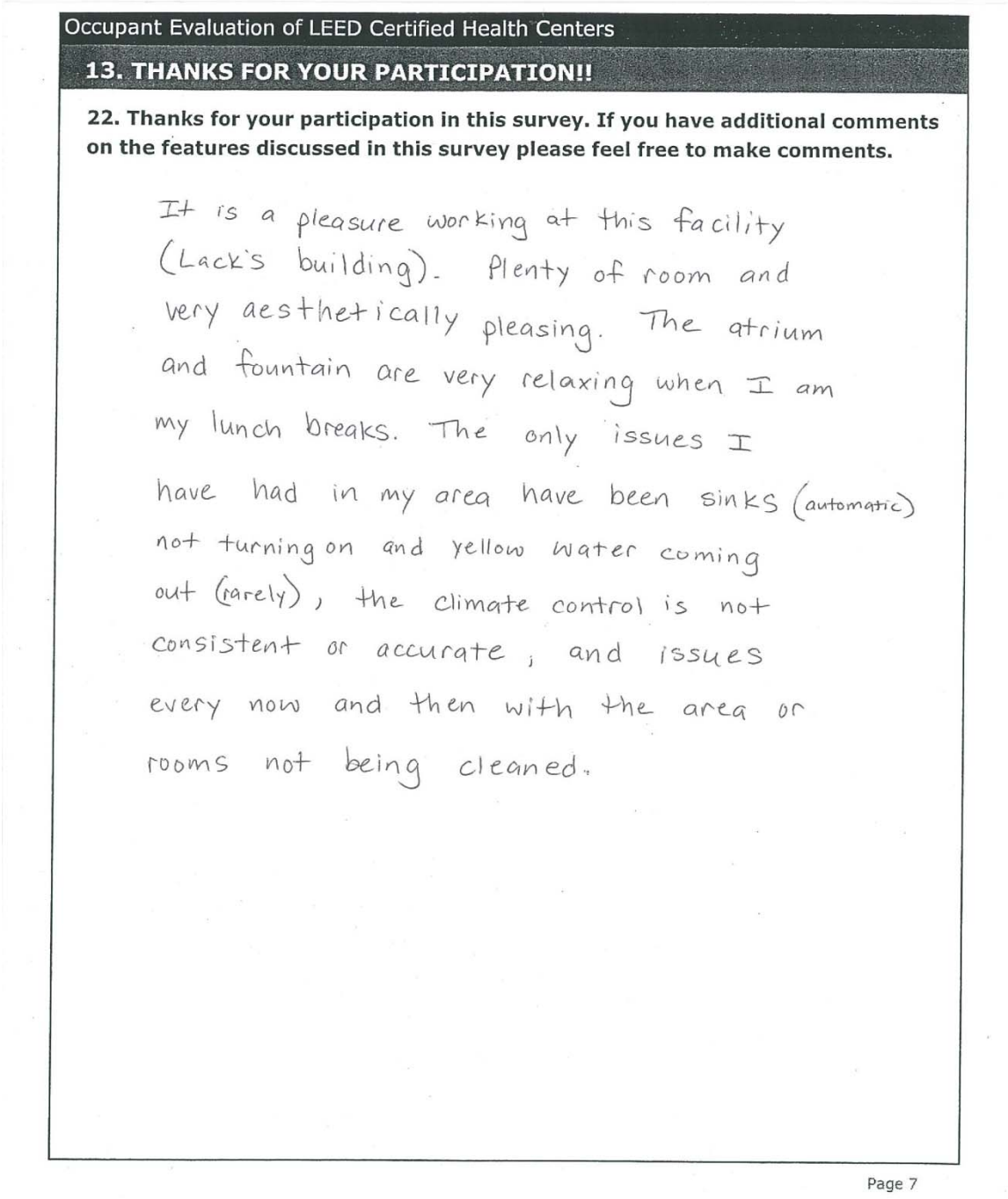
Figure 119: The Richard J. Lacks Cancer Center Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

13. THANKS FOR YOUR PARTICIPATION!!

22. Thanks for your participation in this survey. If you have additional comments on the features discussed in this survey please feel free to make comments.

It is a pleasure working at this facility (Lack's building). Plenty of room and very aesthetically pleasing. The atrium and fountain are very relaxing when I am my lunch breaks. The only issues I have had in my area have been sinks (automatic) not turning on and yellow water coming out (rarely), the climate control is not consistent or accurate, and issues every now and then with the area or rooms not being cleaned.

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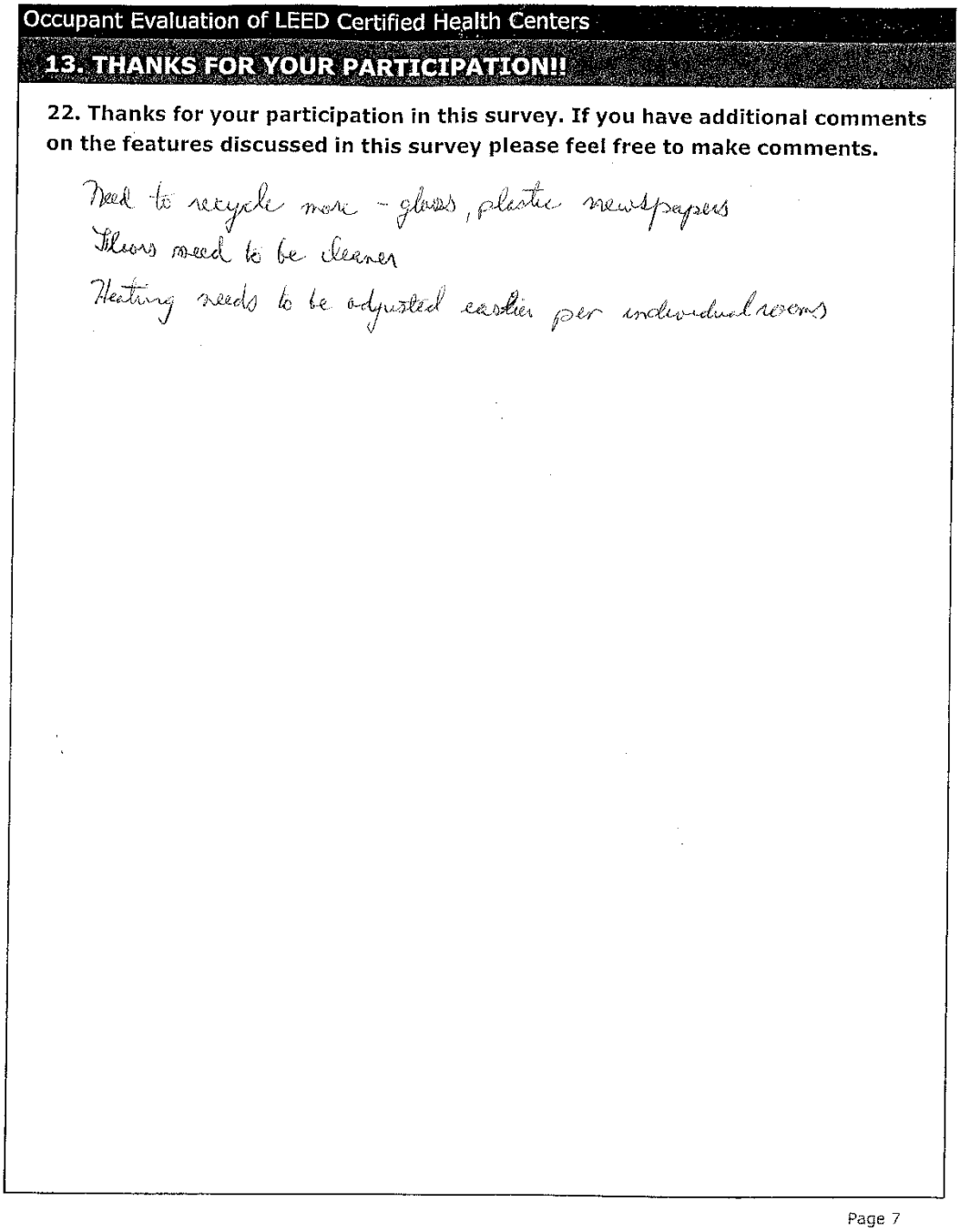
Figure 120: The Richard J. Lacks Cancer Center Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

13. THANKS FOR YOUR PARTICIPATION!!

22. Thanks for your participation in this survey. If you have additional comments on the features discussed in this survey please feel free to make comments.

Need to recycle more - glass, plastic newspapers
Floors need to be cleaner
Heating needs to be adjusted easier per individual rooms

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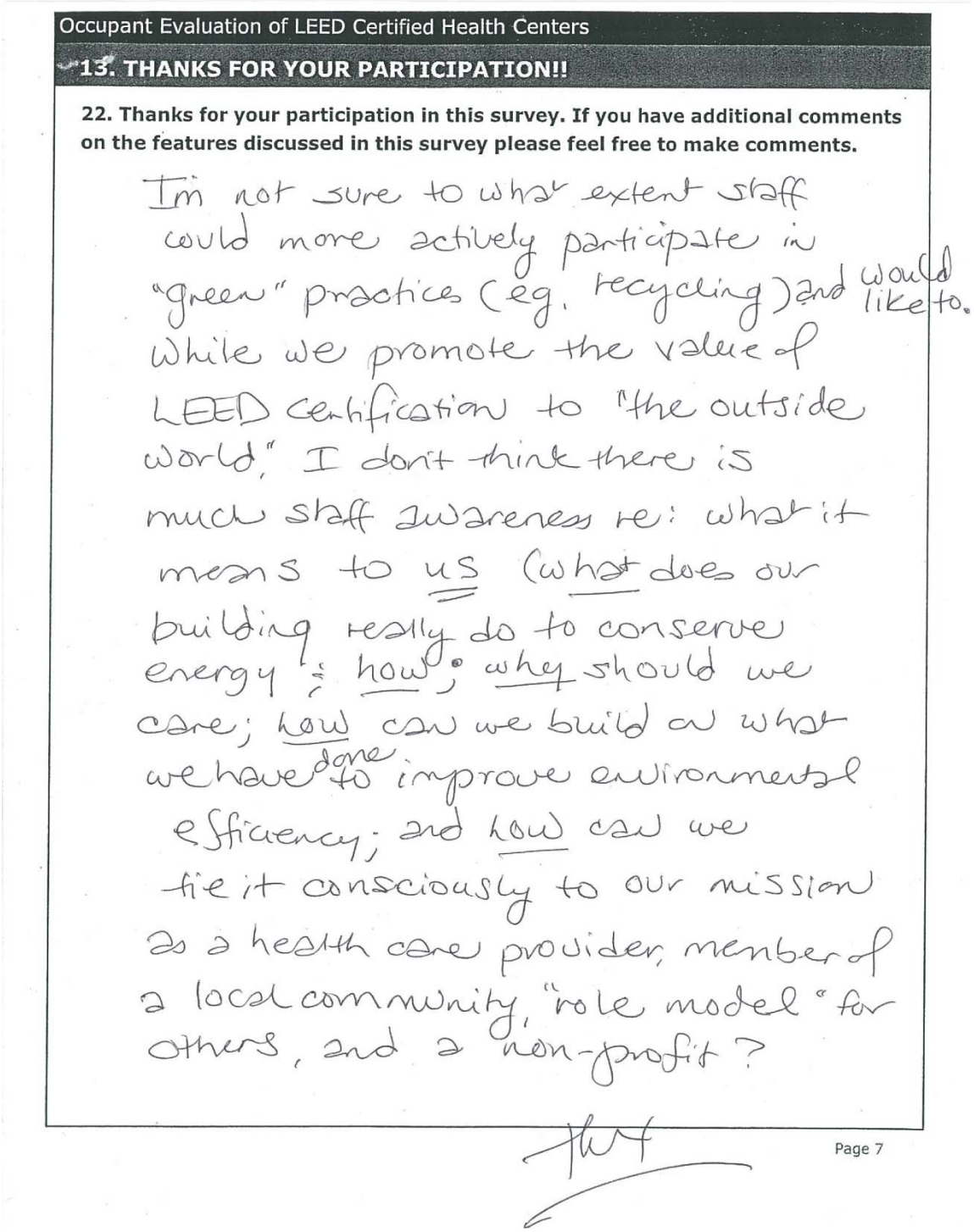
Figure 121: The Richard J. Lacks Cancer Center Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

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I'm not sure to what extent staff could more actively participate in "green" practices (eg. recycling) and would like to. While we promote the value of LEED certification to "the outside world," I don't think there is much staff awareness re: what it means to us (what does our building really do to conserve energy; how; why should we care; how can we build on what we have done to improve environmental efficiency; and how can we tie it consciously to our mission as a health care provider, member of a local community, "role model" for others, and a non-profit?

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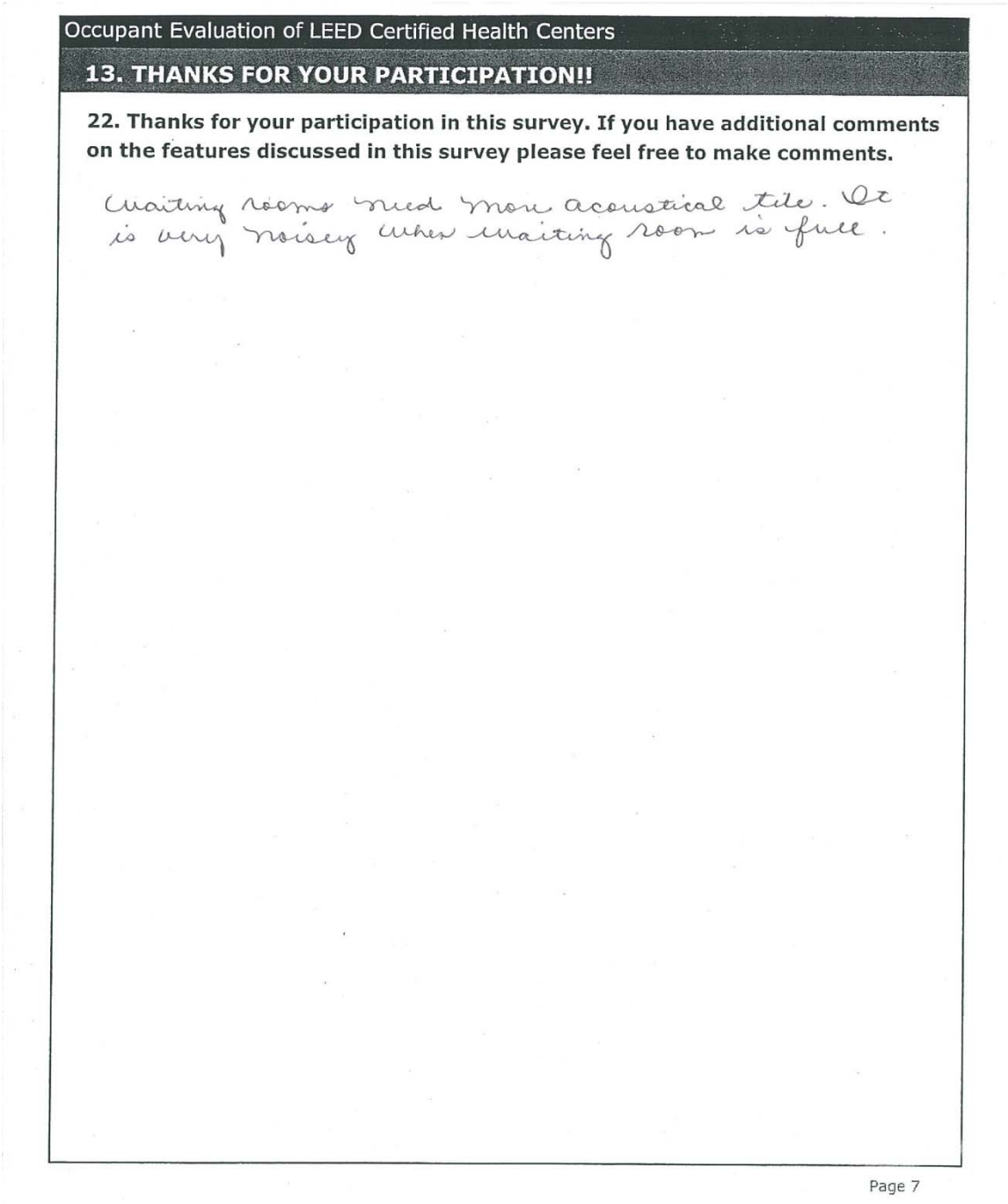
Figure 122: The IWC Center Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

13. THANKS FOR YOUR PARTICIPATION!!

22. Thanks for your participation in this survey. If you have additional comments on the features discussed in this survey please feel free to make comments.

Waiting rooms need more acoustical tile. It is very noisey when waiting room is full.

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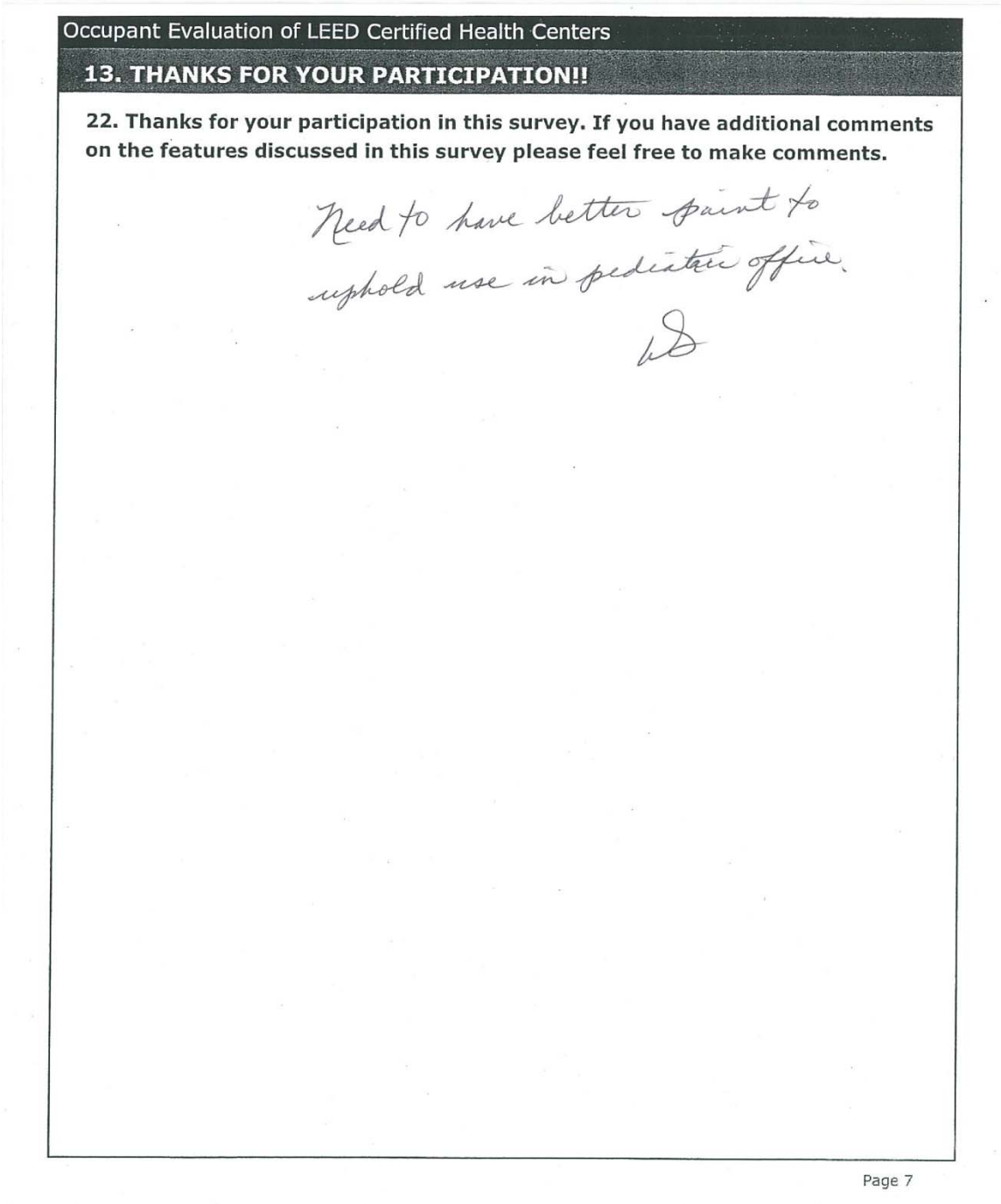
Figure 123: The Pearland Pediatrics Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

13. THANKS FOR YOUR PARTICIPATION!!

22. Thanks for your participation in this survey. If you have additional comments on the features discussed in this survey please feel free to make comments.

Need to have better paint to uphold use in pediatric office.

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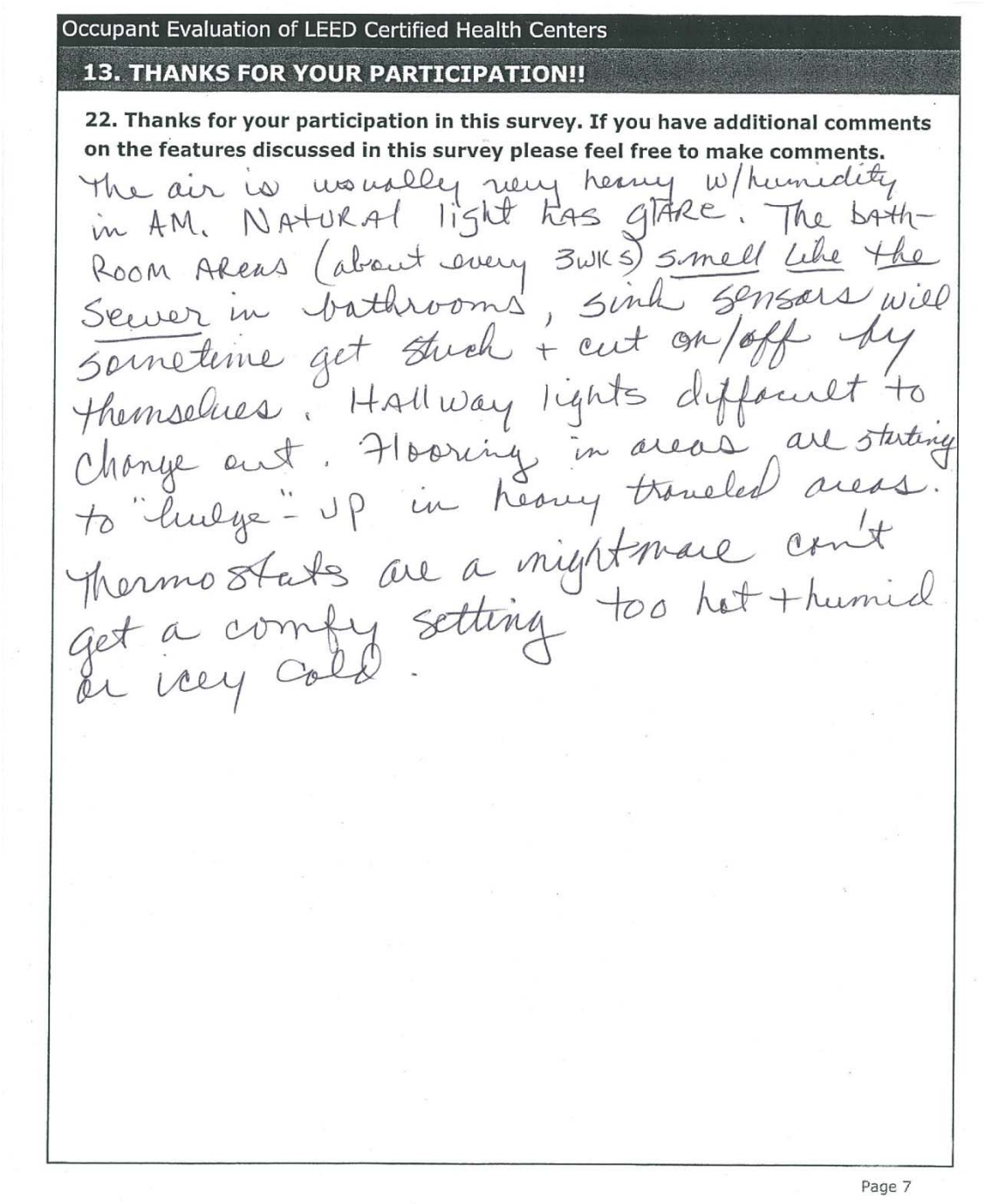
Figure 124: The Pearland Pediatrics Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

13. THANKS FOR YOUR PARTICIPATION!!

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The air is usually very heavy w/humidity in AM. NATURAL light has GLARE. The BATH-ROOM AREAS (about every 3WKS) smell like the sewer in bathrooms, sink sensors will sometime get stuck + cut on/off by themselves. Hallway lights difficult to change out. Flooring in areas are starting to "bulge" up in heavy traveled areas. Thermostats are a nightmare can't get a comfy setting too hot + humid or icey cold.

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Figure 125: The Pearland Pediatrics Additional Comments from Survey Question #13

Upon entering the building you are either greeted by extreme humidity or extreme cold. The temperature through out the office is very inconsistent. Some patient rooms are extremely hot and some are the opposite. We have a chronic problem with the air conditioners. If there are any patients in the front area the noise is piercing. Due to the high ceiling in the front room the noise carries throughout the building. There are no sound buffers to help with the noise level anywhere in the building. When looking around the building it is obvious that the flooring is not made of very good materials. It has buckled areas and when you view it in the light you see areas where it's not flat but is "rollie".

The tall cabinets are a problem to use efficiently. There is no way (w/o a ladder or step stool) to utilize the top shelves of the cabinets throughout the building due to the poor design. The average height of employees is 5'4" and we cannot reach above the second shelf.

The walls in the patient rooms are poorly insulated and conversations, crying and general noise can be heard from room to room and out in the halls which makes privacy nonexistent. This is a significant problem when working in a pediatric practice where children are generally unhappy to be here (for obvious reasons). The noise level is very bad due to the lack of ceiling insulation and the "Open" design. The paint on the walls is flat so it shows scuffs and peeling making the walls appear dirty. The air conditioning ducts are exposed and attract dust and cob webs not to mention look unfinished.

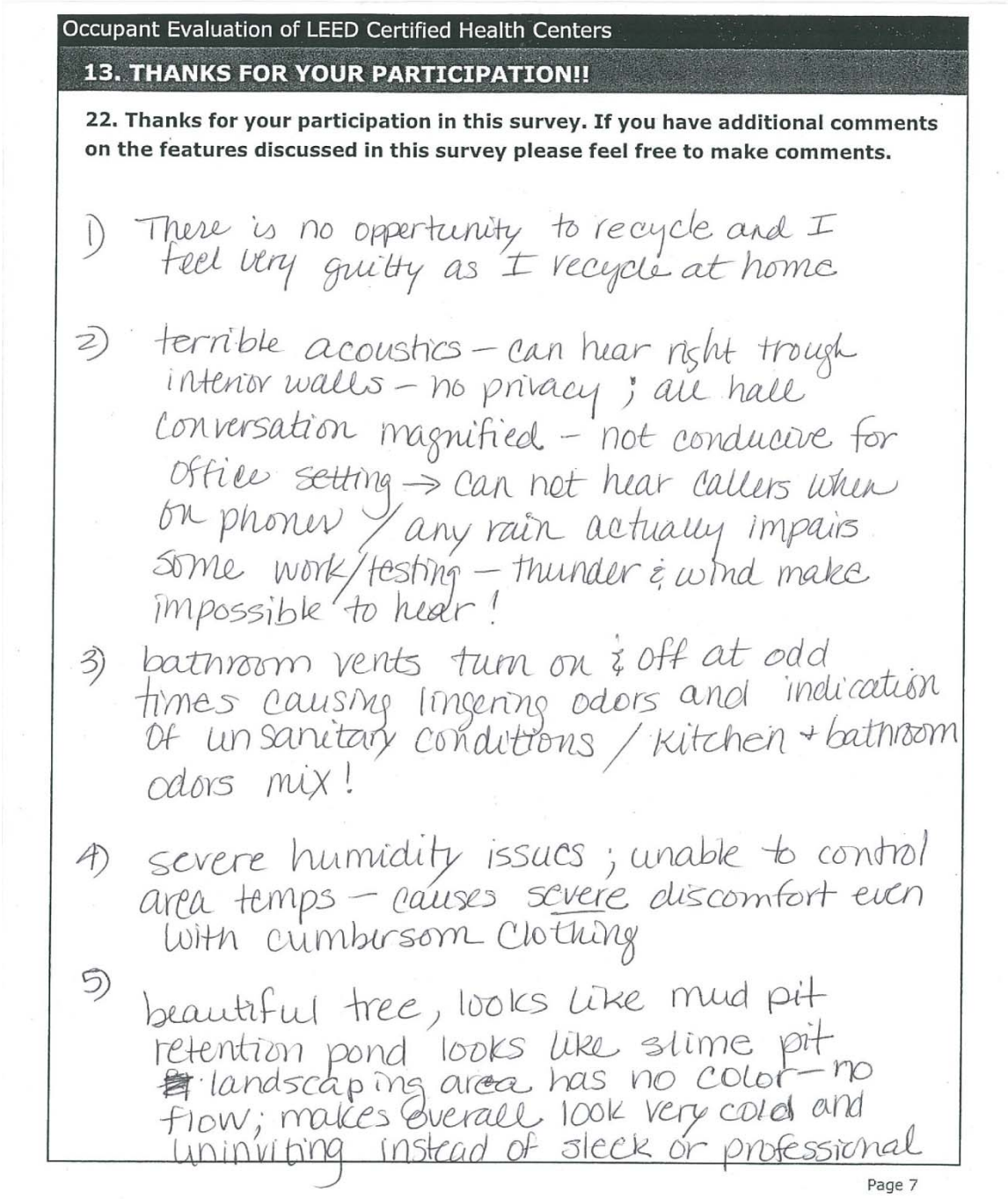
The window coverings do not allow the interior to be private. When the sun is dim you can view into the rooms that are exposed to the parking lot. When the sun is high the heat radiates through the shade which adds heat to the already hot rooms.

The sun is a problem in the mornings and late afternoons due to the high windows not being covered which enables the sun to shine directly into the building.

The toilets are not conducive for this practice simply because children have attendance to use extremely too much toilet paper when using the bathroom which makes the system back up and overflow. We have had chronic problems with the toilets overflowing. The automatic sinks have a mind of their own turning on when anyone passes by.

I do, however, like the automatic lights in the rooms. It makes it convenient when entering each room.

Figure 126: The Pearland Pediatrics Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

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1) There is no opportunity to recycle and I feel very guilty as I recycle at home

2) terrible acoustics – can hear right trough interior walls – no privacy ; all hall conversation magnified – not conducive for office setting → can not hear callers when on phones / any rain actually impairs some work/testing – thunder & wind make impossible to hear!

3) bathroom vents turn on & off at odd times causing lingering odors and indication of unsanitary conditions / kitchen + bathroom odors mix!

4) severe humidity issues ; unable to control area temps – causes severe discomfort even with cumbersom clothing

5) beautiful tree, looks like mud pit retention pond looks like slime pit landscaping area has no color – no flow; makes overall look very cold and uninviting instead of sleek or professional

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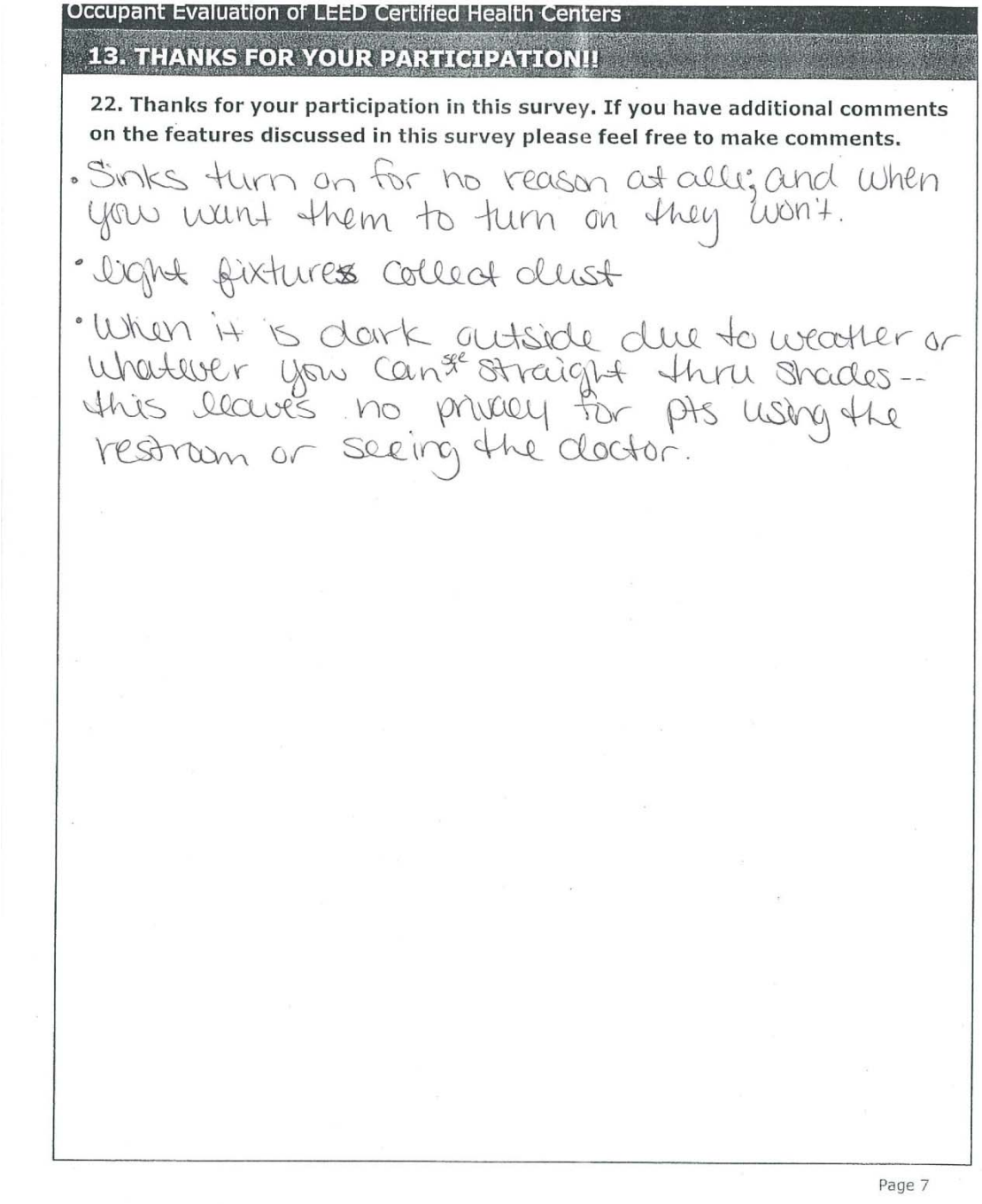
Figure 127: The Pearland Pediatrics Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

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- Sinks turn on for no reason at all; and when you want them to turn on they won't.
- light fixtures collect dust
- When it is dark outside due to weather or whatever you can see straight thru shades -- this leaves no privacy for pts using the restroom or seeing the doctor.

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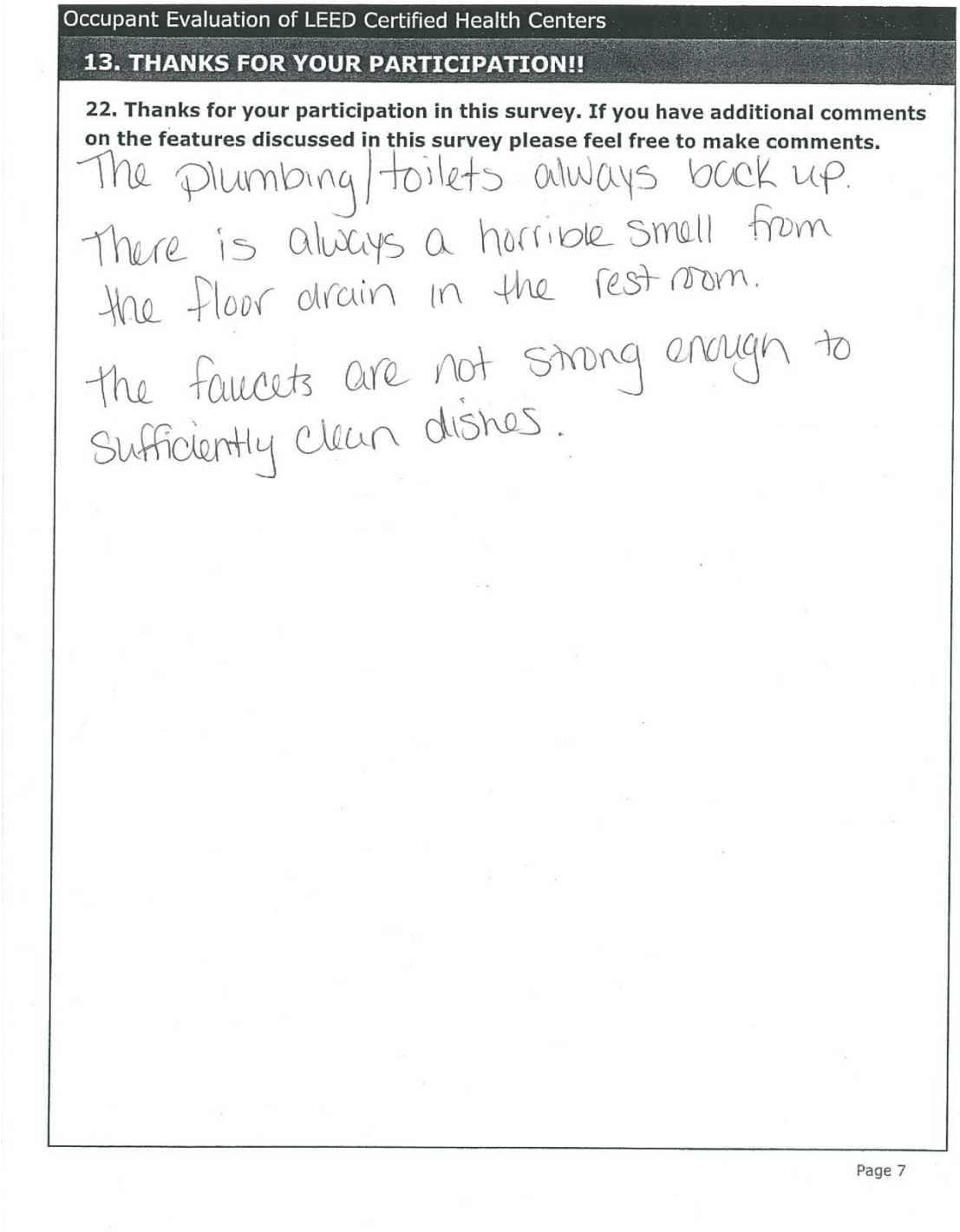
Figure 128: The Pearland Pediatrics Additional Comments from Survey Question #13



Occupant Evaluation of LEED Certified Health Centers

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The plumbing/toilets always back up. There is always a horrible smell from the floor drain in the rest room.

The faucets are not strong enough to sufficiently clean dishes.

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Figure 129: The Pearland Pediatrics Additional Comments from Survey Question #13

VITA

Anorea Marchelle Hill received her Bachelor of Arts degree in Interior Design from The Sam Houston State University in Huntsville, Texas in 2003. She entered the Master of Architecture Career Change program at Texas A&M University in July 2004. After completing the career change program she entered the TAMU Master of Architecture program in the fall of 2005. In January 2006 she switched to the Master of Science in Architecture program at Texas A&M University and received her Master of Science degree in August 2009.

While pursuing her degree she was employed from August 2007 to April of 2009 as an architecture intern, at Page Southerland Page architecture, engineering firm in Houston, Texas.

Her research interests include interior design, sustainability, LEED architecture, health care and psychology. She plans to pursue her own business in healthcare interior architecture and sustainable interior design.

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