

ACKNOWLEDGEMENTS

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INTRODUCTION

The University of Texas Health Science Center at Houston (UTHSC - Houston), with six health professional schools, is the most comprehensive academic health center in Texas. The primary mission of the university is to cultivate knowledge about health and wellness and to transmit that knowledge to students and practitioners so they can care for the health needs of people. A central focus of research is the environment and how it affects the health of all living beings. The environment includes both the built environment and the natural environment.

UTHSC- Houston is committed to creating healthy places for people to learn and work. *The Natural Step System Conditions* are used as a guide for making sustainable, balanced decisions. This four level filter declares that the things TAKEN (1) from the earth's crust must not systematically increase in nature. Substances MADE (2) by society must not systematically increase in nature. The physical basis for the productivity and diversity of nature must be MAINTAINED (3). There must be a FAIR (4) and efficient use of resources with respect to meeting human needs. This kind of thinking leads to sustainable development "that meets the needs of present generations without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development)

UTHSC- Houston defines sustainability in its broadest sense. Sustainability means balancing the social, economic, and environmental impacts of any design decision in order to arrive at positive solutions in each of these areas. Facilities must ensure the long-term financial viability of the institution in a way that contributes to the productivity and well-being of those who attend, work and visit. All of this must occur through the responsible stewardship of resources and the health of the region.

The environment in which students are taught, people are treated, and knowledge is sought reveals much about an institution's principles. Because the university is committed to teaching by example it seeks to model sustainable thinking in the facilities that are created. UTHSC- Houston has learned that sustainable strategies, integrated design, and long range thinking can lead to facilities that minimize environmental impact, save operation and maintenance costs, and promote health and well-being. UTHSC- Houston understands that lower operating costs allows money otherwise tied to infrastructure to be used for the core mission of the university – the cultivation of knowledge. To demonstrate these lessons, all future new and renovated facilities built on the UTHSC- Houston campus will embody the principles of sustainability through all stages of design, construction, and operation.

To help define sustainability as it relates to building, UTHSC- Houston utilizes the Leadership in Energy and Environmental Design (LEED™) rating system from the US Green Building Council (USGBC). The programming and early design of a building should not preclude the project from obtaining future LEED™ certification. The University's goal is to obtain a LEED™ Gold rating or higher on all future buildings. To learn more about the LEED™ rating system contact the USGBC at www.usgbc.org or the Elements division of BNIM Architects. To learn more about the sustainability efforts at UTHSC- Houston please visit the website: http://www.uth.tmc.edu/ut_general/admin_fin/ss/FPD/index.html

UTHSC- Houston uses Seven Guiding Principles which incorporate *The Natural Step* thinking as well as LEED™ and other sustainable design strategies. These will shape all aspects of design and construction on the campus. Design teams are required to integrate these principles.

THE SEVEN GUIDING PRINCIPLES OF SUSTAINABLE DESIGN AT UTHSC- HOUSTON

1. Conserve Natural Resources
2. Strive for a Climate Neutral Building
3. Create Places of Health and Well-being, While Promoting the "Inalienable Rights" of People
4. Design with Flexibility for 100 Years of Occupancy
5. Pursue Integrated Design Solutions
6. Promote Beauty and Pedagogy
7. Promote Fairness and Efficiency in Meeting Programmatic and Human Needs

MEASURING SUCCESS

In addition to the Guiding Principles of Sustainable Design listed above, UTHSC- Houston has specific performance targets and goals that should be adhered to.

Some of these performance targets include:

- Achieve the highest LEED™ rating possible in the current version of LEED™ approved by UTHSC--Houston. It is the goal of UTHSC – Houston to obtain a LEED™ Gold rating or higher on all projects.
- Design with a site respecting all living systems and biodiversity.
- Minimize the use of water first, then collect, reuse and clean water on site.
- Establish energy effectiveness and performance goals prior to design using energy modeling to establish a baseline for the site. In absence of a better performance target the following may be used: Achieve a minimum of 50% more energy efficiency than a base building designed to meet ASHRAE 90.1, 1999 criteria or better, using LEED™ and ASHRAE energy modeling protocol as a basis for comparison.
- Establish a goal for renewable energy prior to design - In the absence of a better opportunity the goal of 20% renewable energy may be used.
- Select regional building materials (within a 500 mile radius of the site) that balance: energy efficiency in the building; human and environmental health and safety; durability, maintenance, and performance; embodied energy; resource limitation; and waste reduction management
- Create indoor environments that promote health and well-being by optimizing daylighting, effective ventilation, and the use of non-toxic materials.

The Natural Step System Conditions will also be used to evaluate success:

1. Condition 1 – (Take) Substances from the Earth's crust must not systematically increase in nature. This means fossil fuels, metals, and other minerals must not be extracted at a faster rate than their slow redeposit into the Earth's crust. The facility must use rapidly renewable resources and energy sources rather than relying on virgin or finite resources.
2. Condition 2 – (Make) Substances that are produced by society must not systematically increase in nature. This means man-made substances must not be produced faster than they can be broken down and reintegrated into the cycles of nature. The facility will use only substances that can be broken down in natural, safe and non-toxic compounds.
3. Condition 3 – (Maintain) The physical basis for productivity and diversity of nature must not be systematically deteriorated. This means that the productive surfaces of the earth must not be diminished in quality or quantity. The facility should not use materials that require a harvest of more from nature than can be recreated and renewed. Habitats and biodiversity must be restored and maintained. Renewable energy must be used.
4. Condition 4 – (Share/Fair) There must be a fair and efficient use of resources with respect to meeting human needs. This means that basic human needs must be met with the most resource efficient methods possible including equitable resource distribution. The facility must balance programmatic needs with resource efficiency and fair distribution. The facility must not be wasteful. The facility must address a connection to community through access, equality and economic vitality for the region, state, nation and world.

Finally, the project will be judged by the ability of an integrated design team, through the collaborative process, to find an innovative balance between social, economic and environmental imperatives. Integrated teams must be diverse in nature with multiple disciplines represented. The team must work in a way that allows each discipline to have input on decisions and solutions. In the spirit of cooperation and shared knowledge teams with a wide range of experiences will be able to learn from one another and apply the best work of each individual toward a common goal. The integrated team and an integrated process will arrive at innovative solutions that are holistic in nature. When each member of the team brings their best to the discussion, the solutions will grow beyond any that could have been found working in isolation.

DEFINITIONS OF THE SEVEN GUIDING PRINCIPLES



1. Conserve Natural Resources

UTHSC- Houston promotes the responsible use of natural resources for the construction and operation of the building. Conserving natural resources begins with the careful development of the site and its resources such as soil, and vegetation. It then examines the use of water for construction and operations as well as protecting water quality on site.

Through careful planning, it is essential to explore all opportunities for shared spaces, flexible use spaces, and to design the most appropriate and efficient building module. In some cases a smaller building may create adequate program capacity through the creative sharing of spaces for a variety of functions and because the module is flexible enough to adapt to different purposes. This principle asks all participants to explore opportunities to avoid building spaces that may not be necessary. This is the ultimate conservation of resources.

This principle also seeks to minimize resource use through the careful selection of building materials. Materials that contain high amounts of recycled content or are manufactured regionally (to reduce transportation distances) are often appropriate. Materials should be selected that do not threaten biodiversity, such as wood from certified forests. Conserving natural resources means managing waste during construction and throughout the building's operation.

ACTION ITEMS

DEVELOP SUSTAINABLE SITES

- The first occupied floor must be 2'-0" above the 500 year flood plain defined by FEMA
- Balance the building footprint with parking & open space requirements so that local zoning requirements for open space are exceeded and local zoning ordinances for parking are not exceeded
- Create a dense urban footprint (a minimum of 60,000 square feet per acre)
- Limit earthwork during construction (40 feet beyond building perimeter & 5 feet beyond paving)
- Protect soil and water during construction by implementing EPA Best Management Practices requirements into the specifications

CONSERVE WATER

- Use native, xeriscape (drought tolerant) landscaping that will restore soil hydrology and biodiversity without the need for irrigation or chemical treatment
- Collect rainwater on-site (from roof tops and facades to be stored in cisterns)
- Minimize impervious surfaces (use green roofs, pervious/permeable/porous paving, limited paving, underground parking)
- Create opportunities to use rainwater for the buildings water fixtures (greywater system)
- Use efficient fixtures (waterless urinals, 1.6 gallon flush valve toilets, low-flow shower heads etc.)
- Reduce, reuse, and treat waste water on-site (greywater, blackwater, composting toilets, constructed wetlands, Living Machines®, or other biological waste water systems)

CONSERVE MATERIALS & RESOURCES

- Select regional building materials (within a 500 mile radius of the site) that balance: energy efficiency in the building; human and environmental health and safety; durability, maintenance, and performance; embodied energy; resource limitation; and waste reduction management
- Select products based on life-cycle cost considerations over a minimum of 100 years (use Baseline Green or Athena software when applicable)
- Provide a waste management specification to encourage the salvaging or recycling of construction, demolition, and deconstruction waste and the creation of a waste management plan (use WasteSpec™)
- Design a convenient, ADA accessible recycling system for the entire building
- Use the UTHSC- Houston School of Nursing Specification as a resource for material selection



2. Strive for a Climate Neutral Building

The health of human communities is predicated on the health of natural systems. Air pollution contributes to the degradation of the atmosphere which contributes to global climate change. Buildings are responsible for air pollution because of the energy they use throughout their lifetime as well as the energy that it takes to extract natural resources and turn them into building materials. In addition there is pollution generated in transporting materials and in the construction process itself. Understanding these contributing factors, minimizing them, and then balancing the remainder of the negative impact with restorative acts is the process of creating a climate neutral building.

All facilities at UTHSC- Houston will strive to become climate neutral buildings. A climate neutral building is one where the operation and construction of the building results in no net release of global warming gases, such as carbon dioxide, to the atmosphere. The climate neutral building also has the benefit of having the lowest possible annual operating costs. While this may not be achieved in the short term, this is a long term goal of the university.

A climate neutral building uses energy effectively throughout its life. This requires a careful integrated design, as well as proper maintenance and operation of equipment and systems. When the demand for energy is minimized throughout the building, energy can be provided by clean renewable energy sources.

The Climate Neutral building promotes the careful selection of regional materials with low embodied energy. Building materials should first contribute to the energy efficiency of the building, but beyond that materials should be regional and rapidly renewable or recycled content materials. It is important to offset any embodied energy in virgin, non-renewable materials through the use of carbon 'sink' materials. Carbon sinks are materials made from plants, such as wheatboard, that sequestered more carbon during the plant's lifetime than the carbon dioxide that was generated during the harvesting and manufacturing process. Most building materials are responsible for more carbon dioxide emissions in their extraction and manufacturing than the carbon they sequester, if they sequester carbon at all. As such, most materials in building are sources of carbon dioxide pollution rather than carbon sinks. Understanding and balancing sources of carbon dioxide emissions with carbon sink materials is important in creating a climate neutral building.

If the net amount of carbon dioxide emissions cannot be balanced entirely through minimization and carbon balancing, it may be necessary to seek out other restorative acts. An example might be to restore a native prairie

or a natural wetland to help offset the embodied energy and pollution remaining in materials. The plants in these systems will sequester more carbon in their lifetimes than the carbon dioxide that will be released when the plant material decomposes at the end of its life.

A climate neutral building encourages energy effective construction practices. It also encourages resource and energy effective practices for the occupants. The use of alternative transportation, such as bicycles, is encouraged by providing appropriate facilities, such as showers and lockers, to support the behavior. When Laboratories are included in a building program, care should be taken to monitor and filter emissions without sacrificing energy efficiency.

For more information on the climate neutral building see the article "Living Building" in the *World and I* magazine, (October 1999, Berkebile/McLennan).

ACTION ITEMS

CONSERVE ENERGY

- Understand the building's relationship to the site, micro and macro climate
- Orient building for maximum southern exposure
- Limit east & west exposure
- Use the northern exposure for daylight
- Design site lighting that will not allow light pollution upward to the night sky
- Minimize urban heat islands (utilize shade, light reflective paving & roofs or green roofs)
- Protect south, east and west from heat gain with shading devices
- Model for maximum daylight penetration by selecting the proper orientation, superior glazing, light-reflective surfaces, high and reflective ceilings, and light shelves (use physical or computer modeling to evaluate daylighting strategies)
- Optimize the envelope and glazing design to minimize thermal & moisture migration, radiation, convection or conduction
- Design the most effective overall heating and cooling system considering all passive systems and then the most effective equipment and air distribution system that meets performance and safety goals (Use energy modeling, ASHRAE 90.1 1999 or later, or a more stringent applicable code, and the LEED™ Energy Modeling Protocol for determining energy efficiency over a baseline condition)
- Design an electric lighting system that integrates daylight and occupancy sensors (use computer modeling to test lighting design effectiveness)
- Integrate all systems in the building by using an integrated design team and collaboration

MONITOR & COMMISSION

- Allow for commissioning at substantial completion and within 1 year of occupancy (The university will engage a commissioning agent early in design)
- Design a continuous monitoring system for all building systems that allows the university to operate and maintain the systems as they were designed

UTILIZE RENEWABLE ENERGY

- Design to allow photovoltaics to be added to the building
- Consider opportunities for wind power
- Make provisions for adding a fuel cell to the building in the future
- Negotiate agreements for purchasing clean renewable power

MINIMIZE EMBODIED ENERGY IN BUILDING MATERIALS

- Select regional building materials that balance: energy efficiency in the building; human and environmental health and safety; durability, maintenance, and performance; embodied energy; resource limitation; and waste reduction management
- Select products base on life-cycle cost considerations over a minimum of 100 years (use Baseline Green or Athena software when applicable)
- Promote the use of wood, bio-composites or other “carbon sink” materials wherever feasible

ELIMINATE CFC/HCFC EMISSIONS

- Select building materials that minimize off-gassing of volatile organic compounds (VOCs) that will be released into the atmosphere (particularly CFCs and HCFCs)
- Select non-CFC & non-HCFC refrigerant equipment. Non-CFC refrigerants are a prerequisite for the LEED™ rating system and can preclude any type of certification. There is an additional point available for the use of non-HCFC equipment.

UTILIZE ALTERNATIVE TRANSPORTATION

- Design for multiple, alternative transportation options (bikes, trails, transit stops, carpooling designations, alternative fueling stations)
- Provide adequate bike storage and showering facilities (LEED™ requires a minimum of 3 % of the buildings occupants with 1 shower for every 8 people)

REDUCE LABORATORY EMISSIONS:

- Consider the use of alternative fume hoods that filter or scrub the emissions from laboratory work while minimizing the energy lost in the exhausting of conditioned air
- Create a system for the safe disposal of laboratory waste



3. Create Places of Health and Well-being, While Promoting the “Inalienable Rights” of People

UTHSC- Houston is striving to design a campus of healthy buildings that demonstrate the link between human well-being and the built environment. The most important part of this or any institution is its people. The building must enhance the overall indoor environmental quality to promote the health and safety of its occupants. Indoor environmental quality includes issues of air quality, individual control over comfort, lighting, and elements of an effective workplace.

Indoor air quality (IAQ) is a fundamental part of protecting the health, safety and welfare of the occupants of a building. Because people spend most of their days inside, buildings must be safe and provide clean, fresh air. Many traditional HVAC systems do not allow for adequate fresh air to be monitored and consistently delivered to the occupant. Traditional building materials allow harmful substances such as formaldehyde, poly vinyl chloride, or volatile organic compounds (VOCs) to off-gas continuously into a space. Many buildings do not adequately filter or control allergens and molds. Cleaning products may be a source of irritation and hazard rather than a source of protection. Construction practices may also contribute to unhealthy conditions if the building is not properly vented and filtered before occupancy.

This principle acknowledges fairness and that everyone in the institution has a right to standards of safety, comfort and control regardless of their position within the organization. It also acknowledges that people have varying

ranges of comfort and should be able to have some measure of control over how comfort is achieved. Designing buildings that support people's fundamental needs for fresh air, comfort, daylight and a connection to the outdoors is at the heart of this principle. In addition this principle recognizes that people are able to work more effectively if there is equality and quality in interior spaces.

The science of workplace effectiveness studies how individuals and collaborative groups work more efficiently and consistently when they have control over ergonomics, the personalization of territory, varying levels of acoustic and visual privacy, varying levels of fixed and movable space, as well as a general control over the amount of collaboration or concentration that is allowed. There is increasing evidence that paying attention to the quality of indoor environments can lead to increases in productivity. Because UTHSC- Houston believes this is possible and important, all of their facilities will incorporate these principles.

ACTION ITEMS

IMPROVE INDOOR AIR QUALITY (IAQ)

- Design a non-smoking facility and site.
- Design entryway systems to protect IAQ, temperature and humidity (vestibules with separate filtration and entryway mats to collect particulates)
- Comply with LEED™ IAQ Standards (ASHRAE 62-1999 & ASHRAE 55-1992 or more stringent)
- Allow for IAQ monitoring (such as CO₂ monitors)
- Provide core spaces with separate ventilation systems for copiers, printers & custodial supplies
- Provide appropriate disposal and ventilation systems for hazardous waste that will not compromise energy efficiency or IAQ.
- Protect the air handling system from air pollutants and volatile organic compounds (VOCs) during construction (Require an Indoor Air Quality Management Plan that meets or exceeds SMACNA IAQ guidelines)
- Select materials that can be cleaned with non-toxic cleaning practices
- Select materials that minimize the off-gassing of VOCs that will be released into the interior of the building (particularly paint, adhesives, sealants, and carpets)
- Select wood materials that do not contain added urea-formaldehyde
- Avoid materials that contain any form of added formaldehyde (urea or phenol formaldehyde) or methylene diphenyl isocyanate (MDI) binding resins.
- Avoid the use of poly vinyl chloride (PVC) and other vinyl products

PROVIDE INDIVIDUAL CONTROL

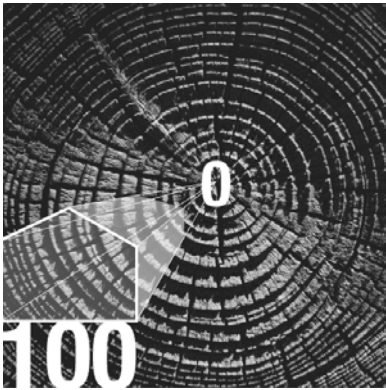
- Provide for individual control of task lighting
- Include operable windows, except in locations where health and safety may be jeopardized (such as in laboratories)
- Encourage the use of mechanical systems that allow user control over thermal comfort (such as individual diffusers) except where they may compromise health and safety (such as in laboratories)

OPTIMIZE DAYLIGHTING & VIEWS

- Provide access to views and daylight from all primary occupied spaces within the building
- Design to minimize glare from daylight through the appropriate design of shading devices and reflective materials
- Design so that daylight is available to all occupants, regardless of their position in the institution
- Design any perimeter offices to share light and view with the rest of the space (or avoid perimeter offices)

DESIGN EFFECTIVE WORKPLACES

- Design so that there is a relationship between the type of work being performed and the amount of acoustical and visual privacy that is achieved
- Design to encourage spontaneous collaboration and communication as well as levels of concentrated work
- Design to incorporate Biophilia principles that suggest private places and open spaces should exist simultaneously
- Design to incorporate Biophilia principles that suggest diverse natural patterns rather than repetitive geometric patterns



4. Design with Flexibility for 100 Years of Occupancy

Each building at UTHSC- Houston must be built to last at least 100 years or longer. The space should be durable and easily modifiable for the multiple uses that may be required over 100 years. The materials and systems in a building must be easy to maintain and must be easily replaceable as technology develops. It is impossible to predict how the institution will use its facilities in the future, and so finely crafting these facilities for the needs of one individual program is not wise. UTHSC- Houston has adopted a “warm shell and core/interiors” approach to project programming, design and construction that addresses these issues. In this approach the shell of the building and its core components are built for maximum flexibility rather than for program specific requirements. The shell of the building is designed to an ideal module that accommodates the best compromises between daylight penetration, structural and mechanical efficiency, and ideal workplace modules. Then the interiors portion of the work customizes this framework to the needs of the program.

A few exceptions to this approach exist. Laboratories, large assembly rooms, and highly technical spaces may require the kind of expensive infrastructure that does not lend itself to adaptability.

For more information about high performance workplaces and designing for flexibility visit the Carnegie Mellon Center for Building Performance and Diagnostics website at:

<http://nodem.pc.cc.cmu.edu:8080/guidelines/home2.htm>

ACTION ITEMS

MAXIMIZE DURABILITY & MINIMIZE MAINTENANCE

- Use durable building materials that are easy to maintain with safe cleaning practices
- Designing for disassembly or deconstruction so that pieces can be taken apart and potentially re-used rather than demolished

INTEGRATE STRUCTURE

- Design an integrated building module that optimizes HVAC efficiency, structural efficiency, vibration control, electromagnetic field control, building material modularity, maximum daylight penetration, and ideal flexibility in interior space planning
- Use structural materials that will endure for more than 100 years

INTEGRATE MASSING & ENCLOSURE

- Design an integrated building module that optimizes HVAC efficiency, structural efficiency, vibration control, electromagnetic field control, building material modularity, maximum daylight penetration, and ideal flexibility in interior space planning
- Design to reduce the thermal bridging through conduction, convection or radiation
- Design a building envelope that will minimized thermal and moisture migration through the wall for more than 100 years

INTEGRATE HVAC

- Design an integrated building module that optimizes HVAC efficiency, structural efficiency, vibration control, electromagnetic field control, building material modularity, maximum daylight penetration, and ideal flexibility in interior space planning
- Oversize mechanical rooms, and chases to accommodate changing loads, without over sizing the mechanical equipment
- Design a mechanical system that can be easily updated as more effective equipment is available over 100 years of occupancy

INTEGRATE CONNECTIVITY

- Make technological infrastructure readily accessible (not imbedded) so that technology can be easily updated as it changes over 100 years of occupancy.
- Consider wireless and wired technologies

INTEGRATE INTERIOR SYSTEMS

- Use interior partitions that can easily be modified and reconfigured over 100 years of occupancy
- Design for deconstruction rather than demolition so that interior finishes and surfaces can be updated with minimal disruption and waste



5. Pursue Integrated Design Solutions

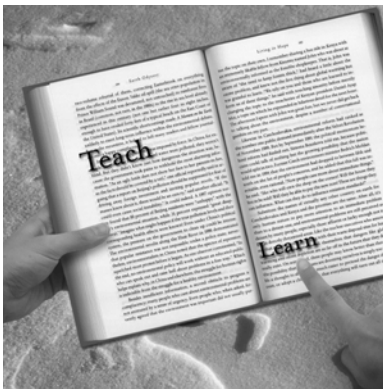
Design solutions that have multiple layers of meaning and functionality are strongly encouraged. Every design solution should be evaluated to see how each of the 7 guiding principles may be affected. For example, a design that meets the recycled content requirements in LEED™ that does not also meet indoor air quality requirements is not acceptable. Likewise, a module that optimizes daylighting but does not consider structural efficiency is not desirable. A mechanical system and an electric lighting design that does not adjust for daylighting is not as efficient or economical as it could be. Even the simplest of design decisions, like selecting a paint color, effects multiple other decisions. Integrated design is a requirement for all projects at UTHSC- Houston.

For successful integrated design both the team and the process must be integrated. The team may include many diverse partners such as university representatives, architects, engineers, landscape architects, sustainable design consultants, workplace consultants, laboratory consultants, biologists, renewable energy consultants, contractors and other specialists. To have all of these varied and specialized people on a team is not enough. They must work in collaboration rather than in isolation. They must meet and compare solutions until the final solution is greater than any individual idea. Only with an integrated design team and through a collaborative process is it possible to change the consciousness that creates traditional design into innovation.

ACTION ITEMS

COLLABORATE

- Include multi-disciplinary design charrettes throughout the project
- Bring all consultants into the project early and keep them actively involved throughout the process
- Share ideas and knowledge until the final solutions are better than any individual contribution
- Integrate visual arts and architecture (Use artists in residence, or include artist on the design team)



6. Promote Beauty and Pedagogy

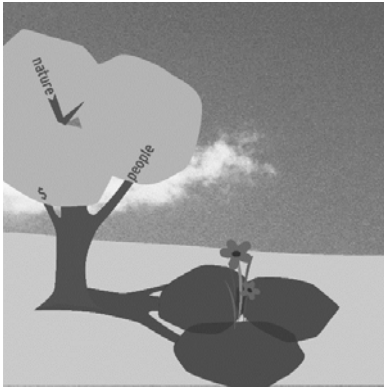
Buildings provide an opportunity to inspire and a place for people to make great achievements. Buildings can also help make people aware of their connection to the environment. A building can even model a connection between human actions and their effect on the environment. All facilities at UTHSC- Houston should be inspiring places to teach environmental stewardship. The goals of the project should be apparent and transparent in the detailing and design. A pedagogical facility is one that teaches people about how to meet their own needs without compromising the ability of future generations to meet their needs.

This principle underscores the idea that sustainable design does not mean sacrificing design quality or aesthetics. Architecture at UTHSC- Houston must meet the highest standards for design and construction, while minimizing environmental impact. The building should provide places of beauty that people will want to use and take care of during their time in the building. The building should create a sense of pride and ownership so that each inhabitant is inspired to do their best work.

ACTION ITEMS

DEMONSTRATE

- Reveal mechanical, electrical and water systems in building wherever possible
- Reveal structural systems in building wherever possible
- Demonstrate sustainable design strategies with signage and real-time data displays
- Provide clean, user-friendly systems to accommodate recycling and safe maintenance practices
- Promote waste minimizing practices in the operation of the building, in office practices, and in break room accommodations



7. Promote Fairness and Efficiency in Meeting Programmatic and Human Needs

Each facility at UTHSC- Houston must inherently respect the dignity and interdependence of living systems. The building should not diminish the health of the site or the region. The development of the building should consider its impact on the vitality of the community of which it is a part. Resources must be allocated efficiently and fairly. All systems must be treated as if they are a part of an interconnected whole.

Responses to programmatic desires of the day must be balanced with a recognition that over time, needs will change. If any one group focuses too much on their individual needs, the needs of the collective group may be impossible to meet. This principle suggests that sharing space and resources will actually achieve a higher standard of quality for all the inhabitants. It also suggests that the greater community and the region will benefit from each decision made for the building.

ACTION ITEMS

SHARE & CONNECT

- Find common spaces that can be shared between various groups
- Establish a physical and visual connection to the community
- Connect nature to the building and the building to nature
- Use resources effectively to meet the needs of many rather than one
- Protect the personal safety of all occupants

SITE SELECTION CRITERIA

Avoid:

- Farmland sites (Farmland trust)
- Parkland sites (Federal, state, city or county)
- Flood plains (FEMA) (The first occupied floor must be 2'-0" above the 500 year flood)
- Natural wetland sites (State or Federal)
- Habitat for endangered species (State or Federal)

Select:

- Urban core sites (developments near the center of a city rather than suburban)
- Sites within urban density (60,000 square feet per acre)
- Brownfield sites (previously developed, industrial sites with contamination, defined by EPA)
- Greyfield sites (abandoned developments in existing neighborhood with infrastructure, not contaminated, defined the by the Congress for New Urbanism)
- Sites that will allow for native habitat restoration
- Sites with multiple options for alternative transportation (bikes, bus, train, carpool, alt. vehicles)
- Sites that allow compact, pervious parking solutions
- Sites that allow for underground parking solutions
- Sites with east/west lengthwise orientation that allow for a long exposed southern façade
- Sites that will allow for on-site, renewable energy (PV facing south or wind turbine)

SITE DEVELOPMENT CRITERIA

- The first occupied floor must be 2'-0" above the 500 year flood plain defined by FEMA
- Orient building for maximum southern exposure
- Limit east & west exposure
- Shelter northern exposure
- Balance the building footprint with parking & open space requirements
- Create a dense urban footprint (60,000 square feet per acre = 2 story downtown)
- Limit earthwork during construction (40 feet beyond building perimeter & 5 feet beyond paving)
- Protect soil during construction
- Use native, xeriscape (drought tolerant) landscaping that will restore soil hydrology and biodiversity without the need for irrigation or chemical treatment
- Collect rainwater on-site (from roof tops, stored in cisterns)
- Reduce, reuse, and treat waste water on-site (greywater, blackwater, composting toilets, constructed wetlands, Living Machines®, or other biological waste water systems)
- Design site lighting that will not allow light pollution upward to the night sky
- Design for multiple alternative transportation options (Bikes and shower facilities, transit stops, carpooling designations, alternative fueling stations)
- Minimize impervious surfaces (green roofs, pervious paving, limit paving, underground parking)
- Minimize urban heat islands (shade, light reflective paving & roofs or green roofs)
- Allow for on-site renewable energy (PV facing south, wind turbines or fuel cells)
- Protect existing site resources including water systems, soil, biodiversity, vegetation, trees and habitat

EXISTING BUILDING CRITERIA

- Understand the building's relationship to the site, micro and macro climate
- Create opportunities to use rainwater for the buildings water fixtures (greywater system)
- Replace old plumbing fixtures with effective fixtures (waterless urinals, 1.6 gallon flush valve toilets, low-flow shower heads etc.)
- Reduce, reuse, and treat waste water on-site (greywater, blackwater, composting toilets, constructed wetlands, Living Machines®, or biological waste water systems)
- Provide adequate bike storage and retrofit showering facilities (3 % of the buildings occupants with 1 shower for every 8 people)
- Consider a retrofit that will protect south, east and west facades from heat gain
- Optimize existing daylight penetration by retrofitting with superior glazing, light-reflective surfaces, reflective ceilings, and light shelves
- Maintain existing views
- Design to minimize glare or undesirable lighting contrast on the east, west & south so that daylight and electric light have even, quality distribution
- Improve the envelope and glazing design to minimize thermal & moisture migration
- Design the most effective overall heating and cooling system considering the most effective equipment (Use energy modeling, ASHRAE 90.1 1999 or later, and the LEED™ Energy Modeling Protocol for determining energy efficiency over a baseline condition)
- Consider an electric lighting strategy that integrates daylight and motion sensors
- Allow for commissioning & monitoring of all energy and water consuming equipment
- Select any new building materials for the shell construction that balance: energy efficiency in the building; human and environmental health; durability, maintenance, and performance; embodied energy; resource limitation; and waste management
- Select materials based on life-cycle cost considerations over a minimum of 100 years
- Provide a waste management specification to encourage the salvaging or recycling of construction and deconstruction waste and the creation of a waste management plan
- Design a convenient, accessible recycling system retrofit for the entire building
- Design surfaces & materials that require minimal and safe maintenance practices
- Convert a smoking facility to non-smoking facility that will accommodate smokers away from the building's air intake system and entryways
- Redesign entryway systems to protect indoor air quality, temperature and humidity (vestibules with separate filtration and entryway mats to collect particulates)
- Replace windows with high-efficiency, operable windows & daylight design
- Design an air distribution system with individual control over air flow, and humidity
- Provide for individual control of lighting
- Comply with LEED™ IAQ Standards (ASHRAE 62-1999 & ASHRAE 55-1992 or better)
- Allow for indoor air quality monitoring (such as CO₂)
- Provide cores spaces with separate ventilation systems for copiers, printers & custodial supplies
- Provide appropriate disposal and ventilation systems for hazardous waste that will not compromise energy efficiency or indoor air quality
- Protect the air handling system from air pollutants and VOCs during construction
- Schedule construction so that the building will not be occupied during construction or after construction until the system has been flushed with fresh air and the filters have been changed