

NEXT GENERATION LIVING

An Undergraduate Research Scholars Thesis

By

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ABSTRACT

Next Generation Living (May 2013)

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The idea and attempts of sustainable design in architecture is common today. Sustainability as it relates to architecture ranges from small modifications or minute enhancements all the way to full projects. There is no term to differentiate these vast ranging sustainable efforts. We casually say “sustainable design” when referring to our project yet there is a disconnect between the common and familiar phrase and what the term actually means when it comes to a particular project. Our research will be focused on the relationship between the calculated and proved efforts of sustainability in design and the perceived or idea of sustainability in architecture. We seek to project a commonality and dependence that proves that design of space, design of mechanical systems, and our perceived outlook of sustainability can collaborate and aid each other toward sustainable architecture. This collaboration will take form through the proposal or a living and learning community for the students and faculty of Texas A&M University.

CHAPTER I

INTRODUCTION

The world is growing and developing at a rate that we have never seen before. Not only is our world growing by population, but it is experiencing new growth in areas such as technology, health, and science, among others. With this growth comes several issues that affect our world and lifestyle. For example, with the growth of the world's population comes the requirement of the necessary resources to provide for those inhabitants. It is examples like this that call sustainability and sustainable practice into the way we live. Practicing sustainability is not only the trendy or green way of living; it usually is the smart thing to do. When one can consume less while still maintaining the same level of comfort while saving money, wouldn't this be the smart thing to do?

Sustainable architecture and sustainable design are a common topic and effort in architecture. This form of sustainability, however, ranges from minute modifications and minor enhancements to full projects. Although there is such a wide range of sustainable projects we still refer to any form of sustainable efforts as sustainable design in architecture. In an effort to save energy and in turn save money, it has become a worthwhile task to research methods and formulas that will achieve this task all while creating a greater presence of sustainability in architecture.

One realm currently lacking energy efficiency is the cooling and heating in buildings. The methods and procedures that are most commonly being used today in air heating and cooling are not the most efficient. Houses, schools, and office buildings all over the world are consuming more energy than is needed to maintain their familiar level of comfort. There is a need for more sustainable methods in the way we cool and heat our living environments.

One place where there is room for efficiency is in the way we condition spaces. Most air conditioners are set up to work, at present, using an air conditioning unit that is sending cooled air into every room that has an air duct leading to it. The flaw in this method is that there is no need to cool a room or a space that is not being occupied or inhabited at the moment. Requiring a machine to consume more electricity than it is required is not only more wasteful, but it is more expensive.

After researching various sustainable methods, as it refers to architecture, this research has taken a direct focus. In order to ensure sustainability across all boards, from lifestyle to aesthetics, this research began to look at what is required to be considered “sustainable” in all scenarios. True sustainability is as much a lifestyle as it is a systematic approach. This research is focused on creating a community that embodies true and practical sustainability. The integration of design and systems will prove to be the key in energy savings. The method of energy savings that this research is being conducted on is referred to as “partial use” and “partial conditioning” of space. Partial conditioning simply contributes to energy savings to ensure sustainability while partial

use refers to the sustainable lifestyle component. Both are needed and dependent upon each other to ensure sustainability in architecture and in our daily life.

Partial conditioning is a method that is more efficient and self-sustaining. In a partial conditioning system, conditioned air does not get wasted in spaces where there is no one occupying that space. With this method the air from the occupied space is used and then moved to unoccupied spaces to partially condition the unoccupied spaces. Then that air is moved into other unoccupied spaces, referred to as reuse air, and then moved into an atrium, and then finally exhausted to the outside. This creates a circulation pattern within the interior living space. One of the ways that we will be carrying out our research is by running simulations with specific scenarios through data simulation programs such as eQuest and EnergyPlus. We will simulate specific scenarios for specific environments trying this method as opposed to traditional methods.

Partial use results from the conditioning method. Partial use realizes that we use different spaces in our home for different reasons and during different times of the day. This design effort arranges what we call “rooms” in our homes in such a way that utilizes both space and location relevance to each other. This design revolves around the introduction of a true atrium. This atrium space serves as a functional space when the temperature permits and a space for brief movement during when the weather reaches an extreme high or extreme low. In some seasons the thermal loads on the building will likely be high so that the full space may not be comfortable. For this case, since the atrium is not conditioned with the first-use air, it may be not

usable. This atrium is simply a form of inexpensive and extra space in our home. In relation to partial conditioning, this space is subject to uncontrollable changes in temperature, relative to the outside temperature, because it is the last stop for the air cycled through the partial conditioning system.

This partial use and partial conditioning system, with the understanding that collaboration in architecture is necessary to achieve a truly sustainable project, introduces an idea and proposal for the campus of Texas A&M University. This project has the great potential to benefit the community, the university, and its students simultaneously. The introduction of a community that achieves a great level of sustainability through design, construction, living, and learning, is the goal. This project seeks to improve the community of College Station, Texas by giving this area visibility from other communities and universities who also seek to achieve great sustainable design. This community will gain a destination point while, in collaboration with local businesses, uniting this community in one common effort: sustainability in environment and community. This project understands the goals of this university. For Texas A&M, incorporating this living and learning community, with the collaboration of administration, faculty, and students, sets new standards for sustainability in academia. This project also seeks to benefit the students of this university. By introducing sustainable living, this project will provide students a healthier place to live which, in turn, predictably affects mood and academic performance. This living while learning community is designed to benefit the vastness of our community and the individuality of our student body all while setting the example for what sustainability in architecture can become for other communities and universities.

This self-sustainable community seeks to produce only what we consume as an effort toward total sustainable design. This movement allows Texas A&M University the opportunity to take the lead into this fairly new emerging technology. It is possible for Texas A&M to develop more efficient campus housing. This new way of living would have more efficient cooling and heating, as well as use of more efficient materials. This could potentially grow into something greater than just student housing. In the hopes that this community will serve as a living and learning hub for new growth and technology, the Texas A&M students and faculty housing will be included in the master plan. There is an opportunity here to build a community that has never been done on a university campus. A community that promotes education and learning about innovative and efficient technology while practicing this lifestyle will transform Texas A&M University into a true example for others in how to not only view sustainability but put theory into practice.

Certainly, this project will be a living-learning community; there must be an element of education built into the community fabric and infrastructure from the very start. The community will serve as an out-of-the-classroom interactive learning facility for all professions and fields of study at Texas A&M University, College Station. This component of education is integrated in with the other characteristics and goals of the project. The community will strive for resource-independence, consuming what it produces and closing the loop on a small scale. When resource-independence is achieved on a small scale, it will serve as a precedent for larger new communities, allowing for incremental growth of self-sustaining communities until the

limitations are discovered. This community, completed for Texas A&M University, will become the first innovative community of its kind.

Although we wish to lead this effort on the university level, we are not the first to think of such an idea. Other attempts at self-sustaining environments or communities have already been made. Although they have not been exactly what we are proposing, they are worth researching and understanding. A project that has seen much publicity in the realm of sustainable environments is Biosphere 2. Space Biospheres Ventures was the joint venture between Decisions Team and Decisions Investment that built Biosphere 2, a scientific research facility that housed miniature replications of Earth's five biomes. Biosphere 2 was a closed ecological system that aimed to collect data as it pertains to carbon dioxide levels in a closed system, the capability of a human, controlled closed-system to house human beings for an extended period of time, and other areas of research that relate to the functionality and success of such an environment (Prado 2012). The ambitions of Biosphere 2 proved to be too great and the project ultimately failed, no longer serving its original purpose.

The community we propose would be more comparable to Can Masdeu, a small community of inhabitants located in the hills between Barcelona and Collserola National Park, Spain. This community was born on December 22, 2001 and remains to this day. Can Masdeu is only a 25-minute bike ride from Barcelona's center, just out of reach (for now) of the urban sprawl. After its renovation and occupation, the core group behind what is now Can Masdeu identified their goal: to create an urban social center based on rural principles or what they call a "rurbano"

social center. Now, this urbano center serves as a community for the inhabitants but also as a classroom for anyone curious enough to visit, as well as a meeting place designated for grass roots and resistance movements and as a venue for musical performances. All members of the community perform chores and contribute to the functioning of the community along with paying for acquisition of food supplies or food if it cannot be grown on-site which amounts to 25 euro per month. This community is almost completely self-sufficient. There is much to learn from the Can Masdeu community although many distinctions would be made to our proposed community. Examples of infrastructural implementations such as paved bike roads can be seen in countries such as The Netherlands, where the main mode of transportation is the bicycle. For a student community living adjacent to campus, we feel that such infrastructure would be necessary to minimize the community's ecological impact on the environment.

As it relates to Texas A&M University, the community would help reach Vision 2020 by contributing to each of the Twelve Imperatives that compose this goal. Our proposed community would create a new arena in which faculty, research, and scholarship will be elevated. The field of sustainability has room to grow in our school and this project would create the medium where research regarding alternative energy technologies and other aspects of sustainability would flourish. As a result of this, the university would attract graduate students interested in pragmatic sustainability by offering a one-of-a-kind community that would enable them to learn in and out of the classroom. As it would be a student community, the undergraduate academic experience would be vastly enhanced. Undergraduate students would be able to live and work in this community while developing strong relationships with faculty and gaining hands-on learning that would be unique to Texas A&M. Because of the community's foundation in sustainability, it

would bring a new culture to our school. This complex would serve as a cultural center for the arts and sciences that is now unspecified on campus. By expanding our constituency, the university would increase student diversity, which would enrich the student body. This community would serve as a perfect ground for creating innovation in Texas A&M University's professional programs. As an example, architecture students could learn from the built environment of the community while engineers would be able to learn from the structural, mechanical, and energy side of the built environment. Our campus would attract students from all over by providing a unique living-learning sustainable community, thus increasing the diversity of our school.

Since Vision 2020 expresses the need to increase our library holdings, the unbuilt character of this proposed community creates the perfect opportunity to incorporate a new supplementary library as a component of the master program. This library could house all the books and knowledge resources that relate to the interdisciplinary activities that would take place on the site. This community would be built in such a way that would greatly enrich Texas A&M University's campus by adding a new campus amenity embedded in trees and vegetation. Collaboration with private construction and design companies to build this proposed community creates an excellent opportunity to build community and metropolitan connections that would serve both the school and its private partners. This collaboration would enhance the value of the community and once built, this community founded in pragmatic sustainability, economic, ecological, and social aspect would help Texas A&M University reach its goal of attaining resource parity with the best public universities in the nation.

Regarding our commitment to Texas, nothing would aggrandize the state of Texas more than having its land-grant universities lead the way in the field of sustainability and sustainable development. In all these ways, our community would help Texas A&M reach Vision 2020, in turn enhancing the education of our students, our university, our state, our nation, and the world.

The vision of the sustainable living-learning community is to be just that. The location of the community would be on the outskirts of campus, enabling the structures to be built in close vicinity to nature. Since students and faculty members would be living there, an alternative transportation infrastructure would be incorporated into the design. Safe bike paths, physically separated from vehicle paths, would be necessary. The complex would include high-density student housing (dormitories), low-density student housing (duplex or home style), faculty housing (individual homes or duplexes), an office building, a dining hall, and student-operated sustenance gardens. Plans have been designed for this community but the layout must remain flexible due to the changes in site location and other limiting factors. To make this community become a reality, we have presented our design and fundamental concepts and implications to the administration of the Texas A&M University system to initiate conversation and interest about the proposition.

One of the elements that would be involved in this next generation living and how it benefits students would be designing dormitories that are intended to elevate the well-being and reduce the stress of students from school. Dr. Roger Ulrich states “a small but rapidly expanding body

of research has tested the old belief that visual contacts with nature have restorative or stress-reducing influences” (Ulrich and Parsons 1990). Findings from a sequence of” studies of nonpatient groups such as university students suggest that views of everyday, unspectacular nature, compared to urban scenes lacking nature, are significantly more effective in promoting recovery in the psychological component of stress”. This leads us to believe the findings surveyed above suggest that short-term visual contacts with nature can be effective in promoting recovery from stress. This has also been found in a few studies where patients in healthcare settings were exposed for comparatively short periods, such as 10 minutes, to views of nature. One possible method of implementation of stress reduced living environments would be designing dormitories and a living community that has, for example, views to nature consisting of greenery, more natural sunlight as opposed to more artificial light, as well as the sight and sound of water.

By implementing such things as these, students and faculty at Texas A&M University would be living in an environment that already requires less amounts of energy while keeping the same level of comfort and would in fact gain comfort due to a reduction in stress that is happening at a psychological level. Students would be able to live more comfortably which has the potential to raise grades of students as well as the morale; applying this to home would make Texas A&M University a much more pleasant place to study, learn, and live.

One key aspect contributing to the sustainability of this community is the high-density student housing that will be used. The dormitories will be of a unique design centered on the concept of

partially used and partially conditioned space. Each dorm room will house two students and will be composed of a bedroom area, restroom area, and atrium area. This atrium space would be physically separated and would provide leisure and study space for the students. The idea behind this atrium space is that it would only be used during environmentally comfortable times and would not be conditioned while not in use. This means that a substantially less volume of the dormitories would require temperature maintenance and would result in a drastic decrease in building operation costs. This innovation in design, implemented over a significant number of units, is critical in achieving the economically sustainable aspect of this living-learning community. This dorm design successfully integrates efficient systems with innovative design and environmental qualities. With the introduction of an atrium, each student will be living in an area that provides a larger amount of sunlight, and the possibility of greenery within their unit. The introduction of these natural elements will, founded on evidence based design, create a healthier living environment which will inevitably reduce stress and increase academic performance. We are designing to improve what is considered sustainable living at Texas A&M University and to introduce an enhanced lifestyle that will benefit all associated with this university.

In addition to the dormitory units in our master plan, we are proposing student and faculty homes. The integration of various designs of living units for students will attract a diverse group of students which will benefit the university as a whole as well as this new community. Housing faculty on site, yet given privacy, will ensure the living-learning aspect that this community has been founded upon. The academic benefit of students living and learning within close vicinity of faculty is a benefit that is unheard of in academia. This new shift in the way we view teaching

and learning will place Texas A&M above the rest in research and innovative teaching methods. This close interaction between students and faculty will benefit the student in ways that we can only perceive to be boundless. Students will have the rare opportunity to not only learn about sustainability and groundbreaking methods and technology, but be able to practice these methods and live a truly sustainable lifestyle. Faculty will be able to “practice what they preach” and lead by example as they interact with their students on a daily basis.

These student and faculty home units will be very similar. Like the student dormitory, these homes seek to integrate efficient systems and innovative sustainable design. All three of the living units are similar in the introduction of *partial use and partial conditioned* space, which is given form through the atrium. As previously stated, this atrium will introduce greater amounts of sunlight which enables the introduction of plant life. This space does not require conditioning and will serve as a common room for each connecting living zone. These zones may include, but are not limited to, bedrooms, kitchen, living room and bathroom. This design-focused atrium creates a new lifestyle which has bridged the gap between our current state of unrealistic comfort and true sustainability: sustainability in the form of environment. Through this community, Texas A&M will have productively transformed the idea of sustainability into a community based, practice constructed and design oriented lifestyle. Sustainability no longer is chained to the quick-fixes or after thought enhancements, but takes true form in this practical and design integrated community, and everyday routine.

This community concept for Texas A&M University has proposed what has yet to be accomplished within any university: to integrate the correct efficient system and practical sustainable design to redefine sustainability as a working and breathing environment. This environment will be put into practice as a true lifestyle for the students and faculty of this university. This lifestyle is the practice of sustainable living through residing in a partial use and partial conditioned housing unit, learning how to consume only what is produced on site as well as becoming educated in new innovative energy saving methods as taught by faculty living within this same community. The systems practiced and put into action in this community environment will positively integrate all fields of study offered at Texas A&M University. This new form of communication between departments will effectively promote the progression of true sustainability. This campaign will give this university a platform to set an example for other universities and to the world about what sustainability has the potential to accomplish.

CHAPTER II

METHODS

Sustainability in architecture requires two parts of understanding: the known results of calculated savings and the environmental quality that is known when perceptions are made. This contrast of science versus perception are opposites that must collaborate to understand and identify true sustainability in architecture. The methods that this research will take begin with this understanding. As designers of architecture it is our responsibility to take our topic of research and make it beneficial to a group of people through design. Our research methods will simply take the results of calculated energy savings and translate those results into form and space that will satisfy a community. Science is transformed into part of our daily life through design in architecture.

The main test subject in this research is the energy use and energy consumption in our designed structure. The *partial use and partial conditioning* system sets a high bar for lowering energy consumption when it comes to the conditioning of living spaces. When the air is conditioned only in spaces of a house that are being occupied and then pushed and circulated into other areas that are not being occupied; less energy is used. The contrary to this method would be to condition the air in all rooms of a house regardless of whether any one person is occupying that space or not. Through tests and simulation we can provide the data that is required to show that these methods are, in fact, more efficient than any other current standard for the conditioning of air in human occupied spaces.

Collaboration between fields of study, science, and perception is what we view as irreplaceable when discussing sustainable design. The success of a sustainable community requires the collaboration with city officials as well as those who make up the community. This project must be marketed in such a way that removes any fear of change and introduces benefits. This successful living and learning community will rely greatly upon the willingness and understanding of this university. The administration of Texas A&M must be informed of our progress and ideas of the transformation of sustainability on campus. We will be required to present clear evidence of energy savings as well as perceptual perks. The students at Texas A&M must be clearly presented the facts as well as the painted picture of this lifestyle. The collaboration that we seek involves those who can quickly provide energy simulation data, which will then be used to create a design, which will then be creatively displayed and presented to the community, the university, and the students at Texas A&M University.

The necessary data needed would include a data set of the amount of energy used in a standard house using a nontraditional air conditioning system and the data set of the amount of energy used in a house using the non-traditional partial use and partial conditioning system. The major tool that will be used to gather the necessary and appropriate data is a program named eQUEST. eQUEST is a data gathering program that was designed with the purpose of analyzing buildings in a variety of manners. This program has the capabilities of providing users with information about a building such as how much energy a specified building is using or will use, what areas can be changed or modified to get specific results, as well as what energy is being used where and by which mechanical system or appliance. The procedure for documenting and gathering the

proper data consists of inputting the necessary information required by eQUEST. eQUEST also is intended to simulate how buildings react under certain conditions. These conditions include weather, location, time of day/night, and all the different types of materials that are a part of the building. The process that would be necessary to gather the correct and needed data would consist of first inputting into eQUEST specific parameters such as geographical location, spatial dimensions, materials, types of mechanical equipment being used to run the building, types of heaters, types of windows, etc. After inputting the correct information to eQUEST a simulation is run based on the data entered into the program which results in information such as energy usage, what is causing the usage and where the energy is being used. In this case, data would need to be acquired from what is called a “baseline” building which is a building with standard features. After the simulation is ran for the baseline building, a second simulation is ran with the appropriate modifications are made to accommodate for the “improved” building. After this is done, we will compare the energy usage by the traditional air conditioning system to the energy usage with the improved house using the partial use and partial conditioning system. This is the most efficient tool we have when trying to make comparisons in energy efficiency in buildings. Multiple tests will be run to establish a solid set of numbers and data.

The goal of any research in architecture is to exceed and advance spatial quality. This research will not only produce accurate and useful information by testing the energy efficiency as well as the effect of spatial quality. As previously stated, the energy use of this partial use and partial conditioning system will be tested and analyzed through the eQuest, simulation software. In order to truly discover the spatial quality and environmental elements of this system, this research will proceed with the design of a home that advocates partial use and partial

conditioning. It is important to partner the numbers derived from energy savings with the five human senses that can only be put to use when physically experiencing the space.

CHAPTER III

RESULTS

The purpose of this research is to question the familiar category of sustainability in architecture. The methods that we took to stretch the boundary of this familiar topic in architecture morphed from a single effort to a mutual effort. When we began this project we had the mindset that there would be one formula and one method that would bridge the gap between sustainability and great design. The method and theory we had in mind had been one that was understood by our team which, we thought, would take this research into one where we could predict the outcome. Although partial use and partial conditioning of space is a method that has proven to lower energy costs and create sustainability in design in architecture, it is not a method that can stand alone and create true sustainability.

We have come to realize that sustainability in architecture is not one single method, one single design, one single formula. Sustainability in design in architecture is collaboration. As stated previously, it is collaboration between mechanical systems and layout, but the collaboration does not start and end with this relationship. True sustainability is the sharing of ideas and methods between research groups, the progressive link of mechanical system and layout, the understanding of compass orientation, and the knowledge of how true sustainability is a lifestyle change and should be advocated through design in architecture.

This research has morphed into a rich collaboration towards a common goal of discussing and searching for true sustainability in architecture. This idea that absolute sustainability in architecture is not found in one formula or one method is a realization that came unexpectedly. The original thought that collaboration between mechanical system and organic form would bridge the gap needed to reach true sustainability has since been enriched. Although this method has proven to reduce energy consumption, it will be enriched through the introduction of more collaborative elements. There may never be one formula or one true design that satisfies sustainability in every aspect. In order for a structure to be completely sustainable it must agree with the environment and the user. Sustainability begins to reach its full potential in architecture when we introduce multiple methods and formulas that unite with one another to create a low impact on the world we live in and a large impact on the functionality of the way we live our lives.

Once this intricate collaboration was identified we began to brainstorm how we could truly create an ideal sustainable project that would become the ideal design for others to follow and learn from. We teamed up with other research students at Texas A&M to learn about how they were contributing to the world of research in sustainability and began to take steps forward in a collaborative sustainable design. We have collaborated with Vanita Negandhi, a PhD student, to implement her 2500 square foot house into a collaborative master plan. This aesthetically recognizable residence has been designed around the partial use and partial conditioning system to reduce the use of energy in the home as well as advocate an efficient lifestyle. The collaboration with Vanita has allowed our team to introduce this design and way of living to the faculty that would be provided with homes in our project. We have teamed up with Simge

Andolsun to introduce her small residence to the students that will be housed on our site. Her research and insight into designing small spaces using the partial use and partial conditioning guidelines have allowed us to better understand the credentials and to better equip the students of Texas A&M University with a sustainable and pleasing place to live on campus. The knowledge of how to incorporate different styles of living while still using the same standards is key to designing a successful living environment for both faculty and students. We have also shared our interest and ideas about this community master plan with those with The Pecan Street Project in Austin, Texas. This journey towards a sustainable community and a sustainable lifestyle led us to them. The Pecan Street Project specializes in analyzing energy use in the home. They are equipped with the necessary methods to calculate energy and how it is being used. Through their techniques they are able to tell the home owner exactly how much energy is being used in their daily routine and where it is being used. This shared passion has sparked a great collaboration. They have become invested in our progress and we in theirs. These contacts that have provided a mutual excitement in various research projects and the creation of teamwork in moving forward are what great progression in research is all about. We have gained momentum in presenting this research to both students and faculty, whose opinion and interest in this project are where positive results are given. We seek to not only receive great numbers in the amount of energy saved through our design methods but also to receive positive feedback to those who will provide the greatest amount of participation: those who will one day live in these homes and live out this lifestyle of sustainability.

This intricate collaboration changed our role as a research team to a research community.

Through this exchange of ideas and goals towards a sustainable world of architecture we shifted

our mindset from this is our research to this is the Texas A&M University's research. Our research and contribution to sustainable architecture became the glue that will unite various ideas and formulas that, together, will produce true and absolute sustainability in architecture.

With the evolution of our methodology from something simple to one that requires scheduled intricacy, the results that we received proved that a collaborative design and involvement would result in a more sustainable project. The idea of sustainability in this sense is both derived from the numbers of simulation and the response from others. This new idea of sustainability no longer is solely based on whether the project saves more energy or is made of local materials, for example. This project's sustainability is derived from, not only the calculations required to prove energy savings, but depends on whether or not those who will use the structure are satisfied with its aesthetic and function, and whether they are willing to adapt the sustainability lifestyle that the environment of this project requires to achieve true sustainability.

As our research group developed into the role of collaborative designer, we began to understand the various new ideas and formulas that are being developed through Texas A&M University and started to compile this information into a project that could be understood and relevant to others, especially this university. This compilation of ideas will be united and designed to be a learning community that advocates sustainability in architecture and lifestyle. This master plan community, located on campus grounds, will elevate Texas A&M University into the front runner and prime example for sustainable design. With the excitement and collaboration of those who are contributing to the field of research here at the university and afar, we will design and

present a living and learning community comprised of students and faculty that will not only understand true and relevant sustainability but put it into practice.

This community will be composed of dormitories, experimental student housing, faculty housing, commercial real estate, research labs, classrooms, and gardens. The proximity and unity of these structures will allow students at Texas A&M University to learn about what it means to live efficiently and easily put it into practice. Texas A&M faculty will be able to live in these units and guide the students as they learn and live an efficient and sustainable lifestyle. Faculty and fellow researchers will be able to use the facilities provided to further their research and efforts to a sustainable world. This master community plan for Texas A&M University will become a destination and prime model for others to learn from and implement to understand and experience true sustainability.

CHAPTER IV

DISCUSSION

Sustainability in architecture is a common theme in design and construction today. The extent of sustainability is commonly an alteration or modification in one aspect, whether it is material choice, orientation, or location, etc. Yes, this design choice to introduce a hint of sustainability in to a project makes an impact but it bares the question, is there such a thing as a truly sustainable structure or project? Is there a building or community that exists that encompasses every sustainable alteration and modification that we tack on to a regular and familiar structure and if this is accomplished is the project then truly sustainable?

As we began to analyze these questions and discuss the theory of sustainability in architecture it became clear that sustainability in architecture can be more than one or two modifications towards a sustainably recognized structure. The job of an architect and designer is to be a problem solver. Simply choosing local materials, for example, and calling a building “sustainable” is taking the easy way out and not taking full advantage of the skills that we are required to use towards a project; problem solving and organizing.

This movement from modification to a total and complete immersion into the sustainability efforts is the key to truly making a mark on sustainability in architecture. As a research theory in proposal, true immersion in sustainability in architecture can be accomplished through the collaboration and implementation of various sustainable efforts of others. This collaboration

between architects, engineers, and others will secure that every design made and every line drawn will be guided by a push towards a sustainable structure. If architecture, in general, is aimed towards the needs of the user and enhanced through aesthetics and quality of environment, then we should seek affirmation from not only the amount of energy we save but the satisfaction of the user. A successful sustainable structure must be energy efficient and cost effective and also ensure that the lifestyle changes that will come with the design are accepted by those who will live in the structure or use it on a daily basis. Once this balance is achieved the structure will exude sustainability and those who inhabit the structure will engage in a sustainable lifestyle both enhancing the sustainability within the project and the community at large.

The conclusion of this project resulted in a master community plan that encompassed the sustainable efforts and ideas of various research groups. Although this entire community proved to reduce energy use and costs, the test of true sustainability was only partly achieved. The complete test of accomplishing true sustainability would come from both the amount of energy saved and the money and the acceptance and transformed lifestyle of the user. The structure could encompass everything that, on paper, makes a structure sustainable and efficient but if the user is not willing to adapt to the lifestyle that living in the structure requires and in turn does not practice sustainable living the structure is not truly sustainable. The community master plan designed for Texas A&M University has conserved energy, gained excitement from faculty and students, and contributes to the further investigation of sustainable design in architecture.

This developing theory in our research has allowed us to step back and examine why architecture exists. As we wanted to answer a bigger question we were ironically moved to step back and

examine the fundamentals to architecture. This exercise brings one to realize why sustainable architecture is important.

Architecture exists to protect individuals and to guard them from natural elements: rain, wind, sun, etc. Not only is architecture used in the form of personal or residential use but it has also been transformed into places of business and leisure. Architecture surrounds us. As a society, we are drawn to architecture and all have an opinion on what we like and dislike about it. We recognize what is aesthetically pleasing and have an opinion on what should have never been built. We live in a world that praises extraordinary structures, we seek to live in beautiful homes, and we succumb to mood changes when our environment does not suite our liking. Architecture creates lifestyle; it affects where we go and what we choose to do.

Architecture is the link that creates comfort in a natural environment that is uncontrollable.

Architecture exists for people. Sustainable architecture is necessary to better the relationship and connection between people, architecture, and the natural elements of the world we live in.

Sustainability is a known term because we desire to create minimal impact on the natural world through the architecture that we need to survive. Through this research, we advocate that sustainable architecture should not be limited to architecture alone. As previously mentioned, the relationship between architecture and people is not an exclusively mutual one; it requires the effects and inputs from the environment. The natural environment, the built environment, and society are the three components that become affected by the existence of each other. Sustainable architecture must exist to create a positive relationship with the natural environment; just as

sustainable architecture cannot advocate an efficient lifestyle which all in all creates a low impact on this delicate triangle that we require every day.

This discussion about sustainable architecture is an ongoing conversation. This research is not complete and the conversation should never end. The collaboration between all fields can continue to develop and to grow. In architecture, results come with those shown through simulation and theory or experience. There is a delicate balance between what can be calculated in architecture and what is perceived. In architecture, opinions are made and energy calculations can be found yet the two rarely coincide in any other field. This discussion on sustainability in architecture has transformed from a calculated energy analysis to one that now relies on the acceptance of human beings. Successful architecture has been taught as something that looks beautiful. It is impossible to predict the scale of how a particular structure ranks on a “scale of appeal”. We have approached this research not as one that is impossible to measure or one that is strictly based on simulation data. This research project and continued discussion is for others to simply realize that the common theme of sustainability in architecture cannot withstand as a single modification or addition to a complex project. Sustainability in architecture is the collaboration of every field and choice that is compiled to create a built structure. This collaboration exists to transform every inch and every line drawn towards one that advocates a low impact on the world we live in and the resources we use. This change in thinking also relies on the opinion of those who interact with the given structure. If we are not willing to live in a home that is structured around partial use and partial conditioning or willing to transform the way we use energy then the sustainable effort is lost.

Indeed, this research project has taken a turn from calculated research to the discussion of theory but there remains a necessary balance. This project is expected to continue and to advance towards an understanding of sustainability in design in architecture and how the calculated effort of sustainability can, and should, coexist with the theoretical and opinion-based world of design in architecture.

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