SUSTAINABLE ASPECTS OF THE HISTORIC BUNGALOW

by

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(Under the Direction of Mark Reinberger)

ABSTRACT

This thesis examines the sustainable aspects of the historic bungalow house type. A through exploration of the origins and definition of the bungalow form as well as its relationship to the Arts and Crafts movement resulted in a compilation of the of the design characteristics which make a historic bungalow unique. A three fold approach to defining sustainability examines the social, economic and environmental components of residential design. Utilizing these components the characteristics of the historic bungalow are analyzed to determine if the building type is sustainable. A case study in which the Chicago bungalow used as an example of bungalow design and is examined for sustainable characteristics showed that the bungalow does possess the necessary qualification to be defined as a sustainable type of architecture.

INDEX WORDS: Bungalow, Sustainable, Arts and Crafts Movement, Architecture, Chicago Bungalow, Residential Design, Historic Preservation, LEED

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CHAPTER ONE

INTRODUCTION

Upon my arrival at the University of Georgia I began to see an opportunity for the field of preservation to expand. It struck me that there is an inherent link between preservation and the growing field of sustainability, but this link was being overlooked in traditional research. Each field focuses so much on their own ideas that they fail to see the connection and the possibilities for collaboration. As I further explored the interconnections of sustainability and preservation I noticed that certain building types and styles already possessed characteristics that have been defined as sustainable. One such building type, the bungalow, reappeared continually in my research.

My interest in bungalow houses started at an early age, perhaps it was the result of growing up in one of the many colonial revival houses that dot suburban Atlanta. Driving through the older portions of the city on my way to school or church I was enamored with the small houses, tucked into the landscape, each one a little different but still familiar. This interest in bungalows followed me through my studies both in college and graduate school. It quickly became apparent that it was more than happenstance that bungalows were often the subject of modern sustainable retrofitting while still maintaining their historic integrity. The more I examined this phonemeon the more I became aware that there are specific characteristics unique to bungalow design and theory which not only make them easily adapted to sustainable buildings, but define them as sustainable in their own right. With this paper I am seeking to

define the characteristics and aspects of bungalow design and theory which make bungalow houses sustainable.

The first step to complete this undertaking was to define a bungalow. Open any recent architectural or design publication from the past century and chances are a featured article will reference a bungalow. The term *bungalow* has become an integral part of the American vocabulary in a way that very few architecture terms have before. Widely and loosely applied to buildings of all shapes, sizes and ages across the country, understandable confusion surrounds the true definition of the building type. In order to clearly define the term 'bungalow', the origins of both the word and design philosophy as well as the characteristics which mark it as such, needed to be clearly laid out.

Secondly, in order to make an assessment as to whether or not a building is considered sustainable a definition of sustainability as well as a method for quantification must be in place. All too often modern research links the term sustainability only to environmental sustainability and discounts the social and economic aspects. To avoid this one-sided approach, I outlined the characteristics of residential design which contribute to both social and economic sustainability as well as environmental. Quantifying sustainability has always been a difficult task; one of the most widely accepted methods of doing so is utilizing the Leadership In Energy and Environment Design (LEED) guidelines. Originally my intention was to utilize these guidelines to show the sustainability of historic bungalows. However, upon further research I found the LEED guidelines lacking. There was too much focus on the use of modern technologies to protect the environment and not enough focus on other aspects of sustainability. So rather than

use the LEED guidelines as the ultimate definition of sustainability I have chosen to use them as simply one tool.

As part of my research into the background and history of the bungalow I noticed a fundamental shift in bungalow philosophy during the Arts and Crafts period, the point that bungalows became recognizable in the forms we know today. Exploring this connection was paramount to understanding how historic bungalows could incorporate sustainable ideas into their design. The Arts and Crafts movement acted as more than just a change in aesthetic preferences of the time; it was also a social and cultural movement. By exploring the theories of the movement and their relationship to bungalow design, a more complete picture emerged of the components of bungalow design.

Finally, armed with knowledge about the origins of the bungalow, a complete definition of sustainability, and a better understanding of design theory, I analyzed the physical and philosophical aspects of bungalow design. As part of this analysis I utilized the Chicago bungalow as a case study. The Chicago bungalow was selected for the case study based on a number of reasons. There is a high concentration of bungalows within a small area, which gave me a very large sample to draw my conclusions from. The Chicago bungalow exemplifies the characteristics of the bungalow movement. The houses were built as part of the expanding suburb movement as housing for the growing middle class. Each home was unique but followed a distinct pattern of design. Additionally, within Chicago there is already a movement to explore the sustainable aspects of the bungalow and methods of further 'greening' the structures. The Historic Chicago Bungalow Association (HCBA) was developed in 2000 to raise awareness about the unique cultural resource. The HCBA provides guidelines for the restoration of

bungalows, as well as information and grants for making the restoration sustainable. I visited the city and a number of the bungalow neighborhoods while looking at the sustainable aspects of their design and how they functioned in the real world. It was my desire to show that historic design theories should not be discounted by the sustainability movement simply because they are historic.

CHAPTER TWO

BACKGROUND TO THE BUNGALOW HOUSE TYPE AND MOVEMENT

Origins of the term and early Indian building forms

The term 'bungalow' is an Anglicized version of a Bengal word, *b*ā*ngl*ā. Originating in India, *b*ā*ngl*ā refers to a local vernacular building type which gained popularity with the British occupation as a result of its easy adaptation to the British ways of life. The first English use of a derivative of *b*ā*ngl*ā appeared in a letter sent by Edmund Foster, an agent for the East India Trading Company. In his letter of 1659, Foster noted that an invading native army set up camp quickly, "making bunguloues and houses".[1] Little information about the shape or form of the bunguloues is provided, though the context of the letter indicated they were temporary forms of housing, quickly and easily built.

It was not until 1676 that records show mention of this particular form of indigenous housing. In his diary Streynsham Master, another East India Company agent, noted the creation of "Bungales or Hovells for habitation for all such English in the Company's service".[2] As in Foster's reference, Master's reference to the building type indicated it was a primitive structure. Both men remarked on the temporary nature of the building as well as its lack of refinement but no definition of building type was given. Comte du Modave is one of the first European visitors to clearly define what he believed a *b*ā*ngl*ā to be. In his words, "A *b*ā*ngl*ā is a pavilion of

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[1] Anthony D King, *The Bungalow: The production of a global culture* (London: Rouledge and Kegan Paul, 1984): 17.

[2] Anthony D King, *The Bungalow: The production of a global culture* (London: Rouledge and Kegan Paul, 1984): 18.

bamboo covered...with thatch or leaves from trees which one constructs for some special occasion".[3] (Figure 1) Again, the European belief that a *bāngl*ā was purely a temporary structure becomes apparent.

Figure 1: A traditional *bāngl*ā

While the Europeans in India saw the *bāngl*ā as a makeshift and temporary form of housing, native Indians utilized it as a more permanent housing type. Rather than referring to their own homes as *bāngl*ā, natives used the term Banggolo. A Banggolo was marked by its sloping roof on two sides and its two gable ends. The same general house plan and layout was used by both wealthy and poor, by increasing or decreasing the size of the primary building.[4]

A banggolo's most predominant feature was the thatched roof which extended out on all sides, creating a verandah. This plan appeared in the earliest accounts of Anglo-Indian bungalows. In a letter written in 1783, it was noted that the British would turn the large

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[3] Anthony D King, *The Bungalow: The production of a global culture* (London: Rouledge and Kegan Paul, 1984): 18.

[4] Anthony D King, *The Bungalow: The production of a global culture* (London: Rouledge and Kegan Paul, 1984): 69-22.

verandahs into additional rooms for themselves and guests as needed. A more detailed description states:

> Bungalows are buildings in India, generally raised on a base of brick, one, two or three feet from the ground, and consist of only one story; the plan of them usually is a large room in the centre for an eating and sleeping room, and rooms at each corner for sleeping; the whole is covered with one general thatch, which comes low to each side; the spaces between the angle rooms are viranders or open porticos to sit in during the evenings; the center hall is lighted from the sides with windows and large door in the center. Sometimes the center viranders at each end are converted into rooms.[5]

It was this version of a bungalow, *bāngl*ā or banggolo that became the prototype for the housing type adopted by the British military and industries in India.[6]

Anglo-Indian bānglā

As more British and European citizens began to conduct business in India, the traditional *bāngl*ā or banggolo was adopted as the primary form of residential architecture. In a majority of British records and documents the housing type was not referred to as a banggolo as the natives did, but instead by the more formal term, a *bāngl*ā. Used to refer to the houses built for the officers in the Bengal region using local traditions, the term described a rather specific style of building. While *Bāngl*ā all have a number of common characteristics, the term was used to refer to different building types, ranging from a single family house to larger compounds.[7]

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[5] Anthony D King, *The Bungalow: The production of a global culture* (London: Rouledge and Kegan Paul, 1984): 28.

[6] Anthony King, *The Bungalow,* 45-51.

[7] Paul Duchscherer and Douglas Keister, *The Bungalow: America's Arts and Crafts Home (*New York: Penguin Studio, 1995), 1-2.

The Anglo-Indian *bāngl*ā are defined by their low profile as well as exterior porches running around a majority of the structure. There are differing accounts as to the roof line of the *bāngl*ā; some records show they had a low sloping roof extended out over the porches, providing protection from the heat, [8] while others suggest the *bāngl*ā roofline was of a higher pitch, made out of thatch, with extensive overhanging eaves.[9] (Figure 2) This type of unclear definition of characteristics has become part of the bungalow's unique history and development. Despite the discrepancy about the roof line, both descriptions noted the overhanging eaves, one of the most easily recognizable traits of a bungalow. The interior was compact, with rooms opening onto the porches and a central living room to facilitate ventilation. Multiple windows, doors and clearstory windows were utilized for cross-ventilation. The *bāngl*ā were seen by the British as primitive structures and unsuitable for long term occupation. The term "hovel" was often used

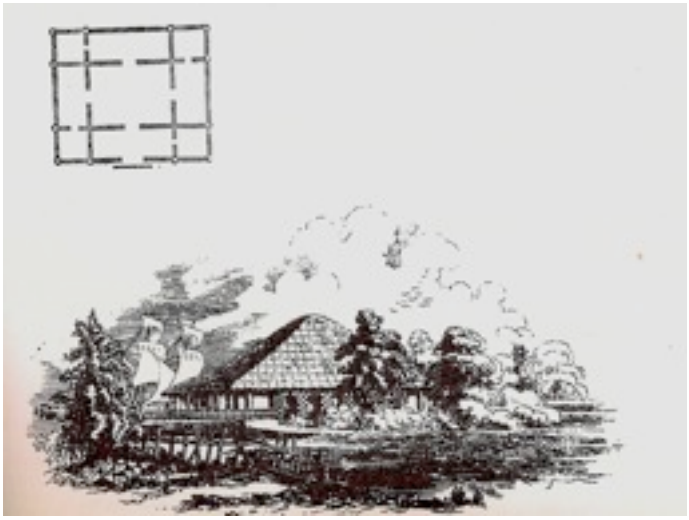

Figure 2: Anglo-Indian *bāngl*ā

[8] Duchscherer, *The Bungalow, 2.*

[9] Paul Duchscherer and Douglas Keister, *Inside the Bungalow: America's Arts and Crafts Home (*New York: Penguin Studio, 1997), 1-2.

interchangeably with the term *bāngl*ā, giving some indication of how the British felt about the native form of architecture.[10] While the *bāngl*ā may have been seen as a temporary form of housing originally, it slowly became part of the British architectural vocabulary.

The simple single-story design, complete with strong roofline covering the porches became a popular form of military architecture throughout the British Empire. The low cost and quick rate of construction made the *bāngl*ā a popular form in a number of the British territories such as India, South Africa, the British Virgin Islands, and Australia. Additionally, the *bāngl*ā was easily adapted to the unique needs of different geographic areas. The low roofline and well-ventilated plan made the structure much more suitable for tropical territories than traditional types of British architecture. The familiar shape and forms became a retreat for British merchants and their families. The addition of traditional European elements helped create a safe haven away from the unknown and foreign surroundings. As it was introduced to each new territory, the *bāngl*ā took on vernacular architectural characteristics from each area, allowing the architecture to blend in with the surroundings so as not to call too much attention to itself, while still maintaining a feeling of separateness.[11] (Figure 3) Unlike traditional native forms of architecture in the Empire, the bungalow was never intended to be utilized as farm architecture. The purpose was simple, to provide shelter and a place to oversee work. They were never intended or utilized as places of production or manufacturing.[12]

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[10] Lancaster, "The American Bungalow," 239.

[11] Duchscherer, *The Bungalow, 2.*

[12] Anthony King, *The Bungalow, 36.*

Figure 3: English Adaptation of the Anglo-Indian *bāngl*ā

Its origins as a native, local, vernacular form have impacted how the *bāngl*ā, and by extension, the bungalow, were received by the British. In unfamiliar territories the building type was seen as a method of connecting with nature and the surroundings, but from a safe distance. Upon its arrival in England, the bungalow came to be known as a retreat, a way to reconnect with nature.[13] As a result of its origins in a building type form the most remote parts of the Empire, once it was introduced to England the bungalow was embraced as a suburban and rural type of architecture rather than as an urban form of architecture.

Exportation to England: Leisure Resorts

While the introduction of the bungalow form to England was a direct result of the expanding Empire, a number of external factors contributed to its increasing popularity. The most important of these included an increasing public and academic interest in exotic architecture, including Indian design. The second was the Domestic Revival, a movement which encouraged style based on the late medieval era. The third and final factor was a rapidly changing social structure.[14]

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[13] Duchscherer, *The Bungalow, 2.*

[14] Clay Lancaster, *The American Bungalow, 19-33.*

Before the bungalow was formally introduced to the British architectural vocabulary, a stylistic shift was underway. The first bungalow in England was built in 1869, but as early as the mid-to late 18th century designs based on Indian architecture were becoming popular. One important example of this is Sezincote in Gloucestershire, built for Sir Charles Cockerell. The design was drawn from Cockerell's brother's experiences as an architect and surveyor for the East India Company. Sezincote's final design included a number of elements traditionally seen in Indian architecture and was unlike any British building seen before. The second monumental British design which drew heavily from Indian architecture was the design for the Palace at Brighton.[15] Both Sezincote and the Palace at Brighton were built not as architecture for the masses, but as architecture for the elite. Their scale and detailing remove them from the same plane as the bungalow. (Figure 4) But these buildings did set a precedent for the use of Indian design in British architecture.

Figure 4: Early English Resort Bungalow

[15] Clay Lancaster, *The American Bungalow,* 22

The first known example of a bungalow outside of the Eastern hemisphere was a shore front house in Westgate, England built in the 1869. The growth of the bungalow and the growth of leisure resorts are closely tied. As a result of the industrial revolution there was more material wealth in England as well as a surplus of time. Travel became easier, and people began to look for new ways to spend their time. Westgate is an example of a community which evolved as a result of this economic and social prosperity. The architecture for these communities needed to reflect a number of factors: economic standing, social standing, ideology and health. The bungalow was an easily adaptable form which could address these factors.[16]

In addition to its adaptability, the bungalow was embraced as a representation of an era gone-by; it encapsulated aspects of British life lost to the changes of the Industrial Revolution. As the Industrial Revolution moved forward it generated a great deal of social, economic and political change. The way of life people were used to quickly disappeared and was replaced with a fast paced, mechanized lifestyle. As a result, people sought a return to a simpler past, away from the industrialization and constant changes. When in the foreign parts of the Empire, the bungalow became a symbol of escape from the 'otherness' of the native culture. Once adopted in England, the bungalow became an escape from the rapid industrialization and urbanization which was occurring throughout the country.[17]

This idea of a contemporary form of pure English architecture is closely tied to the ideas of the Domestic Revival movement which in turn is part of a greater reaction to the Industrial Revolution. The Domestic Revival sought a way to return to a more simple, pre-industrial way

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[16] Anthony King, *The Bungalow,* 74.

[17] Anthony D King, *The Bungalow: The production of a global culture* (London: Rouledge and Kegan Paul, 1984): 65-70.

of life. Architecture was not meant to be ostentatious, but rather it was to be sensible and unassuming.[18] A reflection of a more simple way of life.

As industrialization continued and with the introduction of railways, city dwellers sought refuge in more rural environments for rest and relaxation. One popular method of escape was to visit resorts. For the first time, the new middle class had a surplus of both time and money and a desire to be removed from urban environments. This resulted in speculative development of resort communities and a physical representation of the stratification of the social classes within the built environment. The bungalow was well suited for this type of development boom.

Seaside bungalows often adopted the physical characteristics of the original *bāngl*ā. They were not necessarily small, but were low, often only one story in height. The house's horizontality was emphasized by the low pitched roof with large overhanging eaves, which mimicked the roofline that extended over the porches on a *bāngl*ā.[19] (Figure 5) The early English bungalows were not only an escape from the urban environment but also an escape from the confines of the elaborate ways of living during the Victorian period. The houses were designed so they could be run by the smallest number of servants possible and with little pomp and circumstance. Furniture was simple and modular in design, often designed by the architect himself. This was a reaction to the formal and ostentatious designs popular at the time. The focus of a bungalow was health and recreation as reflected in their simplicity.[20]

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[18] Clay Lancaster, *The American Bungalow,* 32.

[19] Clay Lancaster, *The American Bungalow 1880-1930* (New York: Dover Publications Inc, 1985): 33-37.

[20] King, *The Bungalow, 74-85.*

Figure 5: Recreational Bungalow

Because of their purpose-- health and recreation-- bungalow design depended heavily on how the structure interacted with the natural environment. Rooms were oriented so they would receive optimum sun and wind exposure. A great deal of attention was paid to the views from different parts of the house. Nature was seamlessly incorporated into the overall design and features of the structure. Despite the fact that nature was embraced in the bungalow, the harsher less genteel parts of nature such as areas to attend to personal hygiene, were kept separate and hidden from view. This ensured that the occupants of the house were able to enjoy a purely pleasant environment.[21]

Eventually the bungalow became an integral part of the architectural vocabulary in England. Shedding its association as a second home for those looking to escape the city temporarily, the bungalow was adopted as the architecture of the new suburbs. The introduction of suburbs allowed people to remove themselves from the urban environment completely and once again interact with nature.

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[21] Clay Lancaster, *The American Bungalow 1880-1930, 35-39.*

One of the first bungalow suburbs in England was Ballagio. Created in 1887, south of London by noted bungalow architect, R.A. Briggs, the development represented a shift away from the traditional Indian form and its relationship with the *bāngl*ā. Briggs' houses were low, single storied structures made of natural stone, brick, or stucco, with a thatched roof and veranda. While the casual layout and similar characteristics provide some cohesion to the bungalow designs, overall there was no specific bungalow building type. Briggs published *Bungalow and Country Residences* in 1891 and this lack of cohesion is reflected in the drawings of 'bungalows'.[22]

In his published work, Briggs attempts to define his design theories. He stated:
What is a bungalow?...our imagination transports us to India...to low, squat, rambling one-storied houses with wide verandahs, latticed windows, flat roofs and with every conceivable arrangement to keep out the scorching rays of the sun...A Cottage is a little house in the country but a Bungalow is a little country house, a homely little place, with verandahs and balconies, and the plan so arranged as to ensure complete comfort with a feeling of rusticity and ease.[23]

Though Briggs intended his bungalows to be used as a retreat from the city, they quickly appealed to those citizens who sought a refined yet simpler way of life. As society began to change and become less rigid, so too did architecture. Based on Briggs definition of the bungalow, the houses were simple, easy for the occupants to run and manage and creating a less expensive and yet luxurious way of life.

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[22] Clay Lancaster, *The American Bungalow 1880-1930, 35-39.*

[23] Anthony D King, *The Bungalow: The production of a global culture* (London: Rouledge and Kegan Paul, 1984): 96.

Exportation to America: Early Development

As in England, the first recorded example of a bungalow in America was a second home at the beach on Cape Code, Massachusetts. Appearing in a 1880 edition of *American Architect and Building News*, the building encompassed some of the bungalow's characteristics: it was a small structure, with a number of porches. But overall the ornate detailing, and gabled and dormered roofline do not reflect the ideals of the bungalow style. The second bungalow to appear in *American Architect* was featured in 1895 and the third in 1896. All three homes reflected a variety of influences and had very different characteristics and elements.[24] The loose interpretation of the term 'bungalow' quickly became part of the American adaptation of the style. As with their British counterparts, these early and ill defined bungalows were primarily found in resort or vacation communities. (Figure 6)

Figure 6: Early American Vacation Bungalow

[24] Clay Lancaster, "The American Bungalow" 239-240.

Americans drew on native precedents to help define their own version of the bungalow form. At the time when bungalows were introduced, American architecture was primarily defined by regions. As each area of the nation was settled, immigrants from all over brought with them their own distinct styles of architecture. Buildings in early New England tended to be small and simple, reflecting the ideas of the Puritans who settled there. Along the Hudson River Valley, Dutch and Flemish brought architecture which was characterized by the use of shingles on the exterior and projecting eaves known as "flying gutters". Mississippi Valley architecture was characterized by the use of a porch running the entire perimeter of the building, a feature introduced by the French. The Spanish in the Southwest embraced a combination of Native American design and traditional Spanish design to create low, single story buildings with a patio or courtyard. [25] All of these traditions were regionally specific, and as such, had an impact on how the American bungalow developed in each region as well as within the nation as a whole.

Each region adapted the bungalow to reflect the architectural heritage and style of that particular region. The Shingle Style was utilized in beachfront communities, while the Adirondack style was used in mountain resorts. Despite the different physical incarnations, the theories and ideas behind the bungalow remained consistent. As the style became more popular, regions began to incorporate characteristics from other regions, creating a more cohesive style.

Similar to the early English bungalows, the main purpose of the American bungalow was leisure and recreation. No matter what style of bungalow, this purpose was reflected in the design. In addition to the stylistic focus on function, the early bungalow design drew inspiration from the rustic and natural. This interest in using the natural as a source of inspiration for the

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[25] Clay Lancaster, *The American Bungalow,* 43-52.

bungalow suggests a parallel to the Arts and Crafts movement both in America and in England. The Arts and Crafts movement began in England in the mid 1900s as a reaction to the Industrial Revolution and advocated for a return to handcraft. The movement's greatest advocate in America was Gustav Stickley. He combined William Morris's ideas about the power of the natural with his own ideas concerning design and architecture, specifically the idea that indigenous building types had their own virtues which were being lost and eroded with the industrial revolution.[26] Under the influence of both the Arts and Crafts movement as well as localized influences, the bungalow style began to coalesce into a more cohesive and easily identifiable form.

American Adaptation and Popularization

Early bungalows were typically small structures with flexible floor plans. The main focus was on the living and dining rooms, which were not formally divided as they would be in a primary residence. Numerous small bedrooms and sleeping porches were used to accommodate the largest number of friends and family. All aspects of design and decoration were based on what was practical and convenient. Because the bungalow was originally a temporary dwelling, luxury was not a large concern.[27](Figure 7)

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[26] *The New Bungalow,* 23-26.

[27] Paul Duchscherer and Douglas Keister, *The Bungalow,* 11-15.

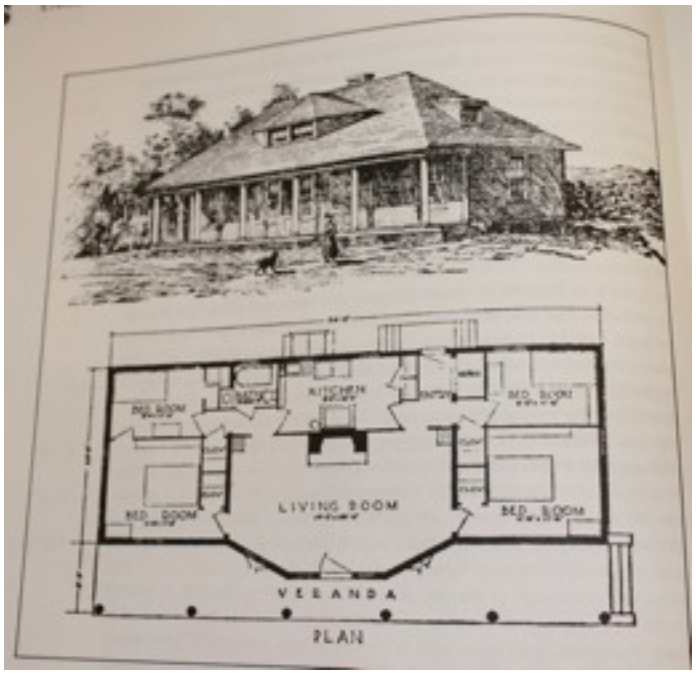

Figure 7: Informal and flexible bungalow floor plan

As the bungalow became a more permanent house type, a number of the physical characteristics and theories remained the same. A large number of windows, as well as the inclusion of large porches allowed a family to be exposed to as much fresh air as possible. To encourage the flow of air, the interior spaces were open and allowed for a fusion of the interior and exterior. The informal aspects of the bungalow carried over in its transition to a primary residence as well.[28]

Much like the British bungalow's connection to the Arts and Crafts movement, the American bungalow was also adopted as the domestic architecture for the movement in the United States. The popularity of the movement and its lifestyle, in combination with other changing social factors, quickly led to the rapid spread of interest in the bungalow. The first bungalow in America was built in 1879 at Monument Beach at Cape Cod, Massachusetts.(Figure

[28] Paul Duchscherer and Douglas Keister, *Inside the Bungalow,* 3-6.

6) Between 1880 and 1930 the bungalow movement spread across the country. The spread of the bungalow form was due in part to the popularization of the Arts and Crafts movement. Additionally, the creation of suburbs in the early 1900s meant that a large quantity of housing had to be created relatively quickly. The bungalow was ideal for this situation. It was affordable, fashionable, easily individualized, practical and simple.[29] It was also rapidly becoming the most widely recognized and most frequently published housing type in America.

An important component of this phenomenon was the popularization through plan books and mail order houses. The bungalow was perfectly suited to this new venture. Easy to design and customize and inexpensive to produce, the bungalow became the house of choice for builders and first time homebuyers. Companies such as Sears, Roebuck and Montgomery Ward produced plans and kits for the mass production of bungalows starting in 1909. The number of different plans available from each company in conjunction with the large number of house-plan books and catalogues allowed for a variety of bungalows to be created and built, all sharing the same general theory, principles and characteristics.[30]

Through a number of publications such as *The Craftsman* written by Gustav Stickley, *Ladies Home Journal,* and *House Beautiful,* the form and structure of the American bungalow was defined. According to Stickley it was:

> a house reduced to its simplest form where life can be carried on with the greatest amount of freedom; it never fails to harmonize with its surroundings...it was never expensive

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[29] Paul Duchscherer and Douglas Keister, *Inside the Bungalow,* 3-6.

[30] Paul Duchscherer and Douglas Keister, *The Bungalow,* 15-19.

because it was built of local material and labor; and it was beautiful as it was planned to meet the simplest needs in the simplest way.[31]

Bungalows remained one of the most popular housing styles until the Great Depression slowed down suburban development. The economic decline in conjunction with the introduction of more contemporary styles (such as the ranch house) and the revival of former styles of architecture resulted in the rapid decline of the bungalow's popularity.

Definition of a Bungalow and Application of the label

Forming a coherent and complete definition of a bungalow is a difficult task. There are a multitude of variations on the form. Early representations differ greatly from later incarnations. The bungalow does not represent one specific region or even time period and it encompasses characteristics from at least three different countries; India, England, and America. Instead of creating a written definition, a list of characteristics is more appropriate. If a house has most or all of these characteristics a bungalow label can be truthfully and rightfully applied.

As defined in the first chapter of this work, a bungalow has a low form, one or one and a half stories in height. Its most predominant exterior physical feature is an overhanging roof with large eaves. A connection to the surrounding environment should be easily identified; the building should blend with its setting.[32] The floor plan should be compact and efficient with no excess. There should be an openness to allow for air flow from the large number of windows in the structure. A bungalow is simple, with simple design and details, again no excess. A deeper

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[31] Anthony D King, *The Bungalow: The production of a global culture* (London: Rouledge and Kegan Paul, 1984): 134.

[32] Clay Lancaster, *The American Bungalow,* 239.

look into the physical and theoretical aspects of a bungalow reveals a series of very specific characteristics which mark a bungalow as such.

Starting at the front facade of a bungalow, one is usually faced by a front porch. This porch provides a way to unite the exterior of the house and the setting in which it was placed as well as defining the individual character of the building. More than just a transitional space from the exterior to the interior, the bungalow front porch turned the natural environment into a secondary livable room for the residents. By using the porch to encourage the growth of domestic plants such as climbing vines, bungalow architects literally rooted the building to the site, creating an unbreakable link between the house and its environment. In addition to linking the building to the site, front porches also allowed for the domestication of the environment. Using built-in planters helped domesticate and tame the wild, creating a safe haven for the residents away from the wild outside environment while still providing them with the joy and pleasure of nature. [33] The materials chosen for the porch often reflected the materials for the rest of the house. Local materials, especially stone and wood, were utilized to reaffirm the building's connection to the environment and specific location. Porches also helped define the area between the public and private spaces of the home. A porch could be either public or private depending on the immediate need.

A front porch acted as more than a connection to the outside world, it also served as an extension of the living space within the house. Easily adapted to address the changing weather many porches were able to be enclosed in inclement weather using large pieces of glass.[34] This flexibility allowed the front porch to serve as a place of entertainment, relaxation and

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[33] Paul Duchscherer, *The Bungalow,* 17-23.

[34] *American Bungalow Style,* 42-43.

socialization. To facilitate these functions, porches were often decorated in the same manner as the interior of the house, with simple yet comfortable furniture and textiles.

The front porch often led directly into the house's living room, with no additional transitional space. This openness was reflected in the rest of the floor plan. Rooms run seamlessly into one another with little division. Overly formal rooms such as the Victorian parlor were replaced with casual and functional rooms such as the living room, the heart of the home.[35] This less formal space served a variety of functions. It was a place for gathering, circulating, socializing, and relaxing. Generally lit by a great number of large windows, a properly designed bungalow living room was warmed in the winter by ambient light and cooled in the summer by the large overhanging eaves. At the heart of the living room was the fireplace. More than just a decorative feature, the fireplace served as a source of warmth and comfort for the residents.

The fireplace is a defining characteristic of the bungalow; while some bungalows exist without them, most utilized the fireplace to bring light, warmth, comfort and joy to the space. Usually simply decorated with a wooden mantle and either brick or stone surround, the fireplace exemplified the casual character of bungalow style. The use of natural materials allowed for inherent asymmetry and maintained the feeling of handcraft rather than mechanization.

In addition to the fireplace, most bungalow plans incorporated the use of built-in furniture. Often found around the fireplace were built in bookshelves, cabinets or benches. Similar built-in's are found in other areas of the house, specifically the kitchen, dining room and bathrooms. The use of built-in furniture was a reminder of the changing nature of the home as well. Traditional homes of this time would have been served by a number of servants who would

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[35] Diane Maddex, *Bungalow Nation,* 22-23.

assist in the running of a large household. The bungalow movement emphasized the idea of running a self sufficient household, one in which servants were unnecessary. The use of built-in furniture was a way for architects to assist the residents in making an easier transition to this type of lifestyle. It made everyday objects easily accessible while displaying them in a functional and aesthetically pleasing manner.

From the living room, the floor plan of a traditional bungalow transitioned into a dining room and kitchen. These rooms were designed and built using the same principles as the living room. Built-in furniture was used: shelves, cabinets, and even tables and benches. The space was generally compact and efficient to minimize the amount of work needed to run the household and perform daily chores such as cooking and cleaning. Much like the living room there would be a large number of windows to allow for ventilation as well as a great deal of natural light.

Bedrooms and bathrooms complete the bungalow floor plan. Generally these rooms would be clustered together, helping define the different areas of the house, public from private. Designed using the same principles as the rest of the house, a great deal of attention was paid to efficient use of space and maximizing the functionality of each room.

The characteristics of a bungalow are fairly easy to distinguish. The overall emphasis on an efficient use of space was paramount. The home was designed to promote socialization both within the household, through the open floor plan, and with the community as a whole, through the use of a transitional porch. Formal rooms were forgone in favor of less formal and more functional spaces which better fit the changing needs of the population. Along with a less formal floor plan, the bungalow was equipped for less formal living.

In addition to the design aspects of the bungalow a number of physical characteristics help define the style. A use of natural materials such as wood, stone, and brick was widespread. When possible the materials used were of local origins, helping connect the building with its location and surroundings. In addition to the natural materials, nature also appeared in the decorative elements. Using natural forms, shapes and images also bridged the connection between the building and its environment.

Overall, bungalows were designed to be simple structures, ones which met the basic needs of a family without formality or extravagance. The detailing was simple; clean lines and natural forms were the dominate characteristic. The use of built in furniture diminished the need for additional furniture and maximized the usable living space in the house.

Figure 8:Bungalow

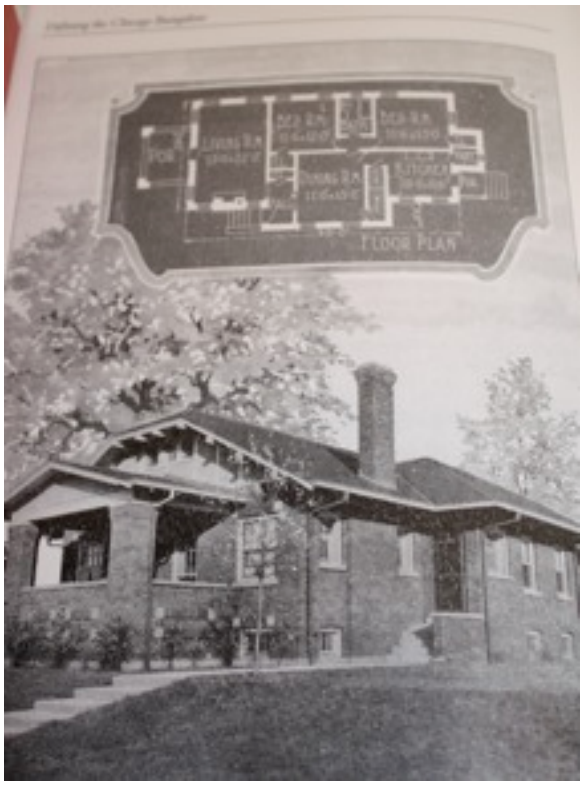

Figure 9 and 10: Bungalow Floorplans

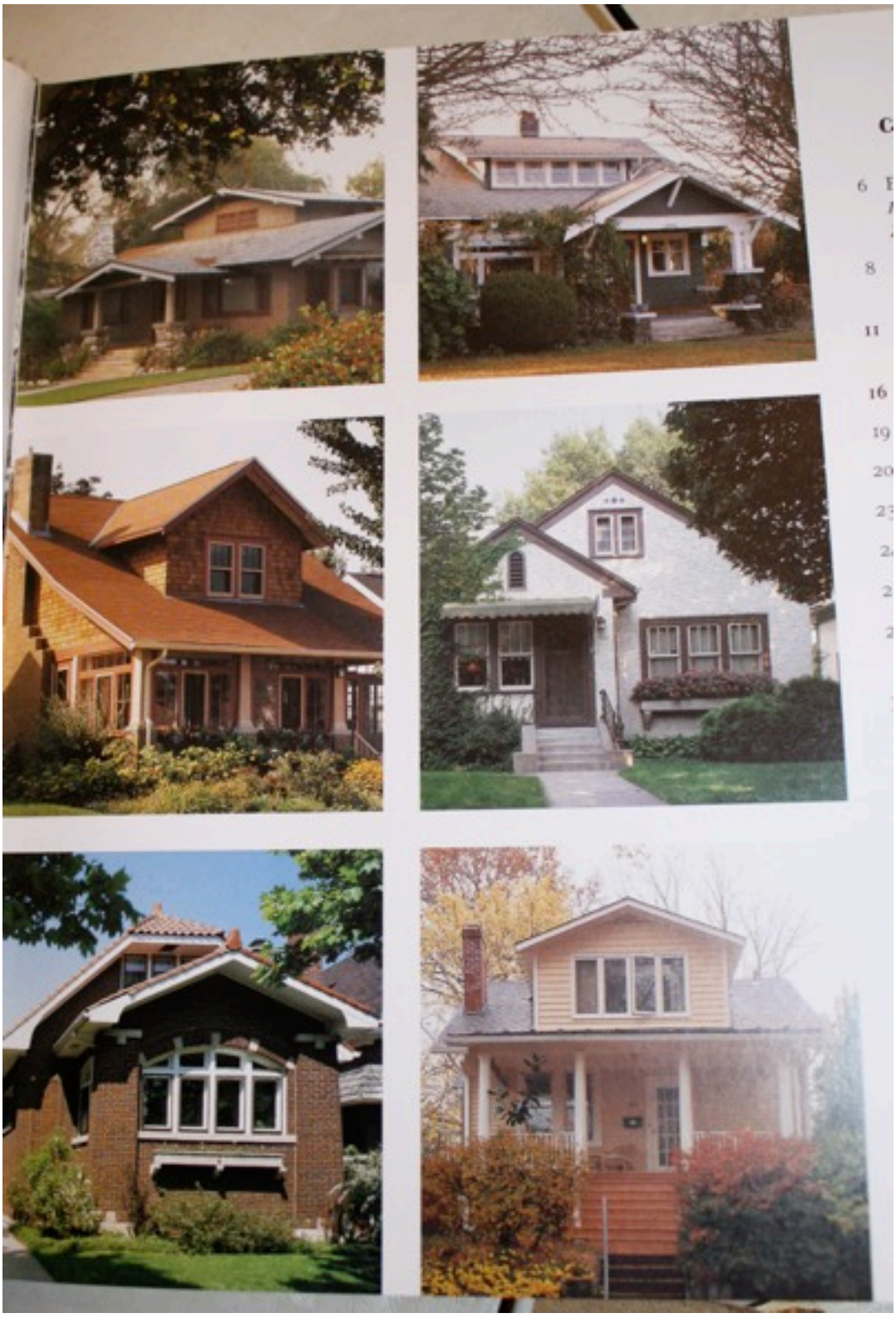

Figure 11: Bungalow Types

CHAPTER THREE

DEFINING SUSTAINABILITY IN RESIDENTIAL STRUCTURES

Background to Sustainability

As defined by the Oxford English Dictionary sustainability is the 'ability to be maintained at a certain rate or level' with a sub-definition which states 'conserving an ecological balance by avoiding depletion of natural resources'.[36] Within this definition, sustainability is linked directly to environmental concerns, a very limited view. As defined by the Bruntland Commission's report, *Our Common Future*, sustainability 'meets the needs of the present without compromising the ability of future generations to meet their own needs'.[37] True sustainability addresses multiple aspects of development and requires a much more inclusive definition. True sustainability utilizes a three part approach to development. A truly sustainable development will maintain a community or society at a certain rate or level or quality of life; this is known as social sustainability. It will also address economic concerns. Economic sustainability involves the creation of an environment in which the economy can be maintained at a specific rate. This three pronged approach to sustainability-social, economic and environmental- creates a more inclusive method of analyzing the sustainability of development.

Quality of life (QOL) is an integral component to the process of quantifying sustainable development. Directly related to the social aspects of sustainability, (including both social and economic sustainability), QOL depends on a variety of factors. Overall QOL highlights the

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[36] http://oxforddictionaries.com/definition/sustainable?region=us

[37] http://www.un-documents.net/ocf-02.htm

interconnected aspects of all of humanity, from a global level down to the individual. Just as true sustainability depends on all three aspects of sustainability working together, QOL relies on the interconnectedness of multiple aspects as well.[38] At the highest level of complexity, QOL is dependent on the global community; each individual's QOL is dependent on the QOL of every other member of the community and visa versa. There are individual indicators of QOL for each level of the global community. At the global level QOL is determined and quantified by the eradication of poverty, universal primary education, gender equality, reduced childhood mortality, improved material health, environmental sustainability, fair trade, and end of war. While these goals are impressive and worthy, they are also lofty and difficult to obtain quickly or easily. [39]

Creating and maintaining a higher QOL on a lower level is one step in creating a global QOL. At a national level QOL is determined by factors unique to the nation. These are generally identified and utilized by politicians and governments as ways to improve the lives of their citizens and voters. Broad issues include nutritional concerns, control of diseases, environmental health, sustainable agriculture, integrated development, and concern for the aging population. More individualized issues are education and training, human rights, equality, building local communities, participation in local democracy, eradication of poverty, reduction of crime, social inclusion, healthy and safe work environment, personal safety, health, decent housing, environmental quality, and access to services.[40]

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[38] *Closing the Loop,* 53-55.

[39] *Closing the Loop,* 59-63.

[40] *Closing the Loop,* 69.

On an even smaller community level each individual building has its own indications for QOL. Each group who experiences or interacts with the building will have different indicators to determine the QOL. But overall, people have positive feelings about their buildings if there is a high proportion of natural light and opportunities for the residents to experience the natural light, such as window seats in an office building. Ideally the building occupancy is relatively low so residents do not feel over crowded. Individuals desire control over their specific environment, such as individual thermal controls, either mechanical or by the opportunity to open and close windows.

The last level for determining QOL is an individual or personal level. Every individual has different requirements, qualifications and quantifications for their own QOL but overall everyone has the same general indicators. They want an environment which is quiet, safe, healthy, has thermal comfort, offers adequate protection from the elements, and incorporates large quantities of natural light. In addition to the technical and quantitative requirements for QOL there are also more individual requirements. These can include nurturing spaces, pleasing design, comfortable textures and colors, a good community, and contact with nature. Finally, there are also economic factors for a personal QOL. For a residence these can include low maintenance costs as well as low initial costs.[41]

No matter what level is examined, sustainability and QOL are dependent on one another. Sustainability is utilized in determining how high a person's or community's QOL is. On the other side QOL is a determining factor for quantifying sustainability. This idea of a symbiotic

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[41] Closing the Loop, 53-63.

relationship is an integral component of sustainability and appears in multiple aspects of the study of sustainability.

The United States Green Building Council (USGBC) utilizes this three pronged approach, also known as the triple bottom line. The USGBC is the leader in sustainable development education and is responsible for the development and design of the Leadership in Energy and Environmental Design (LEED) rating system. LEED is the leading method of quantifying the sustainability factor for buildings and development and will be discussed later in this paper. The triple bottom line requires that all three dimensions of sustainability be addressed equally to ensure optimum sustainability.[42] Despite the need for equal distribution between all three aspects of sustainability, the environmental component is often given more attention because it was the focus of the movement's origins.

Over the past half a century an increasing amount of interest has been paid to the effects of modern lifestyles on the environment. Due in part to an increasing population as well as greater demands on the available natural resources, the environment is under tremendous strain. Doomsday predictions indicated that if no drastic changes were made, by the year 2050 there would be no breathable air or drinkable water, all fossil fuels would be used up, and the Earth would be uninhabitable due in great part to the amount of waste on the planet. Though that is a rather drastic prediction, it is proven that current lifestyles contribute to extensive environmental damage.[43] The first major environmental agreement was at the Stockholm Conference on the Human Environment in 1972. Subsequently a number of additional agreements concerning air quality and air pollution were ratified, the most important of which was the Montreal Protocol on

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[42] Green Building and LEED Core Concepts, 16-17.

[43] Brian Edwards, *Rough Guide to Sustainability* (London: RIBA Enterprises, 2005)3-5.

the Ozone Layer in 1987. The same year the Montreal Protocol was established, the Bruntland Commission published *Our Common Future.* This was followed by a series of agreements concerning global warming and climate change.

While protecting the environment was the ultimate goal for the protocols and treaties, it quickly became apparent that additional concessions needed to be made, thus paving the way for the more inclusive version of the sustainability movement. As defined by the *Bruntland Report* written by the World Commission on Environmental and Development, sustainable development "is not a fixed state of harmony, but rather a process of change in which the exploration of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs." The focus of sustainable development is to ensure the needs of the present are met but the needs of the future are not compromised.[44]

As we know, sustainability is not just about the environmental impact. It is also requires a synergistic balance between people, profit, and planet: the triple bottom line. For sustainable development to occur, communities must become sustainable, not just the built environment. Sustainable development is also dependent on economic prosperity and profitability. The cost of environmental protection should be shared equally to allow for better opportunities for all in a competitive market. Finally, sustainable development includes careful environmental stewardship. But without the inclusion of both people and profit, protecting natural resources is not enough.[45]

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[44] Terry Williamson, *Understanding Sustainable Architecture,* (London: Spon Press, 2003). 4.

[45] Jean Carroon, *Sustainable Preservation: Greening Existing Buildings*, (Hoboken, John Wiley and Sons, Inc, 2010)45-47.

Aspects of Sustainability

Social

As discussed above, an important component of overall sustainability is social sustainability. This includes both social and cultural diversity as well as social factors for QOL. For architecture this has a three fold effect. First, the architect has to take into account, context and cultural diversity, this can be done through the use of certain architectural styles or elements as well as materials and building techniques. Secondly, architecture should facilitate social living. This can be done through a floorplan which facilitates socialization both within the house and with the exterior world. Finally, the architect must address concerns of accessibility for all as well as the impact of the construction on both the resident's health as well as the overall health of the community.

Social sustainability requires the maintenance of diversity among cultures and societies. Cultural diversity is not only an important player in the creation of sustainable architecture, it also has an enormous impact on one's sense of place and belonging which in turn affects the QOL experiences. As it relates to the sustainability of architecture, social sustainability affects not only the design and construction of buildings but also location and placement.

The preservation of cultural diversity is paramount to the creation of a socially sustainable global society. Diversity allows for increased adaptation and innovation in form and function: a loss of diversity would result in stagnant architecture. Cultural diversity is maintained through the transmission of traditions from one generation to the next. Physically, traditions can manifest as building types, forms, materials used, or the method of construction. This creates a specific aesthetic which is unique to the community. For a community with a

specific building tradition, the physical reinforcement of a unique community reaffirms the residents sense of place and belonging. Remove these aesthetic cues and the social sustainability begins to decrease as a result of the loss of tradition and the resulting lower QOL.

While each community may have an aesthetic which grew from traditions specific to its location, this does not mean the aesthetic is only utilized in that one location. As the global community becomes closer knit, these traditions are brought with people who immigrate or are moved from their traditional locations. This moves architecture away from an association with a particular place or region. A melding of societies and cultures gives architecture more relevance to the modern society in which it exists.[46] Additionally, sustainability of any form, including social sustainability, requires adaptation. As architectural aesthetics travel from region to region of from society to society, they change to meet the needs of each region or group. As mentioned above, this keeps architecture from stagnating and ensures constant adaptation and innovation.

Extending beyond the creation of a specific aesthetic or style, social sustainability and architectural design work hand in hand to ensure the highest possible QOL for the residents. An important component of QOL, and thus social sustainability, is the opportunity to participate in the local community. This participation can be personal, social, or work related. The residents should have the opportunity to build positive relationships with the rest of the community through both leadership and participation .[47]

QOL is not determined just by the residents ability to participate in a greater community but also by the opportunities and resources available to the residents. For a community to be sustainable it must be desirable. Residents should have access to all basic necessities including

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[46] *Understanding Sustainable Architecture,* 89-90.

[47] Roaf, *Closing the Loop*, 68-72.

schools, public works, libraries, work spaces, grocery stores, gas stations, leisure actives, and many others. A desirable community means more opportunities for participation which results in a higher QOL.[48]

The effects these aspects of social sustainability have on architecture is important to note. Social sustainability can either result in or require the use of a specific aesthetic in the designing of buildings. This can regulate the materials used, the forms, function and overall design of a building. The influence of traditional forms and materials within socially sustainable architectural design directly relates to the transfer of knowledge from one generation to the next. It also marks the transmission of cultures among regions. Thus, the aesthetic of a building can be used in an equation to determine social sustainability.

Additionally, social sustainability can influence or affect the placement and location of architecture. To ensure a high QOL and the option to participate fully within a greater community and benefit from local services, a building needs to be placed within a certain area. A structure placed in isolation would never be considered socially sustainable because it would be removed from a community. Overall, the effects and influences of social sustainability manifest physically within architectural design.

Economic

All too often QOL and economic sustainability are linked to economic growth. It is assumed that the more economic growth a country or community experiences the more economically sustainable it is. For example, a developing country would be considered less sustainable than an established power by the simple fact the developing country experienced less

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[48] Sassi, *Strategies for Sustainable Architecture,* 57-81.

economic growth. But there is little or no correlation between the standard of living and increased economic wealth once basic QOL is met. In reality, in the example above, neither country is economically sustainable . For an economy to be truly sustainable at any level (global, national or locally) a shift needs to occur away from a consumer based economy to one with a relatively non-materialistic, socially oriented and nature focus.[49]

While this lofty global goal requires a complete and fundamental shift in the collective thinking, there are smaller objectives and issues which can be more easily addressed and obtained. First, regional competition and economic performance should be increased, as quantified by variations in Gross Domestic Product (GDP). The GDP not only refers to the total of goods and services produced within a country but can also be used as a method to quantify the country's standard of living. Large discrepancies between the GDPs of countries indicates an unequal distribution of resources, while a narrower range would indicate increased competition between countries. Secondly, it is crucial to close the gap between communities with great amounts of wealth and those who are poorer. As mentioned, economic sustainability relies on an equal distribution of resources among communities, including monetary resources. A smaller gap between those with extreme wealth and those without indicates a better and more equal distribution of the resource. Third, local businesses should exhibit diversity as identified by new business startups and failures. Sustainability in all forms relies on diversity; if there is expressed and quantifiable diversity among the new businesses of a community then the community is more sustainable than a similar community which only attracts one kind of new business. Fourth, the rate of unemployed ethnic minorities should be reduced.[50] This requirement

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[49] Sassi, *Strategies for Sustainable Architecture,* 7-8.

[50] Roaf, *Closing the Loop,* 72.

highlights both the need for diversity as well as the equal distribution of resources within the community.

Broad view economic sustainability is not judged or calculated based upon the capital lost or gained within the transactions. Instead, it looks holistically at the economy within a much larger context. With a focus on ensuring that equal opportunities exist for all it does not discount the needs of the future against the needs of the present. Nor does it allow for more emphasis on the needs of the many over the needs of the few. An economically sustainable society is one which could exist indefinitely by carefully conserving and distributing resources equally among the population.

Small scale economies (for example the economy of a single household) do rely on a profit based model, but also contribute to the greater conservation and redistribution of resources among a greater community. As mentioned above, sustainability revolves around the distribution of resources. Economically sustainable distribution of resources not only requires distribution on a large scale (such as between countries) but also requires distribution on a smaller scale (such as between individual projects). For an individual project to be considered sustainable under the current economic system, the distribution of resources results in an accumulation of capital. The ratio of capital benefit to capital cost must show a positive net gain, ultimately there must be a proven profit.[51] A component of the positive net gain for architecture requires a low life cycle cost for the building. The life cycle cost is the total cost of building ownership. This includes the cost of maintenance for building systems, material replacement, and general operations. It is a more inclusive method for determining the a building's economic sustainability than just taking

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[51] *Understanding Sustainable Architecture,* 91-92.

into account construction costs. The second component of creating a positive net gain building, it the ultimate return on the initial investment. Even if a building has a low cost of construction and low life cycle cost if the owner does not receive a return on their initial investment the building is not economically sustainable.

Economic sustainability under current economic conditions requires projects to take a two fold approach utilizing both broad scale and small scale economic sustainability. By creating a situation in which a project generates a profit as a result of reasonable distribution of resources the small scale economy positively impacts the larger economy as well. A positive net gain in the production of a building acts as a boost to the local economy, which in turn has a greater positive impact on the regional economy, which shows as a net gain in the national economy, and eventually the net positive gain is seen within the global economy.

Method for Quantifying Sustainability-LEED

One method for quantifying sustainability is through Leadership in Energy and Environmental Design (LEED) building certification. Designed by the United States Green Building Council (USGBC), LEED accreditation reflects the highest standards of sustainability for the design, construction and operation of new construction, residences, commercial interiors, existing buildings, schools, and neighborhood development. Within the LEED rating systems there are no distinct guidelines for use in historic buildings. All the rating systems listed with the exception of the existing buildings system are meant to be applied exclusively to new construction. The rating system for existing buildings is only applicable for commercial buildings and does not take into account the distinct and unique characteristics of historic buildings. All of the LEED systems uses the three step approach to sustainability: economic

prosperity, social responsibility and environmental stewardship. Despite the use and application of the triple bottom line approach to sustainability, there is a heavy emphasis on the environmental aspect of sustainability.

For certification to occur, the Green Building Certification Institute (GBCI) must receive the project registration. For a registration to be approved, the project must meet minimum requirements unless otherwise specified. These requirements include compliance with environmental law, a complete and permanent space, reasonable site boundary, minimum floor area, minimum occupancy rate, sharing of water and energy use data, and a building to site ratio. Once minimum requirements are established, it is the responsibility of the owner or design team to submit the appropriate data. This data includes the project information and identification, project details, owner information, as well as all LEED templates and the required certification fees.

If the GBCI finds that all criteria are met, a building is designated as either LEED Certified, LEED Silver, LEED Gold, or LEED Platinum based upon the number of points earned over the course of the project. To earn these points, a building project must complete requirements for credits in the following categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation in design. The sustainable sites requirement addresses the site selection for the building, site design and management as well as access to transportation.[52] The requirements for water efficiency, energy and atmosphere, as well as materials and resources all are concerned with the type and

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[52] LEED Green Associate Study Guide, 50.

quantity of resources used in the creation and maintenance of the building. Additional credits may be earned based on the type of projecting being pursued.

For the purpose of this research, LEED for Homes Reference Guide will be used as one quantitative method for determining sustainability, to illustrate the strengths and weaknesses within the rating system. The LEED for Homes Rating System is divided into eight categories including the six categories listed above as part of all LEED guidelines. In addition to these six, LEED for Homes also includes a category for Locations and Linkages, and Awareness and Education.

Participation in LEED for Homes requires five distinct steps. First, the project must be registered with a LEED for Homes provider and join the program. There are no minimum project requirements or prerequisites for LEED for Homes projects as there are with other LEED projects. Secondly, a project team must be created. This LEED team is an example of the synergistic and interdisciplinary aspects of the LEED system as a whole. The team will create a project plan which should include goals as well as challenges and a comprehensive design plan. A preliminary review will be conducted to determine the performance testing of a builder's design, completion of a preliminary checklist, and an estimate of the score and certification level to be obtained. Third, the home needs to be built. Fourth, certification needs to be completed. The certification requires a completed checklist, completed Accountability Forms, and completed Durability Risk Evaluation Form.[53]

While both LEED and LEED for Homes utilize a comprehensive list of criteria for determining the sustainability of a structure, there are some downfalls to this method of

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[53] LEED for Homes, iv-vii

quantification, specifically when applied to historic structures. As stated earlier, LEED for Homes is not intended for application to existing structures. But, given the limitations of other LEED guidelines the LEED for Homes is the most well suited for application to historic residential buildings. Because of the lack of distinct guidelines for historic buildings, inappropriate guidelines have to be applied when possible. As a result, the historic buildings are penalized and cannot be fully analyzed and evaluated.

LEED does not place a high emphasis on the reuse or continued use of historic buildings; though not expressed in the LEED guidelines it is implied. With a heavy emphasis on the use of new technologies to address the use of resources and indoor environmental quality, LEED discounts historic technologies which bring about the same result. LEED also does not take into account the embodied energy of an existing building. New construction requires a great deal of energy and other limited resources to produce.[54] Because there is no set of equations which can calculate the amount of resources saved by reusing a building the reuse of buildings is often discounted completely and the building is replaced. The construction of a new building and the demolition of an old building simply because the new building will utilize newer technologies is not a sustainable practice. You expend energy and use up resources which will no longer be available to future generations in the production of the new building. And you expend energy and resources in the demolition of the old building.

As seen in the following section, LEED for Homes applies very specific technologies and methods of quantification to determine sustainability. By requiring these new technologies, the LEED guidelines do a disservice to historic technologies and structures. If a historic technology

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[54] *Sustainable Design in Historic Buildings,* 20-21

is as effective as a newer technology but requires less invasive action into the structure there is a greater conservation of energy and materials in recognizing the merits of the historic technology. Discounting historic methods and demanding the use of modern methods for supporting a sustainable lifestyle and residence is detrimental to both the sustainability movement and the practice of historic preservation.

For example, demanding that historic windows be replaced with double pane 'efficient' windows can irreparably damage the historic integrity of the building and often does not result in a drastic increase of sustainability. Requiring the replacement of exterior materials with more 'efficient' materials can have the same effect. Just because the materials are newer of utilize new technologies does not make them more efficient than the historic materials, it just means there is more research about them. Non-invasive sustainable changes however are beneficial when used properly. For example, replacing faucets, tubs, and toilets with more water efficient, yet historically accurate fixtures does not harm the integrity of the house. And it is well documented that these historic fixtures are dramatically less sustainable than their new counterparts. The key to reaching an understanding between the LEED guidelines and preservation practices is further research into creating a method for the quantification of the sustainable component of historic structure.

LEED for Homes Rating System Credits

Innovation and Design Process

Credit 1:Integrated Project Planning

The purpose of this credit is to ensure that an integrated design approach is utilized in both the planning and construction of the residence. The ultimate goal is for all members of the

project team to work together as a unified whole to address the unique needs of the family as well as any necessary considerations for the site. As part of this credit, a requirement for solar orientation is included. The requirement states:

a) The glazing area on the north- and south-facing walls of the building is at least 50% greater than the sum of the glazing area on the east- and west- facing walls.
b) The east-west axis of the building is within 15 degrees of due east-west.
c) The roof has a minimum of 450 square feet of south-facing area that is oriented appropriately for solar applications.
d) At least 90% of the glazing on the south-facing wall is completely shaded (using shading, overhangs, etc.) at noon on June 21 and unshaded at noon on December 21.

This credit is applicable to historic buildings, but because it would be applied after the design and construction phase can be difficult to obtain.

Credit 2: Durability Management Process

This credit encourages the use of durable and high performance materials on the buildings. To receive points for this credit, the project team must analyze the need for durable materials, including what parts of the structure are most at risk and create a plan to address these risks. If the durability of historic materials is taken into account, this credit can be applied to historic buildings with no affect on the building's historic integrity. But if the durability of historic materials is not taking into account and the materials are replaced, this credit is not compatible with historic preservation practices and can be detrimental to the historic integrity of a building.

Credit 3: Innovative or Regional Design

To earn this credit, the project team must demonstrate new and innovative uses of green building design, construction methods or technologies beyond those described and included in the LEED for Homes System. This credit can also be earned by addressing environmental problems unique to the region of construction based on a predetermined list created by the

USGBC. Many historic designs were adapted based upon their location and the unique environmental challenges presented, therefor this credit is applicable without harming the integrity of a historic structure.

Location and Linkages

Credit 1: LEED for Neighborhood Development

This credit simplifies the Location and Linkages requirements down to locating the residence in a neighborhood certified according to LEED for Neighborhood Development

Credit 2: Site Selection

To insure the residence is constructed on an environmentally stable and appropriate site this credit requires the building to be located away from areas of possible flooding, as well as threatened species habitats. Nor should the land designated for development be parkland or have prime soil.

Credit 3: Preferred Locations

The purpose of this credit is to maintain a high density housing stock within a designated community. Credit is awarded when the LEED residence is located either in a previously developed location, as an infill project with developed land surrounding it, or on the edge of a development.

Credit 4: Infrastructure

To reduce the environmental impact of development, this credit requires the residence to be located within 1/2 miles of preexisting water and sewer lines.

Credit 5: Community Resources/ Transportation

The purpose of this goal is to encourage alternative options to the use of a personal vehicle. This includes walking, biking and public transportation. For this credit to be achieved the residence must be located within a close radius of a number of community resources and transit services. Community resources include but are not limited to: arts and entertainment, banks, civic center, store, daycare, library, medical offices, and public services.

Credit 6: Access to Open Space

This credit ensures that residents of the LEED home have easy access to high quality open space to encourage physical activity and spending time outdoors.

Sustainable Sites

Credit 1: Site Stewardship

This credit is geared towards reducing the long-term effects and damage to the environment as a result of construction and development. The first step requires the design team to control erosion during the construction process. The second requirement is focused on minimizing land disturbance. This is achieved by maintaining as much of the natural landscape as possible and restoring landscape when necessary. This credit is difficult to apply to the analysis of historic buildings since the construction and development already took place and often there is little documentation about the resulting land disturbances or erosion.

Credit 3: Local Heat Island Effect

To contribute to a pleasant outdoor environment and encourage residents to interact with the natural environment, this credit focuses on the reduction of the heat island effect through the use of shade landscape and light colored building materials. When applied to the landscaping of a historic building this credit will not negatively impact the historic integrity of the property and

is within preservation guidelines. If applied to the roofing material a light colored but historically accurate roof would be acceptable, while a light colored modern roof would not be.

Credit 6: Compact Development

To maintain a high density of development, this credit calls for the construction of new homes in areas of moderate to very high density. Density is calculated by the number of dwellings on a square acre of land.

Water Efficiency

Credit 1: Water Reuse

This credit encourages the use of alternative sources of water to avoid depleting the water supply. To achieve this credit the residence may either utilize a rainwater harvesting system, a graywater reuse system, or the use of municipal recycled water system. The overall goal is to encourage the capture and reuse of non-potable water to reduce the amount of potable water used for things other than consumption. When applied to historic properties without disturbing the aesthetic of the property, this credit does not harm the integrity of the property.

Credit 3: Indoor Water Use

To reduce the demand for water usage indoors this credit requires the use of high efficiency fixtures and fittings including low flow faucets, showers and toilets. To ensure historic accuracy the fixtures should be aesthetically similar to those produced during the original construction of the house.

Energy and Atmosphere

Credit 1: Optimize Energy Performance

This credit is a broad based performance credit, the goal of which is to have the house meet or exceed ENERGY STAR for Homes requirements. Credit is awarded based on a mathematical calculation which is based on the climate zone the home is located in. While this credit is a simplification and combination of credits two through six, the impetus behind it is to ultimately create a house which uses less energy that a conventional home.

Credit 2: Insulation

Because a majority of energy use in a residential structure is spent on creating a pleasant atmosphere, this credit is focused on maintaining that atmosphere with limited energy loss through heat transfer. To achieve this credit, the design team must insulate the building to a certain standard to avoid heat and cooling loss through thermal bridging. If the insulation process does not disturb the original materials or structure of the house this credit can be applied to historic properties. But if the insulation process will require extensive demolition of historic materials the resulting affects would irreparably harm the building's historic integrity.

Credit 3: Air Infiltration

Similarly, this credit reduces the energy expended by stopping air leakage into and out of the building. This is done by weatherizing the building envelope.

Credit 4: Windows

To ensure that the residence is expending energy in an optimal fashion, this credit focusses on lessening the energy expenditure that results from faulty windows. This credit focuses on the use of windows in a well thought out manner that includes placement and size, to

reduce heat gain in the summer and heat loss in the winter. Also, the credit takes into account the location of the residence as well, to further maximize the energy saving potential. Often seen as one of the most dangerous credits for a buildings historic integrity, this credit should be applied very carefully. No historic windows should be removed or replaced, and no additional alterations should be made to the historic windows.

Credit 5: Heating and Cooling Distribution System

To further reduce air leaks and thermal bridges, this credit requires that all air ducts are properly installed and the exposure to the exterior is limited. There are allowances for both forced air systems as well as nonducted HVAC systems. The goal of both is to reduce distribution losses and ensure a high efficiency.

Credit 6: Space Heating and Cooling

This credit is based upon a need for strong heating and cooling design and instillation. The appropriate size HVAC system is necessary as well as appropriate instillation.

Credit 7: Domestic Hot Water

To reduce the amount of energy necessary to heat domestic water systems. This includes maximizing the water distribution system, insulating the pipes and using efficient equipment. Efficient water distribution includes a controlled circulation loop of the smallest possible size, with minimal branch lines. Overall the design should be as compact as possible.

Credit 8: Lighting

The purpose of this credit is to reduce the energy consumption from lighting usage. This credit relies heavily on the use of ENERGY STAR technologies and requirements. But the overall intent is to limit any excess energy usage in the lighting of the residence.

Credit 9: Appliances

In an effort to further reduce energy consumption this credit requires the use of high efficiency appliances including refrigerators, ceiling fans, dishwashers, and clothes washers.

Credit 10: Renewable Energy

To reduce the consumption of nonrenewable energy, this credit encourages the use of renewable energy sources.

Materials and Resources

Credit 1: Material Efficient Framing

To limit the amount of waste generated by the construction process, particularly wood used in the process of framing the building. To achieve this, the design team should have detailed documents, this should include framing documents as well as a cut list and order documents. Additionally, all possible effort should be made to create a design that will use lumber in standard dimensions to further reduce waste. This credit is difficult to address in historic buildings, because the framing occurred in the past, often with little or no documentation.

Credit 2: Environmentally Preferable Products

The materials used in construction should also have a minimal impact on the environment. They should be sustainable as well as harvested in an environmentally conscious manner. To reduce the exposure of the residents to harmful toxins emitted during the production of construction materials this credit requires the use of low emission materials. Furthermore, this credit encourages the use of locally grown and produced materials in an effort to reduce the environmental impact of transporting materials.

Credit 3: Waste Management

This credit is intended to reduce the amount of waste generated during the construction process. To achieve this, the credit calls for the creation of a comprehensive waste management plan.

Indoor Environmental Quality

Credit 3: Moisture Control

In an effort to reduce the risk of mold-related illnesses and increase the life of the building, this credit calls for strict control of indoor moisture levels. This is achieved through the use of dehumidification when the climate calls for it. This is not necessary in all locations, so the treatment should be tailored to the specific location.

Credit 4: Outdoor Air Ventilation

To reduce the exposure of residents to outdoor air pollutants this credit calls for outdoor air coming into the house to be monitored and ventilated. This includes increasing the air flow within the building through either active or passive systems.

Credit 5: Local Exhaust

Reducing moisture and indoor pollutants in local specific places is also important to the overall indoor environmental quality. Kitchens and bathrooms are particularly prone to excess moisture and indoor pollutants. To mitigate these pollutants bathrooms and kitchens should have additional exhaust removal systems to remove the air to the exterior of the building.

Credit 6: Distribution System

For thermal comfort to be achieved, appropriate cooling and heating systems should be installed. These can either be in the form of forced air systems or non-ducted HVAC systems.

Air should be circulated freely and quickly throughout the building. Calculations are done on a room by room basis to determine the appropriate air flow requirements.

Credit 7: Air Filtering

Working off of the requirements for the distribution system of credit 6, this credit calls for high quality air filters to be installed in the HVAC and forced air systems to reduce air leakage and keep contaminants and pollutants out of the indoor environment.

Credit 8: Contaminant Control

To protect both residents and construction workers, this credit requires a source removal of indoor airborne contaminants. This includes sealing all vents during construction to reduce intake of contaminants. As well as a fresh air flush prior to occupancy to remove all airborne construction contaminants. To ensure that the risk of indoor contamination remains minimal, control measures should be put into place as well.

Awareness and Education

Credit 1: Education of the Homeowner

Credit 2: Education of the Building Manager

Home Size Adjustment

A crucial component in creating sustainable homes is designing and building a structure that utilizes the minimum amount of space necessary for the occupants to live comfortably. If the size of a home is increased by 100% it will increase its annual energy usage between 15%-50% and the usage of materials increases between 40%-90%. These equations do not include the increase in resources required to maintain such a home. An increase in size solely to

have a larger residence is not a sustainable building practice even if the design, construction and materials utilized are all considered sustainable in their own right.

The creation of a method to adjust LEED certification points to account for home size addresses the practice of overbuilding as discussed above. By calculating the area of the home and the number of bedrooms as defined by local building code, an adjustment in the point threshold can be determined. A smaller building with a greater number of bedroom means that the points required to be considered a LEED certified home will decrease. On the other hand, a large home with few bedrooms will need to meet a higher point threshold for the same qualification.

General Quantification for Sustainable Home Design

Social

The social aspects of sustainability are related to creating a better quality of life. For the creation and promotion of a sustainable community there must be economic vitality and employment, a healthy environment, good access to resources, access to services, housing, strong planning and design principles and practices, and good local environmental quality.[55] All these elements contribute to a feeling of belonging to a community, a sense of place, and personal identity. Though more difficult to quantify, one of the strongest indicators for social sustainability is the availability of goods and services within the community, but more importantly how accessible these goods and services are to the residents of a particular home. A second marker for determining how sustainable a residence is, would be the participation of the resident within the community. Finally, because sustainability and especially social

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[55] Roaf, *Closing the Loop,* 72.

sustainability require diversity, a socially sustainable residential design will protect and help transmit the traditions of culture from one generation to the next while still respecting and including cultural diversity.

For a home to be considered part of a larger community it must be centrally located while still meeting the personal needs of the residents. A central location will allow the residents to participate in the local community through work, educational experiences, local governmental undertakings, social interaction, etc. These interactions occur naturally in local community facilities such as schools, libraries, grocery stores, and parks. A residence located in such a community has already increased the sustainability of the community by contributing more people to diversify and engage in the community.

Based upon the research for this paper, the following chart was compiled as a rubric for determining the characteristics of a residential design which must be present for the building to be considered socially sustainable. The rubric is a more general method of quantifying social sustainability on a broad range. Each characteristic addresses a component of social sustainability as outlined within the above chapter, in a method which is more quantifiable and easily identified than the broader topics discussed in the chapter.

Table 1: Characteristics of Social Sustainability

Strong Community Planning and Design
Easily Accessible Community Resources
Social Interaction
Common Philosophy
Sharing Knowledge
Security
Sense of Belonging
Sense of Place
Cultural Diversity
Transmission of Knowledge from Generation to Generation

Economic

Designing a building with a net zero environmental impact is not a sustainable building practice if the resulting building is too expensive to produce or run. The economy of a single individual or family shares a connection with the local economy and thus the national and global economies. Elements which affect one portion will directly affect the other. For a house to be economically sustainable it must positively contribute to both the economic structures. The larger economy is affected by a transfer of specific goods and resources within the community. These include money and employment opportunities. The second part of economic sustainability deals with the allocation of available resources both amongst projects and within a single project. When utilized correctly the resulting building will show a positive new capital gain, ultimately a profit.[56]

A truly sustainable structure should contribute to the embodied wealth of a property. The costs associated with its design, construction and maintenance should be proportionte to the size and complexity of the building. Not only should a sustainable residence contribute in a positive way to the occupying family's economy but also to the economy of the community as a whole. It should encourage spending money within the immediate community through the purchase of local materials and labor. The environmental aspects of sustainability often result in a building which is less costly to run and maintain than conventional buildings. This results in an increase of discretionary spending for the residents. These resources can be spent within the local community on food, entertainment and other extras. Also, if the residents find their home to be a

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[56] Williams, *Understanding Sustainable Architecture,* 91-92.

pleasant and enjoyable place to be they will invite friends and relatives to visit. This will add additional resources to the community through tourist spending.

Based upon the research, the following chart was compiled as a rubric for determining the characteristics of a residential design which must be present for the building to be economically sustainable. Research indicates that when the following four characteristics are applied to residential building design the resulting building meets all the identified requirements for economic sustainability.

Table 2: Characteristics of Economic Sustainability

Contributes to Property's Embodied Wealth
Maximizes Return of Resources Investments
Contributes to the Equal Distribution of of Resources
Low Life Cycle Cost (LCC)

Environmental

Environmental sustainability for residences is marked by conservative and thoughtful use of resources both in the construction of the building and the future running and maintenance of the building. The quantification of the use of these resources can occur by utilizing the LEED guidelines. But even without using the LEED guidelines there are specific elements that when in place will result in inherently sustainable domestic architecture.

First, the building must be designed using a minimal amount of square footage in which the family can comfortably live. Second, the building must be located within a preexisting community. This is a separate indicator from the social sustainability discussed above, in addition to contributing to the conservation of natural resources. Third, the residence needs to be efficient. All water and energy usage should be minimized without sacrificing comfort of the

family. This can be achieved either through modern technologies discussed in the LEED guidelines or through passive systems such as limiting the number of bathrooms in a building or utilizing solar heat gain and loss. Fourth, the construction process should occur on site to reduce the environmental impact of transporting the building. Additionally, local materials should be used in the construction to again reduce the environmental impact of transporting materials. Local materials are often better suited to the climate in which the residence is being built, resulting in a more energy efficient building in the long run. Finally, the building should be a healthy building. This means it should be comfortable for the residents and free of pollutants. Below are the characteristics which must be present in architectural design if the design is to be viewed as Environmentally Sustainable.

Based upon the research, the following chart was compiled as a rubric for determining the characteristics of a residential design which must be present for the building to be environmentally sustainable. Rather than using the restrictive and explicit guidelines set by the LEED standards, this rubric provides a more general set of guidelines for determining environmental sustainability while still addressing the underlying issues which are at the core of the LEED guidelines.

Table 3: Characteristics of Environmental Sustainability

Comfort of Building Inhabitants
Maximum use of Natural Light
Conservation of Natural Resources
Use of Recycled Materials
Energy Efficiency
Natural Ventilation
Passive Solar Energy
Building Management System
Efficient Use of Water
Efficient Use of Space

CHAPTER FOUR

ARTS AND CRAFT THEORIES: RELATIONSHIP TO SUSTAINABLE DESIGN

Foundations of the Arts and Crafts Movement

The Arts and Crafts Movement was so named by the founding and organization of the Arts and Crafts Exhibition Society in 1887. Its purpose was simple, to undo the harm caused to the arts by the Industrial Revolution. The Great Exhibition in 1851 at the Crystal Palace had originally galvanized the founders of the movement into action. The leaders of the Arts and Crafts movement felt the exhibits devoid of soul and referred to them as the "wonderful ugliness." They believed such mass-produced art took away the humanity of their creators.[57] The Society believed the importance of designing was found not only in the creative process but more importantly in the physical act of creating something. As a result, mechanizing the creative process and using machinery for labor removed the value and meaning of the resulting piece.[58] The ideas of the movement evolved slowly, developing alongside the technology of the Industrial Revolution.

The first theorist to begin developing a codified theory based on the principals of the movement was Augustus Welby Pugin. Pugin's theories galvanized a movement known as the Domestic Revival, a precursor to the Arts and Crafts Movement. The Domestic Revival sought to return English architecture to simpler forms and truly 'English' design. It drew heavily from

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[57] Pamela Todd, *The Arts and Crafts Companion* (New York:Bulfinch Press, 2004): 11-12.

[58] Wendy Kaplan, *The Arts and Crafts Movement in Europe and America: Design for the Modern World* (New York: Thames and Hudson Inc.,2004): 11-17.

the medieval period for inspiration. Pugin felt Gothic architecture was the original manifestation of a purely British architecture, fully representative of the time and place in which it was developed. Gothic architecture was the architecture of the aristocrats, the gentry. The style represented strength and hospitality, both for the individual and the country as a whole. For the supporters of the Domestic Revival, the gothic style had a timeless integrity, a drastic departure from the ever changing designs popular during the nineteenth century.[59]

This constantly changing aesthetic worried Pugin. As an architect, he felt British architecture had lost its meaning. Designs were drawn from "a confused jumble of styles and symbols borrowed from all nations and periods"(Naylor, 13). It was not just the lack of a specific style that Pugin found disconcerting but the influences on popular architecture at the time. Pugin and the supporters of the Domestic Revival felt that true architecture should express the time and place in which it was created. The basic principals he used were simple. First, only necessary features should be included in a building. Necessary features were defined as any thing which affected the convenience, construction or 'propriety.' An important component in determining what kind of feature was deemed necessary was the function of the building. This excluded utilizing elements that were inappropriate for the specific time or place as well as those which did not serve the building's function. Second, any ornamentation should enrich the design and construction. Pugin felt that ornamentation should come from nature. And much like the application of architectural details, ornamentation should always be appropriate and

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[59] Naylor, *The Encyclopedia of Arts and Crafts,* 22-33.

significant to the structure. [60] With these ideas, Pugin set forth the most basic tenants of the Arts and Crafts Movement more than half a century before the movement would be given a name.

Following in the footsteps of Pugin, John Ruskin, a noted architectural critic and Professor at Oxford, added his own theories to the developing canon of Arts and Crafts literature. Similarly to Pugin, Ruskin felt British architecture was lacking. He believed that a return to Gothic architecture would be beneficial to British design and the Empire as a whole. Ruskin may have shared Pugin's belief in Gothic architecture as the true form of English architecture, but they differed on their reasons why it was so. Ruskin felt that Gothic architecture was representative of humanity. Unlike the rigid design of classical and neo-classical buildings, gothic architecture allowed for imperfections, as well as flexibility in design.[61] Despite the creative quality of Gothic architecture Ruskin felt it was the most rational of all forms and as such was the ideal architecture for an industrializing England.

In his book *The Seven Lamps of Architecture,* Ruskin outlined the characteristics of what he believed to be great architecture: sacrifice, truth, power, beauty, life, memory and obedience. He felt power could be found in simplified massing; beauty in naturalistic ornamentationl obedience in the use of historic styles; and truth in the honest use of materials. In his second architectural work, *The Stones of Venice,* Ruskin further examined the elements which create what he views as pure architecture. These elements are most commonly seen in Gothic architecture and can be defined as what gives Gothic its character. There is always a 'rudeness' or imperfection that reaffirms Ruskin's belief that for architecture to be truly pure it has to reflect

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[60] Gillian Naylor, *The Arts and Crafts Movement: A study of its sources, ideals and influence on design theory* (Cambridge, The MIT Press, 1971): 13-15.

[61] Peter Davey, *Arts and Crafts Architecture,* 17-20.

the imperfect craftsman. Gothic architecture has a 'changeful' quality, a flexibility in design marked by variety and asymmetry. 'Naturalism,' 'grotesqueness,' and 'rigidity' are all required as well. Architecture should be truthful and real, convey the fantastic, and utilize energy through the use of forms and ornament. Finally, there must be 'redundancy.' The combination of these elements work together in different configurations for each craftsman, giving the completed building a personality unique to the individual craftsman.[62] The importance of the craftsman is paramount to Ruskin's ideas of Gothic architecture.

Ruskin expanded his theories on architecture from simply aesthetics to creation as well. One of his basic beliefs was that the next pure aesthetic will come from the craftsmen themselves . "The painter should grind his own colours, the architect work in the mason's yard with his men; the master and manufacturer be himself a more skillful operative than any man in the mills; and the distinction between one man and another be only in experience and skill, and the authority and wealth which these must naturally and justly obtain."(Naylor, 29). In combination, the ideas of Ruskin and Pugin laid the ground work for the Arts and Crafts Movement. It was to be a social, cultural and aesthetic revolution based on respect for the craft and the men who labor so others can create.

Evolution in England

The influence of the Arts and Crafts Movement grew in England as a direct result of the impact of the Industrial Revolution on both production and lifestyle. The Industrial Revolution brought about the mechanization of production and thus the removal of the human element in the process of design and production. Many followers of Pugin, Ruskin and others felt this type of

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62 *The Encyclopedia of Arts and Crafts: The International Arts Movement, 1850-1920* (New York: E.P. Dutton, 1989): 9-11.

production resulted in a loss of traditional crafts, degraded craftsmen and produced poorer quality products. The Industrial Revolution not only reduced the quality of craft but also had a negative impact on the greater environment and overall quality of life for craftsman, those involved in production, and the general population as a whole.

The quality of life was degraded for many as a result of the Industrial Revolution. Factories crowded workers together and individuality disappeared resulting in identical products being churned out and giving the workers no feeling of accomplishment or ownership of their work. Additionally, the mechanization of work allowed for greater competition in the job market, removing any sense of economic stability for the workers. They were no longer the sole owner of the knowledge necessary to perform a service; anyone could be trained to take their place. This also degraded the value of the knowledge and made it difficult and unnecessary to transmit such knowledge from one generation to the next.

It was not just the personal identifiers for quality of life which are negatively affected but also the environmental ones. The air quickly became full of smog, soot and other pollutants. These were compounded by the dirty streets, dirty factories, and a generally unsafe and unhealthy environment. Additionally, because factories required a greater number of people to operate, this increased the population density of the cities. This in turn created cramped and unhealthy living environments. Overall the environmental quality was degraded to an unhealthy level and had a negative impact on a large portion of the population's quality of life.

The Arts and Crafts movement was ultimately an attempt to return production and creation to a pre-industrialized state. As a result of these negative aspects of the Industrial Revolution, the Arts and Crafts Movement held strong anti-industrialization principles. The

followers of Pugin and Ruskin and the founders of the Arts and Crafts movement- William Morris, along with his cohorts W.R. Lethaby, A.H. Mackmurdo, Philip Webb, Walter Crane, Ernest Gimson and others-strove to restore dignity to workers and return joy and satisfaction to their lives.[63] As a frequent lecturer and popular artist in his own right, Morris helped facilitate interest in a more traditional process of creation. His ideas resonated particularly with the poor and unsuccessful artists of East London. Architects, lawyers and painters were drawn to the ideals of Ruskin and Morris as a method of social reform, returning a sense of pride for traditional craftsmen.[64] Lethaby sought to determine the proper form for architecture and, more importantly, what it meant to society. He believed that high style architecture was a product of tyranny and as such, modern architects should seek a new form which was reliant on the symbolism and vocabulary of nature and addressed utility and need.[65]

While the movement quickly gained popularity, it was not until the Art Workers' Guild and The Home Arts and Industries Association were created in 1884 that the movement was seen as a codified philosophy of design and decoration. The idea behind both institutions was free collaboration between artists with an ultimate goal of creating total works of art. These qualities arose as a result of a deep understanding of how the materials worked. Ultimately, Arts and Crafts design and the total work expressed a strong yet simple form through intricate and thoughtful craftsmanship and special attention to the use and user.[66]

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[63] Pamela Todd, *The Arts and Crafts Companion,* 12.

[64] Wendy Kaplan, *The Arts and Crafts Movement,* 20-34.

[65] Peter Davey, *Architecture of the Arts and Crafts Movement,* 55-66.

[66] Isabelle Anscombe, *Arts and Crafts Style, 53-55.*

These total works would bring together artists from all different disciplines. Painters, sculptors, architects and those who worked with the decorative arts all embraced the idea of a total work of art. The multidimensional acceptance of the total work of art was a separate yet equally important component of the movement. By uniting multiple disciplines to create all encompassing works of art the movement set the stage for future collaborative efforts between the various disciplines to further the cause of the movement. This cooperative element of the movement spurned the creation of numerous cooperative artist groups starting with the 1882 Century Guild. The Century Guild strove to bring about a resurgence of traditional crafts and restore the craftsman's prominence within the community. The creation of the Art Workers Guild in 1884 brought about decorative unity between all artisans. Finally, the as of yet unnamed movement was given a name through the creation of the Arts and Crafts Exhibition Society, the leader in the propagation of the movement and its principles.[67]

The Society clearly defined its purpose in a series of published works. It stated "Our business as artists is to supply the lack of tradition by diligently cultivating in ourselves the sense of beauty,... skill of hand, and niceness of observation, without which only a *makeshift* of art can be got".[68] The focus of the society was to organize and host exhibitions to expose the general population to the goods produced as part of the movement. As part of the early shows, there was a great deal of interest in showing the negative impact industrial progress had on the art trade. As previously stated, the followers of the Arts and Crafts Movement believed the products produced by mechanized means were cheap, both poorly made and under valued. They detracted

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[67] Pamela Todd, *The Arts and Crafts Companion,* 14-15.

[68] Peter Davey, *Architecture of the Arts and Crafts Movement,* 53.

from the inherent qualities of creating art and degraded the user.[69] To protect the founding principles of the movement, all those who showed products at the exhibitions had to be able to prove the handmade nature of their creations. This helped highlight the differences in quality between those made with traditional methods and those produced through mechanical intervention.[70]

Utilizing the principles set forth by Medieval guilds and reaffirming the connection between medieval crafts and the movement, the Arts and Crafts societies and guilds solidified ideas on aesthetic standards as well as techniques. Keeping with the traditions of the Medieval guilds, the societies contributed to continued education of craftsmen and the transmission of artistic knowledge. The Arts and Crafts Exhibition Society held demonstrations in the practical application of the movement's principles. These demonstrations, in conjunction with lectures led by the leading artists from each specific field, extended the reach, depth and breadth of the movement. It was through these guilds that the movement grew and expanded, covering all of Europe and North America.[71]

The Arts and Crafts guilds did far more than simply providing standards for the artists and craftsmen. A number of them also advocated for social reform. For example, C.R. Ashbee's Guild of Handicraft was started in East London in 1888, providing support for the underprivileged local craftsmen. By 1902 he had moved the Guild to Chipping Camden, near a number of other prominent Arts and Crafts settlements and artists. In addition to utilizing democratic principles to ensure equality for all the members of the Guild, Ashbee also

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[69] Peter Davey, *Architecture of the Arts and Crafts Movement* (New York, Rizzoli, 1980): 53.

[70] Pamela Todd, *The Arts and Crafts Companion,*14-16.

[71] *The Encyclopedia of Arts and Crafts,* 12-13.

established a school, provided the craftsmen with homes, gardens, leisure activities and entertainment.[72]

The Arts and Crafts gained popularity both as an aesthetic and as the basis for social reform. As the movement grew, the principles were applied to a variety of different outlets. The Garden City movement utilized the Arts and Crafts' philosophy that workers should have a happy and healthy environment in which to live and work. Often the official architecture of these Garden Cities would be Arts and Crafts as well, reinforcing the connection between built environment and those who live and work there. [73]

As stated earlier, the Arts and Crafts Movement evolved as a response to rapid industrialization, because the mechanization of the production of goods was detrimental to both the user and the craftsman. Unfortunately because of the economic and societal constrains of the time, the poor quality mechanically produced goods were marketed to and utilized by the poorer people of England. A primary goal for the movement was to make handcrafted goods available to all people. But because of the amount of labor and the materials that went into Arts and Crafts good, their final price was often too great for the lower classes to afford. This created a fundamental contradiction within the movement.

Despite an inherent dislike and distrust of industrialization, the movement was forced to come to an uneasy understanding with the idea of progress. Mass production was a crucial factor in ensuring that their ideas and designs reached as many people as possible, yet it stood against everything inherent to the Arts and Crafts Movement. Companies such as Liberty's and Heal & Son produced goods which aesthetically were influenced by the Arts and Crafts but were not

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[72] Pamela Todd, *The Arts and Crafts Companion, 16-17.*

[73] Pamela Todd, *The Arts and Crafts Companion, 24-27.*

created utilizing the Arts and Crafts philosophy. While these companies made the Arts and Crafts aesthetic readily available to a much larger audience, they also undermined the purpose of the movement and ultimately contributed to its end.[74]

American Adaptation

The Arts and Crafts Movement in America followed roughly the same outline and trajectory as the movement in England. Analogous to the World Exposition which spurred the Arts and Crafts movement in England, an 1876 Exposition in Philadelphia raised awareness about the low quality of products being produced in American factories. In addition to the poor quality of these manufactured goods, there were no strong representations of an American style, depriving America of a cultural identity.[75] The American artists who adopted the Arts and Crafts manifesto wanted to create a method of design and production which not only represented a unique American identity but also held a manifestation of the principles on which the country was founded.

While in England the movement's main focus was a reaction against the Industrial Revolution, in America the focus was placed squarely on the creation of a way to democratize design. The goal was the creation of a design philosophy that was easily accessible to all citizens, both physically and intellectually. This required a cheaper way to produce goods and materials and an aesthetic that did not retain elements of aristocratic high styles from the past. Both of these requirements also played into the desire of American Arts and Crafts artists to

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[74] Pamela Todd, *The Arts and Crafts Companion, 28.*

[75] Pamela Todd, *The Arts and Crafts Companion, 21.*

develop a style which created a sense of a shared past and used this past to inform the designs of the future.[76]

Utilizing the British idea of guilds and societies to bring artists together to share techniques and ideas was paramount to the rapid proliferation of the Arts and Crafts ideals in America as well as advancing the search for a national style. The Society of Arts and Crafts in Boston (SACB), created in 1897, was one of the better known of such societies. The foundation and principles were based on those of the Arts and Crafts Exhibition Society. The first president of the SACB, Charles Eliot North, traveled through Europe with some of the premier Arts and Crafts theorists of the time including John Ruskin, William Morris and others.[77] Bringing back his knowledge of the British Arts and Crafts movement, North styled the SACB using many of the same elements. For example, SACB worked to educate artisans about traditional methods, in a manner similar to the guilds and societies founded in England. SACB also staged and hosted numerous exhibitions all over the country to introduce a broader base of consumers, artists and craftsmen to the philosophy of the movement. Unlike its British counterpart, SACB also organized a way to evaluate the work of a craftsman and his or her level of mastery of their skill.[78] The goals of groups such as SACB were not solely aesthetic or design based. They, like their British counterparts, attempted to bring about a societal change through their works.

Though the American movement did not share the same dislike and distrust of the industrialized mechanization of production that drove the British movement, mechanization was still viewed somewhat skeptically. The documented ill treatment of the workers as well as the

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[76] Wendy Kaplan, *The Arts and Crafts Movement in Europe and America, 246-285.*

[77] *The Encyclopedia of Arts and Crafts,* 12-13.

[78] Janet Kardon, *The Ideal Home,* 57-58.

overall negative impact on the human psyche were of great concern to the American proponents of the Arts and Crafts movement. They sought to use the philosophy of the movement as a jumping off point for bringing about social change. Design schools taught workers manual and flexible skills instead of teaching them how to perform one non-transferable task.[79] In addition to these schools, the American movement also embraced the idea of a utopian artistic community.

Similar to Ashbee's creation of an Arts and Crafts community in Chipping Camden, a number of prominent American Arts and Crafts leaders also set up their own communities. The Roycroft community near Buffalo, founded by Elbert Hubbard in 1892, was one of the earliest of such communities in America. Hubbard's goal was to return production to the country, reconnecting with the natural. His community included production facilities such as a printing plant and a smithy, as well as more commercial industries such as banking. Homes were built in communal fashion, and a community library as well as playgrounds were seen as fundamental to the happiness and productivity of the workers.[80] The idea that a pleasant and enjoyable work and home environment would bring about a higher caliber of design was utilized by other leaders in the community as well.

Another famous American Arts and Crafts community was Craftsman Farms founded by Gustav Stickley in Eastwood, New York. Similar to Roycroft, Craftsmen Farms was created to bring prestige to the occupation of craftsman. The goal was not to bring about radical social change, but to enhance the process of creation and ensure that traditional methods were not lost

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[79] Wendy Kaplan, *The Arts and Crafts Movement in Europe and America,* 247.

[80] Pamela Todd, *The Arts and Crafts Companion,* 21-23.

or degraded as part of the Industrial Revolution.[81] Stickley's influence on the Arts and Crafts movement goes far beyond the creation of Craftsman Farms. Stickley became one of the leaders of the Arts and Crafts movement, disseminating the ideas and philosophy through his magazine *The Craftsman.* Between *The Craftsman* and numerous other publication including catalogues, Stickley's work quickly began to be recognized as the ultimate American Arts and Crafts Design. In addition to developing a style unique to the American movement, Stickley also helped define a theoretical and philosophical difference between the American movement and the British movement.

In England, machinery was seen as part of the problem. It was a sign of industrialization; the source of workers' lost pride, the cause of pollution, and a stagnation of creativity. In American, due in great part to Stickley's beliefs, the machine was seen as an integral component in the creation of Arts and Crafts goods. He stated:

> given the real need for production and the fundamental desire for honest self-expression, the machine can be put to all its legitimate uses as an aid to, and a preparation for, the work of the hand, and the result be quite as vital and satisfying as the best work of the hand alone...the modern trouble lies not with the use of machinery, but the abuse of it.[82]

Stickley felt that by allowing the machine to do the work it was intended for, workers would be free to complete more meaningful tasks. This would encourage productivity and creativity by eliminating the most menial of tasks. The utilization of machine production also allowed a greater portion of the population to afford Arts and Crafts products.

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[81] Janet Kardon, *The Ideal Home,*126.

[82] Pamela Todd, *The Arts and Crafts Companion,* 23.

The inclusion of machinery in the production of Arts and Crafts is not the only philosophical difference between the British and American movements. Within America, there was a desire to find an art and aesthetic which represented both America's past and informed its present and future. As part of this quest, the movement took on very regional adaptations. In the Midwest, this search for a regional identity as part of a larger nation identity lead to the creation of the *Organic* style, while the California Arts and Crafts movement created very different styles of design.[83]

Overall, the Arts and Crafts movement in America was based on the same ideas and principles as the Arts and Crafts movement in England. Both were driven by a desire to create simple and well designed pieces, crafted with care and thought. While the English movement was built upon a desire to undo the effects of industrialization, the American movement was focused on finding its own identity, one which would encompass the nation's rich past. The idea of a national identity as manifested in design required the creation of an inclusive style, one which was affordable and appealed to a large portion of the population.

Architectural Design Theories

Distilling the theories of the Arts and Crafts movement into a single architectural aesthetic or type is nearly impossible. The movement was not based on a foundation of ornamentation, which results in a structure easily identified by its physical appearance. Rather, the Arts and Crafts building is identified through the intent of the design instead of the final product. There are a number of crucial components to Arts and Crafts architecture. First, there is an acceptance of the vernacular. This includes historic forms as well as locally prevalent

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[83] Wendy Kaplan, *The Arts and Crafts Movement, 255.*

designs. Second, there is an overall simplicity to the design. Ornamentation is not abundantly used. The form becomes the building's greatest ornamentation. Third, there is a desire to connect with the landscape. The building should work together with its surrounds to create an overall seamless and aesthetically pleasing vista.

As mentioned above, the use of history and the past within the Arts and Crafts Movement played a profound part in the design theories of the movement. While the rest of the industry was looking towards the future for inspiration, the movement was utilizing a centuries old tradition of creating a modern style drawn from the past.[84] Though using the forms and styles of the past is not an unusual method in the creation of new architecture, the Arts and Crafts movement also utilized the vernacular style at a scale never before used.[85]

In its earliest adaptation, the Arts and Crafts architect looked to the Gothic as the truest and purest form of architecture. Both Pugin and Ruskin held Gothic architecture in high esteem. For Pugin, the use of Gothic architecture was only a means to an end. He felt that by utilizing the Gothic aesthetic he could re-create the medieval period and return England's creative world back to its former glory. For Pugin, the Gothic aesthetic was particularly important. Based on this belief, he designed so that there would be meaning in all decoration but more importantly that 'all ornament should consist of enrichment of the essential construction.'[86] Pugin sought to create an architecture which was Gothic in style but held a deeper meaning.

Ruskin however felt the power of the Gothic was not in its aesthetic design but rather in its functional form and its imperfections. By expressing the building's function rather than a

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[84] Wendy Kaplan, *The Arts and Crafts Movement, 61.*

[85] Pamela Todd, *The Arts and Crafts Companion, 95-98.*

[86] Isabelle Anscombe, *Arts and Crafts Style,* 21-23.

predetermined aesthetic design, the Gothic architect was true both to himself and his subject. Ruskin noted ' It is one of the chief virtues of Gothic buildings, that they never suffered ideas of outside symmetries and consistencies to interfere with the real use and value of what they did.'[87] This idea of asymmetry also relates to Ruskin's desire to create imperfect architecture. He felt that to fully express a functional and rational design there must be some amount of imperfection. These small inconsistencies are what makes a craftsman an artist. They are signs that the artist is thinking for himself and not merely acting as a machine. Additionally, the imperfections lead to a type of architecture which is 'changeful.' To Ruskin, Gothic architecture was truly rational because it was easily adapted to serve any function.[88] This adaptability and exterior expression of the interior became hallmarks of Arts and Crafts architecture.

For the Arts and Crafts architect, honesty in design was paramount. It was thought that architecture should be expressive of the function and purpose which it serves. By using the most basic of architectural elements including massing, placement and scale, Arts and Crafts architects were able to create expressive buildings which drew from the past but were unique to the current time period.[89]

Arts and Crafts Bungalow

The bungalow embodies the ideas and theories of Arts and Crafts design. Both use natural materials, utilitarian floor plans, and hand craft. The connection between the bungalow form and the Arts and Crafts movement is furthered by the fact that many of the Arts and Crafts architects were known for their bungalow design. Gustav Stickley is the most well known Arts

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[87] Isabelle Anscombe, *Arts and Crafts Style,* 24-27.

[88] Peter Davey, *Architecture of the Arts and Crafts Movement,* 10-15.

[89] *The Encyclopedia of Arts and Crafts, 30-34.*

and Crafts bungalow architect. His magazine, *The Craftsman,* did more than any other publication to popularize the bungalow form.[90] Due in part to the popularization of the bungalow through Arts and Crafts publications, it became the one of the most well recognized forms of Arts and Crafts architecture.

The Arts and Crafts movement was created to bring about a fundamental shift in architecture for the masses. By bringing a flexible, functional and affordable design to the public the bungalow form is the realization of this desire. It was a home for the masses which was more than just a residence.

As an example of Arts and Crafts architecture, the bungalow fuses work and art to create a higher quality of life for the residents. Historically the bungalow was to be a retreat from the unknown elements of the British territories, within the context of the Arts and Crafts movement it became a safe haven from the rapidly industrializing cities. Using a design which highlighted the buildings connection with nature, the bungalow form reaffirmed the tenants of the Arts and Crafts commitment to reconnecting with nature.[91] The bungalow was designed to use materials that were locally available. The overall design was simple and inexpensive to produce. As an easily adaptable form, the bungalow design could be easily altered for a variety of family sizes.[92]

Aspects of Sustainability in Arts and Crafts Design

Social

The Arts and Crafts movement was a galvanizing point for many; it spurred them to create a better community not just for themselves but for the future as well. The industrial

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[90] American Bungalow Style, 18-19.

[91] *Chicago Bungalow,* 12-14.

[92] *Gustav Stickley,* 72-74.

revolution created an environment which was not conducive to healthy living. It was polluted, dirty, unhealthy and stifled creativity. The theories of the Arts and Crafts movement were based upon the idea that all workers should have access to a clean environment, free of pollutants and harmful elements. Arts and Craft communities such as Chipping Camden and Roycroft were based upon the idea of giving craftsmen and their families a higher quality of life than they would have in a city such as London.

These communities embodied social sustainability. They provided greater equality for those living and working there. Craftspeople were no longer looked down on for pursuing their chosen trade. The gap between those with plenty and those without would begin to narrow as ideas of equality spread.

A good quality of life is a strong indicator for a sustainable society. By removing the negative connotations with certain professions, and by reconnecting with the natural environment, the Arts and Crafts movement tried to bring about a drastic change in the quality of life for many people. Living in a clean and healthy environment where one is intellectually and artistically stimulated and challenged is a much more sustainable way of life compared to that lived by the industrial workers of London.

Additionally, the idea of a sustainable society, is also an important component of the Arts and Crafts theory. The communities created as part of the movement reflect this idea. They are built to be self-sustaining organizations, with recreational, educational, and consumer spaces as well as public services. They also are built around creating an idea of community, places where people share similar ideals and goals and can work together to achieve these goals.

Social sustainability within the Arts and Crafts movement goes beyond the communities specifically created as part of the movement. By applying the principles of equality, quality of life, and interconnectedness or self sustaining as part of the design theory for their buildings, the architects of the movement also brought sustainability into the greater outside community and society as well.

Equality was to be achieved through the use of traditional, generally unobtrusive, vernacular structures. By utilizing vernacular over high style architecture, the architects connected the building owner with the local community. High style architecture alienates, it sets the owner apart from the common citizen within the community and acts as a constant and permanent reminder of one's social status or lack thereof. Vernacular architecture or a variant thereof provides a visual link between the homeowner and the community as a whole. Equality is also realized through use of moderation in design. Rather than create an extravagant and elaborate design with an extensive floor plan, the Arts and Crafts architects tended toward more reserved and modest buildings (such as the bungalow) with enough space to be comfortable but not so much as to be ostentatious.

Achieving a better quality of life for the community as a whole is also realized through the architecture of the movement. By creating and maintaining an economically sustainable structure the community also becomes more economically sustainable (as discussed above). This results in a higher quality of life for those within the community.

Economic

The modern idea of economic sustainability is not as closely related to economic growth as it was once thought. There is little or no correlation between standard of living and increased

economic wealth once a basic quality of life is met. One of the most basic aspects of the arts and crafts movement is economic sustainability. This requires a careful distribution of resources within the project as well as amongst separate projects.[93] But the idea of economic sustainability is deeper than just the profit of one building. A truly economically sustainable structure will have a positive impact on the overall economy of the area in which it is located.

The founding fathers of the Arts and Crafts movement sought to create a system in which craftsmen were able to develop their skills to be able to support themselves rather than relying on the industrial complex to do so. The overall design of Arts and Crafts buildings also contributed to economic sustainability. A simple structure is generally easier to build, costs less, and retains its value better than a large heavily decorated building, thus increasing the individual profit margin. Arts and Crafts ideas of flexibility in architecture meant that the resulting buildings were easily adapted for new owners and new time periods in the future. Additionally, by minimizing the size of the structure and eliminating all superfluous design and decorative elements, an Arts and Crafts building was less costly to produce.

These buildings also contributed to the economic stability of the area in which they are located. By utilizing local materials and labor (a paramount principle of the Arts and Crafts canon), the construction of these buildings provided an economic boost to the area. The merchants who sold the materials benefitted, as did the laborers who created them and the artists who installed them. In boosting the local economy, Arts and Crafts buildings created a positive feedback loop which contributed to overall economic sustainability for the whole area not just the homeowners.

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[93] *Understanding Sustainable Architecture, 91-92.*

Environmental

Though the idea of environmental sustainability as we recognize it was not present during the period in which the Arts and Crafts Movement was developed, the idea of environmental stewardship was already an important component of the Arts and Crafts theory. It was strongly felt that a connection with nature was a necessary part of creating a high quality of life. This connection with nature was to be achieved through the use of carefully selected material as well as developing a connection between the building and its site. By embracing the natural as part of the design theory and aesthetic, the Arts and Crafts movement also encouraged treading lightly on the environment and working with it rather than against it.

The use of local materials was believed to aid in developing a relationship with the surrounding environment and helped maintain the connection. It was also rightly believed that local materials were best suited to the individual needs of the specific location and climate. By utilizing them as building materials Arts and Crafts architects felt that the resulting building was better connected to the environment and was a stronger structure.

Architects also carefully sited their buildings so as to maximize the impact the environment had on the structure. Windows were carefully designed in a layout which brought in cross breezes and cooled or warmed the house and removed stale and unhealthy air. The houses were situated so make the best use of the rising and setting sun allowing the homes to better regulate their temperatures while still providing adequate light.

Other aspects of environmental sustainability are also addressed in the Arts and Crafts cannon. Some of these decisions were purposely made with environmental consciousness in mind, others were less intentional but have no less of an impact on the environmental

sustainability of the movement. The mitigation of pollution and environmental toxins is one such element. Since one of the motivating factors in the movement was to get away from the pollution and toxic environment of industrialized cities, the Arts and Crafts practitioners sought to ensure that these conditions were never recreated elsewhere. For example, they utilized handcrafted elements which produce little environmental pollution by the use of machine made materials. Another example of latent environmentally sustainable actions is the Arts and Crafts desire to reduce waste in the construction method.

Overall, the Arts and Crafts movement made significant strides in advancing awareness about the impact the environment can have on a building as well as the impact a building can have on the environment. By striving to bring forward this interconnection the movement created a foundation for the incorporation of environmentally sustainable elements into architectural design without sacrificing its theories.

Quantified Sustainability of Arts and Crafts Buildings

The graphs below illustrate the characteristics of sustainability that can be found in Arts and Crafts architecture. For each characteristic which is addressed in the construction or design of an Arts and Crafts building a X appears in the second column.

Table 4: Aspects of Social Sustainability in Arts and Crafts Buildings

Strong Community Planning and Design	X
Easily Accessible Community Resources	X
Social Interaction	X
Common Philosophy	X
Sharing Knowledge	X
Security	X
Sense of Belonging	X
Sense of Place	X
Cultural Diversity	
Transmission of Knowledge from Generation to Generation	X

Table 5: Aspect of Economic Sustainability in Arts and Crafts Buildings

Contributes to Property's Embodied Wealth	X
Maximizes Return of Resources Investments	X
Contributes to the Equal Distribution of of Resources	X
Low Life Cycle Cost (LCC)	X

Table 6: Aspects of Environmental Sustainability in Arts and Crafts Buildings

Comfort of Building Inhabitants	X
Maximum use of Natural Light	X
Conservation of Natural Resources	X
Use of Recycled Materials	
Energy Efficiency	
Natural Ventilation	X
Passive Solar Energy	X
Building Management System	
Efficient Use of Water	
Efficient Use of Space	X

CHAPTER FIVE

SUSTAINABLE ASPECTS OF HISTORIC BUNGALOW

Characteristics of Social Sustainability

The design philosophy which contributed to the creation of the bungalow movement evolved from the Arts and Crafts ideas about raising the quality of life for workers and addressing the needs of a growing middle class. The leaders of the movement felt that all citizens should have the opportunity to live in a clean, safe and stimulating community with access to goods and services to meet their most basic needs. Bungalow design was meant to enhance the quality of life for the residents by meeting these standards for social sustainability.

The prevalence of specific bungalow communities is the first indicator of the socially sustainable aspects of the bungalow as a building type. Bungalows were designed to be part of a greater community, whether already in existence or newly developed. There are very few instances of bungalows found in secluded places; generally they can be found in groups either in or near large manufacturing cities such as Chicago. In the formal city limits of Chicago there are more than five distinct bungalow communities which account for hundreds of bungalow houses. Bungalow communities were often based on the ideals of the Arts and Crafts communities discussed earlier. As such, they were developed to be clean and safe environments for the residents, an escape from the dirty and overcrowded cities while still maintaining a sense of place and belonging to a larger community.

A large component of social sustainability is not only access to common services but also the ability to interact with the larger society. Bungalows are built for socialization. The front porch allows for socialization with the outside community. It encourages the residents to interact with those who pass by the house, and invites visitors into the space for further socialization. Once inside the house further socialization is encouraged through the open and unrestrained floor plan. By encouraging the flow of people social sustainability is encouraged.

Social sustainability is also dependent on the preservation and continual transfer of knowledge unique to a particular group. This is achieved in the bungalow design plan as a result of the incorporation of elements unique to the individual regions in which bungalows are found. By using aesthetic designs and building practices which are distinct from region to region, bungalow designers ensured the transmission of crafts and practices which otherwise could have been forgotten and become extinct.

Characteristics of Economic Sustainability

As discussed earlier, the definition of economic sustainability is a positive feedback loop. First and foremost, the creation of the building should result in a net financial gain for the owners. Secondly, the structure should positively contribute to the local economy which in turn will positively affect the residents of the structure. A sustainable structure should utilize the least amount of financial resources possible both in its creation and in maintenance, thereby allowing these resources to be used within the community at large. Ultimately an economically sustainable structure will utilize available resources carefully while maximizing potential profit.

Bungalow design ensures the most ‘bang for the buck’. A properly designed bungalow will utilize the least amount of materials necessary to produce a high quality living environment.

This means that no financial resources are lost in the creation of the house. In addition to ensuring that financial resources are used as efficiently as possible, the construction of bungalows houses contributed to the economic sustainability and well being of the entire community. Because a tenet of the bungalow movement was to encourage the use of local craftsmen, this brought an increase of financial resources to the community.

Characteristics of Environmental Sustainability

The bungalow was designed with environmental sustainability in mind years before the movement had been named as such. The design for a bungalow utilized the least amount of resources possible. By keeping the floor plan compact and efficient, the architects reduced excess material waste. In addition to ensuring that the building was constructed as simply as possible, material use was reduced by utilizing modular construction. In an interesting twist of fate, the mechanization and industrial production so despised by the Arts and Crafts movement allowed for the standardization of production.

Utilized in the creation of bungalows, especially in America, standardization of building elements allowed for a more efficient use of material in the construction and completion of a bungalow building. It reduced the need for special construction cuts. Utilizing standardization of dimensions in the building design meant that no excess material was lost as construction waste from special building cuts.

Reducing building waste was not the only method used to maintain the environmentally sustainable aspects of the bungalow. The materials used in the creation of the bungalow also assist in maintaining the environment. By making it a point to use materials from the local

environment the construction of bungalows reduced the amount of pollution put into the environment as a result of transporting materials over long distances.

The Chicago Bungalow: Case Study of Sustainability

General Characteristics

The Chicago bungalow is characterized by its rectangular one or one and a half story design. Usually located on a narrow lot, the Chicago bungalow footprint is usually 25 feet wide by 125 feet deep. This differs slightly from other bungalow forms which tend to have more square footprints. Chicago bungalows are found in planned neighborhoods, houses are usually separated by 5 to 15 feet and face the street with garages and public service allies in the back of the property. The orientation of the building created a safe community in which residents could watch activities outside from the comfort of their front porches or front living rooms.

The approach to the bungalow leads to a covered porch. The Chicago bungalow's front porch is small, where traditional bungalows have a full front porch. As with other bungalow forms, the Chicago bungalow's porch acted as a transitional space between the public and private areas of the house. The remainder of the front of the house is given over to an enclosed bay as part of the living room. Other physical characteristics of the Chicago bungalow's exterior include low walls with built-in planters to connect the house to the environment, a low pitched roof, and wide overhangs.

As with other bungalow forms, the Chicago bungalow utilizes a large number of strategically placed windows. Windows are usually grouped along the exterior walls and reference the interior layout. Public portions of the house are marked by a larger number of windows. For example, the front bay of the bungalow often had three to four double-hung

windows in addition to dormer windows and the dining room is marked by two or three double hung windows. This contrasts with the smaller number of windows used in the private portions of the house (kitchen, bedrooms and bathroom). Light is also brought into the basement and attic spaces through the use of low single windows and dormers. In addition to providing light and ventilation the windows were used as a way to connect the building to the environment. Panes of glass were decorated with patterns and colors which reflected images found in nature. This method of using windows as filters, brining nature to the interior of the house, is a common practice in other forms of bungalow design.

The interior layout of the Chicago bungalow reflects the same simplicity that is seen in the house's exterior design. With a traditional layout of six rooms on the main level and an unfinished full-sized attic and basement, the floor plan provides just enough room for comfortable living with room to expand. The floor plan for the first floor usually included a living room, dining room, kitchen, bathroom and at least two bedrooms. Minimizing the number of rooms is a typical characteristic of other bungalow forms as well, it maximizes the efficient use of space.

The Chicago bungalow interior decoration, decor and materials all exhibit characteristics of traditional bungalow design. Natural elements are common in both the materials used as well as in the decorative motif. Woodwork, such as the wood framing of doors and windows as well as the floor, was left unpainted to allow the natural beauty of the wood to show through. Leaded glass was decorated with representations of natural elements to connect the interior of the house with the exterior. As with other bungalow forms, the Chicago bungalow's interior was designed for functionality. Built in furniture was common, especially pieces utilized as storage such as

bookshelves and china cabinets. These storage pieces were often found flanking a central fireplace in the house's living room. The fireplace acted as the heart of the home, providing a place to congregate even though modern technology made it functionally unnecessary. The fireplace was often decorated with ceramic tiles depicting natural motifs, reaffirming the building's connection with nature.

The functional rooms of the Chicago bungalow were designed with utility in mind. The materials in both the kitchen and bathroom were primarily light colored tile with subtle decorative details. As with other bungalow forms, the materials where chosen because they represented cleanliness, dirt was easy to see against the pale background, and were durable and were easy to clean. Both the kitchen and bathroom incorporated modern technologies such as electric lighting, modern plumbing, refrigeration and many other conveniences.[94]

Overall the Chicago bungalow is a good representation of the bungalow form. The design and construction reflect a connection to nature and the surroundings. This is seen in both the choice of materials as well as the decorative elements. The bungalow's design is simple and functional, with no wasted space or materials. Space is divided unequally between the private and public, with more space given over to public spaces as a way to encourage socialization. Functionality and is also seen in the use of built-in furniture, and the choice of building materials materials. Though perhaps a little smaller than other bungalow forms, the Chicago bungalow embodies all the necessary elements which define the bungalow style.

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[94] *The Chicago Bungalow,* 16-29.

Figure 12: Bungalow Neighborhood

Figure 13: Front Porch and Projecting
Living Room

Figure 14: Windows for Ventilation and Natural Light

Figure 15: Incorporation of Natural Elements in Decorative Details

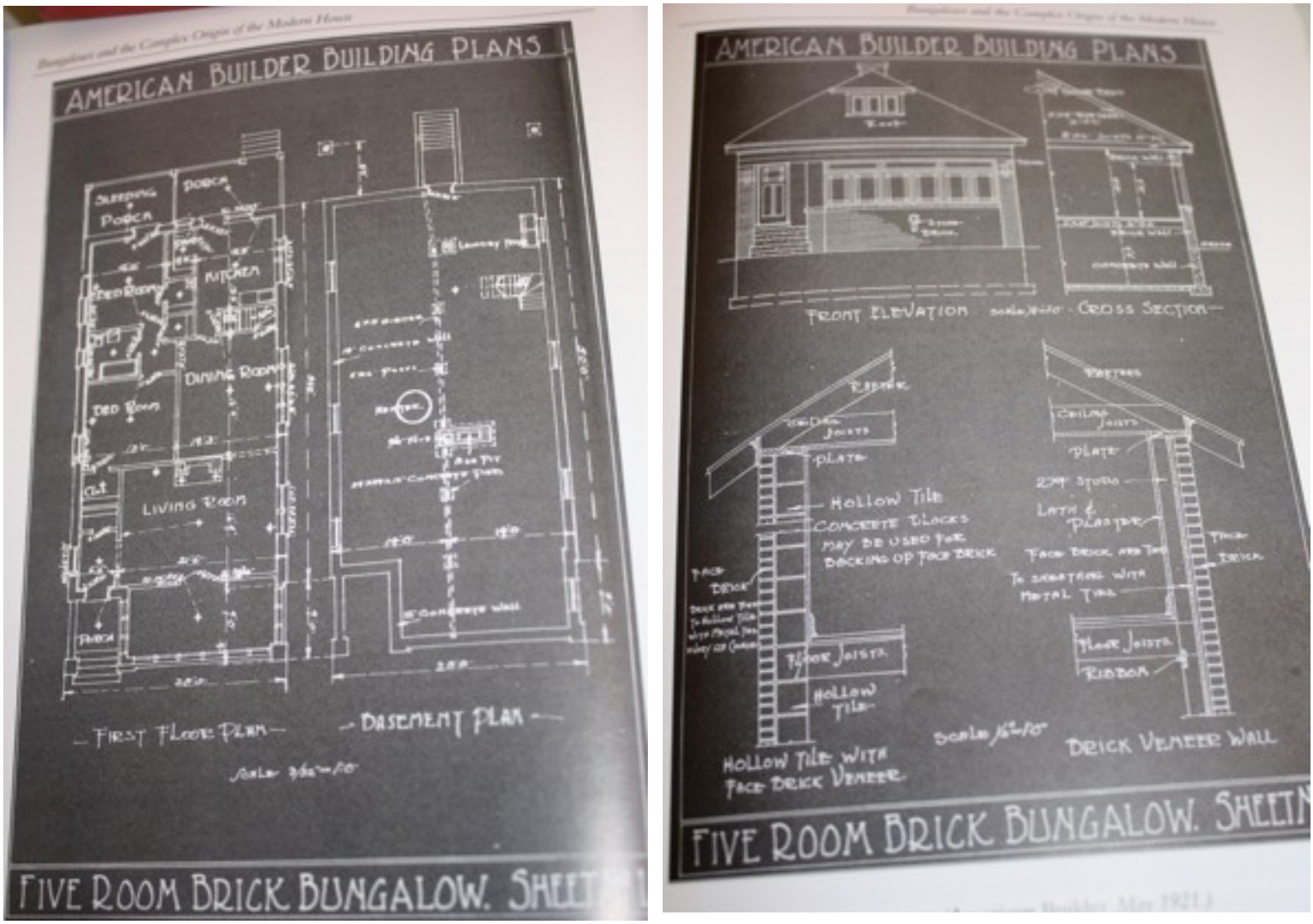

Figure 16: Floorplan and Construction of Chicago Bungalow

Aspects of Sustainability

The graphs below list the characteristics of social, economic and environmental sustainability. For each characteristic which is addressed in the design or construction of the Chicago bungalow an X appears in the middle column. In the far right column the physical characteristics which embody the element of sustainability are outlined.

Table 7: Aspects of Social Sustainability in the Chicago Bungalow

Strong Community Planning and Design	X	Enjoyable and functional neighborhood layout
Easily Accessible Community Resources	X	Local Shopping Centers (food, entertainment, medical needs, etc) usually within walking distance
Social Interaction	X	Close knit social community
Common Philosophy	X	Areas generally inhabited by residents with a common background and similar occupations
Sharing Knowledge		
Security	X	Low crime, low population density
Sense of Belonging	X	Residents engaged in the community
Sense of Place	X	Specific architectural aesthetic, distinct boundaries
Cultural Diversity		
Transmission of Knowledge from Generation to Generation		

Table 8: Aspects of Economic Sustainability in the Chicago Bungalow

Contributes to Property's Embodied Wealth	X	Conservative use of materials resulted in a positive net gain
Maximizes Return of Resources Investments	X	Owners can typically expect to make a profit on the sale of their house
Contributes to the Equal Distribution of of Resources	X	Participation in the local community and utilization of local labor and materials
Low Life Cycle Cost (LCC)	X	Low maintenance and upkeep cost

Table 9: Aspects of Environmental Sustainability in the Chicago Bungalow

Comfort of Building Inhabitants	X	Enough private space for comfortable living, social space and a healthy environment
Maximum use of Natural Light	X	Large number of strategically placed windows to maximize natural light
Conservation of Natural Resources	X	Minimal construction materials used
Use of Recycled Materials		
Energy Efficiency	X	Well constructed building envelope reduces heating and cooling costs
Natural Ventilation	X	Large number of windows allows for maximum ventilation
Passive Solar Energy	X	Large windows and extended overhangs allow the rooms to be warm in the winter and cool in the summer
Building Management System	X	Efficient to operate
Efficient Use of Water		
Efficient Use of Space	X	Compact yet open floorplan allows for the maximin amount of livable space within a compact footprint

The Chicago bungalow boom was a direct result of the increased populations of the city and the resulting poor living conditions for so many. The bungalow was particularly popular in the early half of the 20th century, with the new rising middle class, those who lived simply but comfortably. Usually constructed as a part of a much larger community the Chicago bungalow exemplified ideas of the early subdivision. Lots were small and narrow, usually 30 feet wide and 125 feet deep with a buffer of roughly 5 feet protecting the house from the street and between the houses. Within these communities there is a very clear community plan laid out. Each area has its own distinct style with clear boundaries and sense of place.

Theses newly developed bungalow communities provided a welcome relief from the congestion and pollution of the city. Streets were lined with trees, and each bungalow lot had an individual garden. In addition to the clean and safe environment these areas provided for all the basic necessities of a middle class family. There were local restaurants, often owned and

operated by families within the community, as well as corner stores, doctors and all other necessities as well as luxuries. In addition to providing for the physical and social needs of the community, the Chicago bungalow neighborhoods areas also had their own schools and religious institutions. The bungalow blocks were fairly self sustaining communities in which residents lived, worked and socialized.

Chicago bungalows were usually constructed using both local materials and local labor. This both aided in creating a sustainable economy as well as contributing to the conservation of natural resources. By using local labor, financial resources were kept within the local community. This also assisted in the redistribution of wealth between those with a surplus and those with a deficit. The same is true of the use of local materials. As a result of choosing to build with local products, the financial resources are redeposited back into the community at a more even rate. Additionally, the use of local resources, both material and labor, reduced the environmental impact of the building process.

Local materials are better suited for the climate in which they are found, thus reducing the maintenance costs associated with the operation of the building. Using local materials also places less stress on the environment by lessening the impact transportation of materials has on the natural resources. Local materials do not have to travel as far to reach the building site; this conserves energy resources and helps protect the environment.

The physical design of the bungalow reflects simplicity and conservation of resources, both financial and natural. The floor plan usually included a large informal living room, dinning room, kitchen, and 2-3 bedrooms. This maximized the social space within the house while still providing a comfortable living area for the whole household. Rather than building the bungalow

to meet theoretical future needs of the family the Chicago bungalow was designed to accommodate future growth within the confines of the original plan and construction. Using this method allowed the household to only expend additional resources when it was necessary and financially feasible. To achieve this, the bungalow was designed with an open attic and basement plan so they could potentially be converted to future living space.

The construction of the Chicago bungalow also helped conserve resources by utilizing standardized methods. This reduced construction waste and maximized the functionality of the available resources. The design also helped conserve resources. There was minimal decoration and the decoration used was very simple, linear detailing. This too reduced the use of materials and aided in the overall conservation of resources.

Overall the Chicago bungalow meets 19 of the proposed 24 criteria for sustainable home design, making it a throughly sustainable building. These calculations were based on a traditional Chicago bungalow design, floor plan and community with no modern intervention.

LEED Guidelines

The chart below illustrates the proposed score which a Chicago bungalow could earn according to the LEED guidelines. Because of the nature of the guidelines, and the fact that they are not intended to be applied to existing buildings, there are some categories in which no points were awarded simply because of the nature of this study. That does not mean the Chicago bungalow does not meet those standards, but rather, more information and analysis needs to occur for a complete score to be awarded. As illustrated, even without a complete technical assessment of the Chicago bungalow, the building type and construction scored 21 points, this is the very lowest end of the spectrum of possible points which may be awarded to the bungalow.

There are a number of areas in which the Chicago bungalow can increase its LEED score without damaging the integrity of the historic structure. These areas include: landscaping, local heat island effects, surface water management, nontoxic pest control, water reuse, irrigation system, indoor water use, water heating, residential refrigeration management, combustion ventilation, local exhaust, distribution of space heating and cooling, air filtering, contaminant control, radon protection, insulation, air infiltration, lighting, appliances and renewable energy.

Table 10: Chicago Bungalow LEED Scorecard

LEED for Homes Checklist

Builder Name:	
Project Team Leader (if different):	
Home Address (Street/City/State):	

Project Description:

Building Type:
# of Bedrooms: *0*

Project type:
Floor Area: *0.0*

Adjusted Certification Thresholds

Certified: *45.0*
Silver: *60.0*
Gold: *75.0*
Platinum: *90.0*

Project Point Total:	**0**	**ID:**	**0**	**SS:**	**0**	**EA:**	**0**	**EQ:**	**0**
Certification Level:	**Not Certified**	**LL:**	**0**	**WE:**	**0**	**MR:**	**0**	**AE:**	**0**

Notes:
1. Detailed information on measures below are provided in the LEED for Homes Rating System
2. ✍ Indicates measures that must be documented using the Accountability Form

					Max Points Available	Project Points Y / Pts	No	Maybe
Innovation and Design Process (ID) (No Minimum Points Required)								
1. **Integrated Project Planning**		1.1	Preliminary Rating		Prerequisite			
		1.2	Integrated Project Team		1			
		1.3	Professional Credentialed with Respect to LEED for Homes		1			
		1.4	Design Charrette		1			
		1.5	Building Orientation for Solar Design		1			
2. **Durability Management Process**		2.1	Durability Planning		Prerequisite			
		2.2	Durability Management		Prerequisite			
		2.3	Third-Party Durability Management Verification		3			
3. **Innovative or Regional Design**	✍	3.1	Innovation #1		1			
	✍	3.2	Innovation #2		1			
	✍	3.3	Innovation #3		1			
	✍	3.4	Innovation #4		1			
			Sub-Total for ID Category:		*11*		*0*	
Location and Linkages (LL) (No Minimum Points Required)				*OR*		Y / Pts	No	Maybe
1. **LEED ND**		1	LEED for Neighborhood Development	**LL2-6**	10			
2. **Site Selection**	✍	2	Site Selection		2	2		
3. **Preferred Locations**		3.1	Edge Development		1			
		3.2	Infill	**LL 3.1**	2			
		3.3	Previously Developed		1			
4. **Infrastructure**		4	Existing Infrastructure		1	1		
5. **Community Resources**		5.1	Basic Community Resources		1			
		5.2	Extensive Community Resources	**LL 5.1, 5.3**	2			
		5.3	Outstanding Community Resources	**LL 5.1, 5.2**	3	3		
6. **Access to Open Space**		6	Access to Open Space		1	1		
			Sub-Total for LL Category:		*10*	7	*0*	
Sustainable Sites (SS) (Minimum of 5 SS Points Required)				*OR*		Y / Pts	No	Maybe
1. **Site Stewardship**		1.1	Erosion		Prerequisite			
		1.2	Minimize Disturbed Area of Site		1	1		
2. **Landscaping**	✍	2.1	No Invasive Plants		Prerequisite			
	✍	2.2	Basic Landscape Design	**SS 2.5**	2			
	✍	2.3	Limit Conventional Turf	**SS 2.5**	3			
	✍	2.4	Drought Tolerant Plants	**SS 2.5**	2			
	✍	2.5	Reduce Overall Irrigation Demand by at Least 20%		6			
3. **Local Heat Island Effects**	✍	3	Reduce Local Heat Island Effects		1	1		
4. **Surface Water Management**	✍	4.1	Permeable Lot		4			
		4.2	Permanent Erosion Controls		1			
		4.3	Management of Run-off from Roof		2			
5. **Nontoxic Pest Control**		5	Pest Control Alternatives		2			
6. **Compact Development**		6.1	Moderate Density		2			
		6.2	High Density	**SS 6.1, 6.3**	3	3		
		6.3	Very High Density	**SS 6.1, 6.2**	4			
			Sub-Total for SS Category:		*22*	5	*0*	

					Available	Points Y / Pts	No	Maybe
Water Efficiency (WE) (Minimum of 3 WE Points Required)				OR				
1. **Water Reuse**		1.1	Rainwater Harvesting System	**WE 1.3**	4			
		1.2	Graywater Reuse System	**WE 1.3**	1			
	✍	1.3	Use of Municipal Recycled Water System		3			
2. **Irrigation System**	✍	2.1	High Efficiency Irrigation System	**WE 2.3**	3			
		2.2	Third Party Inspection	**WE 2.3**	1			
	✍	2.3	Reduce Overall Irrigation Demand by at Least 45%		4			
3. **Indoor Water Use**		3.1	High-Efficiency Fixtures and Fittings		3			
		3.2	Very High Efficiency Fixtures and Fittings		6			
			Sub-Total for WE Category:		***15***		***0***	
Energy and Atmosphere (EA) (Minimum of 0 EA Points Required)				OR		Y / Pts	No	Maybe
1. **Optimize Energy Performance**		1.1	Performance of ENERGY STAR for Homes		Prerequisite			
		1.2	Exceptional Energy Performance		34			
7. **Water Heating**	✍	7.1	Efficient Hot Water Distribution		2			
		7.2	Pipe Insulation		1			
11. **Residential Refrigerant Management**		11.1	Refrigerant Charge Test		Prerequisite			
		11.2	Appropriate HVAC Refrigerants		1			
			Sub-Total for EA Category:		***38***		***0***	
Materials and Resources (MR) (Minimum of 2 MR Points Required)				OR		Y / Pts	No	Maybe
1. **Material-Efficient Framing**		1.1	Framing Order Waste Factor Limit		Prerequisite			
		1.2	Detailed Framing Documents	**MR 1.5**	1	1		
		1.3	Detailed Cut List and Lumber Order	**MR 1.5**	1	1		
		1.4	Framing Efficiencies	**MR 1.5**	3			
		1.5	Off-site Fabrication		4			
2. **Environmentally Preferable Products**	✍	2.1	FSC Certified Tropical Wood		Prerequisite			
	✍	2.2	Environmentally Preferable Products		8			
3. **Waste Management**		3.1	Construction Waste Management Planning		Prerequisite			
		3.2	Construction Waste Reduction		3			
			Sub-Total for MR Category:		***16***	2	***0***	
Indoor Environmental Quality (EQ) (Minimum of 6 EQ Points Required)				OR		Y / Pts	No	Maybe
1. **ENERGY STAR with IAP**		1	ENERGY STAR with Indoor Air Package		13			
2. **Combustion Venting**		2.1	Basic Combustion Venting Measures	**EQ 1**	Prerequisite			
		2.2	Enhanced Combustion Venting Measures	**EQ 1**	2			
3. **Moisture Control**		3	Moisture Load Control	**EQ 1**	1	1		
4. **Outdoor Air Ventilation**	✍	4.1	Basic Outdoor Air Ventilation	**EQ 1**	Prerequisite			
		4.2	Enhanced Outdoor Air Ventilation		2			
		4.3	Third-Party Performance Testing	**EQ 1**	1			
5. **Local Exhaust**	✍	5.1	Basic Local Exhaust	**EQ 1**	Prerequisite			
		5.2	Enhanced Local Exhaust		1			
		5.3	Third-Party Performance Testing		1			
6. **Distribution of Space Heating and Cooling**	✍	6.1	Room-by-Room Load Calculations	**EQ 1**	Prerequisite			
		6.2	Return Air Flow / Room by Room Controls	**EQ 1**	1			
		6.3	Third-Party Performance Test / Multiple Zones	**EQ 1**	2			
7. **Air Filtering**		7.1	Good Filters	**EQ 1**	Prerequisite			
		7.2	Better Filters		1			
		7.3	Best Filters	**EQ 7.2**	2			
8. **Contaminant Control**	✍	8.1	Indoor Contaminant Control during Construction	**EQ 1**	1			
		8.2	Indoor Contaminant Control		2			
	✍	8.3	Preoccupancy Flush	**EQ 1**	1			
9. **Radon Protection**	✍	9.1	Radon-Resistant Construction in High-Risk Areas	**EQ 1**	Prerequisite			
	✍	9.2	Radon-Resistant Construction in Moderate-Risk Areas	**EQ 1**	1			
10. **Garage Pollutant Protection**		10.1	No HVAC in Garage	**EQ 1**	Prerequisite			
		10.2	Minimize Pollutants from Garage	**EQ 1**	2			
		10.3	Exhaust Fan in Garage	**EQ 1**	1			
		10.4	Detached Garage or No Garage	**EQ 1, 10.2, 10.3**	3	3		
			Sub-Total for EQ Category:		***21***	4	***0***	
Awareness and Education (AE) (Minimum of 0 AE Points Required)						Y / Pts	No	Maybe
1. **Education of the Homeowner or Tenant**	✍	1.1	Basic Operations Training		Prerequisite			
	✍	1.2	Enhanced Training		1	1		
	✍	1.3	Public Awareness		1	1		
2. **Education of Building Manager**	✍	2	Education of Building Manager		1	1		
			Sub-Total for AE Category:		***3***	3	***0***	

Project Checklist, Addendum A
Prescriptive Approach for Energy and Atmosphere (EA) Credits

Points cannot be earned in both the Prescriptive (below) and the Performance Approach (pg 2) of the EA section

Energy and Atmosphere (EA) (No Minimum Points Required)				OR	Max Points Available	Y / Pts	Project Points No	Maybe
2. Insulation		2.1	Basic Insulation		Prerequisite			
		2.2	Enhanced Insulation		2			
3. Air Infiltration		3.1	Reduced Envelope Leakage		Prerequisite			
		3.2	Greatly Reduced Envelope Leakage		2			
		3.3	Minimal Envelope Leakage	EA 3.2	3			
4. Windows		4.1	Good Windows		Prerequisite			
		4.2	Enhanced Windows		2			
		4.3	Exceptional Windows	EA 4.2	3			
5. Heating and Cooling Distribution System		5.1	Reduced Distribution Losses		Prerequisite			
		5.2	Greatly Reduced Distribution Losses		2			
		5.3	Minimal Distribution Losses	EA 5.2	3			
6. Space Heating and Cooling Equipment		6.1	Good HVAC Design and Installation		Prerequisite			
		6.2	High-Efficiency HVAC		2			
		6.3	Very High Efficiency HVAC	EA 6.2	4			
7. Water Heating		7.1	Efficient Hot Water Distribution		2			
		7.2	Pipe Insulation		1			
		7.3	Efficient Domestic Hot Water Equipment		3			
8. Lighting		8.1	ENERGY STAR Lights		Prerequisite			
		8.2	Improved Lighting		2			
		8.3	Advanced Lighting Package	EA 8.2	3			
9. Appliances		9.1	High-Efficiency Appliances		2			
		9.2	Water-Efficient Clothes Washer		1			
10. Renewable Energy		10	Renewable Energy System		10			
11. Residential Refrigerant Management		11.1	Refrigerant Charge Test		Prerequisite			
		11.2	Appropriate HVAC Refrigerants		1			
				Sub-Total for EA Category:	***38***		***0***	

By affixing my signature below, the undersigned does hereby declare and affirm to the USGBC that the LEED for Homes requirements, as specified in the LEED for Homes Rating System, have been met for the indicated credits and will, if audited, provide the necessary supporting documents.

Project Team Leader _____ Company _____
Signature _____ Date _____

By affixing my signature below, the undersigned does hereby declare and affirm to the USGBC that the required inspections and performance testing for the LEED for Homes requirements, as specified in the LEED for Homes Rating System, have been completed, and will provide the project documentation file, if requested.

Rater's Name _____ Company _____
Signature _____ Date _____

By affixing my signature below, the undersigned does hereby declare and affirm to the USGBC that the required inspections and performance testing for the LEED for Homes requirements, as specified in the LEED for Homes Rating System, have been completed, and will provide the project documentation file, if requested.

Provider's Name _____ Company _____
Signature _____ Date _____

CHAPTER SIX

CONCLUSION

There is a lack of understanding about the importance historic buildings should play as part of the sustainability movement. The current guidelines for determining sustainability places too much emphasis on environmental sustainability and uses modern technologies as the ultimate benchmark for sustainability. This discounts any historic methods and theories which address aspects of sustainability and results in historic buildings being penalized.

While not a perfectly sustainable building type, the bungalow deserves recognition as an example of sustainable historic design. By utilizing innovative ideas about a building's interaction and connection to nature, the architects and designers of the bungalow were able to create a building which addresses all the major concerns of modern sustainable design before the discipline existed. This highlights a fundamental problem within the field of sustainable research. Historic technologies and design ideas are all too often discounted because they do not incorporate modern technologies as a problem solving tool. The bungalow shows that historic technologies are equally as effective at solving the same problems.

The bungalow meets standards in all three areas of sustainability; social, economic and environmental while many modern sustainable buildings only meet basic standards for social and economic sustainability and place a much heavier focus on environmental sustainability. As illustrated by the Chicago bungalow case study, the bungalow house type scores well on both the rubric for determining sustainability created as part of this study as well as the more stringent

LEED scorecard. By utilizing the Chicago case study it is easier to identify the problems which arise when applying LEED guidelines to pre-existing historic structures. Over all, the final LEED score for the Chicago bungalow illustrates both the sustainable aspects of the building type, but also the pitfalls of applying a set of guidelines in a manner in which it was not intended. Perhaps with a more balanced approach to sustainability, preservationists and sustainability practitioners will be able to reach an agreement which both protects the environment as well as the historic resources.

If this research were to progress further there are a number of different paths it could take. Guidelines for adapting historic bungalows to fit LEED standards for sustainability is one such possibility. Another is developing a more inclusive version of LEED guidelines which addresses the unique characteristics of historic structures rather than discounts them.

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