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The stewardship of cultural and natural resources has been a goal of our society for generations and has manifested itself in movements for historic preservation and the sustainable use of our planet's resources. In the United States the sustainability movement took shape during the 1960's and 70's in response to damage done by corporations and a growing energy crisis. Only recently have the concepts of sustainability been embraced en mass by our society, yet few understand how they intertwine with the conservation of historic resources.

Historic preservation, at first, set out to preserve structures that were monuments of our nation's development, but the movement has grown to incorporate broader societal and cultural values, as well as entire landscapes. In addition to these values preservationists have, over the last ten years, begun stressing environmental sustainability. This incorporation is seen in all governmental levels, from federal to certified local governments, through numerous publications and projects. Recommendations however, are necessarily broad and provide little stylistic context.

This thesis examines recommendations being made by public sources as well as local, city, state, and national governing bodies and then deciphers how these could best be applied to common residential architectural styles found in National Register Historic Districts within North Carolina. These districts were the focus for this study because many do not have local design guidelines to provide reference for the homeowners. Information from the nominations was fused with sustainability recommendations to create an illustrated homeowner's guide to good stewardship of both cultural and environmental resources for the most common historic residential styles within the state.

A GUIDE TO GOOD STEWARDSHIP: SUSTAINABLE PRESERVATION STRATEGIES FOR POPULAR HISTORIC HOUSE TYPES IN NORTH CAROLINA

by

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CHAPTER I

INTRODUCTION

Of growing concern in recent years to many individuals and institutions is our impact upon the environment. While there are numerous factors that have emerged around these environmental concerns some that have the largest impacts on the environment involve the energy efficiency of buildings and the material waste created during construction and demolition. In response to the calls for environmental sustainability, preservationists have greatly increased their dialogue of good stewardship for both natural and cultural resources, especially in the last ten years. Even though this trend has been seen from local to national levels it was not until the last three years that some historic districts have started widely incorporating sustainability within their guidelines. Yet many local historic districts – which encompass the majority of our nation's historic homes – do not incorporate sustainability within their district guidelines, and many national districts have no guidelines at all. Also while there is a wealth of information available to homeowners for incorporating sustainability the ideas are widespread, often necessarily broad, lack cohesion between sources and can be difficult to find. To fill the gap between information and users I created illustrated guidelines that identify the significant parts of the home for the users as well as how to

increase their efficiency while maintaining the home's integrity and historic characteristics.

The second chapter, Conceptual Combinations, follows the development of historic preservation and historic districts, as well as the concept of sustainability, the shared values of natural and cultural resource preservation, and the growth of sustainable technologies. The Preservation Roots section discusses the creation of the National Park Service and National Register, how these concepts came to the states, what creates significance in a building, and how the idea of significance has developed over time. The next section, Historic Districts, provides an outline of how districts are created, regulated, and preserved with the help of guidelines. Also this section explores how the language concerning the implementation of sustainable initiatives has changed over the years. The Concept of Sustainability section covers the growth of the idea from its roots in environmentalism in the 1960s to the creation of the United States Green Building Council in 1993 while Green Preservation identifies the shared values of Sustainability and Preservation and how they have been incorporated throughout all levels of government. Finally, Sustainable Technologies addresses new and traditional efficient building features, new technologies, and assessment tools for identifying areas that can be made more efficient.

The third and fourth chapters define the research and results that have led to the creation of homeowner guidelines for increasing sustainability within historic houses in North Carolina. Chapter three discusses the information that was compiled for research, the requirements used to compile the information and the methods used to extract the data needed to establish the guidelines. This includes matrixes of National Register districts in North Carolina, sustainable recommendations from various sources, and styles found across the state. The fourth chapter explores the various discoveries that were made during the research phase. These include specific recommendations for different historic house types, the inclusion of common sustainable tips, explanations of the various standards and guidelines provided by the Secretary of the Interior, climatic changes in each region, and other information and resources to help homeowners retain their homes' integrity and historic character while increasing efficiency.

CHAPTER II

CONCEPTUAL COMBINATIONS

Preservation Roots: The Icons

> The concept of preservation is built on a finely wrought and sustained balance between respect for private rights on the one hand and a concern for the larger community on the other... Preservation in America is about nurturing the grass roots and assisting communities with the preservation of physical structures, objects, and settings that tell the story of our collective experience (Lea, 2003, p. 1).

Preservation is not just about structures; it also involves saving distinct settings and objects that shape our experience. Historic preservation in America started with a desire to preserve the values (and the places associated with them) that this country had fought to create during the Revolutionary War (Lea, 2003). Some of the first acts of structural preservation were Independence Hall (where the Declaration of Independence was signed) in the early nineteenth century and Mount Vernon (George Washington's original residence) in the mid nineteenth century. This was only one piece of the preservation movement however, as the federal government would create the first national park — Yellowstone, located at the intersection of Montana, Wyoming and Idaho — in 1872 to preserve our profound scenic landscapes. Similarly, New York City took steps toward protecting urban green space with a competition to design Central Park — as a space to buffer people and industry — in the mid-nineteenth century (Lea,

2003). While preservation of structures was being pursued by private organizations in the nineteenth century, the twentieth century would see the federal government broaden its focus of environmental preservation to include the built environment, while citizens began to realize the need to protect the "big picture" of their neighborhoods from encroaching industrialization (Lea, 2003).

The NPS, New Deal, and National Trust

The Department of the Interior created the National Park Service in 1916 as a way to deal with the growing amount of federally held lands. It gradually grew as other land management programs were consolidated and would eventually be the home of historic preservation. Other federal programs came as a result of the Great Depression and Roosevelt's New Deal, such as the Historic American Building Survey (HABS), the country's first national review of historic architecture; the Historic Sites Act of 1935 created to conduct surveys of historic places across the country and to identify any properties that could be included in the system; and the designation of sites as National Historic Landmarks, which were properties of national significance that were privately owned and not likely to be made parks, and which would eventually be listed on the National Register of Historic Places (Lea, 2003).

After World War II there was a housing and industry boom and, with the availability of the automobile, expansion was the order of the day. This expansion was threatening all of our resources, not only natural but historic and cultural as well (Brand, 1994). In 1947, the National Council for Historic Sites and Buildings was created in Washington, D.C. to protect our historic and cultural resources and "immediately set about obtaining a congressional charter for the National Trust [for Historic Preservation], a non-governmental agency that could enlist voluntary support and act as a liaison between public and private agencies" which was chartered in 1949 (Lea, 2003, p. 9). The National Trust became influential in shaping preservation after purchasing its first historic property, and the 1956 criteria for site evaluation stressed a "broad cultural, political, economic, or social history of the nation, state, or community" (Lea, 2003, p. 9).

Shortly after this our country's urban centers experienced what has become known as *urban renewal* but in reality was the destruction of whole sections of cities that were perceived as decayed and replaced with new development. These actions led to a heightened sense of urgency for a "comprehensive national historic preservation program" which in turn led to the creation of the National Historic Preservation Act of 1966 (Brand, 1994). This piece of legislation expanded the National Register of Historic Places to include places of state and local significance, created the Advisory Council on Historic Preservation, and guided preservation to where it is today (Lea, 2003).

Bringing it Home: State and Local Programs

> While the American preservation movement has moved beyond the saving of individual buildings, communities have the option of devising their own philosophy about what is important and how to preserve it. A few will go no further than preserving a historic house museum. Others will target entire neighborhoods. Others will merge traditional preservation interests with large issues involving planning and growth management. This freedom for local governments to determine for themselves what they will seek to preserve and how is the real beauty of the American system (Confresi & Radtke, 2003, p. 117)

The seat of preservation in each state is the State Historic Preservation Office (SHPO), which in North Carolina is a section of the Division of Archives and History in the Department of Cultural Resources, an office devoted to historic preservation and archaeology. The North Carolina SHPO has been active for over 40 years and provides technical, professional, and planning assistance as well as procedural information for interested parties. By providing these and other services they are helping to "identify, protect and enhance all properties, sites, and resources of historical, architectural, or archeological significance throughout the state" (Dakin, 1994, p. xii).

The Certified Local Government (CLG) program is a federal program created in 1980 that is administered through the State Historic Preservation Office (SHPO) and allows a local government to be certified to participate in the national framework of preservation programs (Dakin, 1994). This designation allows some benefits like the ability to apply for certain grants and other funds, the ability to share their local experience with others on a statewide and national level through recognition of historic

resources, and expands the expertise of local preservationists through training and continuing education (Dakin, 1994; Elizabeth A. Lyon & Brook, 2003).

The SHPO offices also place a high priority on assisting CLGs — as a way to expand their outreach and encourage participation with local communities — by helping to draft enabling legislation for local communities, as well as offering technical assistance and training. This special recognition within state and federal governments has been a major catalyst for support of historic preservation even with minimal funding. Along with other national programs, states and local governments also largely adopted components like architectural surveys, establishing a broader cultural context, established preservation planning programs, the distribution of federal grants, and public education and technical assistance efforts (Elizabeth A. Lyon & Brook, 2003).

The Seven Aspects of Integrity: Creating Significance

> The idea of "significance" is exceedingly important to the practice of historic preservation. In significance, preservationists pack all their theory, ideology and politics — and their wonder at the capacity to use historic fabric to reflect on the past...Once defined, significance is used as a basis for policy, planning and design decisions. There are problems, though, with the use and conceptualization of significance. The overriding one is that the preservation field fails to fully appreciate its contingent nature (Mason, 2003, p. 64).

The concept of significance in historic preservation has functioned as the "means to establish the value of historic places and to motivate people to save them" (E. A Lyon

& Cloues, 1998). There are seven aspects of a building that convey significance through their integrity which are the location, design, setting, materials, workmanship, feeling and association (Joeckel, Andrus, & Shrimpton, 2001; Leimenstoll, 2009c).

The location of the building is the physical site where it was constructed — some buildings within historic districts have been relocated from other areas which can impact their significance — or where a historic event happened and the specific context that the site provides is crucial in understanding its significance (Joeckel et al., 2001; Leimenstoll, 2009c). Moving a building from its original site is strongly discouraged since it would disconnect the building from its context thereby diminishing its significance; however it may be acceptable if the building is being moved to a suitable location reminiscent of its original, especially if this movement would save the building from demolition (Leimenstoll, 2009c). The setting of the building can be simply described as the physical environment in which the structure sits (Joeckel et al., 2001). This is of particular importance within historic districts because the settings link the individual resources together by providing visual cues for orientation and connection through unified streetscapes, tree canopies, landscaping, fencing, lighting, and paths of travel (Leimenstoll, 2009c).

Materials are the physical elements that compose the structure and define the significance of a particular period of time (Joeckel et al., 2001). These materials are

extremely important in conveying the significance of a particular place and time and reflect original preferences, locally available materials, and the technologies that were in use at the time (Leimenstoll, 2009c). The workmanship of a building is evidentiary of the particular culture or people that constructed the structure and recognizes earlier building technologies, local traditions, and the skill of the worker (Joeckel et al., 2001; Leimenstoll, 2009c). Similarly to the materials, workmanship is crucial to the integrity of the building because it speaks to the place and time of construction (Leimenstoll, 2009c). The design of the building is the combination of elements that create its space, form, plan, massing, style and structure and has most likely changed since its original construction (Joeckel et al., 2001; Leimenstoll, 2009c). Changes to the elements that make up the design of the building can impact its significance, but may be necessary to restore integrity (Leimenstoll, 2009c).

Less quantifiable is the feeling of the building which is how a property expresses its aesthetic which represents its sense of place and period of time (Joeckel et al., 2001). The feeling is comprised of the cumulative effect of the pieces that make up a resource such as setting, landscaping, materials, and craftsmanship (Leimenstoll, 2009c). The final aspect of integrity is the association between a particular event, person, or institution and a historic property and is essential to the significance of the resource (Joeckel et al., 2001). This association may also be representative of economic booms or the introduction of industrialization like the introduction of street car and railroad lines, and

disruption of this association may detrimentally affect the overall integrity of the resource (Leimenstoll, 2009c).

Evolution of Significance: From Curatorial to Cultural

> [t]he value of historic properties must be publicly evident and based on a valid understanding of history, one that takes into account the richness and diversity of the American experience and displays a place in history for all our citizens. To be effective, we must achieve a consensus for preservation based on everyone's ability to see and appreciate the richness of the historic resources that make up the mosaic of American communities (E. A Lyon & Cloues, 1998, p. 48).

When the National Register was first expanded to contain places of local and state significance "there was a shared, almost intuitive understanding among a relatively small preservation population about what was important: large, high-style houses, and places associated with national heroes and events of politics and war" (E. A Lyon & Cloues, 1998, p. 38). It was not until the mid-twentieth century that historic preservation started stressing values beyond antiquity and national ancestry. This broadening approach is pivotal in understanding the evolution of significance within historic preservation from a "curatorial approach" to a "value-centered" approach in determining what is significant enough to preserve (Mason, 2003). At preservation's roots, the main goals were curatorial and memorial: to represent the past for present-day society through the preservation of physical remains only, while today's inclusion of places of local significance, diverse interest groups, and the need for economic

development has increased the inclusion, diversity and robustness of historic preservation as a social movement within the United States (Mason, 2003).

The breadth of this inclusion has broadened the "choices of what gets preserved, how it is preserved and interpreted, and who makes the decision" (Mason, 2006, p. 21). This is important to note as it has caused confusion about what the core methods and purposes of historic preservation should be (Mason, 2003). Our relationship with the built environment is a "memory/fabric connection" based on the scholarly and emotional connections that we make between our memories and the surrounding environment which allows us to see old buildings as "sources of wonder, documents about the past, or ways to reform wayward citizens and advance political causes" (Mason, 2003). However, in the past the preservationists' approach has been firmly rooted in the fabric part of the connection as it lends scientific legitimacy to Historic Preservation in a quantifiable manner with objective standards and methods (Mason, 2003). More recently, the approach has changed to one that focuses on the retention and cultivation of social memory and that protecting the historic fabric of the built environment is only one tool with which we cultivate memory.

Preservationists, then, need to embrace the driving forces of significance — social process and cultural change — and have begun to shift from a fabric based concept of significance to a values-centered approach. This approach shifts the balance

from fabric-based preservation theories and gives priority to the memories, ideas, and social impulses that motivate the physical preservation of the built environment (Mason, 2003). However, incorporating these ideals within preservation public policy is difficult because cultural meaning is in itself difficult to define and due to its nature requires periodic redefinition as cultural and social values change (Anderson, 1998, p. 130).

Historic Districts: The *Tout Ensemble*

> Communities seek to save old buildings and their settings for a variety of reasons: to safeguard a historical or architectural legacy, to enrich the cultural identity of an area, to stabilize and strengthen property values, to attract businesses, residents, and tourists who value the area's special qualities or simply to maintain a sense of place...(Bowsher, 1985, p. 9)

The American mosaic wouldn't be complete without the creation of the historic district. During the early twentieth century citizens began to realize the need to protect the "big picture" of their neighborhoods from encroaching industrialization (Lea, 2003). As Stewart Brand notes in his book *How Buildings Learn* "[w]idespread revulsion with the buildings of the last few decades has been an engine of the preservation movement worldwide. Shoddy, ephemeral, crass, over-specialized, the recent buildings display a global look especially unwelcome in tradition-enriched environs" (p. 92). In response to the threat of industrialization Charleston, South Carolina employed a Pittsburgh planning firm to create the first historic zoning ordinance (Lea, 2003).

Charleston, South Carolina created the first historic district in 1931 (Anderson, 1998; Bowsher, 1985; Brand, 1994; Lea, 2003). In addition, Charleston also created the first Architectural Review Board "to approve plans for exterior details on any construction in the Old and Historic Charleston District" (Lea, 2003, p. 7). The coalition of preservationists and government officials engaged a planning firm to "draft a comprehensive zoning ordinance" and by so doing put preservation in the realm of land-use controls with a firm backing of both "public and private leadership and funding" and an objective "to address historic areas as a whole" (Lea, 2003, p. 7).

The Charleston experiment led to a concept known today as the *tout ensemble.* This concept embraces the idea that "the character of an area is derived from its entirety, or the sum of its parts, rather than from the character of its individual buildings" (Lea, 2003, p. 7). This advance in preservation thinking led Charleston to be seen as model for communities across the country and their use of an architectural review board would be inspirational for preservation commissions. There are now more than 2,000 historic preservation commissions in operation throughout the country and many of these include preservation ordinances and design guidelines in the design review of renovations and new construction (Winter, 2008).

The leading force behind historic designation was the National Historic Preservation Act (NHPA) of 1966. The significance of this act was linking together

federal, state, and local governments with federal funding and historic resources of local significance (Confresi & Radtke, 2003; Fowler, 2003). This linkage included expanding the National Register of Historic Places to recognize resources of state and local significance and made them eligible to receive federal grants for planning, acquisition, and preservation. Other legislation that considered historic resources are the Section 106 and Section 4(f) reviews and processes which holds highway and urban renewal projects using federal funds to environmental and cultural standards(Confresi & Radtke, 2003; Stipe & Lee, 1997).

Historic Preservation Commissions: To Protect and Preserve

> Commissions must evaluate property owner requests against design guidelines and standards that inevitably require group interpretation and determination on technical, historical, and aesthetic grounds. In too many cases, however, guidelines are largely derived from National Register criteria or the Secretary's Standards, without sufficient emphasis placed on the special overall character of each local district so regulated (Confresi & Radtke, 2003, p. 132).

The NHPA, along with Section 106 and 4(f) Reviews, acted as a national framework for State governments (Elizabeth A. Lyon & Brook, 2003; Stipe & Lee, 1997). As discussed earlier this framework created SHPOs, which in turn created CLGs and effective Historic Preservation Commissions (HPCs) are established by a CLG which sets into place the reasons and purpose for regulation, the membership duties and powers of the HPC, and provides guidelines for decision making through the use of state

enabling legislation (Bowsher, 1985; Confresi & Radtke, 2003; Dakin, 1994; Stipe & Lee, 1997).

In North Carolina, state enabling legislation was first passed in 1965 to legitimize Winston-Salem's historic district on a state level (Dakin, 1994). The legislation was rewritten in 1971 to apply statewide, and enable the creation of historic district commissions, and also added protections for properties within historic districts, but provides little protection to individually designated properties (Dakin, 1994). In 1979, it was significantly revised to make commission operations more consistent, clarify procedures, increase independence for local commissions, and to "clearly separate the local designation process from the National Register Program" (Dakin, 1994, p. xi). Another significant change to the legislation was that it was broadened to include cultural resources with significance outside of a historic basis. In 1989, this legislation was repealed and replaced with documentation that renamed historic properties as landmarks and consolidated legislation for historic districts and commissions. In addition the new legislation increased powers to regulate alterations, infill and demolition.

Once designated the responsibilities for protecting the district's character goes to the HPC (Bowsher, 1985). The commissions has nine main functions in this regard: identifying the most important concerns, provide minimum standards for review boards, assure fair treatment of all applicants, promote consistency in decisions, establish

evidence of fair and objective criteria to strengthen judicial position, clarify standards of appropriateness for ease of compliance, inform owners of techniques that respect integrity, speed the process of routine alterations, and increase public awareness of architectural character within the community (Bowsher, 1985; Dakin, 1994). These functions are established within the documents created by the HPC.

There are four fundamental documents used by HPCs to protect a district's character: the local preservation ordinance, commission bylaws, policies and procedures, and design guidelines (Wilkinson, 2003). The local preservation ordinance is the local law that creates the HPC and states its powers, purposes, and responsibilities and is based on the state enabling legislation. The commission bylaws are written by the HPC and explain how it will operate; this also ensures consistency in treatment. The policies and procedures document simplifies the bylaws and contains basic information on how the HPC operates (Bowsher, 1985; Wilkinson, 2003). District guidelines however play the largest part in providing a framework for decision making and encouraging public awareness. An informed public is more likely to care and appreciate historic preservation within their community and is more likely to support work of the HPC (Bowsher, 1985).

Design Guidelines: A Framework for Appropriateness

> Design guidelines are policy statements that guide communities on historic preservation matters. Guidelines enable local preservation and planning commissions to make consistent and fair

> decisions based on a uniform standard when property owners seek to renovate or construct new buildings in a historic area(Winter, n.d., p. 2)

The framework that is provided from guidelines creates a checklist to measure standards against in four categories: rehabilitation and maintenance of existing resources, signs and landscape, new construction, and demolition (Bowsher, 1985; Dakin, 1994). In North Carolina until guidelines are adopted nothing within the district can be designated and changes to properties will not be regulated (Dakin, 1994). These guidelines protect the significant architectural and visual qualities that define the character of a district and therefore should differ from place to place and be tailored to represent the preservation philosophy and goals of the commission (Bowsher, 1985; Dakin, 1994).

Design guidelines should be established for every exterior feature for which design review is required and should be based upon a thorough architectural survey. The survey should include descriptions, historic importance, condition and relationships of structures for each resource in the district, along with an overview of the district with identifying styles and features, geographic features, visual impressions, landmarks that provide orientation, and characteristics of heights, massing, open spaces, materials, and roof forms (Bowsher, 1985; Dakin, 1994).

Along with protecting visual characteristics of the district, guidelines also help engage the public (Bowsher, 1985; Confresi & Radtke, 2003; Dakin, 1994). They protect

property owners by protecting due process, equal protections, and property owner rights by telling owners in advance what is expected in changes and by using consistent guidelines to judge every proposed change (Bowsher, 1985; Dakin, 1994). In addition guidelines encourage public awareness and an informed public is more likely to care about and appreciate the work of the HPC and therefore support the work of the commission(Bowsher, 1985).

The Secretary of the Interior's Standards and Guidelines

> The Standards (Department of Interior regulations, 36 CFR 67) pertain to historic buildings of all materials, construction types, sizes, and occupancy and encompass the exterior and the interior, related landscape features and the building's site and environment as well as attached, adjacent, or related new construction. The Standards are to be applied to specific rehabilitation projects in a reasonable manner, taking into consideration economic and technical feasibility (Grimmer, Hensley, Petrella, & Tepper, 2011, p. 2).

The definitive source for basic guidelines has been the Secretary of the Interior's Standards which were originally developed in 1976 (Bowsher, 1985; Morton, 1979; Stipe & Lee, 1997). These standards now form four distinct approaches to the treatment of a historic resource: preservation, rehabilitation, restoration, and reconstruction. Each of these has a specific set of standards and guidelines that are intended to be used to promote responsible preservation practices(Weeks & Grimmer, 2001). The Standards were developed to determine the appropriateness of proposed work on buildings

recognized as historic and are neither technical nor prescriptive. Once a treatment approach has been selected, the Standards provide philosophical consistency for the work.

The Preservation treatment places the highest emphasis on retention of *all* historic fabric — explaining how the building has changed over time — through conservation, repair and maintenance (Weeks & Grimmer, 1992, 2001). The Restoration treatment focuses on a specific period of time within the history of the resource to allow for the removal of historic treatments that are not part of the period of significance. Reconstruction is a treatment that establishes limited opportunities to re-create a lost resource; the most well-known of these reconstructions is Historic Williamsburg. Of all these treatments however the most common is Rehabilitation which emphasizes the retention and repair of historic fabric but assumes that the resource is in a more deteriorated condition and therefore allows more leeway in replacement materials (Weeks & Grimmer, 1992, 2001)

The guidelines for rehabilitation were expanded on in 1983, revised in 1990 after a period of review and commentary, and published as a book in 1992 (Jandl, 1992). The guidelines were originally created to help property owners, developers, and managers in applying the Standards by providing technical and design recommendations during a project's planning phase (Weeks & Grimmer, 1992, 2001). The guidelines, like the

standards, were intended to assist with projects in general and do not give case-specific advice. To help provide a clearer understanding for those using them, the guidelines are set out in a recommended/not recommended approach which are listed in an order of highest concern, and color coded (Grimmer et al., 2011; Weeks & Grimmer, 1992).

The Changing Voice of Guidelines

> Of course, the buildings and landscape features that define a districts character are the real guidelines, but unless the principles and relationships that they represent are translated into words and pictures, many people will not recognize them (Bowsher, 1985, p. 25)

While early on preservation commissions and design review boards developed guidelines based on the Secretary's Standards and incorporated local significance and character, they were difficult to understand for property owners due to their formal nature. As preservation has progressed from the individual property to embrace whole neighborhoods, design guidelines have progressed to incorporate a multidisciplinary approach, and a tone that invites public interest.

Most of today's guidelines have four parts: a description, the guideline, amplifications to the guideline, and illustrations. The description of the guideline outlines the "desired condition of the design element being discussed" (Winter, 2008) and may also include a statement of broader or related policies, and descriptions of significant design features within the topic being discussed (Winter, n.d.). While it seems

that descriptions have always been a part of guidelines, descriptions today are much more thorough.

The guideline itself addresses the specific design topic, defines the quality of the performance or the prescriptive measure that one needs to meet. Design guidelines can either be performance oriented, which give several different design solutions for a particular problem so that the outcome would meet certain qualitative standards, or prescriptive which offers only a single design solution and are more quantitative. With prescriptive guidelines it is clear when the guideline has been met whereas performance oriented solutions may need further clarification (Winter, n.d.). The majority of older design guidelines seemed to only use prescriptive solutions which can be seen in the language used to establish the guideline. Terms such as shall/should or shall/should not leave only one solution to a design issue or explain the only acceptable solutions.

Amplifications to the guideline may include additional requirements or provide expanded information about the guideline (Winter, 2008). Winter goes on to note that these amplifications may also suggest specific ways to meet the guideline. Leimenstoll's district guidelines for Raleigh, Hillsborough, and Davidson exemplify this concept as each design issue has within it specific suggestions for care, and considerations for maintenance and repair. Comparatively speaking guidelines before the mid-1990's seem

to have little to no clarification of ideas or expansion on guidelines and considerations therein.

The final element of modern guidelines is the illustration. Illustrations are used to clarify the intent of the guideline through pictures of representative works within the district and diagrams to explain complex concepts. Some preservationists disagree on the inclusion of illustrations that depict inappropriate solutions — rather than only appropriate solutions — for rehabilitation projects. However, when new construction is on the table these visuals can be an important tool in constructing appropriate infill. Illustrations within guidelines are another change that has occurred over time with advances in printing, copying, and digital functions, but even today few guidelines incorporate illustrations to the extent that Winter's do. In fact, there are guidelines that have been published since the new millennium that only incorporate illustrations as reference and visual breaks, as can be seen in the guidelines from Knoxville, TN. While other guidelines incorporate illustrations that identify the design issue at hand (Leimenstoll, 2009a) and still others use illustrations to clarify concepts, terms, and technical details (Marvelli & Preston, 2012).

District guidelines encompass more than just design information, the document is usually organized "with an introduction that describes the district and explains local procedures, followed by sections addressing changes to buildings exteriors, new

construction and additions, landscaping and site features, and demolition or relocation of historic buildings" (Leimenstoll, 2009b). It is also important to note that in addition to these sections some guidelines also include important information pertinent to the intended audience in the form of an appendix which contains supplemental information such as a glossary of architectural terms, resources and references, works exempt for design review, and maps (Leimenstoll, 2009b).

Along with changes in layout and information, design guidelines have also experienced changes in what topics need to be addressed, and the tone that is used to convey the information. Currently one of the biggest changes in district guidelines is incorporating sustainability which takes a multi-disciplinary approach, an "accepting and encouraging tone," and including examples and illustrations of sustainable recommendations (Leimenstoll, 2009b, p. 39).

The Concept of Sustainability

Before going further on incorporating sustainable approaches into historic district guidelines it is important to understand the concept of sustainability and how it has come to be embraced in many disciplines. Sustainability is the newest face on a generations old idea: we need to protect our resources and our identities. While sustainable ideas have been noted for centuries — millennia in some cases — the focus here is on *Modern Environmentalism* and *Sustainable Design* beginning with

environmentalism in the 1960, the energy crisis and the responses of the 1970's, and the evolution through today.

Sustainability is a commonly used term in today's world, but it is also one that has a very broad — and not fully understood — meaning. The Environmental Protection Agency states that "sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations" (EPA, 2012). They also assert that "everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment" (EPA, 2012). It is this reasoning that continues to drive a desire to incorporate sustainable practices within our everyday lives, but this idea did not spring up overnight. It instead grew out of a wealth of groups mainly concerned with hazardous environmental practices, to include cultural, social, and economic activists as well, all of whom realized that sustainability goes beyond the purely natural world.

Environmentalism

> Environmentalism created significant constituencies at both the popular and the official levels and united four dominant concerns: 1) an awareness of the profound spiritual links between human beings and the natural world; 2) a deep understanding of the biological interconnection of all parts of nature, including human beings; 3) an abiding concern with the potential damage of human impact on the environment; and 4) a strongly held commitment to make ethics an integral part of all environmental activism (Edwards, 2005, p. 15).

The modern environmentalist movement in America was launched in 1962 with the publication of Rachel Carson's book *Silent Spring* (Edwards, 2005; McLennan, 2004). This publication "set off an alarm heard through all levels of society" by depicting the devastating impacts of "toxins and pollutants on the environment" which caused officials and the public to "reevaluate the limits of ecosystems" since Carson made clear "that our survival is linked to the viability of ecosystems" (McLennan, 2004, p. 15).

Following the growth of the movement, in 1970, Gaylord Nelson — a democratic congressman from Wisconsin — was inspired to create a "national teach-in on the environment" that turned into a "grassroots explosion" by fusing the energy of student anti-war protests with a growing awareness for environmental concerns about pollution; also known as the first Earth Day, on April 22nd. Probably due in part to the bi-partisan cooperation of republican congressman Pete McCloskey and national coordinator Daniel Hayes, Earth Day lead to the creation of the Environmental Protection Agency, Clean Air, Clean Water, and Endangered Species acts (Edwards, 2005).

Energy Crisis, Earth Day, and the EPA

> ... on the 22nd of April, 20 million Americans took to the streets, parks, and auditoriums to demonstrate for a healthy, sustainable environment in massive coast-to-coast rallies. Thousands of colleges and universities organized protests against the deterioration of the environment. Groups that had been fighting against oil spills, polluting factories and power plants, raw sewage, toxic dumps, pesticides, freeways, the loss of wilderness, and the extinction of wildlife suddenly realized they shared common values.(Earth Day Network, 2011, p. 1)

While the environmentalist movement started in the 1960's, the major motivator for sustainable design came in the 1970's with the energy crisis: "The escalating price of oil in the seventies energized a lot of designers to begin to look at how buildings could be designed to reduce energy demand and be more cost effective" (McLennan, 2004, p. 28). Some important events that took place during this time such as the revival of "passive, climate responsive, bioregional strategies;" early experimentation with alternative energies, waste technologies, and building materials; a popular negative perception of green architecture was established due to its experimental nature; and many of the leaders of sustainable design, some of whom continue today to develop new ideas and strategies, "experienced their sustainability initiations" (McLennan, 2004, p. 30).

One of the key events in the history of contemporary environmentalism — "the roots of sustainability" — was the United Nations Conference on the Human Environment in 1972 where the concerns expressed at Earth Day were internationalized (Edwards, 2005). This conference was seen as the first step in the "Sustainable Revolution" since the forum was an "attempt to find positive links between environmental concerns and economic issues such as development, growth and employment" and led to the creation of international environmental programs (Edwards, 2005, p. 15). Also environmental disasters like the Love Canal toxic waste debacle and the Chernobyl meltdown of the seventies and the Bhopal toxic gas release

and Exxon Valdese oil spill of the eighties, sparked demand for environmental responsibilities (Blackburn, 2012).

The Eighties, Nineties and Today: Sustainable Design

> Sustainable design is the philosophical basis of a growing movement of individuals and organizations that literally seeks to redefine how buildings are designed, built and operated to be more responsible to the environment and responsive to people. This movement is a powerful one, but still maturing and seeking to find its footing and vocabulary. Because of this maturing, a significant amount of disparity in understanding exists between its adherents and the definitions, terminology, and jargon used to describe itself (McLennan, 2004, p. 4).

By 1980 the sustainable design movement was just starting to get organized with the formalization of industry groups like the American Solar Energy Society, and the Passive Solar Industries Council however, since the cost of energy had gone down, fewer people were concerned with the need to conserve (McLennan, 2004). There are numerous references to the growth of the sustainable movement during this time such as published works, world commissions, and the sustainable revolution (Edwards, 2005). Broader attention was drawn to the movement from publications like Lester Brown's *Building a Sustainable Society* which begins with an "analysis of the economic predicament facing the world because of our careless inattention to, and disregard for, fundamental ecological limitations" and outlines a comprehensive strategy for changing our unsustainable global relationship with nature (Edwards, 2005).

Additionally *Our Common Future*, also known as the Brundtland Report, was published in 1987. This report was the product of the World Commission on Environment and Development (WCED) which was established by the United Nations General Assembly in 1983 (Rogers, Jalal, & Boyd, 2012). The WCED was charged with proposing a long term environmental strategy for achieving sustainable development by the year 2000, recommending ways to achieve an international, multidisciplinary, values-centered approach to development, and to help define shared goals and perceptions of long term issues for protecting and enhancing our environment (Edwards, 2005, p. 17). This report defined sustainable development as "meet[ing] the needs of the present without compromising the ability of future generations to meet their own needs" (Rogers et al., 2012).

The Brundtland Report advanced the Sustainability Revolution in two significant ways: institutionally and conceptually. Institutionally, he attests, that "it created the first framework for concerted action to protect the Earth's life support systems while promoting both economic and social justice goals (Edwards, 2005, p. 17)." Also conceptually this was the first articulation of the three fundamental criteria of sustainability: ecology/environment, economy/employment, and equity/equality (Edwards, 2005; Rogers et al., 2012).

In the early 1990's, the United Nations held a conference in Rio de Janeiro, Brazil called the Conference on Environment and Development, also known as Earth Summit, which brought together 180 world leaders, media and hundreds of nongovernmental agencies (Edwards, 2005). Earth Summit also produced the Statement of Principles on the Management, Conservation and Sustainable Development of All Types of Forests; the UN Framework Convention on Climate Change; the UN Convention of Biological Diversity and a recommendation for an international convention on desertification. Following this summit, Bill Clinton created the President's Council on Sustainable Development which produced a domestic agenda that would create a multidisciplinary approach to identify and develop new strategies for the fundamental criteria for sustainability (Edwards, 2005).

In addition to governmental efforts, in the early 1990s the American Institute of Architecture formed the first Committee on the Environment (COTE) which was initially funded by the EPA and the DOE (Edwards, 2005). The group began research to "understand how the construction industry affected the environment" and in 1996 published the Environmental Resource Guide which was the first attempt at quantifying the life cycle impacts of the materials used in buildings. Another large step in sustainable design came from David Gottfried and Mike Italiano who formed the United States Green Building Council (USGBC) in 1993 to address questions and concerns that had been raised by representatives from all aspects of the field including engineers,

builders, interior designers, landscape architects, academics, industry representatives and architects (McLennan, 2004). A few years after their first meeting the USGBC created the Leadership in Energy and Environmental Design (LEED) system which "helped the designer with a structure of designated points in several broad categories including energy, water, materials, indoor environmental quality and site design" (McLennan, 2004, p. 32).

Green Preservation

> Historic Preservation and sustainability are inextricably linked through their shared values of good stewardship, the revitalization of neighborhoods, and the ongoing use of the built environment. Both advocate a culture of reuse, community reinvestment, and appreciation of our heritage. The guiding principles of preservation resonate with the three fundamental principles of sustainability: economic strength, environmental stewardship, and social equity. Together they speak to the wise use of resources to sustain our communities (Leimenstoll, 2012, p. 6)

Green preservation is the intersection of historic preservation and green design (Elefante, 2007). The concept embraces the similar goals shared between the two fields and has been growing rapidly within the last ten years. This growth has been seen on a national level with incentives from the National Trust for Historic Preservation, Environmental Protection Agency, and the National Park Service. Historic preservation publications have also embraced sustainability. For example, the *APT Bulletin* published a special issue on sustainability and preservation in 2005 and another issue in 2009 geared towards sustainable design; *The Alliance Review* — a publication of the National

Alliance of Preservation Commissions — has also published entire issues concerning resource conservation, incorporating sustainability with design guidelines and "Going Green."

Before understanding how the intersection of these ideas has evolved and disseminated from national objectives to local guidelines, it is necessary to recognize how the fundamental concepts of each field intersect. After investigating how the information has been dispersed through the population, an inspection of the elements of sustainable technology and how they are incorporated with historic technology will follow.

Letters for Everyone

Within the fields of preservation and sustainability, there are numerous acronyms for the various groups, agencies, and theories that are used within each field and many of them have been discussed so far, but the fundamental concepts of each can be summed up in a few letters. For sustainability it is the three e's of ecology, economy, and equality, and for preservation it is the three p's or triple bottom line of planet, people, and profit (Edwards, 2005; Rogers et al., 2012; Young, 2012). The two concepts, or six letters, come together in concept of sustainable preservation which consists of the physical environment, economic environment, and social environments (Carstens, 2010; Young, 2012)

Sustainability has expanded its earlier focus of environmentalism through preservation of the environment to equally include issues related to the economy and equality of inclusion. In ecology there are three issues: a short or long-term perspective, understanding of ecosystems indispensability to human existence, and the concept of built in limits that these ecosystems can sustain (Edwards, 2005). Economic sustainability recognizes the importance of providing secure long-term employment within a healthy ecosystem. More importantly it incorporates the idea of "natural capital" — our natural resources, living systems and ecosystems — as being equally as important as more conventional forms of capital in economic development (Edwards, 2005). The final component that makes up sustainability is equality which adds community values — such as the interdependency of the individual and the larger community — and social justice into the mix.

Similarly historic preservation has expanded its early focus on national significance to envelope not only structures but sites, context, cultural affiliations, entire landscapes and districts as well. Historic preservation is intertwined with the planet through the reuse of existing buildings which, studies have shown, contain embodied energy and carbon, and have a life-cycle that is equal to or greater than that of energy costs and life-cycles of new construction (Carroon, 2010; Rypkema, 2006). Through preserving a site, building or community, people and social concerns become integrated with historic preservation which has been expanding its definition of cultural history and

incorporating diverse communities (Carroon, 2010). In addition historic preservation offers long-term employment through the rehabilitation of structures which creates jobs due to the labor intensity of repair of existing structures (Carroon, 2010; Rypkema, 2006). Finally preservation has proven itself to be very profitable throughout the years not only from the aforementioned jobs but also by improving profits through increasing property values in local historic districts, increasing federal funds, and providing affordable housing (Rypkema, 2006).

National Incentives and Publications

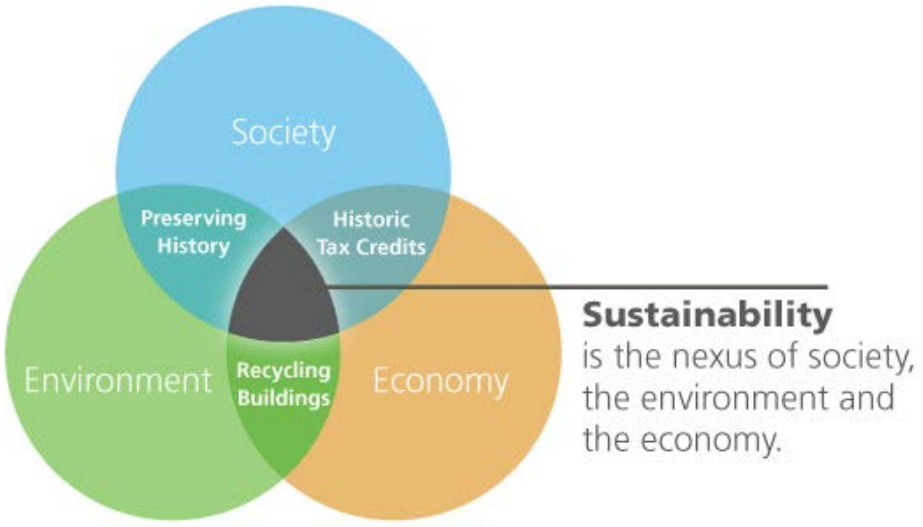

Figure 1. Sustainability Diagram by Blank Space LLC for the National Park Service

The concepts of environmental, societal and economic sustainability have been incorporated and expanded upon by preservationists. In the case of environmental sustainability most of the initiatives have been incorporated within the last ten years.

The National Trust for Historic Preservation started many sustainable initiatives like the Green Lab, the Greenest Building Report, and publishing issues of its magazine and journal dedicated to green design and sustainability. Similarly the National Park Service incorporated incentives within the parks for sustainability and addressing climate change along with numerous publications from the Technical Preservation Services (TPS) on sustainability and resource efficiency. The EPA has also done quite a bit with promoting sustainability through its region 5, which has been spearheading sustainable preservation within the EPA, associated publications with the National Trust and Government Services Agency, as well as providing energy advice to historic and older home owners, and technical assistance to communities throughout the country. In addition to these governmental programs there are also many organizations associated with preservation at a national level that have spread the ideas of incorporation through publication of scholarly journals such as The Association for Preservation Technology International, the National Alliance of Preservation Commissions, and the National Trust for Historic Preservation.

The National Trust for Historic Preservation is a reference point for professional preservationists and private enthusiasts as well as owners and defenders of historic resources. The Preservation Green Lab, created by the NTHP, was started in Seattle in 2009 to further research the values that historic buildings bring to their communities and how to sustainably reuse historic structures (Preservation Green Lab, 2012). In

addition the Green Lab also aims to reduce carbon impacts through reducing direct emissions from older structure retrofits and reuse and to "conserve character-rich and human-scale communities that attract people to more sustainable urban living patterns (Preservation Green Lab, 2012, p. 2)." In addition the Green Lab has produced significant research concerning the contribution of windows to sustainability, and a report quantifying the environmental value of the reuse of historic structures. This study found that the reuse of historic structures had a varying energy savings between 4-46% higher than that of new construction and that "building reuse almost always yields fewer environmental impacts than new construction when comparing buildings of similar size and functionality" (Preservation Green Lab, 2012, p. vi).

The NPS has also made significant contributions to spreading the ideas of sustainable preservation of not only historic resources but natural resources as well. One of the most impressive examples is the newly updated Standards for Rehabilitation with illustrated sustainability guidelines. Published in 2011 these guidelines were developed to replace an earlier chapter entitled "Energy Conservation" that appeared in the 1992 publishing of the *Illustrated Guidelines for Rehabilitating Historic Buildings* however this document goes far beyond resource conservation to explain the inherent sustainability of historic buildings as well as making recommendations for increasing sustainability in structures that comply with the Secretary's Standards for Rehabilitation (Grimmer et al., 2011). In addition to this publication the TPS reports on various issues

concerning sustainability and structures such as the Preservation Brief 3: Improving Energy Efficiency in Historic Buildings which discusses Energy Audits to locate areas of loss, inherent efficient features, and actions that can be taken to improve efficiency (Hensley & Aguilar, 2011). In addition TPS publishes a series called ITS — Interpreting the Secretary of the Interior's Standards for Rehabilitation — which gives further clarification of many features covered in the Standards including encouraging efficiency through sensitive alterations to traditional features. Additionally the NPS published a work on energy conserving features of older buildings in 1982 in association with Housing and Urban Development, which covers all of the common historic conserving features found in historic homes (Burns, 1982).

Region 5 of the EPA has also promoted sustainability with the Green Historic Preservation Initiative from April of 2010. This initiative found preservation experts in the EPA collaborating with other agencies and organizations to highlight the benefits of greening existing structures instead of demolition and new construction (Bouchee, 2010). Additionally this region has organized two symposiums relating to sustainable preservation and what the EPA's role should be in preservation efforts. These conferences centered around seven key issues such as influencing rating systems, addressing window repair versus replacement, improving education on sustainable issues, measuring and communicating inherent green value of older buildings, and fitting new systems within older buildings without affecting character (Bouchee, 2010).

In addition to these symposiums the EPA has also published *Energy Advice for Older and Historic Homes* in association with the NTHP along with offering energy conservation advice on its website. This publication discusses how to take advantage of a home's historic features, embodied energy, air sealing, HVAC systems, insulation, windows and doors, removing potentially hazardous material and maintenance. In addition it supplies checklists and worksheets as well as additional resources for efficiency.

Other publications on a national level have embraced sustainability and encouraged their readers to do the same such as the National Trust for Historic Preservation, the National Association of Preservation Commissions, and the Association for Preservation Technology International. The National Trust has been leading the way for both public and private awareness through its *Preservation Magazine* and *Forum Journal* publications since the mid-1980's, each of which published an issue dedicated to incorporating sustainability. In January of 2008 and March of 2009, *Preservation Magazine* published "Green Issues," which espouse the compatibility of old and new through building reuse, and increases public interest through the use of articles and case studies of green projects, and tips for greening their own homes. Also in 2009, they published the *Forum* spring journal "Positioning Preservation in a Green World," which focuses on constructive relationships between preservationists and sustainable

advocates, green rating systems intersection with existing buildings, and the incorporation of sustainability within district guidelines.

The APT *Bulletin* has also published two special issues on sustainability in 2005 and 2010 following symposia in Halifax, Nova Scotia and Montreal, Quebec that were aimed at the leaders of the field to clarify its mission, and advance the techniques of sustainable preservation. The 2005 issue examines the scope of work accomplished throughout the U.S. and Canada through articles establishing the benefits of building and material reuse, studies quantifying embodied energy in historic buildings, and use of new high-performance systems, green materials, and sustainable practices. The 2010 issue went even further to establish a maturing of the field through the deep interconnectedness of sustainability and preservation with articles on embodied energy, green rating systems, maintaining integrity, and how to strengthen the relationship in coming years through education and interdisciplinary cooperation.

Most impressive has been the outpouring of incorporation from the National Alliance of Preservation Commissions who has published at least four issues of *The Alliance Review* dedicated to sustainable practices in the last ten years. Most recently was the September/October 2010 issue on "Weatherization" which covers state and federal partnerships and incentive programs, inherent efficiency in buildings, and new technologies for energy efficiency. In 2009 the November/December issue, "Suitability and Sustainability" which features articles on alternate green materials and agendas to

incorporate sustainability on a local level. Two years earlier they published "Going Green" in January/February which discusses inherent sustainability, and provides help for the design review process. Finally in the first quarter of 2003 they published a special double issue on rehabilitation codes for existing buildings and alternative materials.

State Initiatives

The states as well have added to the implementation of sustainable preservation by focusing on the different interest groups such as legislators and decision-makers; owners, builders, and designers; and preservationists. Some of the best examples come from New Hampshire, Nebraska, and Washington as each one is directed towards a different audience and therefore explores a different intersection of the concepts: the New Hampshire initiative is aimed at town and city decision makers, the Nebraska guide is aimed at builders, owners, and designers, and the Washington initiative is aimed specifically at preservationists.

The New Hampshire initiative provides seven talking points on incorporating sustainability within the state (New Hampshire Preservation Alliance, 2009). The first is to lead by example through building related investment and management by adopting sustainable practices for public works, utilizing existing buildings, and relocating services to town centers. Secondly, they encourage choosing sustainable design options and to perceive preservation as "the original green" due to the locality of the resources, and

the site and design of the building. By doing this they encourage consultation with preservation professionals for comprehensive evaluations for renovation and reuse instead of demolitions and new construction, advocating energy audits and efficiency, the repair of windows instead of replacement with new materials, and the use of locally produced materials. The other four talking points encourage reinvestment in downtowns and town-centers through advancing green planning centered around these areas, employing environmental and agricultural policies that support the state's economic and environmental sustainability goals, encouraging the reuse of older structures as "workforce" housing by using rehabilitation codes and other innovative approaches to promote a walking community that utilizes existing infrastructure, using schools as a sustainable showcase through proper maintenance and energy efficiency efforts, and through the redevelopment of a safe and effective public transportation option that meets civic and sustainability goals.

Nebraska's initiative was developed specifically for individuals interested in increasing energy efficiency and maintaining integrity in historic buildings (Rebuild Nebraska, 2001). This guide gives a broad overview of the steps that should be taken when taking on an energy efficiency project in a historic building, encourages a whole building framework which accounts for all aspects of an existing building including its condition and the interaction of its elements, and establishes project goals and evaluates the solutions available to achieve those goals. This document establishes a

common language for room use and occupancy, helps to determine the buildings condition/occupancy, discusses the components, fixtures, and equipment of a building and provides information on establishing a plan of approach and project team. Most importantly this document provides a checklist at the end which features each building component — exterior walls, roof, foundation, windows and doors — and the type of materials used in their construction along with fixtures and equipment that is in the buildings, to help establish energy efficiency as well as architectural integrity.

The Washington publication is clearly aimed at professionals through its content which provides advice for future directions, relates the compatibility with the Secretary of the Interiors standards, as well as relating economic information and providing case studies (Washington State Department of Archaeology and Historic Preservation, 2011). The information contained within the three-page brochure addresses the resource efficiency of buildings not only through what can be done to make them more efficient but also addresses the embodied energy and resources inherent in historic buildings. In addition to providing substantiated facts about the sustainability of historic buildings on a country wide level it also provides case studies featuring residential, commercial, and multi-family structures throughout the state that provide examples of various funding opportunities, rating systems, and other initiatives that were used in improving the building's sustainability. Additionally it provides an agenda for future preservation work including developing new and innovative building codes, new partnerships and

collaboration between professionals, expanding education on sustainability, conducting further research on the efficiency of maintenance and repair, and expanding planning for sustainable development. Finally, the summary features tips for rehabilitation projects similar to those featured in Nebraska's initiative including consulting with professionals, evaluating existing systems, and espouses the merits of repair and maintenance.

Local Incorporation: Guideline Variations and City Recommendations

Unlike recommendations that are made on a national or state level, local guidelines are developed for use within a specific district, are narrowed to the styles and materials represented, and rarely address interiors. On a local level sustainable initiatives and publications have been combined into the guidelines for historic downtowns, rural communities, residential neighborhoods, and commercial districts throughout the country and are usually seen in one of three forms: a complete incorporation, a separate chapter, or a stand-alone brochure (Winter, 2008). The same can be said of city recommendations for buildings outside of historic districts that have no regulations or protections as evidenced in Cheltenham Townships Historic Preservation and Sustainability guide, the City of Boulder's Energy Efficient volumes, and the City of Binghamton's Eco-Friendly Tips brochure.

Cheltenham's document specifically states that it is in no way regulatory and is intended only as a guide, as there is no design review process. It incorporates the Secretary of the Interior's Standards as well recommendations for insulation, HVAC systems, draft-proofing, windows, doors, appliances, alternative energy sources, landscaping, and rainwater retention. Significant to this document is a bulleted list at the end which lists quick fixes to increase sustainability within the building that emphasize weatherization techniques, native plantings, and inherent features.

The City of Boulder's efforts at incorporating sustainability within historic buildings may be one of the most comprehensive at a city level. It comprises two volumes: principles and approaches, and technical details. This document covers preservation principles, and a systematic approach for examining a building's performance in the first volume then covers adding performance value and how to undertake retrofitting measures. This document, similar to the Nebraska initiative, approaches sustainability through a whole building approach that addresses energy audits, and plumbing, mechanical and electrical systems. The second volume expands on this by breaking down information for rooms that are commonly inefficient and discusses how to address additions and vertical expansions and inherent features. It goes on to discuss proper measures to undertake retrofitting for energy efficiency in appliances, renewable energy, HVAC systems, insulation considerations, windows and doors and material considerations.

Unlike Boulder, the City of Binghamton provides a tri-fold brochure that focuses solely on concisely increasing energy efficiency in historic homes. This is accomplished through ten short tips which encourage the use of existing features as well as incorporating the site and energy audits. These ten tips include keeping original windows, using light paint colors, insulating attics and basements, reusing old materials, closing off openings, opening the windows in the summer, keeping doors air tights, restoring porches, planting shade trees, and conducting an energy audit.

Sustainable Technologies

> Preserving a building is often called the ultimate recycling project, yet preservationists commonly fight the stigma that historic buildings are inefficient and require daunting corrective measures to retrofit with energy saving devices and systems... Preservation and "green" goals overlap, and reconciling their differences is possible, provided both sides strive to be as creative and flexible as possible (Tepper, 2009, p. 1)

The incorporation of sustainability within historic buildings is especially necessary due to perceived weaknesses in operating efficiency and window energy loss that leads to loss of historic integrity or even demolition (Frey, 2007). The initiatives and incentives that are being espoused by various levels of government and private agencies can be broken down into four broad categories: the use of assessment tools, the retention of traditional features, the incorporation of new technologies, and resource efficiency for site and structure.

Assessment Tools

There are more than 25 approaches for green home rating systems but most were developed with new construction in mind, and have been eventually developed to incorporate historic buildings (Jackson, 2009). Some of the most commonly used are Leadership in Energy and Environmental Design (LEED), Life Cycle Analysis (LCA), Energy Audits, and a whole building approach.

Gottfried and Italiano, who formed the USGBC, developed LEED in 1998 to integrate the various building industry sectors, educators, practitioners and owners (Carroon, 2004, 2010). LEED is also the most commonly used system in the U.S. to promote green building and has developed differing systems to address new construction, existing buildings, commercial interiors, as well as residential, school, retails, and healthcare (Carroon, 2010). This system is comprised of five categories from which a project can earn points towards certification which are sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality (IEQ). Sustainable sites provides points for redevelopment of urban areas, incorporating rainwater filtration, and access to alternative transportation methods (Carroon, 2010; Jackson, 2009). Water efficiency refers to native plantings and other forms of efficient landscaping such as permeable surfaces. The energy and atmosphere category may be the broadest and rewards minimization of ozone depletion, alternative

power, and continued performance of interior systems (Carroon, 2010). Materials and resources are focused in building and material reuse, and low impact materials while IEQ is focused on carbon emissions, daylighting, and views (Carroon, 2010). Unfortunately LEED is often at odds with preservation because it places a very high emphasis on direct energy consumption and oftentimes historic building envelopes are less than optimal at retaining energy (Carroon, 2004; Tepper, 2009). More importantly however LEED does not give points for the inherent sustainability of historic building materials, their retention, or embodied energy (Tepper, 2009).

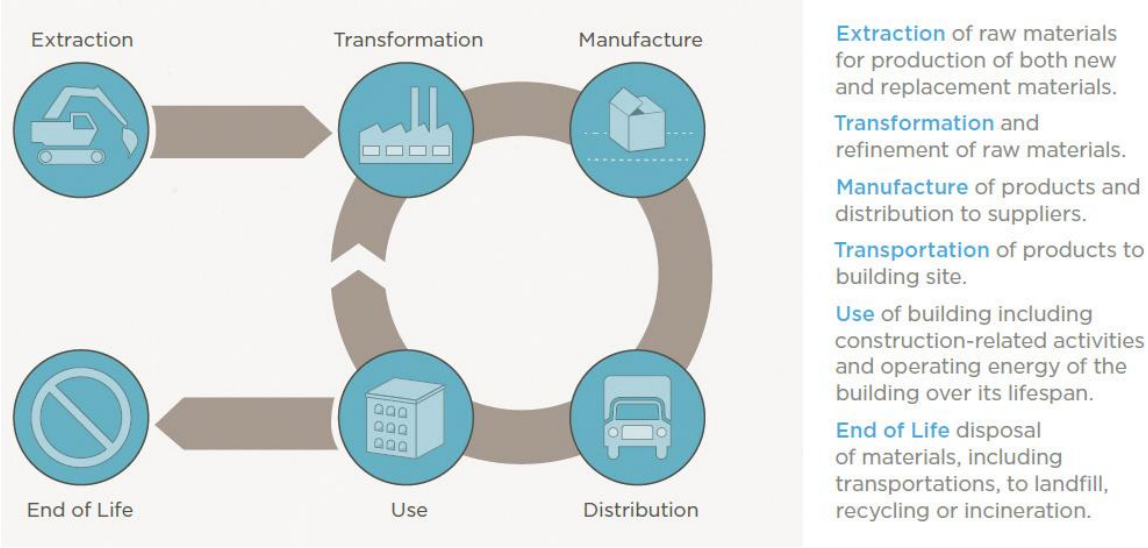

Figure 2. Life Cycle Stages diagram by Preservation Green Lab, NTHP

Life Cycle assessment tools have proven to be an invaluable resource to historic preservationists in assessing the environmental impacts associated with all the stages of a building's life from-cradle-to-grave including previous years maintenance and recap

investments (Powter & Ross, 2005). It is also considered superior to other forms of environmental assessment because it examines all of the impacts caused by a building throughout its life, rather than focusing on a particular stage of existence like LEED does (Frey, 2007). This is achieved by measuring the environmental effects of building materials from the *extraction* of raw materials, to their *transformation* into new materials, then to their *manufacture* and distribution as building materials. The cycle continues with the *transportation* of the materials to the site, their *use* and reuse within the structure over the building's lifetime, until the *end of life* of the materials which includes further transportation for the site to the landfill, and any recycling or incineration processes that may ensue (NTHP, 2012).

This thorough exploration of a building's life cycle allows a clearer understanding of both what the environmental impacts are and when they occur during cycle. By using this model the National Trust for Historic Preservation, in association with Cascadia Green Building Council, Green Building Services, SKANSKA and QUANTIS, conducted research that led to *The Greenest Building* report which produced three primary findings that quantify the common belief that the greenest building is one that already exists (NTHP, 2012). These findings show that the reuse of buildings yields fewer environmental impacts than new construction, the reuse of buildings with average energy performance offer immediate environmental savings compared to new construction that is "more energy-efficient," and that the types and quantities of

materials used in adaptation can alter these outcomes even to the point of entire negation of the benefits of reuse (NTHP, 2012, p. 7). Energy audits and simulations are often used in conjunction with LCA's as part of the larger goal of achieving energy savings that are not only cost effective but respect the integrity and historic character of the buildings (Cluver & Randall, 2012).

While LCA's and LEED are usually pursued by professionals, energy audits and a whole building approach are intended for use by homeowners looking to improve efficiency. Energy audits are used to locate air leaks throughout the house which can dramatically alter the efficiency of a structure, however air sealing can also alter the way that moistures moves through a building resulting in accumulation that can damage the structure and should therefore be undertaken sensitively and with professional assistance (NTHP, 2010). Air infiltration is one of the most common problems in older and historic homes, and can be easily remedied once the major sources of loss are identified through an energy audit (Wilson, Kinney, & Clute, 2007a). There are two tests usually used to gather information on air infiltration: the blower door test — which uses a strong fan placed in an exterior door to depressurize the house to identify air leaks — and infrared imaging to detect changes in temperature that indicates other sources of energy loss (NTHP, 2010). Additionally auditors will collect data on duct condition, gas appliance efficiency, and electrical use and safety as well as analyzing utility bills and consumption information to identify other areas of waste (Wilson et al., 2007a).

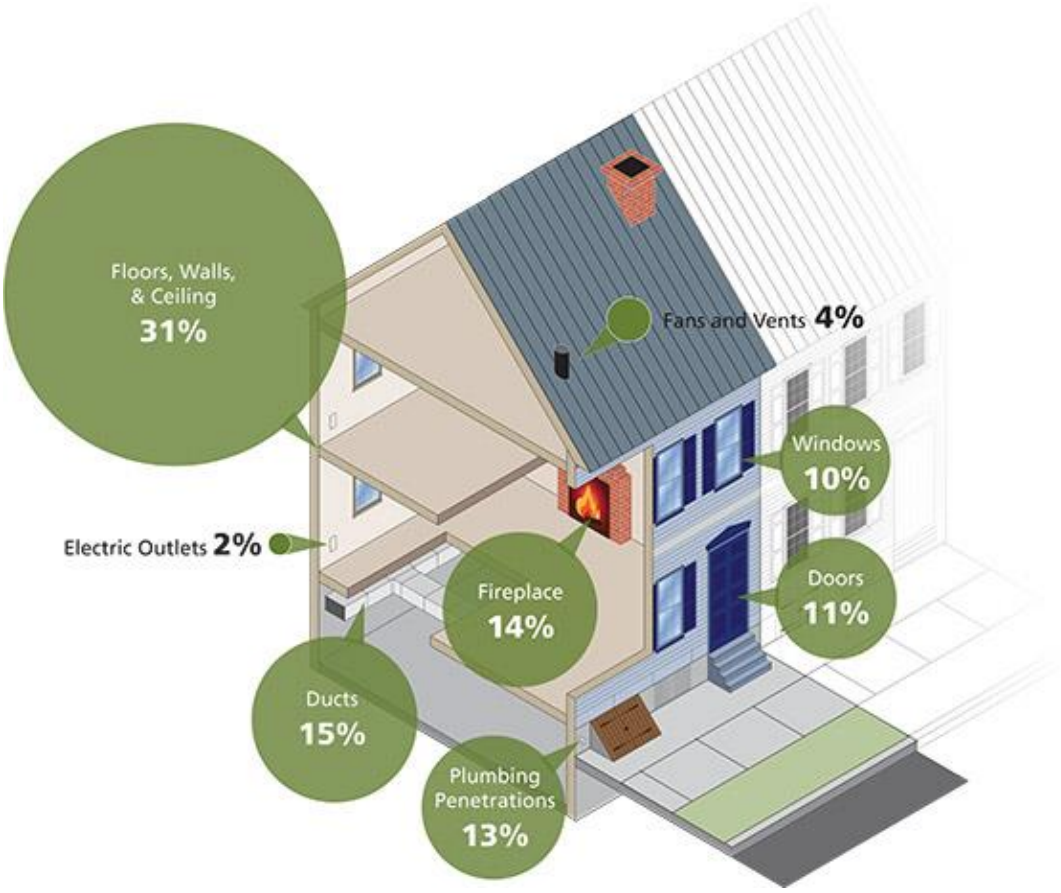

Figure 3. Major Sources of Air Leaks (Data from US DoE) Created by Blank Space, LLC for NPS

These areas include insulation, mechanical systems, ducts, adjusting thermostats, lighting, fans and ventilation, and appliances and are usually addressed within a whole building approach (NTHP, 2010; Rebuild Nebraska, 2001; Wilson et al., 2007a).The whole building approach incorporates information gained in energy audits, along with considerations for the existing condition of the building and its envelope, and allows the project to be broken up into manageable stages (Rebuild Nebraska, 2001). The largest element of the building that needs inspection is the envelope which is

comprised of the exterior walls, foundation, roof, windows, and doors (NTHP, 2010; Rebuild Nebraska, 2001; Wilson, Kinney, & Clute, 2007b). These are also the elements that are addressed by the Secretary's Standards, and comprise a large part of the architectural integrity of the structure and should be sensitively altered (Rebuild Nebraska, 2001). There are many sources of energy loss that are addressed within the envelope including recessed lighting, chimney chases, electric boxes, wall framing, exhaust fans, penetrations for utilities, fenestration, missing trim and inherent features (Wilson et al., 2007b). Interior elements also lead to energy loss through inefficient appliances, inferior insulation, cracks and gaps on elements, through laundry chutes, built-in cabinetry and stairwells, the loss of interior trim and baseboards and lighting (Rebuild Nebraska, 2001; Wilson et al., 2007a, 2007b).

Resource Efficiency

Energy is only one of the resources that needs to be addressed when dealing with sustainability and historic structures; other resources include water, site, light and air (Carroon, 2010; Lynn, 2007). While energy efficiency must be addressed on numerous levels and through a variety of different solutions, the other resources that add to the efficiency of a structure can be covered through fewer recommendations. Site features protect the integrity and efficiency of a structure through native plantings that encourage a natural habitat and shade trees that help reduce energy use in the

summer, permeable paving to manage storm water and adding other features such as bioswales and rain gardens for on-site water reuse, and the reduction of heat islands through the use of light reflecting surfaces and proper paving techniques (Carroon, 2010; Grimmer et al., 2011; Lynn, 2007; Wilson et al., 2007b). Additionally the ideas of *xeriscaping* (landscaping with the use of drought resistant native plants and advocates the removal of turf), *edible landscapes* (locally produced food; mainly in urban areas), and *phytoremediation* (uses plants to contain or remove toxic pollutants from a sites soil and water) are common sustainable practices that can be easily incorporated in historic sites (Carroon, 2010).

While rain gardens, bioswales and drought resistant native plantings help the sustainability of the site they also help in water efficiency by redirecting storm water, collecting rain water, and increasing the capabilities of grey water reuse (Carroon, 2010). Additionally water efficiency can be achieved through the introduction of low-flow fixtures, rain barrels, through condensate recovery, and the use of automatic controls (Carroon, 2010; Lynn, 2007).

A commonly overlooked and undervalued resource for historic homes is that of natural light and the quality of indoor air. Since historic homes were built with technologies that embrace natural light, shade, and ventilation as well as site orientation in combatting temperature change throughout the seasons there are many

suggestions on how best to address these resources (Burns, 1982; Carroon, 2010; Grimmer et al., 2011; Jackson, 2005). These recommendations include restoring lost features — such as window openings, operable fenestrations, porches, and shutters — that assist with ventilation and light, the introduction of new unobtrusive openings — such as sky lights, openings on secondary elevations, and vents in basements/attics — that don't detract from the historic nature of the structure, and the use of light controlling devices — like awnings, shutters/window treatments, and interior system controls — that increase the efficiency of heating, cooling and electric bills (Carroon, 2010; Grimmer et al., 2011; Lynn, 2007).

The recommendations that are being made from all levels of involvement can be broken into two groups: the retention, restoration, and education on proper use of traditional features; and the incorporation, selection, and updating of new technologies within historic structures.

Traditional Features

> Even with energy conserving features, providing houses with the appropriate heating, cooling, lighting, and ventilation was difficult, usually expensive, and time consuming for the homeowner until the latter part of the nineteenth century when mechanical systems were introduced. As a consequence, every energy conserving and labor saving device that could be thought of was incorporated in earlier house design and construction (Burns, 1982, p. 2).

It was the introduction of mechanical systems which caused the earlier energy efficient designs — that had been developed through trial and error — to fall into

disrepair and disuse with many people neglecting them due to a lack of understanding about the features' purpose (Burns, 1982). Since these features were unpowered and passive, they can still be useful today without raising the consumption of energy (Burns, 1982; Carroon, 2010; Moe, 2009). These features include: site orientation, roof overhangs and awnings, porches, wall massing, window size and location, splayed window reveals, light wells, fanlights, transom lights and side lights, skylights and clerestories, high ceilings, warm air flues, chimneys, interior and exterior shutters, color and use patterns (Burns, 1982; Hensley & Aguilar, 2011).

Many of the aforementioned features can be grouped together into a general category of windows — including light wells, fanlights, transom lights, clerestories, and skylights — as they provide natural ventilation and light and save energy by reducing the need to use mechanical systems (Hensley & Aguilar, 2011).The use of smaller windows was a common energy saving device since walls provide better insulation; however, often in the south, large windows were common on shaded porches to allow for maximum ventilation during summer months (Burns, 1982; Yapp, 2010). Additionally, window openings on the northern face of buildings in colder climates was uncommon because it led to heat loss; whereas in the south positioning windows on southern faces leads to undesirable heat gains. Therefore, windows were located to be most beneficial in regulating temperature and ventilation (Burns, 1982; Hensley & Aguilar, 2011; Smith & Elefante, 2009). Also common were the use of clerestories and skylights which reduce

the need for electric lighting during the day and can also act as vents for hot summer air (Burns, 1982). Also interior transoms and *borrow lights* served to allow light from exterior rooms to filter into interior rooms thereby "borrowing" light from one room to another (Burns, 1982). Finally, the use of fan and side lights were a common way to allow light into an otherwise dark vestibule or entrance area (Burns, 1982).

In addition to windows themselves, many historic features that assist with energy efficiency were developed around windows such as interior and exterior shutters, awnings, and shade devices, roof overhangs and eaves, and window reveals and operation (Burns, 1982; Hensley & Aguilar, 2011; Smith & Elefante, 2009).While surviving operable exterior shutters are rare, homeowners educated on their use for efficiency is rarer still, but their use can significantly reduce heat loss and gain (Burns, 1982; Moe, 2009). Additionally, interior shutters can be installed in many historic buildings without impacting its integrity although they are more common in thick masonry construction as the walls allow for the open shutters to be hidden (Burns, 1982). Awnings and shade devices like porches were established to provide relief from the high summer sun and heat gain and were quite common in the south to the extent that it was common to see second story porches that were screened and used for sleeping (Burns, 1982). Similarly deep roof overhangs and eaves, which were common in Prairie, Italianate, Second Empire, and Arts and Crafts styles, were also designed to block high summer sun while allowing heat gain from the lower winter sun (Burns, 1982;

Yapp, 2010). Finally the retention and repair of operable historic windows not only allows improved ventilation within a structure by letting hot air escape and cool breezes enter, but also keeps significance intact by maintaining historic character (Grimmer et al., 2011; Yapp, 2010). Additionally recent studies have shown that with the use of exterior or interior storm windows, and the application of low-e film historic windows can be as or more efficient than replacement windows (Preservation Green Lab, 2012; Sedovic & Gotthelf, 2005).

Other exterior features that add to the efficiency of historic buildings include thick masonry walls, and site orientation (Burns, 1982; Grimmer et al., 2011; Moe, 2009). Walls of substantial mass have an advantage over common framed houses because they have a high thermal inertia which reduces heat transfer through the material, leading to cooler interior temperatures in the summer, and more even temperatures in the winter by dampening the peaks of loss and gain (Burns, 1982; Hensley & Aguilar, 2011). Site orientation is a inherent feature of a historic home, and many historic structures were oriented in such a way as to maximize on natural resources like daylighting and northern winds (Burns, 1982; Hensley & Aguilar, 2011). Additionally site features like deciduous and evergreen trees, and berms can help provide wind breaks, and natural shading during summer months (Burns, 1982; Hensley & Aguilar, 2011).

Interior features as well can contribute to the efficiency of a historic structure such as high ceilings, warm air flues, chimneys, color, material and use patterns (Burns, 1982; Hensley & Aguilar, 2011). High ceilings in southern climates were an effective way of overcoming the heat of summer as they allow the hot air to rise above the occupants; the drawbacks during winter were overcome by the use of ceiling fans to circulate air (Burns, 1982; Hensley & Aguilar, 2011). Another way that heat was regulated within historic homes is through chimneys and surrounding *convection flues* which are created in small spaces alongside chimneys by having a draft near the bottom and an exhaust near the top where air warmed by the heated masonry of the chimney escapes even after the fire has gone out (Burns, 1982). Additionally, chimney size and placement would vary depending on the amount of heat needed. In warmer climates chimneys are placed on exterior walls to radiate heat out of the home, whereas in colder climates the chimney is centered within the home to take advantage of radiant heat (Burns, 1982). Chimneys also affected room use and floor plans as in colder climates *living* rooms with low ceilings would be clustered around central chimneys, whereas *auxiliary* spaces were pushed away because heating them was unnecessary (Burns, 1982; Hensley & Aguilar, 2011). Finally the choice of color and material can dramatically affect heat gain as dark colors absorb more heat and lighter colors reflect more, and similarly thinner materials allow more infiltration of cold air while denser materials provide more insulation (Burns, 1982; Hensley & Aguilar, 2011).

New Technologies

While some new technologies are easy to install without harming the structure's historic integrity such as upgrades to electrical, plumbing, HVAC, and other mechanical systems through the use of efficient appliances and other means, others require more attention like alternative energy sources, insulation, low VOC and sustainable materials, and eco-roofing options (Grimmer et al., 2011; Hensley & Aguilar, 2011).

Alternative energy sources have become more diverse and popular during the last ten years to envelop solar, wind, and geothermal technologies. Originally a source of much contention, new technologies in solar energy allow for the placement of film on low pitched roofs and collectors to be placed off of the structure, on secondary roof faces, ancillary buildings, or other inconspicuous locations (Grimmer et al., 2011; Hensley & Aguilar, 2011; Thornton, 2011). In addition to these *active* solar technologies, *passive* ideas — many of which are the traditional features discussed earlier — including material selection, and sensitive additions of radiant floors, vestibules, sun rooms and porches can be incorporated within a historic site (Hensley & Aguilar, 2011). Less common is the installation of instruments to harness wind power however in areas that traditionally harnessed this energy through windmills and turbines this solution may be suitable (Hensley & Aguilar, 2011). This is especially true in rural areas where the availability of large amounts of land away from the main structure can provide a

screening barrier to prevent unwanted visual intrusion of new equipment to historic areas (Grimmer et al., 2011; Hensley & Aguilar, 2011). Finally geothermal technologies are becoming quite popular as they can be unobtrusively incorporated into historic sites, are small of space and moving parts, maintain better indoor humidity and do not require electric backup (Hensley & Aguilar, 2011; Thornton, 2011). All of these technologies however should be considered **after** other sources of efficiency have been thoroughly explored and incorporated (Carroon, 2010; Cavallo, 2005; Grimmer et al., 2011; Hensley & Aguilar, 2011; Thornton, 2011).

Another "new" technology — to historic buildings at least — is the use of insulation as a vapor barrier. It is commonly agreed that the addition of insulation in basements and attics is an excellent approach to increasing energy efficiency as it helps to prevent infiltration and exfiltration of conditioned air (Carroon, 2010; Grimmer et al., 2011; Hensley & Aguilar, 2011; Rose, 2005; Sears, 2010). While there are many recommendations for insulation, the best practice — after the insulation of attics and basements — is the insulation of ducts and pipes, and then the insulation of wood frame walls (Grimmer et al., 2011; Hensley & Aguilar, 2011; Rose, 2005). The insulation of walls is the least recommended addition of energy efficiency due to the difficulty of installation without affecting historic integrity, the cost of installation in comparison to the savings reaped, and the nature of blown-in insulation to settle or foam insulation to

expand and thereby obstruct the ability of the wall cavity to release moisture in high humidity environments (Hensley & Aguilar, 2011; Rose, 2005; Yapp, 2010).

Eco-roofing options are also a popular sustainable technology especially in urban areas as they not only help with water filtration and retention but in heat island elimination and improved air quality (Grimmer et al., 2011; Hensley & Aguilar, 2011; Kooles, 2010). Green roofs could even be considered to be a historic roof covering as it was common with indigenous peoples in many Icelandic and Scandinavian countries which are *intensive* and involve larger trees and shrubs and can be designed as outdoor green space (Kooles, 2010). Additionally, green roofs can be *extensive* which are designed expressly for environmental benefits to help mitigate storm runoff and are a preferable retrofit due to their smaller weight load which requires less structural capacity (Hensley & Aguilar, 2011; Kooles, 2010). White or cool roofs are growing in popularity because of their ability to reflect light to reduce heat gain through the use of light colors and reflective crystals (Hensley & Aguilar, 2011; Kooles, 2010). The addition of these technologies to historic roofs however must be done sensitively and should include preparations to assure watertightness, not disrupt historic character, provide moisture monitoring, and use native properly scaled plants (Grimmer et al., 2011; Hensley & Aguilar, 2011; Kooles, 2010).

The final new technology that should be included in historic structures is the use of low-VOC and sustainable materials ("Considerations for Green Buildings and Historic Preservation," 2007; Thornton, 2011). When selecting new and replacement materials specifying low-VOC materials and finishes like paints, stains, and flooring will help protect indoor air quality ("Considerations for Green Buildings and Historic Preservation," 2007; Thornton, 2011). Additionally the selection of recycled, and renewable materials help with natural resource efficiency and locally produced materials provide a higher level of authenticity to most historic sites as historic materials were usually what was readily available and local (Thornton, 2011).

Focus

In response to the calls for environmental sustainability, Preservationists have greatly increased their dialogue of good stewardship for both natural and cultural resources, especially in the last ten years. Even though this trend has been seen from local to national levels it wasn't until the last three years that some historic districts have started widely incorporating sustainability within their guidelines. Yet many historic districts – which encompass the majority of our nation's historic homes – do not incorporate sustainability within their district guidelines and many, have no guidelines at all. Additionally, while there are many initiatives and recommendations being made

by numerous sources throughout all levels of involvement from local to national, and public, private, and non-profit there is no single source that envelops them all.

This lack of cohesion between sources has left homeowners with an enormous task of going through these recommendations to figure out what may be acceptable for their home. With my thesis I aim to fill this void for owners of traditional pre-WWI houses in North Carolina by providing a manual for sensitive retrofitting of historic sites with sustainable technologies specifically within National Register historic districts. The focus on these districts is due to their lack of local design guidelines and protections which ensure rehabilitations respect the integrity of historic features. Also focusing on these areas allows for inclusion of resources from all styles across the state. The illustrated guidelines created on conjunction with this thesis identify the significant elements of the home for the users, the common styles in the state, types of preservation approaches, and how to increase their home's efficiency while maintaining its integrity and historic characteristics.

CHAPTER III

RESEARCH: METHODOLOGY

To identify the best practices of incorporating sustainability into guidelines for historic homeowners in North Carolina two databases were created. One identified the most common pre-WWI historic house styles while the other surveyed the available recommendations for incorporating sustainability within historic residences for the best practices in incorporation. Several processes were used to identify, determine, and collect the information necessary to establish and narrow parameters including a review of literature centered on historic district guidelines and National Register nominations from historic districts throughout the state. Data was quantified through the creation of matrixes identifying styles, location, type of growth, topic addressed and others.

Requirements for Inclusion

The guidelines and recommendations selected for use in this study, had to meet some basic parameters which addressed environmental and architectural stewardship, included helpful illustrations, minimized use of negative language towards sustainability, and were available online. These restrictions dramatically limited the number of resources that could be considered as few state, city or local governances have adopted guidelines that meet these criteria.

To identify the topics to address within the homeowner's manual these recommendations were analyzed by the following series of questions:

- Is resource efficiency addressed for the site, light, air, water, and energy?
- Does it address the building components of foundations, walls, windows, doors, roof, and porches?
- Does the document incorporate sustainable technologies like paints, interiors, systems, insulation, alternative energy sources, eco-roofing, and materials?
- What external resources are included like glossaries, government and non-profit institutions, and implementation plans and approaches?
- Do the recommendations include positive language and illustrations?
- What other commonalities exist between the documents?

From the National Register nominations, the architectural styles contained in primarily residential historic districts were charted by county and district then tallied to see which styles were the most prevalent. First though, primarily residential districts had to be identified which was achieved by reviewing the types of building use identified in the NR nomination (See Appendix A). Those that only had commercial or other non-residential structures were discarded. Also districts that had residences that

were no longer used for single or multi-family purposes were discarded. The remaining districts were further narrowed by the following parameters:

- Contain between 50 and 150 resources
- Period of significance starts before 1901
- Represented regions: Mountains, Piedmont, Inner Coastal Plain, and Tidewater
- Represented growth: Town, Urban, Suburban, Rural, Mill, and Resort
- Contain the three most popular styles

When the districts were tallied they showed that the three most common styles represented within the state are Craftsman/Bungalow, Queen Anne and Colonial Revival and their representation within a single district was limited to a few examples within each growth type (see Appendix B). Finally the houses that were selected for photographic analysis all had a pre-WWII construction date to ensure the use of period specific materials and construction techniques. Additionally this limitation focused the study on a time before the rapid expansion of housing within the United States that took place after World War II.

The photographic analysis identified building materials like wood, stone and brick. Additionally, common features – structural, stylistic, and sustainable – were found in the photographs for each style and across styles. These features included roof forms, site orientation, porches, shading features, and other details.

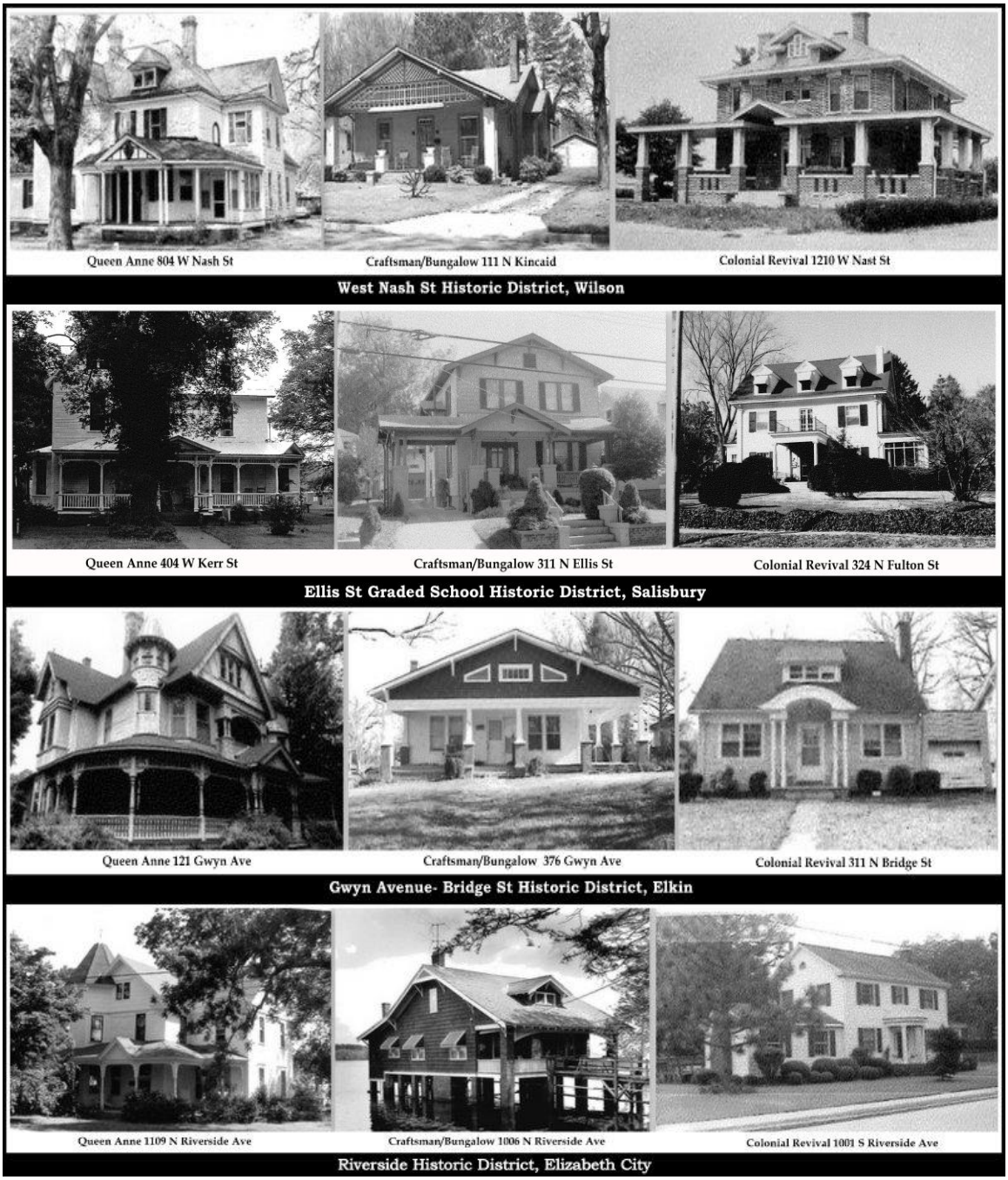

Figure 4. Examples of Historic Districts and Common Styles

The classifications of growth types were identified through an analysis of types of buildings, their functions, density, and location — whether within an urban or rural area — and the type of growth that they represent. This was done to ensure inclusion of a variety of sites, changes in style, and climatic change. Urban districts were the most commonly represented and contained the most resources in the state and therefore an urban district from each region was selected for review. Along with the urban districts an example of suburban, mill, rural, resort, and town districts were selected to account for changes in building elements like porches, and site features. These distinctions helped to establish trends in architecture, for example mill districts commonly apply stylistic elements from the noted styles but, retain the small footprint of mill houses. Similarly resort and suburban districts were developed with a specific purpose in mind, often by a single builder/firm, and therefore often share stylistic elements with other homes in the district.

CHAPTER IV

RESULTS: ANALYSIS

The analysis of National Register districts identified the three common historic architectural styles – Craftsman/Bungalow, Queen Anne, and Colonial Revival – as well as their individual and shared features. The review of literature of recommendations and guidelines established the best practices for addressing sustainability through: resource efficiency, building features, and new technologies and also identified important inclusions and ways to create clarity. Best practices were identified for water, energy, air, and light efficiency; foundations, walls, windows, doors, roofs, and porches; systems, insulation, alternative energy, and materials; and illustrations, language, resources, and assessment tools.

This information was used to understand the inherent efficiency and common features of the three styles and also identified the best ways to incorporate sustainable practices within each of the historic styles. Then the information was combined to create a stewardship manual for owners of historic houses in North Carolina.

Photographic Analysis

Photographs and national register information were selected for ten districts listed in the graph below. These districts cover the state and include four urban districts— one from each region — along with two town districts, and an example of each of the other district types. The chart below shows the districts, their locations, and the addresses of the representative styles. The analysis of photographs from selected districts identified three notable categories: common characteristics, stylistic features, and inherent sustainable features.

West Nash St, Wilson (ICP)	Gywn Avenue-Bridge St, Elkin (M)	Riverside, Elizabeth City (T)	Ellis St Graded School, Salisbury (P)	Kenworth , Hickory (P)	Boone Rd, Eden (P)	Satulah Mountain, Highlands (M)	Central School, Kings Mountain (P)	Columbia (T)	Liberty (P)
804 W Nash	274 Church	737 S Riverside	404 W Kerr	445 2nd Ave	502 Boone Rd	1	119 N Piedmont	506 N Main	227 N Asheboro
606 W Nash	212 Gwyn	1109 S Riverside	501 W Council	439 2nd	400 Boone Rd	28	100 N Piedmont	411 S Martha	605 N Asheboro
901 W Nash	131 Gwyn	1115 S Riverside	525 W Council	505 2nd	429 Boone Rd	35	112 N Piedmont	402 N Bridge	735 N Asheboro
905 W Nash	245 Gwyn	1006 N Riverside	619 W Council	206 5th St	433 Boone Rd	36	118 N Piedmont	404 N Bridge	317 N Asheboro
1003 W Nash	214 Church	747 S Riverside	505 W Council	218 5th St	401 Chestnut	24	206 N Piedmont	410 N Bridge	305 S Fayetteville
1007 W Nash	257 N Bridge	749 S Riverside	511 W Council	232 5th St	411 Chestnut	26	105 N Gaston	606 N Main	301 S Fayetteville
1106 W Nash	305 N Bridge	1207 S Riverside	515 W Council	238 5th St	506 Boone Rd		203 N Piedmont	204 N Water	248 S Fayetteville
1111 W Nash	416 N Bridge	1211 S Riverside	622 W Council	252 5th st	518 Boone Rd		118 N Piedmont	112 N Elm	
1135 W Nash	608 N Bridge	704 E Raleigh	616 W Council	304 5th St	522 Boone Rd		107 E King	114 South Rd	
1301 W Nash	317 N Bridge	708 E Raleigh	522 W Council	316 5th	425 Boone Rd		105 E Ridge	116 South Rd	
111 N Kincaid	411 N Bridge	802 E Raleigh	514 W Council	332 5th st	515 Boone Rd		104 E Ridge	605 S Bridge	
113 N Kincaid	271 Church	806 E Raleigh	214 N Ellis	239 5th St	521 Boone Rd		108 E Ridge	107 N Elm	
116 N Kincaid	354 Gwyn	705 W Raleigh	329 N Ellis	233 5th St	238 Highland Dr				
117 North Ave	376 Gwyn	709 W Raleigh	321 N Ellis	306 3rd Ave					
121 North Ave	430 N Bridge	1103 N Riverside	519 W Council	434 5th St					
107 Lucas Ave	311 N bridge	915 S Riverside	624 W Council						
109 Lucas Ave	401 N Bridge	1001 S Riverside	317 N Fulton						
1200 W Nash	409 N Bridge	1201 S Riverside	324 N Fulton						
1206 W Nash	138 Church	604 E Agawam							
601 W Nash	113 Gwyn								
906 W Nash									
1001 W Nash									
1104 W Nash									
1105 W Nash									
1107 W Nash									
1109 W Nash									
1118 W Nash									
1125 W Nash									
1127 W Nash									
1129 W Nash									
1131 W Nash									
1133 W Nash									
1210 W Nash									
1213 W Nash									
1300 W Nash									
1311 W Nash									
1411 W Nash									
1501 W Nash									
1503 W Nash									

Key

Style	District
Queen Anne	Urban
Craftsman	Suburban
Colonial	Mill
Locations	Resort
(T) Tidewater	Rural
(M) Mountain	Town
(P) Piedmont	
(ICP) Inner Coatal Plain	

Figure 5. Selected Districts and Addresses

Common Characteristics

Common characteristics were found not only for each individual style but also features that crossed styles. Many of these features were added as a way to adjust to the climate of the region and add to the sustainability of historic homes. Common structural features include pitched roof forms like pyramidal, front- or side-gabled, and hipped; brick and wood porch columns; and porches, and *porte-cochères.* Common building features include operable windows, fan and side lights, dormers, clipped gables

and gable vents. Also building materials like stone, brick, wood, stained glass and clear glass were shared across styles. Shared detailing can be seen in railings and balustrades shutters, awnings, and interior features like vernacular floorplans, massing, stairwells, chimneys, shutters and transoms. Shared sustainable features include porches, awnings, shutters, site orientation, and shade trees.

These styles have enough in common between building and structural elements to allow them to be generalized into guidelines for building elements, materials, and features. Yet each style also has elements that are particular to it alone which led to the creation of pages in the guide that identify the stylistic and sustainable features for each.

Craftsman/Bungalow Style

The Craftsman Bungalow style is the most commonly found pre-WWII residential style within the state. This is in part due to the rapid growth and expansion of the time, and in part because the style was similar to vernacular hall-and-parlor and passage plans which were common throughout the state. Also, the large overhanging eaves and deep set porches suited the warm, humid climate of the state.

The photographs revealed exterior detailing ranging from geometrical to oriental to colonial, but usually featured exposed rafter tails, knee braces, and porch columns composed of a low masonry pier and a wooden column. These porch supports however

run the gamut from full length masonry supports that reach to the ground to wooden columns that rest on the porch. Residences ranged from a single-story to two full stories. Along with larger scale came more elaborate decoration and detailing like spindlework in the gables or on the porch, a multi-paned sash over a single-paned sash in the windows, curved decoration between porch supports, and window boxes or balconies. Photographs also revealed that this style commonly incorporated forms from other styles including both Colonial Revival and Queen Anne styles. This was often seen in the patterning of glazing in windows, the incorporation of paired columns, the use of elegant spindlework on porches, and in the incorporation of second story porches.

Figure 6. Selected Bungalow Houses

Some of the features that suited this style to the state are the same ones that make it sustainable. These include large overhanging eaves, open plans with ventilation controls, and deep shaded porches. Other features that add to the inherent sustainability of this style are the use of operable awnings, wood louvered doors, vented dormers, vented basements, and numerous windows.

The large overhanging eaves help shade the home and its fenestration from exposure to the elements. The shading not only reduces heat gain but also helps to protect the structure from moisture problems by channeling water away from the foundation. To further add to the shading of exposed gable ends many homes — especially two-story — added a clipped gable. The style usually incorporated dormers with windows for natural light with vents to allow excess heat to escape. Front gable homes do not often have dormers, but instead have a room above the porch which features vents and windows.

The deep porches further shaded the main body of the house from heat while providing additional living and social space. To further add to the efficiency of this space some homes employed fabric awnings that could be retracted or extended as needed. Many houses also had wooden louvered front doors. Similar to screen doors, they allowed for the home to take advantage of night time cooling and breezes to ventilate the home. The numerous operable windows also help with ventilation and take full advantage of natural light throughout the home.

The compact floorplans also added to the sustainability of the home by requiring less heating and cooling. Many homes also employed interior French doors — often with some glazing — to control ventilation between rooms and as a way to share natural light. Additionally homes often employed built-in cabinetry to maximize the efficiency of

space within the home. While this is true of many historic homes, Craftsman/Bungalow dwellings took it a step further and added built-in dressers, furniture, and other storage spaces.

Queen Anne Style

The Queen Anne style was representative of the new industrial age and construction technologies that allowed for asymmetrical building and elaborates ornamentation. This style was commonly incorporated with vernacular forms, especially L-houses, and can be seen often in windows and on porches. The photographs revealed a drastic change in spatial arrangements. Unlike the previous styles, floor plans were no longer confined to simple rectangles with L– or T–shapes and instead incorporated multiple layers of towers, gables, balconies, wings, and porches. The interior room arrangements also varied from central stair halls and formal rooms, to off-center rectangles with an added tower or bay projection. Similarly porches grew to wrap around facades, incorporate gazebos and porte-cochères, and elaborate spindlework between and around columns.

Other exterior features include steeply pitched roofs of irregular shapes, assorted shingles and other devices to avoid smooth walls such as cut-away bays, cantilevered expansions, false overhangs, recessed upper porches, and decorative detailing. Additionally doublehung windows usually contain a single pane of glass in

each sash, were a single piece of plate glass surrounded by small square panes, or contain stained glass. Contrasting paint was also used to create interest and variation on many exterior features including columns, balustrades, window framing, and other decorative details.

The features that make Queen Anne homes sustainable vary somewhat from Bungalow homes. While these homes also have deep porches, built-in cabinetry, operable windows, and interior ventilation controls they also feature interior shutters, side and transom lights, and perhaps most importantly high ceilings.

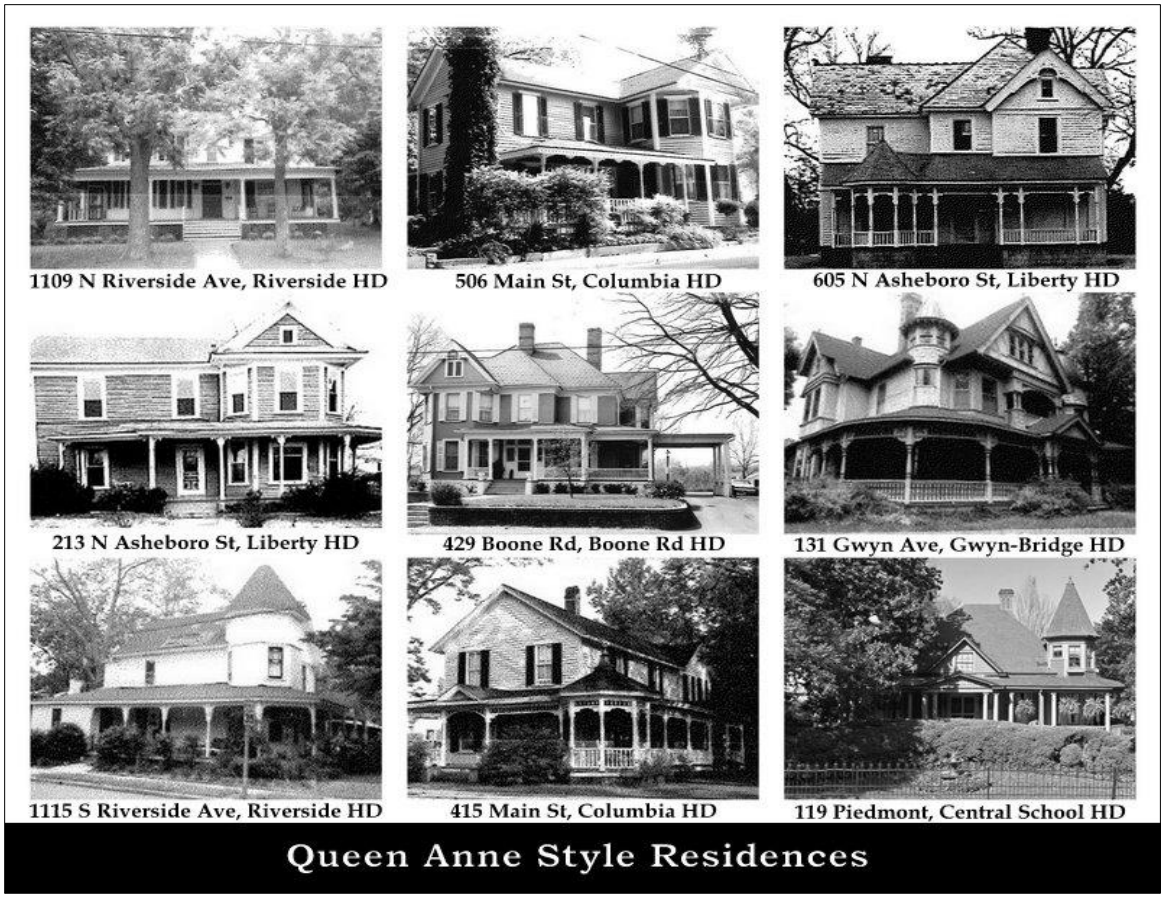

Figure 7. Selected Queen Anne Houses

Queen Anne porches may be some of the most elaborate found in the state. These porches typically wrap-around two or more facades of the building. Some of these incorporate porte-cochères, gazebos with seating, or glazed sections. Queen Anne's often have additional second floor porches around towers, recessed above bays, or projecting from bays. Some go further still and incorporate widows' walks and cupolas. These structures help to shade the main part of the home from excessive heat gains, as well as provide extra living and social spaces.

Photographs revealed that many homes employed operable exterior shutters. These homes also embraced natural light through the use of copious windows, side lights, and transoms to share light in interior spaces. Side lights and transoms were most common at entrances to passageways but interior and window transoms also allowed light to reach further into interior spaces. The relatively high ceilings of Queen Anne homes help to remove heat from the occupied space of the home during hot months because it lets hot air rise above the occupants. In winter months the use of ceiling fans would be used to push warm air back down to occupants.

Colonial Revival Style

The Colonial Revival style was hard to define because it branches off in style to incorporate Federal Revival, Georgian Revival, Dutch Colonial Revival, Cape Cod, and others, as well as being commonly incorporated with Queen Anne and Craftsman bungalow forms. While the state contains some fine high style examples few of these were in the districts investigated. Instead the homes in many districts incorporated Colonial Revival details on Craftsman/Bungalow and Queen Anne forms or in simpler more vernacular approaches like small porticos, or paired columns.

One of the key features of the Colonial Revival house is a central portico of massive order with one-story porches to either side. Additionally the floor plans returned to the vernacular form of a central-passage and often to a double-pile. Other

characteristics to this style were pedimented side bays, paired columns, projecting verandas, dormers, and rectangular massing. Common in North Carolina was the inclusion of a second level porch incorporated with the entrance portico, or continuing around the home.

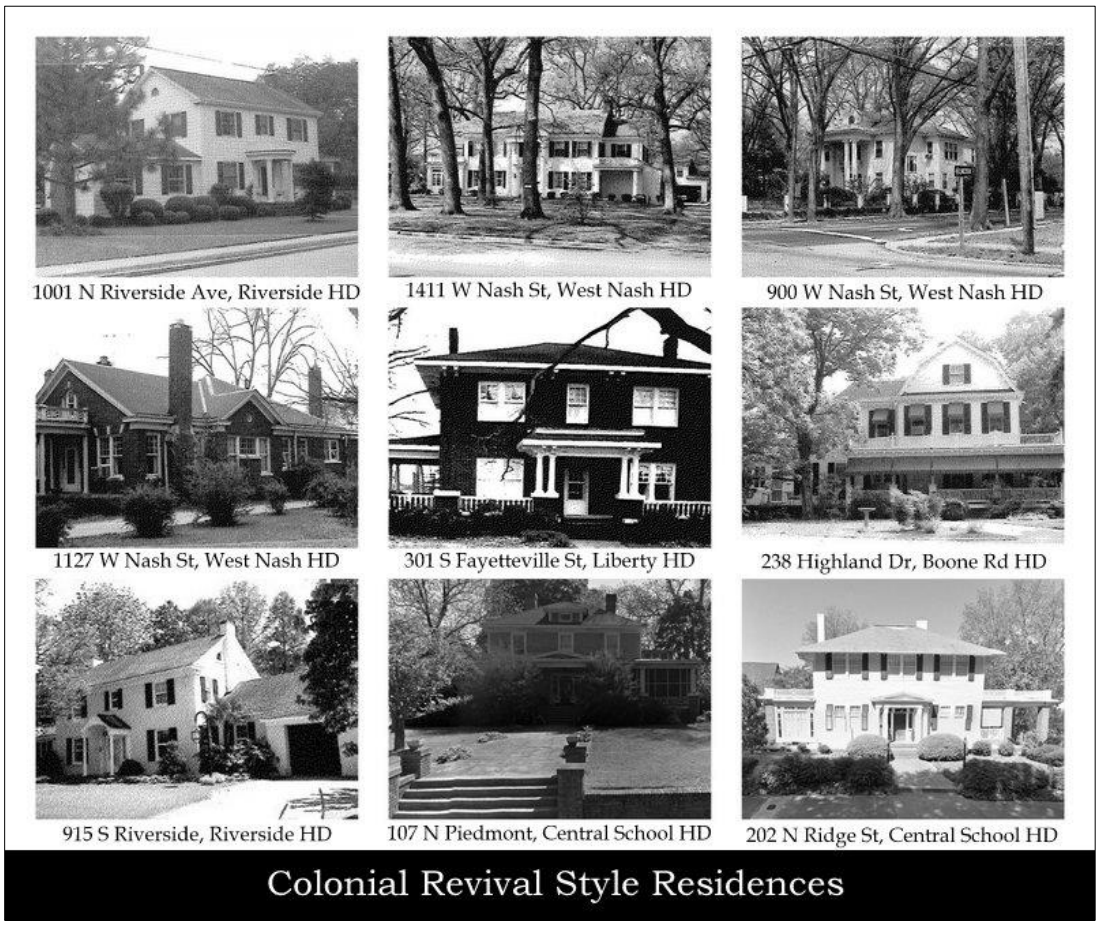

Figure 8. Selected Colonial Revival Houses

Photographs revealed that these homes also feature an accentuated front door with a decorative crown, pilasters, fan/side lights, and portico. Additionally homes are

usually symmetrical, with double-hung, multi-paned sash windows that commonly appear in pairs. These homes also feature roofs with slight overhangs that shade classically detailed cornices with dentils or modillions.

Colonial Revival homes share sustainable features with both Bungalows and Queen Anne homes. Shared sustainable features include the use of operable windows, awnings, shutters, and interior transoms, built-in cabinetry, French door passages, louvered doors, high ceilings, deep porches, and side lights. The Colonial Revival form has other sustainable features like the massive portico, secondary porches, and glazed sunrooms.

While some Revival homes have wrap around porches, the vast majority have a large portico at the main — and sometimes side — entrances. This large pillared structure shades the front façade of the home reducing heat gain. Second story balconies allow for better ventilation and lighting of second floor rooms. Many Colonial Revival homes also feature secondary porches on first floors that are paired with French doors that allow for light to penetrate further into the home. Some homes also incorporated a glazed den or sunroom which can be seen in the Barnes-Bell House in Wilson. Sunrooms were designed to allow inhabitants to enjoy the outdoors in adverse weather but could also be used as a conservatory or greenhouse for growing plants during cold months.

Guideline and Recommendation Analysis

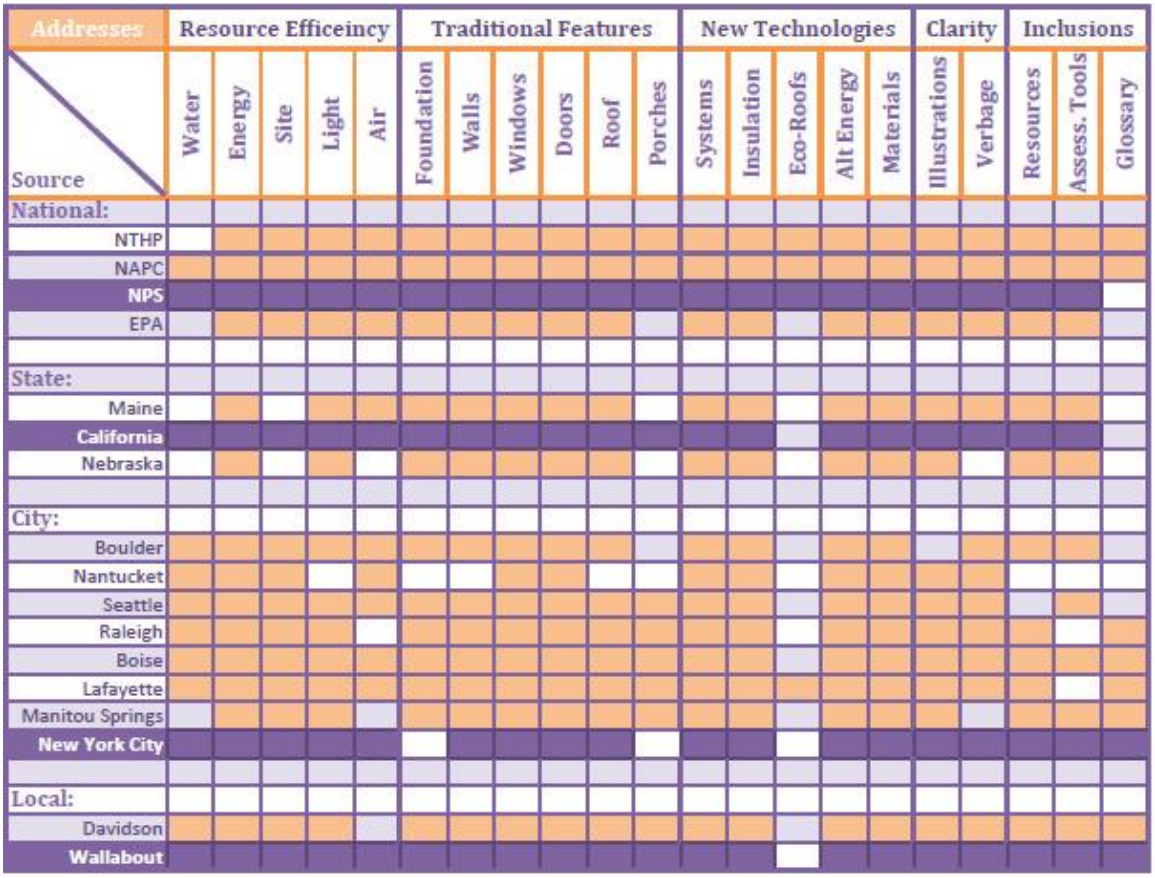

Figure 9. Sustainable Recommendations

Seventeen sources for recommendations and guidelines were selected for use in this analysis (see Appendix C). These included recommendations from:

- Four National Sources
    - Various publications from the National Trust for Historic Preservation, the National Alliance of Preservation Commissions,

the National Park Service, and the Environmental Protection Agency

- Three State Sources
    - Maine: "Guidelines for Improving Energy Efficiency in Historic Buildings"
    - California: "Sustainable Solutions For Historic Houses In Northern California: A Voluntary Green Code & Green Rehabilitation Manual"
    - Nebraska: "Energy Efficiency and Historic Preservation: A Planning Guide for Buildings"
- Eight City Sources
    - Recommendations:
        - Boulder, Colorado: "Making Your Historic Building Efficient"
        - Nantucket, Massachusetts: "Sustainable Preservation"
        - Seattle, Washington: "Green Homes Guide"
        - New York City, New York: "Greening New York City's Historic Buildings: Green Rowhouse Manual"
    - Guidelines:
        - Raleigh, North Carolina: "Design Guidelines for Raleigh Historic Districts"
        - Boise, Idaho: "Design Guidelines for Residential Historic Districts"
        - Lafayette, Indiana: "Design Guide for the City of Lafayette"

        - Manitou Springs, Colorado: “Historic District Design Guidelines”
- Two Local Sources:
    - Davidson, North Carolina: “Davidson Historic District Design Guidelines”
    - Wallabout, Brooklyn, New York: “Wallabout Homeowner’s Preservation Manual”

The national sources were used to provide a baseline for the other recommendations to be built on. The National Park Service provides the most comprehensive source of recommendations. Not only do they provide guidelines for incorporation of sustainability they also provide a wealth of information on maintenance and repair of historic structures. While none of these sources had a glossary many terms were addressed within the text of the documents.

The three state sources provided the first broad incorporations of sustainability on a state level. These did not specifically address styles or sites but gave general information on preservation and resource efficiency. Furthermore, these sources focused almost entirely on resource efficiency, and therefore provide little information on maintenance and repair or identification of historic elements.

More specialized were the recommendations and guidelines being made by local governments and districts, these expounded on the history of the area, explained the

styles found in the districts, addressed identifying areas of structural weakness, and gave advice on maintenance and repair of historic fabric. The eight city initiatives focused on design guidelines with the exceptions of New York City and Boulder. Both of these offered extensive information on sustainability but offered little in the way of maintaining historic features. The two local sources were recommended through preservationists, conferences, and other citations as being the finest examples of local district incorporation set out to specifically address sustainability.

To find the best practices the material was evaluated by asking a series of questions which resulted in the creation of five categories: Efficiency, Building Features, New Technologies, Clarity, and Important Inclusions (see appendix D). There was only a single source that addressed every item in every category: The National Alliance of Preservation Commissions. This is because of the nature of the source — the journal *The Alliance Review* — which advises preservation councils on a number of subjects including guidelines creation and the incorporation of sustainable technologies.

Resource Efficiency

Efficiency can be broken into sections dealing with each resource including: water, energy, light, and air. Water efficiency was addressed in terms of interior fixtures, proper drainage, and site features like landscaping with native plants, incorporating bioswales or rain gardens, and adding rain barrels. None of the national or

state sources addressed interior fixtures in depth. New York City, Seattle, and Boulder were the only cities to address these fixtures in depth while the Wallabout manual briefly discusses them. These recommendations advise that the owners install low-flow fixtures in kitchens and bathrooms as well as, efficient washing machines. Ensuring appropriate drainage to reduce site damage and standing water was addressed by all of the sources except Nebraska and the EPA. The EPA does make recommendations for water management however they are not made within the context of historic preservation. Similarly site features like landscaping, rain barrels, native plantings, and other water management features are discussed by all of the sources except the EPA, Maine, Nebraska, and Wallabout. The State exceptions are most likely due to the type of recommendations as they are focused on energy efficiency and do not address the site.

Energy efficiency is addressed through weatherization, changing personal habits, and inherent sustainability. All of the sources addressed energy efficiency through weatherization by adding weatherstripping, storm windows and doors, and air sealing. Only two of the sources – Seattle and Manitou Springs — do not address inherent sustainability of historic features like maximizing daylighting and natural ventilation. Less commonly addressed were changes to personal habits like lowering thermostats, reducing phantom loads, and preforming seasonal checks. These changes in habits were not addressed by Nebraska, Raleigh, Boise, Manitou Springs, and Davidson.

Light efficiency is addressed in terms of interior, exterior, and daylighting. Daylighting was addressed by all the sources through the retention of openings, skylights, and maximizing its use instead of artificial light. Exterior lighting focused on reducing light pollution and appropriate lighting techniques and was discussed by all of the sources except the EPA, Main, Nebraska, and Nantucket. Interior lighting was the least discussed as only half of the recommendations mentioned lighting values, types of lamps, and lighting applications. The National Trust for Historic Preservation addressed reducing interior lighting on a national level, California and Nebraska on a state level; and Boulder, Nantucket, Seattle, Boise, and New York City on a city level . Neither of the local districts discussed interior lighting in detail.

Indoor air quality was discussed in terms of infiltration and ventilation. All of the sources addressed the reduction of air infiltration as part of energy efficiency strategies. Ensuring appropriate ventilation was advocated by all of the national and state sources however all of the design guidelines (with the exception of Raleigh) fail to address appropriate ventilation as part of indoor health. The cities whose sources were not guidelines (with the exception of Nantucket) all discuss healthy ventilation. Interestingly none of the recommendations discussed the effects of off-gassing from new materials in conjunction with indoor air quality.

One of the best examples of discussing resource efficiency comes from New York City's *Greening Rowhouses* manual which covers all of the resources listed above. This manual explains the issue, and then provides three sections of opportunities to increase the homeowner's efficiency. These sections are low/no, medium, and high cost opportunities. Additionally these sections are followed by related resources, and regulatory considerations for further information.

GREENING NEW YORK CITY'S HISTORIC BUILDINGS GREEN ROWHOUSE MANUAL

PLUMBING & WATER EFFICIENCY

New York City's wastewater treatment system handles 1.3 billion gallons of water every day.

New York City Department of Environmental Protection

While New York has a famously clean and abundant gravity-fed potable water system, the energy intensity of water is growing. Recent federal regulations have required the City to install an ultra-violet (UV) sterilization plant to protect against bioterrorism; this has resulted in a substantial increase in the energy needed in the potable water system. Incorporating efficient plumbing fixtures in your home will minimize water usage which will help reduce consumption and lower your water bills.

Key issues with plumbing and water efficiency in historic buildings

- New York City has long struggled with its combined sewer system that releases partially treated sewage into the rivers during rainfalls of more than 1/20 of an inch. Buildings with leaks, wasteful fixtures, and washing appliances are major contributors to this overflow problem.
- Lead pipes in water lines were banned in New York City buildings in 1961, and lead soldering was banned in 1987. However, the prevalence of original lead piping today is unknown, and some buildings built before 1961 may still have a lead pipe plumbing system.
- Plumbing fixtures, such as toilets and faucets that were installed before 1992 when the US government passed the Energy Policy Act, are likely to be less efficient than current legislation mandates.
- User behavior has a major impact on domestic water consumption. Operational practices can significantly impact a building's water wastage.
- Plumbing in historic buildings that has fallen into disrepair can cause significant water leaks. This is an indoor environmental health quality problem (see the section on Indoor Health, Housekeeping & Materials), as well as a structural problem caused by deterioration in ceilings, walls, and floor materials.

OPPORTUNITIES—LOW/NO COST

50-78% of residential water use occurs in the bathroom.

New York City Department of Environmental Protection

Monitor water use and associated costs

- ***Ensure faucets and fixtures are turned off.*** Eliminate dripping faucets. One faucet that drips 5 times per minute will waste more than 14 gallons of potable water each month. Use the US Geological Survey online calculator (see Resources for web site) to determine how much water your leaky faucets waste over time. If faucets are difficult to turn off completely, it may be time for a new fixture.
- ***Monitor your meter regularly.*** Ensure that water is used efficiently. By reading your water meter and your water bills, you will realize how much water is being used in the house and how much you save once you have implemented some of the opportunities mentioned here.
- ***Alter user behavior to lower water consumption.*** Run water-intensive appliances during off-peak hours, such as after 9pm. Wait until the dishwasher and clothes washer are full before running them. Avoid bathing and running appliances during a rainstorm, so as to limit impact on the sewer system.

Detect potential leaks early on

Routinely check for leaks and reapply caulk around sinks and bathroom fixtures when necessary. Look for signs of water buildup, such as staining, bubbling under paint or wallpaper, and deterioration of wall surfaces. New York City's Department of Environmental Protection (DEP) offers free water leak surveys.

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PLUMBING & WATER EFFICIENCY

REGULATORY CONSIDERATIONS

Landmarks Preservation Commission (LPC) Regulations

If your property is a City landmark or a building in a City historic district

In general, the material in this section is limited to the interior of a building and does not require LPC review. If the work you are proposing requires a DOB permit, and your property is a City landmark or a building in a City historic district, an LPC permit will also be required.

Department of Buildings (DOB) Regulations

Any plumbing work beyond simple repairs and direct replacement of existing fixtures with a same-type fixture, like an existing faucet with a more efficient faucet, requires a plumbing permit. All work must be performed by an New York City- licensed master plumber. For work requiring a permit, the master plumber must apply for and receive a permit prior to the commencement of any work. If the work you are proposing requires a DOB permit, and your property is a City landmark or a building in a City historic district, an LPC permit will also be required.

RESOURCES

US Environmental Protection Agency WaterSense program includes certified fixtures and appliances

www.epa.gov/WaterSense

US Environmental Protection Agency Energy Star program includes rated appliances, including washers

www.energystar.gov

NYC Department of Environmental Protection, on lead in household plumbing for information about what to do if you suspect lead in your water supply

www.nyc.gov/html/dep/html/drinking_water/lead_faq.shtml#A4

NYC Department of Environmental Protection also offers leak detection services and other programs for City water customers

www.nyc.gov/html/dep/html/residents/index.shtml

US Department of the Interior's US Geological Survey, provides an easy calculator for determining how much water your leaking faucet wastes over time

http://ga.water.usgs.gov/edu/wc4.html

NYC Department of Buildings provides a searchable database of licensed plumbers

http://a810-bisweb.nyc.gov/bisweb/LicenseTypeServletV1.for=Y

The Municipal Art Society of New York

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Figure 10. Examples from NYC's Recommendation

Building Features

Building features like foundations, walls, windows, doors and roofs — as well as the materials used in their construction — are the common core of design guidelines.

Foundations were most often addressed in terms of repair. This included addressing cracks, repointing mortar, identifying structural distress and appropriate care techniques. Only Seattle and Nantucket do not address foundation repair. Foundations are also discussed in terms of the material construction however this was done in historic district guidelines and New York City only.

Like foundations, walls were commonly discussed by the materials used in their construction. All of the recommendations discuss the care and maintenance of wood members except for Nantucket which does not address any care or maintenance topics. All of the city guidelines and local sources also addressed masonry walls. New York City was the only city recommendation to discuss masonry, just as Nebraska was the only state. On a national level only the NTHP and NPS discuss masonry walls. Plaster walls are discussed only by the NPS and New York City. This is not surprising because most of the local and city recommendations are historic district guidelines which are directed towards preservation commissions who rarely review changes to interior features.

Windows were the most thoroughly discussed topic as every source advocated the retention, repair, and weatherization of historic windows. Windows were also discussed in terms of their energy saving potential by allowing natural daylight, the lifespan of the original materials and embodied energy by all of the sources except Wallabout. Similarly all of the sources — except Seattle — address doors in term of

historic retention and weatherization of door casings. The importance of door surrounds was not covered as completely. On a national level it is discussed by the National Park service; and on a local level by the cities of Boulder, Raleigh, Boise, and Lafayette, and both local districts.

Roofs were addressed in terms of repair and maintenance by all of the sources (again with the exception of Nantucket). The common construction materials like slate, tile and metal, were discussed less often — only by the NPS, the cities of Raleigh and Manitou Springs, and the Davidson guidelines.

Finally, porches were discussed in terms of their inherent sustainability, repair and maintenance, restoration of lost porches, and the materials/parts used in their construction. California is the only state that discusses the sustainability, repair and materials used in construction of porches. The inherent sustainability of porches is covered by all of the national sources. This information is not incorporated as well on local levels as only Raleigh, Boise and Davidson discuss it. The repair and materials used in construction of porches is discussed more broadly by city and local guidelines as they all incorporate this information. On a national level the only source to not address these concepts is the EPA. The restoration of lost porches is less commonly discussed as only the NTHP and NPS discuss it on a national level, while no states address this concept. On a city level, restoring lost porches is recommended by Boise, Lafayette, and Manitou

Springs. Neither of the local districts stresses restoring lost porches as a way to enhance sustainability.

New Technologies

The incorporation of new sustainable technologies covered new materials, alternative energy sources, eco-roofing options, insulations, and updating systems. Interestingly, eco-roofs are addressed by three of four national sources but only addressed by three city sources — and those do not fully cover the subject. Another interesting pattern occurs in addressing new materials which are consistently addressed on all levels except in the local districts.

The structures interior systems — plumbing, electrical, HVAC, and historic — are not consistently discussed. HVAC systems are discussed by all state and national sources in terms of seasonal care and maintenance, discretion in placement, incorporation without disturbing historic fabric, and air sealing. Similarly the cities of Boulder, Seattle, Lafayette, Manitou Springs, and New York City address all of these concerns. The local district of Davidson also discusses HVAC systems in these terms.

The understanding and use of historic heating systems has been advocated by all national sources except the EPA. This is also true of all of the state recommendations but only half of the city and local sources. Boulder, Seattle, Lafayette, New York City, and Wallabout (along with the other sources) all stress understanding historic systems

in terms of how they operate, their components, and how to care for and maintain them.

Electrical and plumbing systems are the least often discussed. Only the NAPC and NPS discuss updating plumbing and electrical systems through the incorporation of safer materials, low-flow fixtures, and air sealing. The only other sources to discuss these systems are California, Nebraska, Boulder and New York City. Seattle alone discusses updating plumbing systems.

The appropriate addition of insulation to basements, attics, and walls, as well as weatherstripping to windows and doors was discussed by all of the national and state sources except the EPA and Nebraska. Additionally, Boulder, Seattle, Boise, and New York City discuss which areas of the home should be insulated and appropriate materials and R-Values. The EPA, Nebraska, Raleigh, and Davidson do not address the addition of insulation to walls. The Wallabout manual offers general information on insulation types and where they are used however, it does not provide specific advice on what needs to insulated, or where insulation should be installed.

As noted at the beginning of this section eco-roofing options are not discussed by most of the sources. Eco-roofs include extensive and intensive green roofs and white or cool roofs. The only national source to not discuss eco-roofs is the EPA. No state or local sources discuss eco-roofing options and only New York City discusses extensive and

white roofs. Lafayette and Seattle only discuss incorporating extensive white roofs. In the case of many historic residential styles, green roofs are rarely recommended because roof surfaces are highly visible, often inappropriately slanted, and cannot structurally support the additional weight of the roof.

Alternative energy sources include geothermal, wind and solar. Solar power is addressed by every source researched in terms of appropriate incorporation, the use of secondary structures, and standalone photovoltaics. The incorporation of geothermal sources was addressed by all of the national sources as well as Maine and California. Nantucket, Seattle, Boise, New York City and Wallabout also discuss incorporating geothermal sources. Wind turbines are, unsurprisingly, the least often addressed form of alternative energy. The sensitive incorporation of wind turbines is discussed on a national level by all sources except the EPA but they are only incorporated in the recommendations made by Nantucket, Boise, Lafayette, and New York City.

The use of new sustainable, recycled, salvaged, and replacement materials were discussed by most of the sources. On a national level all of these topics were addressed by all sources except the EPA which did not discuss sustainable materials. Similarly all of the states addressed all of these topics except for Nebraska which did not discuss appropriate replacement materials. All of the city districts discuss these topics in similar fashion except for Raleigh which does not include examples of recycled and sustainable

materials. This pattern of integration does not persist to the local level as Davidson only discussed salvaged and replacement materials and Wallabout only covered replacement materials.

Clarity

The clarity of the recommendations was determined by the use of assorted illustrations including diagrams, explanatory images, and architectural styles and through text that embraces sustainability and highlights important information. Illustrations of architectural styles were only found in district guidelines provided by city and local sources. Diagrams and explanatory illustrations were included by every source except Lafayette which did not have diagrams. Similarly, all of the sources take an embracing tone towards sustainability and many sources including the NTHP, NPS, California, Boulder, Boise, Manitou Springs, New York City, and Wallabout highlight sustainability in text through color and style.

Important Inclusions

There were some common inclusions within these documents that can be grouped into resources and assessment tools. Resources included history, external references, and a glossary while assessment tools included energy audits and a whole building approach. All of the sources, except Nebraska and Seattle, give a history of the

area that is discussed in the document. All of the sources provide external resources to institutions like the NPS and NTHP. Additionally the NTHP, NAPC, and all of the city and local districts (except Seattle) provide glossaries for technical terms and further edification. Finally, an energy audit was recommended by every source except Davidson and Nantucket. The whole building approach was not incorporated by district guidelines but was advised by the NPS and NAPC as well as Nebraska and California, and the cities of Boulder, Seattle, and New York City.

Best Practices

From the analysis of material the best practices for addressing sustainability within a historic context were derived. These were selected by identifying those practices that were incorporated by at least half of the sources. This included addressing:

- Water Efficiency:
    - Ensuring appropriate drainage through investigation, maintenance, and repair of gutters, foundations, structural elements, and the surrounding site
    - Adding site features like rain barrels, bioswales, rain gardens, and landscaping with native plants, along with using grey water in gardening

- Energy Efficiency:
    - Weatherizing the home through the addition of weatherstripping, insulation, and interior and exterior storm windows, the maintenance and repair of structural fabric, and the undertaking of an energy audit
    - Adjusting personal habits like lowering thermostats, dressing for the weather, reducing phantom loads, installing timers, performing seasonal checks, and taking advantage of natural sources
    - Explaining how to maximize the use of inherent sustainable features for lighting and ventilation
- Light Efficiency:
    - For interior lighting, maximizing daylight and installing efficient lamps in conjunction with task lights, timers, and dimmers
    - For exterior lighting, limiting pollution by sensitively lighting features, installing timers, and incorporating solar technologies
    - Maximizing daylight through the use of historic glazing and spatial patterns

- Air Efficiency:
    - Minimizing infiltration of air, especially from damp areas, by identifying sources of leakage like structural penetrations, vents, and ducts, and installing insulation
    - Ensuring appropriate ventilation through the use of vents, changing register filters, using louvered shutters and screens to take advantage of cool breezes and ceiling fans and draft snakes to control air movement in the home
- Foundations:
    - Maintaining, repairing, and investigating materials for common problem areas like infiltration of moisture and air
- Walls:
    - Maintaining and repairing wooden and masonry elements and investigating common problems like failing paint or mortar and deterioration from natural elements
- Windows:
    - Stressing the retention and repair of historic windows over replacement
    - Providing information on repair of historic window elements like reglazing

    - Weatherizing windows through the addition of weatherstripping, interior and exterior storm windows, or glazing film
- Doors:
    - Addressing the retention of historic entrances and surrounds as well as interior doors to control air flow
    - Adding weatherstripping to entrances to stop infiltration of air
- Roof:
    - Maintaining, repairing, and investigating materials for common problem areas like infiltration of moisture and structural distress
- Porches:
    - Specifically addressing the sustainability added by porches as shading devices and extra living space
    - Maintaining, repairing, and investigating materials for common problem areas like loose members, damage by insects, and the replacement of missing elements
- Systems:
    - Addressing screening external HVAC components and maintaining internal components to ensure maximum efficiency
    - Providing information on the maintenance and use of historic heating and cooling systems before upgrading to a new system

- Insulation:
    - Adding insulation to basements and attics before considering wall insulation and providing information on available types of insulation
    - Encouraging the use of weatherstripping before replacement of historic elements like windows and doors
- Alternative Energy:
    - Encouraging the addition of solar panels to secondary roof areas, ancillary buildings, or in freestanding arrangements and stressing the importance of appropriate siting for maximum efficiency
    - Addressing the addition of geothermal units for heating and cooling as they are minimally invasive and provide consistent temperatures
- Materials:
    - Encouraging the use of recycled, renewable, and salvaged materials as a way to minimize waste and maximize resource efficiency
    - Addressing replacement of historic materials that are not salvageable or are missing with similar materials that match the damaged or missing element

- Illustrations:
    - Using explanatory illustrations to identify features and problems commonly associated with historic resources including style references, areas of deterioration, and materials
    - Using diagrams to identify elements within a whole, and clarifying more difficult concepts
- Language:
    - Highlighting sustainable and important terms and ideas to provide clarification as well as catch the reader's attention
    - Developing a friendly and embracing tone towards preservation and sustainability
- Resources:
    - Including references like area history, external sources of guidance and assistance, and a glossary of terms for further edification and context
- Assessment Tools:
    - Encouraging homeowners to perform a home energy audit on their own or with the help of a professional to identify areas of inefficiency

There were some topics that were not addressed by the best practices; however the researcher felt they were important inclusions for incorporating sustainability within historic structures. These included: low-flow fixtures, architectural metals, updating plumbing and electrical systems, eco-roofs, and a taking a whole-building approach.

Additionally, given the nature of the research, imagery for each of the common styles was covered along with sustainable features.

Final Product

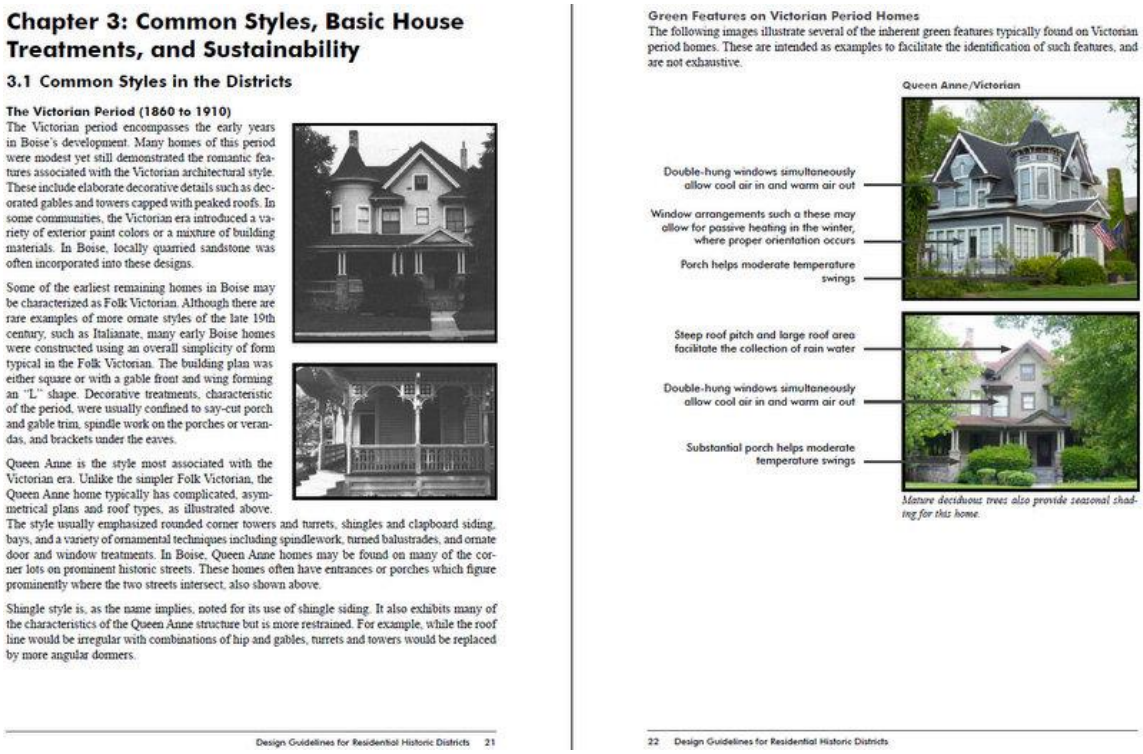
The final product was the creation of a manual that was produced in conjunction with this thesis, which incorporated the three common styles of traditional residences in North Carolina with the best practices derived from the recommendations. This included identifying the styles and their characteristics, along with the maintenance and repair necessitated by specific features and materials, and the incorporation of sustainable features and resources for further edification. These ideas are broken into four chapters that create the homeowner's manual: History; Architecture; Sustainability, Maintenance, and Care; and Resources.

The incorporation of an area's history helps to provide historic context, which includes information on how the area developed, the styles found within the district, historical associations, and other pertinent information. This was replicated in the manual by covering a brief history of the state, incorporating a timeline of events with

illustrations, identifying the four regions of the state, and the types of growth that it has experienced.

The architecture chapter featured a combination of ideas and illustrations from the Wallabout and Boise guidelines. Wallabout's illustrations identify the various parts of the buildings by highlighting and explaining their purpose. On the other hand, Boise's illustrations identify green features and their operations, but not other character-defining features. Boise's guidelines — unlike Wallabout's — combine a history of each style with information on features that make each one sustainable.

Figure 11. Examples from Wallabout's Manual



Chapter 3: Common Styles, Basic House Treatments, and Sustainability

3.1 Common Styles in the Districts

The Victorian Period (1860 to 1910)

The Victorian period encompasses the early years in Boise's development. Many homes of this period were modest yet still demonstrated the romantic features associated with the Victorian architectural style. These include elaborate decorative details such as decorated gables and towers capped with peaked roofs. In some communities, the Victorian era introduced a variety of exterior paint colors or a mixture of building materials. In Boise, locally quarried sandstone was often incorporated into these designs.

Some of the earliest remaining homes in Boise may be characterized as Folk Victorian. Although there are rare examples of more ornate styles of the late 19th century, such as Italianate, many early Boise homes were constructed using an overall simplicity of form typical in the Folk Victorian. The building plan was either square or with a gable front and wing forming an "L" shape. Decorative treatments, characteristic of the period, were usually confined to say-cut porch and gable trim, spindle work on the porches or verandas, and brackets under the eaves.

Queen Anne is the style most associated with the Victorian era. Unlike the simpler Folk Victorian, the Queen Anne home typically has complicated, asymmetrical plans and roof types, as illustrated above. The style usually emphasized rounded corner towers and turrets, shingles and clapboard siding, bays, and a variety of ornamental techniques including spindlework, turned balustrades, and ornate door and window treatments. In Boise, Queen Anne homes may be found on many of the corner lots on prominent historic streets. These homes often have entrances or porches which figure prominently where the two streets intersect, also shown above.

Shingle style is, as the name implies, noted for its use of shingle siding. It also exhibits many of the characteristics of the Queen Anne structure but is more restrained. For example, while the roof line would be irregular with combinations of hip and gables, turrets and towers would be replaced by more angular dormers.

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Green Features on Victorian Period Homes

The following images illustrate several of the inherent green features typically found on Victorian period homes. These are intended as examples to facilitate the identification of such features, and are not exhaustive.

Queen Anne/Victorian

Double-hung windows simultaneously allow cool air in and warm air out

Window arrangements such a these may allow for passive heating in the winter, where proper orientation occurs

Porch helps moderate temperature swings

Steep roof pitch and large roof area facilitate the collection of rain water

Double-hung windows simultaneously allow cool air in and warm air out

Substantial porch helps moderate temperature swings

Mature deciduous trees also provide seasonal shading for this home.

22 Design Guidelines for Residential Historic Districts

Figure 12. Example from Boise's Design Guidelines

For the homeowner's manual created for this thesis the ideas from these guidelines were combined. Each style is illustrated with house types ranging from vernacular to high style. The identifiable features of the style are highlighted on a large image and color coded, with sustainable features indicated in green. Additionally the information on the style, its popularity within the state, and its sustainable features are included.

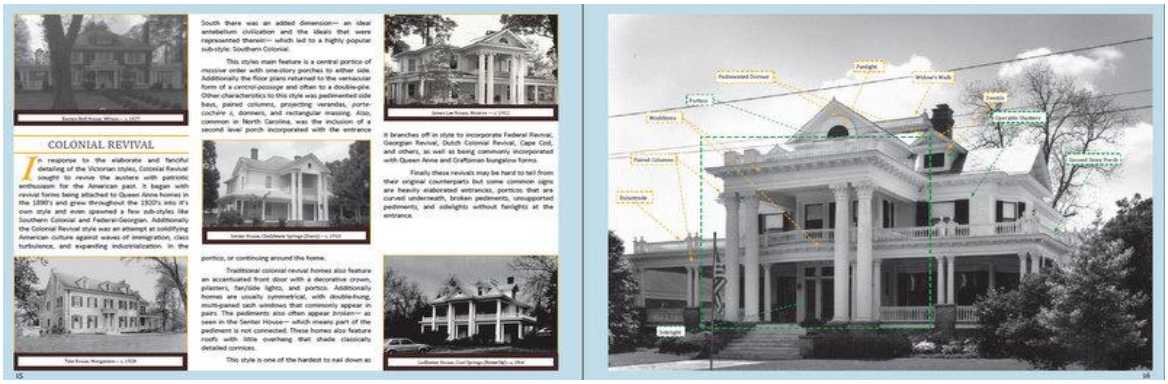

Figure 13. Example from my Guide Showing Sustainable and Common Features

While sustainability is incorporated throughout the manual, it is expressly addressed in the third chapter on Sustainability, Maintenance, and Care. This chapter contains similar information to the other city and local guidelines, which identify common materials, features, and other sustainability information. Similar to the Lafayette guidelines, the manual establishes guidelines in a bulleted format that focus on positive ways to maintain and repair the structure. Additionally this chapter includes information on how to undertake a whole building approach with checklists, owner rituals for increasing efficiency, and information on the Secretary of the Interior's Standards and how to apply the suggested treatments for preservation.

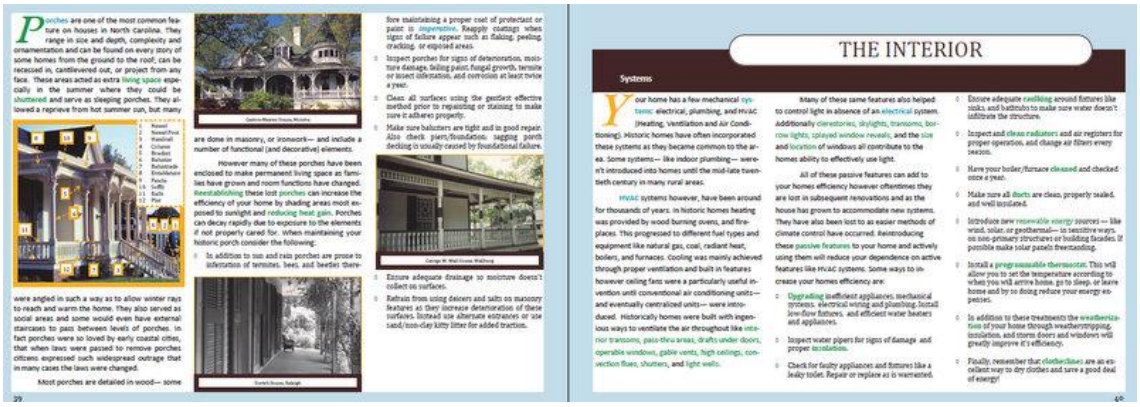

Figure 14. Example from my Guide Highlighting Clarity Through Diagrams, Illustrations and Colored Text

The manual covers materials like architectural metals, wood, masonry, stone, and paints. Additionally it addresses exterior features like porches, windows, and doors and interior features like historic painting techniques; various home systems like HVAC, electrical, and plumbing; and architectural details. This section also covers the site and its features, such as shade trees, drought-resistant plantings, storm water management, and the use of native species, which provide wildlife habitat. Finally, there is some general information on appropriate additions to historic homes.

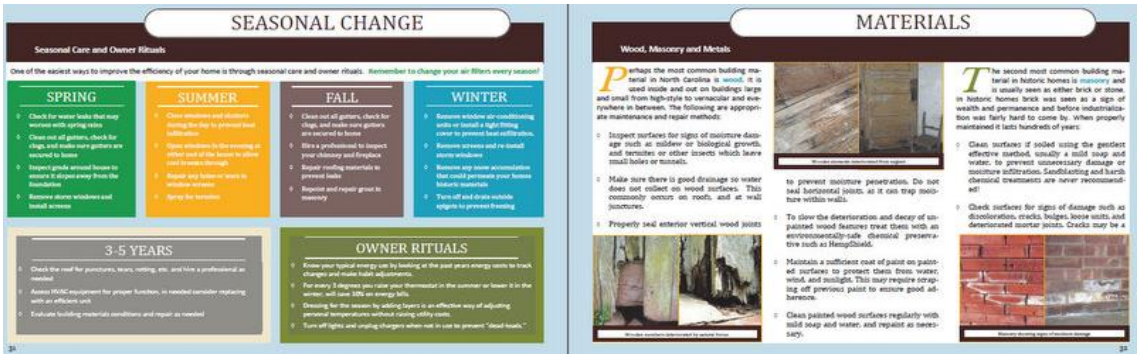

Figure 15. Example from my Guide Showing Personal Habits and Materials

Lastly the homeowner's manual provides additional resources on a state and federal level as well as a glossary defining many of the terms that the homeowner may come across. The federal resources include links to the National Park Service's Preservation Briefs and the Technical Preservation Service's Tech Notes, which provide further information on how to maintain and preserve historic features. Other resources included are the National Trust for Historic Preservation and the Environmental Protection Agency. State resources include the State Historic Preservation Office and Preservation North Carolina, which provide more information for North Carolina residents' on National Register information, services and professionals in preservation, and other issues.

CHAPTER V

CONCLUSIONS

On a national level preservation has grown to widely incorporate principles of sustainability with architectural stewardship and this trend is gaining acceptance in local historic district guidelines. While there are thousands of National Register historic districts, only a small percentage of these have local guidelines to help homeowners understand and apply the Secretary of the Interior's Standards to their home improvement projects. Even fewer guidelines provide information on incorporating sustainability. Additionally only a few of these provide information on the inherent sustainability of historic features. With the manual created in conjunction with this investigation, hundreds of owners of historic home in North Carolina will be able to gain a thorough understanding of how to incorporate sustainable practices in their homes through maintenance, repair, new technologies, and traditional features. In addition to the creation of the manual, the analysis on styles and recommendations covered in the previous chapters also led to the realization of other trends, challenges faced while researching, and ideas for future research.

Trends in Data

Through the research process, there were a few trends that became evident in historic building materials, the incorporation of sustainability, and variations in recommendations by type. Building materials varied little across the state but field stone was more common in the Piedmont and mountain regions than the inner coastal plain and Tidewater regions. This is likely due to the proliferation of stone west of the state's fall line. Similarly, while brick was a common construction material in Colonial Revival homes it was less frequently seen on Queen Anne structures. Wood was the most common material across all styles, as it was used inside and out, from structural members to stylistic details.

The incorporation of sustainability not only showed trends in information that were being addressed on a local level, but also what was not being addressed. The most evident trend is that the replacement of inefficient water fixtures is rarely recommended even though this is a common approach in many renovation projects. Additionally interior lighting is commonly overlooked; however this is likely due to the types of recommendations that were considered here. Similarly, as this investigation was on residential structures it is not surprising that few of the recommendations included information on green roofs as these are more often seen on large multifamily residential or commercial structures.

In conjunction with incorporating sustainability, other trends were identified regarding informational sources. Recommendations made through historic district guidelines featured more information on area history, imagery and styles, and maintenance and repair information. These sources also often did not address interior concerns like electrical and plumbing repairs or upgrades. Recommendations made by cities or districts that were not presented as guidelines tended to feature more information on interiors, but offered less information on repair and maintenance.

Challenges

Challenges were present while analyzing both the National Register information and the recommendations and initiatives. There were some setbacks in the analytical process due to the public nature of National Register documentation. This included missing files, photographs, and interior surveys for every district. One setback was that due to the age of many of the resources, some photographs were no longer available or legible and could therefore not be researched. Common features for interiors of these styles could not be deduced because often there was no photographic evidence of the interiors. For the manual, other resources such as *North Carolina Architecture* by Catherine Bishir were needed to identify common interior features of these styles. Colonial Revival forms were the most challenging to identify. This was due to National

Register documentation not clarifying between subtypes such as Dutch or Southern Colonial Revival in earlier nominations.

Some of the challenges that were encountered included a lack of information provided, differences in sources, and the difficulty of comparing sources because of these challenges. Some sources, like the Maine recommendation, focus solely on energy efficiency and while they frame the information around a historic preservation context, they do not go into detail about maintenance and repair of historic materials. Nebraska, on the other hand, generalizes much of its information to be applicable to commercial, residential, and vacant structures.

Similarly sources varied wildly from one to another. The City of Louisville, Kentucky, provided a short two-page brochure while Boulder, Colorado, provides two appendices that cover every room and aspect therein. On a national level, the NAPC recommendations were in the form of a journal and aimed at professionals, while the rest of the recommendations were aimed at homeowners and officials. These other recommendations were usually in the form of guidelines, or a small book.

Future Research

There are many opportunities available for future research on this subject. The concepts applied here could be developed specifically for various other historic styles. Similarly other states could develop guidelines to help residents in National Register

Historic Districts. Additionally, these same concepts could be applied outside of historic districts as they provide general information based on styles to homeowners. Commercial areas provide an excellent opportunity for future research as many of the new sustainable technologies may work more efficiently on a grander scale. Also these structures address other inherent technologies, such as dense walls and splayed windows that were not researched here. Finally future research may include variations of styles due to climactic change and could be possible for specific regions.

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APPENDIX A

PRIMARILY RESIDENTIAL DISTRICTS

Name	County	Type	Years	Buildings	Region
Hope Mills	Cumberland	Mill	1830-1930	74	Inner Coastal
Rocky Mount Mill Village	Nash	Mill	1835-1948	110	Inner Coastal
Black Creek Rural	Wilson	Rural	1787-1855	23	Inner Coastal
Conoho Creek	Martin	Rural	1810-1947	90	Inner Coastal
Renston Rural	Pitt	Rural	1890-1953	120	Inner Coastal
Woodville	Bertie	Rural	1801-1927	39	Inner Coastal
Lincoln Park	Edgecombe	Suburb	1948-1953	86	Inner Coastal
West Haven	Nash	Suburb	1928-1952	183	Inner Coastal
Ayden	Pitt	Town	1890-1944	325	Inner Coastal
Benson	Johnston	Town	1887-1930	149	Inner Coastal
Clayton	Johnston	Town	1850-1959	274	Inner Coastal
Elm City Municipal	Wilson	Town	1873-1930	118	Inner Coastal
Faison	Duplin	Town	1840-1943	119	Inner Coastal
Hamilton	Martin	Town	1800-1950	123	Inner Coastal
Harrellsville	Hertford	Town	1811-1945	80	Inner Coastal
Haymont	Cumberland	Town	1817-1957	60	Inner Coastal
LaGrange	Lenoir	Town	1858-1950	226	Inner Coastal
Lucama	Wilson	Town	1887-1930	65	Inner Coastal
Maxton	Robeson	Town	1884-1948	49	Inner Coastal
Mount Olive	Wayne	Town	1838-1949	472	Inner Coastal
Murfreesboro	Hertford	Town	1747-1850	40	Inner Coastal
Nashville	Nash	Town	1830-1937	145	Inner Coastal
Raeford	Hoke	Town	1897-1956	50	Inner Coastal
Roanoke Rapids	Halifax	Town	1894-1948	1163	Inner Coastal
Rocky Mount Central City	Edgecombe	Town	1877-1930	222	Inner Coastal
Seaboard	Northampton	Town	1874-1955	112	Inner Coastal
Snow Hill	Greene	Town	1850-1955	224	Inner Coastal
Spring Hope	Nash	Town	1880-1930	161	Inner Coastal
Tarboro	Edgecombe	Town	1760-1950	576	Inner Coastal

Town of Halifax	Halifax	Town	1783-1961	120	Inner Coastal
Weldon	Halifax	Town	1830-1946	268	Inner Coastal
Williamston	Martin	Town	1800-1950	398	Inner Coastal
Windsor	Bertie	Town	1790-1941	168	Inner Coastal
Broad-Kenan	Wilson	Urban	1850-1930	293	Inner Coastal
Brooklyn	Johnston	Urban	1870-1950	106	Inner Coastal
College Street	Sampson	Urban	1839-1936	29	Inner Coastal
College View	Pitt	Urban	1909-1941	343	Inner Coastal
East Wilson	Wilson	Urban	1890-1941	868	Inner Coastal
Edgemont	Edgecombe	Urban	1915-1945	145	Inner Coastal
Falls Road	Nash	Urban	1900-1950	100	Inner Coastal
Hill Grainger	Lenoir	Urban	1900-1941	207	Inner Coastal
Mitchelltown	Lenoir	Urban	1885-1941	235	Inner Coastal
North Smithfield	Johnston	Urban	1850-1950	124	Inner Coastal
Old Wilson	Wilson	Urban	1770-1940	361	Inner Coastal
Skinnerville-Greenville Heights	Pitt	Urban	1845-1955	284	Inner Coastal
Villa Place	Nash	Urban	1900-1950	322	Inner Coastal
West Main-North Chestnutt	Sampson	Urban	1830-1930	58	Inner Coastal
West Nash Street	***Wilson***	***Urban***	***1770-1940***	***99***	***Inner Coastal***
West Selma	Johnston	Urban	1880-1961	221	Inner Coastal
Alexander Manufacturing Co	Rutherford	Mill	1918-1956	87	Mountain
Green Park	Watauga	Resort	1891-1944	53	Mountain
Satulah Mountain	***Macon***	***Resort***	***1885-1945***	***50***	***Mountain***
Cowee-West's Mill	Macon	Rural	600-1954	68	Mountain
Druid Hills	**Henderson**	**Rural**	**1923-1945**	**76**	**Mountain**
Flat Rock	Henderson	Rural	1800	29	Mountain
Highlands North	Macon	Rural	1883-1961	27	Mountain
Penland School	Mitchell	Rural	1905-1953	47	Mountain
Playmore-Bowery	Macon	Rural	1879-1951	30	Mountain
South Montreat Rd	Buncombe	Rural	1900-1960	34	Mountain
Dougherty Heights	Buncombe	Suburb	1897-1960	54	Mountain
Grove Park	Buncombe	Suburb	1908-1938	229	Mountain

Hyman Heights	Henderson	Suburb	1905-1954	123	Mountain
Norwood Park	Buncombe	Suburb	1900-1930	155	Mountain
West Side	Henderson	Suburb	1860-1951	352	Mountain
Bald Creek	Yancey	Town	1900-1958	23	Mountain
Elkin Downtown	Surry	Town	1855-1950	53	Mountain
Hot Springs	Madison	Town	1890-1956	16	Mountain
Marshall	Madison	Town	1849-1957	42	Mountain
Mount Airy	Surry	Town	1880-1920	240	Mountain
Traphill	Wilkes	Town	1897-1921	12	Mountain
Valle Crucis	Watauga	Town	1812-1954	81	Mountain
Avery Avenue	Burke	Urban	1875-1935	97	Mountain
Chestnut Hill	Buncombe	Urban	1865-1929	264	Mountain
Clingman Avenue	Buncombe	Urban	1896-1949	33	Mountain
Cold Spring Park	Henderson	Urban	1910-1953	38	Mountain
East Main	Rutherford	Urban	1900-1955	119	Mountain
East Main Street	Tansylvania	Urban	1900-1959	27	Mountain
Gywn Avenue-Bridge St	***Surry***	***Urban***	***1891-1955***	***125***	***Mountain***
Jonesboro	Burke	Urban	1895-1935	37	Mountain
Lenox Park	Henderson	Urban	1908-1952	43	Mountain
Montford Area	Buncombe	Urban	1880-1929	600+	Mountain
N. Green - Bouchelle St	Burke	Urban	1876-1936	33	Mountain
Proximity Park	Buncombe	Urban	1900-1930	96	Mountain
Spread Out	Haywood	Urban	1895-1958	67	Mountain
W. Union Street	Burke	Urban	1815-1940	48	Mountain
West Main Street	Rutherford	Urban	1867-1958	30	Mountain
Alamance Mill Village	Alamance	Mill	1840-1947	19	Piedmont
Bellemont Mill Village	Alamance	Mill	1879-1880	24	Piedmont
Boone Road	***Rockingham***	***Mill***	***1895-1935***	***50***	***Piedmont***
Durham Cotton Mill Village	Durham	Mill	1880	15	Piedmont
Erlanger Mill Village	Davidson	Mill	1913-1953	289	Piedmont
Glen Royall	Wake	Mill	1900-1949	83	Piedmont
Glencoe Mill Village	Alamance	Mill	1880-1882	53	Piedmont
Golden Belt	Durham	Mill	1901	113	Piedmont
Keseler/ Cannon Mills	Rowan	Mill	1895-1928	108	Piedmont

Lakeside Mills	Alamance	Mill	1892-1893	18	Piedmont
Loray Mill	Gaston	Mill	1900-1955	414	Piedmont
Margrace Mill Village	Cleveland	Mill	1919-1956	56	Piedmont
McAdenville	Gaston	Mill	1884-1961	102	Piedmont
North Charlotte	Mecklenburg	Mill	1903-1939	438	Piedmont
Pearl Mill Village	Durham	Mill	1905-1924	26	Piedmont
Pineville Mill Village	Mecklenburg	Mill	1900-1961	78	Piedmont
Spray Industrial	Rockingham	Mill	1810-1930	94	Piedmont
Thomas F Lloyd	Orange	Mill	1910-1915	30	Piedmont
White Oak New Town	Guilford	Mill	1920-1941	164	Piedmont
Lakeview	Moore	Resort	1903-1940	50	Piedmont
Pinehurst	Moore	Resort	1895-1948	462	Piedmont
Bethabara	Forsyth	Rural	1753	39	Piedmont
Bethania	Forsyth	Rural	1759-1940	81	Piedmont
Cedar Grove Rural Crossroads	Orange	Rural	1800-1947	60	Piedmont
Central School	***Cleveland***	***Rural***	***1870-1950***	***56***	***Piedmont***
Green Level	Wake	Rural	1900-1945	36	Piedmont
Knox Farm	Rowan	Rural	1708-1926	33	Piedmont
Laboratory	Lincoln	Rural	1884-1953	22	Piedmont
Livingstone College	Rowan	Rural	1884-1950	23	Piedmont
Mount Vernon	Chatham	Rural	1885-1920	33	Piedmont
Murray's Mill	Catawba	Rural	1800-1940	25	Piedmont
New Hill	Wake	Rural	1860-1950	62	Piedmont
Richardson Houses	Rockingham	Rural	1840-1930	22	Piedmont
Salisbury Street	Davie	Rural	1828-1940	40	Piedmont
Walnut Hill	Wake	Rural	1860-1952	31	Piedmont
Yadkin College	Davidson	Rural	1856-1924	47	Piedmont
Ardmore	Forsyth	Suburb	1910-1956	2095	Piedmont
Battery Heights	Wake	Suburb	1956-1964	18	Piedmont
Beverly Hills	**Alamance**	**Suburb**	**1919-1959**	**192**	**Piedmont**
Dilworth	Mecklenburg	Suburb	1891-1941	1025	Piedmont
East Marion-Belvedere	Cleveland	Suburb	1921-1951	123	Piedmont
Elizabeth	Mecklenburg	Suburb	1900-1941	893	Piedmont

Fischer Park	Guilford	Suburb	1889-1941	590	Piedmont
Forest Hills	Durham	Suburb	1923-1955	319	Piedmont
Fulton Heights	Rowan	Suburb	1903-1948	442	Piedmont
Gimghoul Neighborhood	Orange	Suburb	1924-1942	43	Piedmont
Glenwood	Wake	Suburb	1906-1937	168	Piedmont
Hi-Mount	Wake	Suburb	1938-1954	169	Piedmont
Hope Valley	Durham	Suburb	1926-1959	84	Piedmont
Irving Park	Guilford	Suburb	1911-1941	173	Piedmont
Kenworth	***Catawba***	***Suburb***	***1900-1940***	***54***	***Piedmont***
Linden Avenue	Wake	Suburb	1907-1930	17	Piedmont
Longview Gardens	Wake	Suburb	1938-1965	194	Piedmont
Madonna Acres	Wake	Suburb	1960-1965	36	Piedmont
Myers Park	Mecklenburg	Suburb	1911-1961	958	Piedmont
North Durham-Duke Park	Durham	Suburb	1880-1930	262	Piedmont
Pharrsdale	Mecklenburg	Suburb	1926-1951	231	Piedmont
Reynoldstown	Forsyth	Suburb	1919-1949	184	Piedmont
Rochester Heights	Wake	Suburb	1957-1964	138	Piedmont
Rocky Ridge	Orange	Suburb	1928-1960	69	Piedmont
Sherrod Park	Guilford	Suburb	1926-1941	74	Piedmont
Washington Park	Forsyth	Suburb	1891-1941	353	Piedmont
Waughntown-Belview	Forsyth	Suburb	1816-1955	1140	Piedmont
Waxhaw-Weddington Roads	Union	Suburb	1897-1938	21	Piedmont
Wesley Heights	Mecklenburg	Suburb	1911-1945	372	Piedmont
West End	Cleveland	Suburb	1882-1955	101	Piedmont
West End	Forsyth	Suburb	1887-1930	610	Piedmont
Aberdeen	Moore	Town	1875-1941	149	Piedmont
Apex	Wake	Town	1870-1944		Piedmont
Badin	Stanly	Town	1917-1950	454	Piedmont
Belmont	Gaston	Town	1873-1946	268	Piedmont
Cameron	Moore	Town	1880-1941	50	Piedmont
Carpenter	Wake	Town	1890-1945	75	Piedmont
Cary	Wake	Town	1890-1945	39	Piedmont
Catawba	Catawba	Town	1870-1930	75	Piedmont

Central Leaksville	Rockingham	Town	1815-1935	104	Piedmont
Central Shelby	Cleveland	Town	1850-1952	183	Piedmont
Danbury	Stokes	Town	1860-1950	71	Piedmont
Davidson	Mecklenburg	Town	1837-1959	401	Piedmont
Downtown Garner	Wake	Town	1870-1940	63	Piedmont
Farmington	Davie	Town	1850-1960	92	Piedmont
Franklinville	Randolph	Town	1900	140	Piedmont
Hillsborough	Orange	Town	1860-1950	82+	Piedmont
King	Stokes	Town	1890-1952	73	Piedmont
Liberty	***Randolph***	***Town***	***1880-1950***	***50***	***Piedmont***
Louisburg	Franklin	Town	1779-1936	212	Piedmont
Mooresville	Iredell	Town	1800-1950	83	Piedmont
Mount Gilead	Montgomery	Town	1900-1955	30	Piedmont
Mount Pleasant	Cabarrus	Town	1840-1935	184	Piedmont
Oxford	Granville	Town	1764-1937	206	Piedmont
Pittsboro	Chatham	Town	1787-1950	135	Piedmont
Reidsville	Rockingham	Town	1865-1941	373	Piedmont
Rockingham	Richmond	Town	1838-1922	236	Piedmont
Southern Pines	Moore	Town	1883-1941	495	Piedmont
Spencer	Rowan	Town	1897-1940	322	Piedmont
Summerfield	Guilford	Town	1836-1955	35	Piedmont
Terrell	Catawba	Town	1880-1930	15	Piedmont
Town of Milton	Caswell	Town	1800's		Piedmont
Wake Forest	Wake	Town	1820-1953	251	Piedmont
Warrenton	Warren	Town	1840-1860	327	Piedmont
Waxhaw	Union	Town		97	Piedmont
Whitsett	Guilford	Town	1894-1930	45	Piedmont
Academy Hill	Iredell	Urban	1874-1915	45	Piedmont
Bloomsburg	Wake	Urban	1914-1952	439	Piedmont
Boylan Heights	Wake	Urban	1907-1940	280	Piedmont
Brooklyn South	Rowan	Urban	1840-1930	88	Piedmont
Burch Avenue	Durham	Urban	1890-1960	157	Piedmont
Cameron Park	Wake	Urban	1910-1950	308	Piedmont
Cameron Village	Wake	Urban	1950-1955	94	Piedmont

Capitol Area	Wake	Urban	1792-1970	55	Piedmont
Carthage	Moore	Urban	1850-1940	126	Piedmont
Centerville	Forsyth	Urban	1900-1958	92	Piedmont
Chapel Hill	Orange	Urban	1776-1950	49	Piedmont
Claremont High School	Catawba	Urban	1870-1930	63	Piedmont
Cleveland Street	Durham	Urban	1880-1920		Piedmont
College Hill	Guilford	Urban	1837-1941	322	Piedmont
East Broad St-Davie Avenue	Iredell	Urban	1870-1930	76	Piedmont
East Davis Street	Alamance	Urban	1888-1942	43	Piedmont
East Durham	Durham	Urban	1890-1955	732	Piedmont
East Raleigh St	Chatham	Urban	1895-1950	39	Piedmont
East Raleigh-South Park	Wake	Urban	1850-1941	535	Piedmont
East Sandford	Lee	Urban	1894-1960	136	Piedmont
Ellis Street Graded School	***Rowan***	***Urban***	***1867-1948***	***77***	***Piedmont***
Fuquay Springs	Wake	Urban	1899-1946	29	Piedmont
Glenwood-Brooklyn	**Wake**	**Urban**	**1907-1951**	**88**	**Piedmont**
Hawkins	Lee	Urban	1885-1950	204	Piedmont
Hayes Barton	Wake	Urban	1920-1952	460	Piedmont
Holloway Street	Durham	Urban	1900-1945	118	Piedmont
Holly Avenue	Forsyth	Urban	1885-1952	116	Piedmont
Lakewood Park	Durham	Urban	1902-1952	76	Piedmont
Lee Avenue	Lee	Urban	1882-1952	70	Piedmont
Lexington Residential	Davidson	Urban	1821-1957	807	Piedmont
Maiden Lane	Wake	Urban	1893-1923	12	Piedmont
Mitchell College	Iredell	Urban	1853-1952	203	Piedmont
Monroe Residential	Union	Urban	1870-1941	471	Piedmont
Mordecai Place	Wake	Urban	1916-1947	183	Piedmont
Morehead Hill	Durham	Urban	1905-1955	208	Piedmont
North Cherry Street (Winston)	Forsyth	Urban	1924-1954	72	Piedmont
North Long Street-Park Avenue	Rowan	Urban	1891-1926	53	Piedmont
North Main Street	Catawba	Urban	1866-1936	105	Piedmont
North Main Street	Rowan	Urban	1896-1935	172	Piedmont
North Union Street	Cabarrus	Urban	1870-1930	190	Piedmont

Oakwood	Catawba	Urban	1880-1940	64	Piedmont
Oakwood	Guilford	Urban	1902-1940	28	Piedmont
Oakwood	Wake	Urban	1840-1925	200	Piedmont
Old Salem	Forsyth	Urban	1766	15	Piedmont
Old South Mebane	Alamance	Urban	1900-1961	255	Piedmont
PeeDee Avenue	Stanly	Urban	1891-1947	80	Piedmont
Roanoke Park	Wake	Urban	1913-1952	447	Piedmont
Rosemount-McIver Park	Lee	Urban	1900-1941	172	Piedmont
Salem Street	Davidson	Urban	1861-1957	33	Piedmont
South Aspen	Lincoln	Urban	1852-1950	47	Piedmont
South Broad & East 5th St	Alamance	Urban	1890-1950	108	Piedmont
South Greensboro	Guilford	Urban	1880-1941	339	Piedmont
South Main Street	Forsyth	Urban	1834-1940	61	Piedmont
South Race Street	Iredell	Urban	1894-1945	85	Piedmont
South Union Street	Cabarrus	Urban	1880-1935	69	Piedmont
Stokesdale	Durham	Urban	1912-1960	230	Piedmont
Summit Avenue	Guilford	Urban	1895-1942	228	Piedmont
Sunnyside Central Terrace	Forsyth	Urban	1880-1958	425	Piedmont
Trinity	Durham	Urban	1900-1955	731	Piedmont
Vangaurd Park	Wake	Urban	1920-1952	140	Piedmont
Washington Street	Guilford	Urban	1906-1963	40	Piedmont
Watts-Hillandale	Durham	Urban	1909-1945	554	Piedmont
Wendell Blvd	Wake	Urban	1890-1958	74	Piedmont
West Chapel Hill	Orange	Urban	1845-1948	305	Piedmont
West Davis - Fountain Pl	Alamance	Urban	1890-1930	163	Piedmont
West Durham	Durham	Urban	1880-1930	116	Piedmont
West Main Street	Lincoln	Urban	1819-1945	27	Piedmont
West Raleigh	Wake	Urban	1886-1956	1175	Piedmont
West Salem	Forsyth	Urban	1843-1957	595	Piedmont
West Warren	Cleveland	Urban	1885-1958	214	Piedmont
York-Chester	Gaston	Urban	1856-1955	653	Piedmont
Edenton Cotton Mill Village	Chowan	Mill	1889-1948	80	Tidewater
Masonboro Sound	New Hanover	Resort	1870-1942	33	Tidewater
Nags Head Beach Cottage	Dare	Resort	1870-1940	60	Tidewater

Row					
Lake Landing	Hyde	Rural	1800-1900	182	Tidewater
Old Neck	Perquimans	Rural	1813-1946	68	Tidewater
Carolina Place	New Hanover	Suburb	1906-1941	337	Tidewater
DeGraffenried Park	Craven	Suburb	1927-1956	87	Tidewater
Ghent	Craven	Suburb	1906-1941	191	Tidewater
North Market St	Beaufort	Suburb	1893-1961	317	Tidewater
Riverside	Craven	Suburb	1894-1937	178	Tidewater
Sunset Park	New Hanover	Suburb	1914-1957	827	Tidewater
Westbrook-Ardmore	New Hanover	Suburb	1914-1956	467	Tidewater
Beaufort	Carteret	Town	1710-		Tidewater
Belvidere	Perquimans	Town	1800-1949	82	Tidewater
Burgaw	Pender	Town	1850-1949	167	Tidewater
Columbia	***Tyrell***	***Town***	***1880-1944***	***124***	***Tidewater***
Creswell	Washington	Town	1874-1952	81	Tidewater
Edenton	Chowan	Town	1790-1959	815	Tidewater
Elizabeth City	Pasquotank	Town	1770-1950	614	Tidewater
Fairfield	Hyde	Town	1850-1957	78	Tidewater
Hertford	Perquimans	Town	1775-1948	225	Tidewater
Morehead	Carteret	Town	1857-1952	123	Tidewater
New Bern	Craven	Town	1800-1953	560+	Tidewater
Ocracoke	Hyde	Town	1823-1959	251	Tidewater
Plymouth	Washington	Town		264	Tidewater
Richlands	Onslow	Town	1860-1940	94	Tidewater
Swansboro	Onslow	Town	1770-1938	77	Tidewater
Trenton	Jones	Town	1784-1970		Tidewater
Winfall	Perquimans	Town	1860-1950	73	Tidewater
Carolina Heights	New Hanover	Urban	1908-1939	406	Tidewater
Mill Avenue	Onslow	Urban	1890-1941	33	Tidewater
Northside	Pasquotank	Urban	1881-1907	573	Tidewater
Riverside	***Pasquotank***	***Urban***	***1894-1942***	***103***	***Tidewater***
Shepard Street-South Road	Pasquotank	Urban	1849-1943	226	Tidewater
Southport	Brunswick	Urban	1885-1905	269	Tidewater
Wilmington	New Hanover	Urban	1740-1971	2530	Tidewater

APPENDIX B

STYLES REPRESENTED AND ELIGIBLE DISTRICTS

Name	County	Type	Years	Buildings	Region
Columbia	***Tyrell***	***Town***	***1880-1944***	***124***	***Tidewater***
Morehead	Carteret	Town	1857-1952	123	Tidewater
Winfall	Perquimans	Town	1860-1950	73	Tidewater
Riverside	***Pasquotank***	***Urban***	***1894-1942***	***103***	***Tidewater***
Boone Road	***Rockingham***	***Mill***	***1895-1935***	***50***	***Piedmont***
Central School	***Cleveland***	***Rural***	***1870-1950***	***56***	***Piedmont***
New Hill	Wake	Rural	1860-1950	62	Piedmont
Kenworth	***Catawba***	***Suburb***	***1900-1940***	***54***	***Piedmont***
West End	Cleveland	Suburb	1882-1955	101	Piedmont
Cameron	Moore	Town	1880-1941	50	Piedmont
Farmington	Davie	Town	1850-1960	92	Piedmont
Liberty	***Randolph***	***Town***	***1880-1950***	***50***	***Piedmont***
Claremont High School	Catawba	Urban	1870-1930	63	Piedmont
Ellis Street Graded School	***Rowan***	***Urban***	***1867-1948***	***77***	***Piedmont***
Holloway Street	Durham	Urban	1900-1945	118	Piedmont
Lee Avenue	Lee	Urban	1882-1952	70	Piedmont
North Main Street	Catawba	Urban	1866-1936	105	Piedmont
Oakwood	Catawba	Urban	1880-1940	64	Piedmont
PeeDee Avenue	Stanly	Urban	1891-1947	80	Piedmont
South Broad & East 5th St	Alamance	Urban	1890-1950	108	Piedmont
South Main Street	Forsyth	Urban	1834-1940	61	Piedmont
South Union Street	Cabarrus	Urban	1880-1935	69	Piedmont
Wendell Blvd	Wake	Urban	1890-1958	74	Piedmont
Green Park	Watauga	Resort	1891-1944	53	Mountain
Satulah Mountain	***Macon***	***Resort***	***1885-1945***	***50***	***Mountain***
Dougherty Heights	Buncombe	Suburb	1897-1960	54	Mountain
Valle Crucis	Watauga	Town	1812-1954	81	Mountain
Avery Avenue	Burke	Urban	1875-1935	97	Mountain
Gywn Avenue-Bridge St	***Surry***	***Urban***	***1891-1955***	***125***	***Mountain***

Spread Out	Haywood	Urban	1895-1958	67	Mountain
Elm City Municipal	Wilson	Town	1873-1930	118	Inner Coastal
Harrellsville	Hertford	Town	1811-1945	80	Inner Coastal
Haymont	Cumberland	Town	1817-1957	60	Inner Coastal
Seaboard	Northampton	Town	1874-1955	112	Inner Coastal
Town of Halifax	Halifax	Town	1783-1961	120	Inner Coastal
Brooklyn	Johnston	Urban	1870-1950	106	Inner Coastal
Falls Road	Nash	Urban	1900-1950	100	Inner Coastal
North Smithfield	Johnston	Urban	1850-1950	124	Inner Coastal
West Nash Street	***Wilson***	***Urban***	***1770-1940***	***99***	***Inner Coastal***

	Style / County	Vernacular	Minimal Traditional	I-House	Georgian	Georgian-Federal	Federal	Federal-Greek Revival	Greek Revival	Italianate	Gothic Revival	Queen Anne	Victorian-other	Classical Revival	Colonial Revival	Spanish Mission	Tudor Revival	Georgian Revival	Rustic Revival	Craftsman/ Bungalow	Period Cottage	Neo-classical	International	Moderne	Art Deco	Misc. Modernist	Std Comm/ Indust	Ranch	Mill	Other
Mountain Region	Ashe	1	1				1					1	1	1	1					2				1	1	1	2			1
	Avery	1	1	1																1	1									1
	Buncombe	4	3		1						1	4		1	8	2	4			9	4	1	1		1	1	2	2		7
	Burke											3	4		5		1			5	6						1			1
	Cherokee	1																												
	Haywood		1									1			1	1				1	1							1		
	Henderson	1	2				1	1			1	1	1		4		1			5		1		1				2		2
	Macon	2		1						1		2			3		1		2	2					1			1		4
	Madison	1		1							2	1		1	1	1				1							2			
	Mitchell																		1	1	1									
	Rutherford		1											2	3	1	1			3				1				2	1	2
	Surry		1						1	1	1	2	1	2	2	1	1			3	2	1	1	1	1		2			2
	Transylvania	1	1									1			1				1	1	1	1						1		
	Watauga	1		1							1	2			2				1	2										1
	Wilkes	1												1																
	Yancey	1										1			1					1										
Piedmont Region	Alamance	2	1						1	2	2	5		2	4	1	1	1		4	2	3			1		2	1	2	2
	Anson										1				1							1					1			
	Cabarrus	2							2	2	2	3	1		4			1		3	2						2		1	
	Caswell	1							2				2																	
	Catawba	4	1	1	1	3		1	1			5			5	1	3	2		6	2	1			1	1		1		1
	Chatham						1		2		2	2	1	1	2		1			2						1				1
	Cleveland	1	2						1		1	3	2	1	4		1			5	1			2	1		1	1	1	2

	Davidson																														
	Davie		1	1					3	3		3			1					3										2
	Durham	7	7		1		2		2	1	2	10	3	3	10	6	7	1		11	5	6	1	2			4	4	3	13
	Forsyth	2	5	1					1	1	4	6	3		11	2	4			12	4	1	1	1		1	3			5
	Franklin					1			1	1	1	1	1		1					1		1								
	Gaston		1							1	1	2	1	1	4	1	2			4	1		1	1	1		1	1	1	5
	Granville	1				1			1	1	1	1	1		1					1	1	1						1		2
	Guilford	1	2	1					1	1	1	8	1	2	9	2	4			10	1	1		1		1	1		1	10
	Iredell	3	1						1	2	2	3	3	3	5		2			4	1	2		1	1			1		5
	Lee	1		2								4			4	1	1			4	1	1								2
	Lincoln		1				2		3			1	1		2		1			2	2			1						
	Mecklenberg	2	1						1	2	2	3	1	1	5	1	5		1	7	1	1		1			2	3	3	5
	Montgomery										1	1												1			1			1
	Moore	1							1	1	1	6		2	6	1	1			6		1								2
	Orange	2					1		3	1	3	1	1		5		1	2		3		2		1			1	2	1	1
	Randolph	1		1			1	1	1			3	1		2		1			2	1							1	1	2
	Richmond	1			1			1		1		1	1		1		1			1	1									
	Rockingham	5		2						2	1	3		2	3		2	1		2	1	1			1			1	1	5
	Rowan	4					1		2	2		2	4		7		2			8	1								1	4
	Stanly										1	1			1			1		2	1								1	1
	Stokes			1					1			1			2					1	1						1			1
	Union									1		3		2						1							1			1
	Wake	6	10	3		1	1		3	6	5	15	10	10	22	5	10	4		21	6		5	4		1	3	13	1	12
	Warren	1			1		1		1	1		1			1							1								1
Inner Coastal Plain Region	Bertie	1			2		1		1		1	1	1	1						2							1			
	Cumberland	1			1		3	2	3	1	2	2	1	1	3		1			3		2					1		1	2
	Duplin						1		2	2		1								1							1			
	Edgecombe	1	1						1	1	2	2	1	1	2		1			2	1	2		1	1		2	1		2
	Greene	1	1						1		1	1			1		1			1										1
	Halifax						1		1	2	3	3	1	2	3	1	2		1	3				1	1			1	1	6
	Hertford			1			1	2	2			1			1					1										
	Hoke											1	1	1	1												1			
	Johnston	2	1	2						3	2	4	1	1	5		3			5	1	2		1			1	2		2
	Lenoir	2							1	1	1	3		1	3	1	1			3	1	3								1
	Martin	2			1		3		3	2	2	2	1		3	1	1			2	1									
	Nash	1		1					2	3		4		1	4		4			5	1	4		2			1	1	1	8
	Northampton											1			1		1			1										
	Pitt	2	1	2							2	2		1	4	2	3			4	1						1	1	1	3
	Robeson										1	1			1							1					1			1
	Sampson						1		2			1	2	2	2		1			1										
	Wayne									1	1	1		1	1		1			1										
	Wilson	3		1				1	2	1	1	5	1	3	5	2	2	3		6	2									1
ate r	Beaufort	2	1				1		1	1		1		1		1				2	1							1		2

	Brunswick	1													1																
	Carteret	2		1	1				2		2	3			1					2							1			1
	Chowan	1	1	1			1		1	1	1	1	1	1	2		1			2								1		1
	Craven	1	1				1		1	1	1	2	1	1	2		1			3		1		2	1					4
	Dare	1									1	1									1									
	Hyde	3						1	1	1	2	1	1		1					3								1		1
	Jones	1			1	1	1		1	1	1	1																		
	New Hanover	1	1					1	1	1	2	4	2	2	5	2	1	1		5	3	2		2	1		1	1		7
	Onslow	1		2				1					3							2	1						1			
	Pasquotank	3		3			1		3	2	2	4			4		1			4		1								7
	Pender										1	1			1	1	1			1										
	Perquimans	2					3		3		1	3	1	1	3					4								1		
	Tyrell	1									1	1	1		1		1			1					1			1		1
	Washington	1								1	1	1	1		1	1	1			2										
	Total	**10**	**52**	**31**	**11**	**7**	**31**	**12**	**71**	**60**	**75**	**17**	**66**	**60**	**21**	**39**	**88**	**17**	**7**	**23**	**66**	**46**	**10**	**29**	**15**	**7**	**46**	**51**	**23**	**15**

APPENDIX C

LIST OF SUSTAINABLE RESOURCES

- National:
  - NTHP
    - "Saving Windows, Saving Money: Evaluating The Energy Performance of Window Retrofit and Replacement" http://www.preservationnation.org/information-center/sustainable-communities/green-lab/saving-windows-saving-money/120919_NTHP_windows-analysis_v3lowres.pdf
    - "Design Guidelines for Solar Installations" http://www.preservationnation.org/information-center/sustainable-communities/buildings/solar-panels/design-guidelines-for-solar.html#.Um19_nCsiqc
    - "Weatherization Guide for Older & Historic Buildings" http://www.preservationnation.org/information-center/sustainable-communities/buildings/weatherization/#.Um19I3Csiqc
  - NAPC
    - "Sample Guidelines for Solar Panels in Historic Districts" http://www.preservationnation.org/information-center/sustainable-communities/buildings/solar-panels/additional-resources/NAPC-Solar-Panel-Guidelines.pdf
    - Weatherization: What Every Commissioner Should Know. Sept.-Oct. 2010. *The Alliance Review*
    - Kooles, K. L. (2010). Roof Rainbow: Introducing Green and White Roofs Into Our Color Spectrum. *The Alliance Review*.
    - Roberts, T. (2007). What's Green Abour Historic Buildings?. *The Alliance Review.*
  - NPS
    - "Illustrated Guidelines on Sustainability for Rehabilitating Historic Buildings" http://www.nps.gov/tps/standards/rehabilitation/sustainability-guidelines.pdf

- "Guidelines for the Treatment of Cultural Landscapes" http://www.nps.gov/tps/standards/four-treatments/landscape-guidelines/index.htm
- "The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings" http://www.nps.gov/tps/standards/four-treatments/treatment-guidelines.pdf
- Preservation Briefs: 3, 6, 9, 10, 14, 17, 18, 24, 28, 39, 44 and 45 http://www.nps.gov/tps/how-to-preserve/briefs.htm
- Interpreting the Standards Bulletins: 3, 4, 7, 8, 9, 18, 19, 23, 37, 39, 41, 51, 52, and 54 http://www.nps.gov/tps/standards/applying-rehabilitation/standards-bulletins.htm
- Technical Preservation Services "Green Roofs" http://www.nps.gov/tps/sustainability/new-technology/green-roofs.htm
- Technical Preservation Services "Solar Panels on Historic Properties" http://www.nps.gov/tps/sustainability/new-technology/solar-on-historic.htm
- Technical Preservation Services "Weatherization" http://www.nps.gov/tps/sustainability/energy-efficiency/weatherization.htm
- "Energy Conserving Features Inherent in Older Homes" http://www.nps.gov/tps/sustainability/greendocs/conservation-features-older-homes.pdf

- EPA
  - "Energy Advice for Owners of Historic and Older Homes" http://epa.gov/region5/sustainable/pdf/Energy-advice-for-owners-of-older-homes.pdf
  - "Region 5 Building Sustainable Communities" http://www.epa.gov/region5/sustainable/energyadvice.html
  - "Healthy Indoor Environment Protocols For Home Energy Upgrades" http://www.epa.gov/iaq/pdfs/epa_retrofit_protocols.pdf

- State:
  - Maine
    - "Guidelines for Improving Energy Efficiency in Historic Buildings" http://mainepreservation.com/wp-content/uploads/2011/04/MainePreserv_5.pdf
  - California
    - Sustainable Solutions For Historic Houses In Northern California: A Voluntary Green Code & Green Rehabilitation Manual http://www.epa.gov/brownfields/sustain_plts/reports/green_home_guide_final.pdf
  - Nebraska
    - "Energy Efficiency and Historic Preservation: A Planning Guide for Buildings" http://www.neo.ne.gov/rebuildbook.pdf
- City:
  - Boulder
    - Making Your Historic Building Efficient: Volume 1 – Principles & Approaches https://www-static.bouldercolorado.gov/docs/making-your-historic-building-efficient-volume-1-principles-approaches-1-201305201348.pdf
    - Making Your Historic Building Efficient: Volume 2 – Technical Details https://www-static.bouldercolorado.gov/docs/making-your-historic-building-efficient-volume-2-technical-details-1-201305201349.pdf
  - Nantucket
    - Sustainable Preservation http://www.nantucket-ma.gov/pages/nantucketma_histdist/Sustainable%20Preservation%20-%20Final.pdf
  - Seattle
    - "Green Homes Guide" http://www.seattle.gov/dpd/greenbuilding/singlefamilyresidential/resources/remodelingguides/
  - Raleigh
    - "Design Guidelines for Raleigh Historic Districts" http://www.rhdc.org/sites/default/files/DesignReview/DESIGN%20GUIDELINES.pdf

- Boise
  - "Design Guidelines for Residential Historic Districts" http://pds.cityofboise.org/media/85582/residential_historic_guidelines_8-7-13.pdf
- Lafayette
  - Design Guide for the City of Lafayette chapters 3 and 6 http://www.wabashvalleytrust.org/guide.html
- Manitou Springs
  - "Historic District Design Guidelines" http://www.manitouspringsgov.com/library/documents/general/historic_district_design_guidelines.pdf
- New York City
  - "Greening New York City's Historic Buildings: Green Rowhouse Manual" http://www.nyc.gov/html/lpc/downloads/pdf/pubs/Manual%20-%20Greening%20Rowhouses%20-%202012.pdf

- Local:
  - Davidson
    - "Davidson Historic District Design Guidelines"
  - Wallabout
    - "Wallabout Homeowner's Preservation Manual" http://issuu.com/bkskarchitects/docs/wallabouthomeownersmanual/1

APPENDIX D

RECOMMENDATION MATRIX

Addresses	Resource Efficiency										Traditional Features																	
Source	**Water**			**Energy**			**Light**			**Air**		**Foundation**		**Walls**			**Windows**				**Doors**			**Roof**			**Porches**			
National:	Fixtures	Drainage	Site Features	Weatherize	Habits	Inherent	Interior	Daylight	Exterior	Infiltration	Ventilation	Materials	Repair	Wood	Brick	Plaster	Retain	Repair	Weatherize	Energy	Surrounds	Retain	Weatherize	Slate/Tile	Metal	Repair	Sustainable	Restore	Repair	Materials
NTHP		■	■	■	■	■	■	■	■	■	■		■	■	■		■	■	■	■		■	■			■	■	■	■	■
NAPC		■	■	■	■	■		■	■	■	■		■	■			■	■	■	■		■	■			■	■		■	■
NPS		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
EPA				■	■	■		■		■	■		■	■			■	■	■	■		■	■			■	■		■	
State:																														
Maine		■		■	■	■		■		■	■		■	■			■	■	■	■		■	■			■				
California		■	■	■	■	■	■	■	■	■	■		■	■			■	■	■	■		■	■			■			■	■
Nebraska				■		■	■	■		■	■		■	■	■		■	■	■	■		■	■			■				
City:																														
Boulder	■	■	■	■	■	■	■	■	■	■	■		■	■			■	■	■	■	■	■	■			■				
Nantucket		■	■	■	■	■	■	■		■							■	■	■	■		■	■							
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Manitou Springs		■	■	■				■	■	■		■	■	■	■		■	■	■	■		■	■	■	■	■		■	■	■
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Wallabout	■	■		■	■	■		■	■	■		■	■	■	■		■	■		■	■	■	■		■	■				

Addresses	New Technologies																		Inclusions										
Source	**Systems**				**Insulation**				**Eco-Roofs**			**Alt Energy**			**Materials**				**Illustrations**			**Language**		**Resources**			**Assess. Tools**	
National:	Plumbing	Electrical	HVAC	Historic	Basement	Attic	Walls	Stripping	Intensive	Extensive	White	Wind	Solar	Geothermal	Salvaged	Recycled	Sustainable	Replacement	Diagrams	Styles	Explanatory	Highlighted	Embracing	History	External	Glossary	Energy Audit	Whole Building
NTHP			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	
NAPC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■	■	■	■	■	■
NPS	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■		■	■
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New York City	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■
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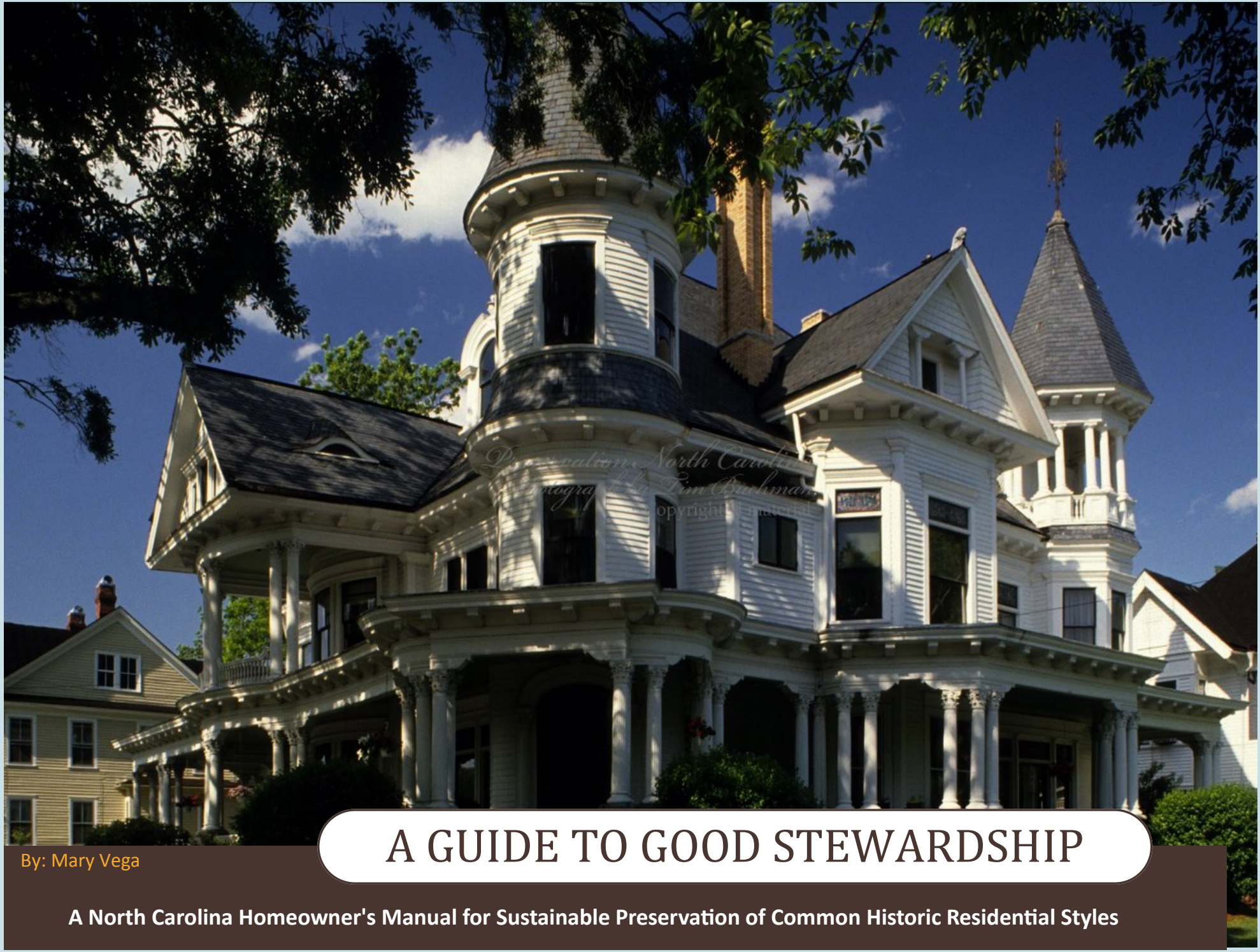
APPENDIX E

GUIDE TO GOOD STEWARDSHIP



A GUIDE TO GOOD STEWARDSHIP

By: Mary Vega

A North Carolina Homeowner's Manual for Sustainable Preservation of Common Historic Residential Styles

Table of Contents

To North Carolina for being a constant source of inspiration, my family for showing me how to follow my dreams, and my teachers for the knowledge to make it a reality.

INTRODUCTION

Charles T. Holt House, Haw River c. 1897

Charles O. Robinson House, Elizabeth City c. 1913

Mayor Earl B. Horner House, Burlington c. 1920-25

Owning a pre-WWII home in North Carolina is preserving a piece of an incredibly rich heritage. From the first settlers to the various social movements that have shaped our country, North Carolina has been representative of our nation's trials, and achievements. Since our state has remained rural in its growth and development (until recently) our architectural history is usually subtle and unimposing. It can be seen through winding rural roads and longstanding small town communities as well as significant trading centers which have developed into large cities and display examples of architectural evolution from small vernacular buildings to impressive and imposing high style buildings. The most popular of these styles are the extravagant Queen Anne, austere Colonial Revival, and cozy Craftsman Bungalow.

Unfortunately many people perceive these homes as energy inefficient and drafty due to their age and believe they aren't "green" because they don't employ the latest technologies. However, this isn't the case as historic residences were often built using local materials that have a long lifespan, and are easily repaired. These homes also incorporated available technologies such as large eave overhangs, interior and exterior shutters, and operable windows which add to the efficiency of the home by controlling heat loss and gain. As noted preservationist Jo Leimenstoll succinctly puts it: "Historic preservation and sustainability are inextricably linked through their shared values of good stewardship, the revitalization of neighborhoods, and the ongoing use of the built environment. Both advocate a culture of reuse, community reinvestment, and appreciation of our heritage. The guiding principles of preservation resonate with the three fundamental principles of sustainability: economic strength, environmental stewardship, and social equity. Together they speak to the wise use of resources to sustain our communities."

While these homes are an excellent reflection of the times they were created in and the incorporation of available technologies of that time, there have been many breakthroughs in technology that now allow buildings to be more efficient. These technologies include insulation, HVAC, electrical, and plumbing upgrades; new recycled and

sustainable materials; alternative energy generating resources like solar panels; and assessment tools for efficiency.

While many local historic districts have guidelines and recommendations that are passed on to residents as a way of maintaining historic integrity and character, these districts only reach a small portion of historic homeowners and they rarely address incorporating sustainability. The purpose of this manual is to help the hundreds of North Carolinians living in pre-WWII homes, that don't have the benefit of helpful guidelines, by providing guidance on maintaining character, sensible additions, repair and maintenance, and other helpful resources.

The manual also advises homeowners on making their homes more efficient while maintaining historic character and integrity. By addressing inherently sustainable features, new technologies, and building features the manual helps homeowners understand their home, and its features, and how to improve its resource efficiency.

The first chapter covers a brief history architecture in the state as well as how it has grown, and how it is divided. The second chapter covers features the three most popular residential styles in N.C, common features for all of the buildings, and floor plans that are commonly adapted with these styles. Chapter three comprises the bulk of the manual and provides preservation approaches, helpful tips and guidance for maintaining your historic home, introducing new efficient features, restoring existing or lost features, and expanding your space. Finally the fourth chapter includes resources for Tax Credit programs, preservation programs in the state, places to find additional information, and a glossary of architectural terms for clarification.

> "Historic preservation and sustainability are inextricably linked through their shared values of good stewardship, the revitalization of neighborhoods, and the ongoing use of the built environment...[t]ogether they speak to the wise use of resources to sustain our communities."
>
> -Jo Leimenstoll

Another purpose of this manual is to dispel myths concerning the preservation of historic homes. One of the most prevalent is that historic homes must be restored to their original appearance. This is simply not true, as restoration is only one option in preservation with others including rehabilitation, reconstruction, and preservation. Another is that being listed on the National Register means the government will tell you what you can do with your house and that you must follow their regulations. Being listed on the National Register is an honorific; meaning that other than recognizing the historic importance of your home, and providing some protection from federally funded projects, inclusion in the National Register is just a title. However, it does not allow the owners to pursue tax credits from the government for the preservation of their homes.

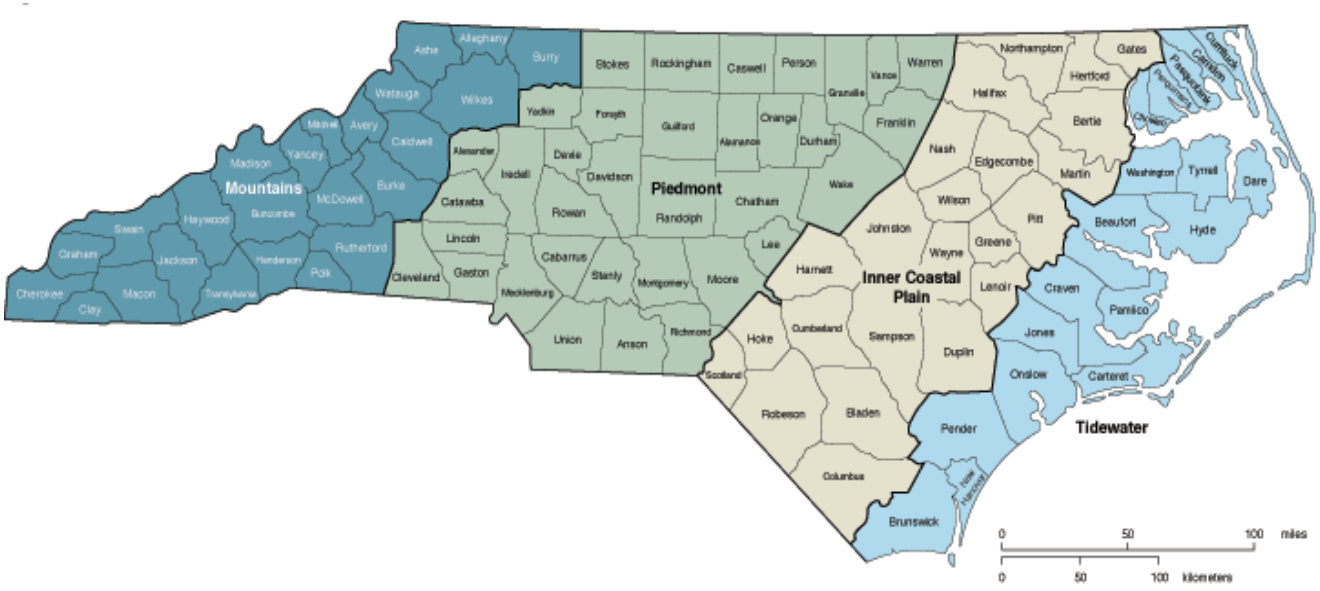
Yet another common myth is that being listed on the National Register will harm your property values however studies have shown that protecting the unique character of historic buildings increases their desirability, as well as their monetary value. Some also believe that their house must stay frozen in time. This is another misconception as preservation of this type is only one that may be considered along with the fact that modern systems and additions can be added without harming a home's historic character. Finally the myth that maintenance of historic homes is an extravagant expense that is unavoidable needs to be addressed. Many repairs can be made by the homeowner without the need to hire expensive professionals. There are many resources that offer assistance for energy upgrades, as well as grants and other sources that can help with the cost of maintenance and repair.

Chapter One

History

STATE REGIONS

North Carolina is the longest and most humid of the Eastern states; it spans nearly 7,000 feet in elevation and 300 miles in width. Due to this, we have one of the most varied climates of any eastern state. It's caused by changes in altitude, soil, plant cover, and bodies of water, as well as changes in oceanic currents. The three regions of the state are: Mountains, Piedmont, and Coastal Plains (which is subdivided into the Inner Coastal Plain and Tidewater areas due to the direct influence of ocean).



◊ Mountains

The westernmost Mountain region of the state is the smallest and makes up one-fifth of the state's area. It is home to the Great Smoky Mountains as well as part of the Appalachian Mountain chain and the Blue Ridge Mountains. This area shows the greatest change in elevation from 6,684 feet above sea level at the peak of Mount Mitchell to only 1,000 feet at the bottom of some of the valleys; however the region starts around 1,500 feet.

◊ Piedmont

Sandwiched between the Mountain and the Coastal Plain region is the Piedmont, which makes up about one-third of the state. This area contains most of the state's larger cities and commercial interests. Also the Piedmont region contains many ranges of gently rolling hills with some steeper ranges and includes the Uwharrie and Kings Mountain ranges. The elevation here varies from roughly 1,500 feet to around 200 feet at the fall line that divides the Coastal Plain region from the Piedmont.

◊ Coastal Plains

The Coastal Plains comprise nearly half of the state, from the piedmont fall line to the Atlantic Ocean, and can be broken into two sections: Inner-Coastal Plains and Tidewater. The Inner Coastal Plain slopes gently east and is a largely agricultural area, while the Tidewater borders the ocean and is otherwise largely swampy and flat and home to numerous wildlife refuges and national parks. There are few large urban areas in the Inner Coastal Plain, with the exception of military bases and the surrounding environments. The Tidewater area on the other hand has been extensively developed to accommodate tourists to the beaches and Outer Banks. The terrain here finishes its descent from around 200 feet above sea level to less than 50 feet in the Tidewater area.

GROWTH TYPES

Through research of National Register documentation for primarily residential historic districts many types of districts were identified. These types represent the differences in building motives and growth across the state.

◊ Urban

Urban Districts are the largest type with districts containing at least 75 properties while some of the larger ones encompass over 2,000. These districts are found in city limits and include commercial buildings along with residences. These districts have the highest variation of styles and show the progression of a city. They also usually include large suburban areas that have merged together as well as homes built by or for individuals. These districts represent most of the residential districts comprising nearly one-third of all districts.

◊ Suburban

Suburban districts have the most variance in number of resources with some districts being in the teens while others encompass over 800. This discrepancy in size is due not only to the loss of structures but also to the encroachment of modern development. In some cases multiple suburbs have been joined together due to similar styles and periods of significance. These districts are usually found in urban areas but some are found in rural areas. For the most part suburban districts are completely residential.

◊ Rural

Rural districts are those that are found outside of town or city limits. Most of these districts range in size from around 20 to 70 resources with a few reaching over 100. Due to their size and location most of these districts include individually built houses, and may include a post office, general store, or educational building. These districts are often threatened by new construction due to their low density, agricultural nature, and lack of zoning.

◊ Resort

Resort districts represent the smallest portion of districts within the state. They include residences that were produced as a vacation destination. These districts have homes that are not as large as typical homes in the area, usually don't have outbuildings, and have few resources (between 30 and 60).

◊ Town

These districts are made up of small towns and usually include the commercial, educational, and institutional buildings along with the residences. Similar to urban and suburban districts there is a large variation in the number of resources included in the districts which range from less than 20 to over 800. The majority of districts however have between 75 and 200 resources and include a Main Street commercial area. While these areas are too large and contain too many non-residential structures to be considered rural districts, they are too small to be considered urban.

◊ Mill Village

These districts include mill buildings and housing from various manufacturers of cotton, and industrial products. Many of these villages have been lost due to the small houses, remote locations, and lack of investment. Districts usually contain between 50 and 100 resources although some are smaller or larger. While the size of these districts changes the ideas behind their construction are similar and can be seen in the limited building styles and repetitive house forms used in them as well as their orientation to the mill.

UPTOWN TO DOWN HOME

The Styles and the State

The architecture of North Carolina is as varied as the people who live here, and was influenced by the industries, geography, and climate that shaped the state's social and economic growth. Architecture has affected the way people interact within their surroundings from homes, to agricultural production and manufacturing, to education and public appearance.

◊ 17th and 18th centuries

Early structures combined available resources with simple, functional building techniques brought by European settlers. Lacking skilled artisans, affluence, and the labor force to create grand residences, most settler's constructed basic homes for shelter rather than to establish permanence or demonstrate wealth or power.

The landscape and climate also impacted early construction as much of the state was unnavigable until the mid-eighteenth century. Coastal forests provided a wealth of timber which immigrants used to construct most of the structures (including chimney stacks). The hot, humid climate influenced building methods to differ from those of European traditions. These influences included large porches, separate kitchens, and open breezeways to help keep occupants cool. These building techniques continued in the state through the nineteenth century because few people employed

A Brief Timeline of Significant State Events

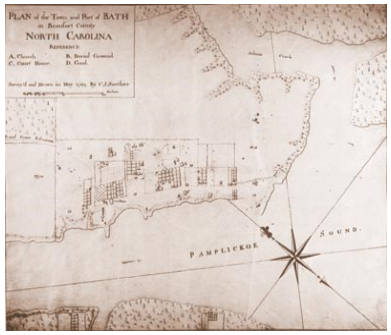
◊ 1580's– First English Colonies on Roanoke

◊ 1590– Roanoke Colonies vanished

◊ 1650's Settlers move south from Virginia

◊ 1663– Carolina chartered as a colony

◊ 1705– Bath is the first incorporated town



◊ 1710– New Bern settled

◊ 1712– Carolina divided into North and South

◊ 1718- Blackbeard is killed off the coast

◊ 1729– Colony goes to royal control

◊ 1740- Wilmington established; Foothills settled.

◊ 1750's– Substantial piedmont growth

◊ 1755-63– French-Indian War

◊ 1765– New Bern made state's capital

◊ 1775– Revolutionary War Begins

◊ 1776– Declaration of Independence

building professionals, and often the owner himself drew up the design for the house and surrounding buildings.

Practical builders' guides and pattern books were popular during the late 1700s through the early 1800s and highlighted the newest fashions, styles, techniques, and floor-plans for modern conveniences and living. These were used by many North Carolinian's to plan their new structures and additions.

Consequently, few of the houses built– even by the wealthiest North Carolinians— were overly decorative, while the landscape was noted as being widespread and unpretentious by many early visitors to the state. Public buildings reflected an unadorned style in many colonies as a way to symbolically reject the ornate architecture occurring in England. Two of the earliest styles that appear in North Carolina architecture are *Georgian* and *Federal*. Georgian architecture was austere and symmetrical, and was popular between 1750 and the early 1800s. Similarly, the Federal style was balanced and classical in nature, and was popular between 1780 and 1830. Oftentimes these two styles would cross over and be used together on a single building.

◊ 19th Century

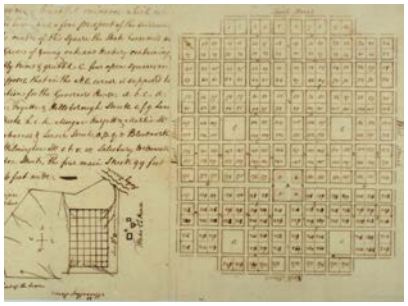
With the introduction of railroads, building materials became easier to mass-produce and distribute. *Greek Revival, Gothic Revival,* and *Italianate* styles were embraced and used in both public and private building to promote the power and permanence of the new nation and its citizens. As these names suggest these styles were representative of classical orders and designs and were applied as a way to signal wealth, permanence, and order.

North Carolina plantations, concentrated in the eastern part of the state, where the soil supported the large-scale growth of cash crops, features elegant main houses and numerous outbuildings. In addition to the elegant main houses, plantations also included houses built for the slaves that worked the land. These simple structures dotted the rural landscape of North Carolina even after the Civil War as sharecroppers and poor farmers continued to make them their home.

Although the Civil War and Reconstruction halted major construction, the Industrial Revolution then provided a tremendous boost

◊ 1783– Settlers reach Western NC

◊ 1789– N.C. Became the 12th state



◊ 1794– Capital is moved to Raleigh

◊ 1797– Asheville founded as an outpost

◊ 1799– Gold discovered in Western NC

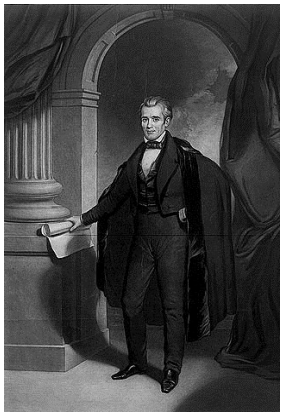
◊ 1828– Native Andrew Jackson became President

◊ 1830's –Railroads lead to expansion

◊ 1840's– First public schools chartered

◊ 1850's– Western Turnpike completed

◊ 1845– Native James Polk became President



◊ 1861– N.C. leaves the Union; Civil War began

◊ 1865– Civil war ends; Andrew Johnson became President

◊ 1868– N.C. readmitted to Union

to building. It introduced mass production thereby making construction materials available at lower costs. This then led to a shift in the design of structures that embodied both form and function (and ornate decoration).

This can be seen in the *Second-Empire* and *Queen Anne* styles which invoke romantic imagery, lavish decoration, a break from traditional building technology, and reflected the modern evolving society of the time. In the mountains of the state, a tourism boom led to the construction of luxurious hotels and private homes detailed in Queen Anne styles, while in the coastal plains and piedmont areas these styles were mostly used on residences.

◊ Early 20th Century

In response to the ornate Victorian styles, *Colonial Revival* sought to revive the austere with patriotic enthusiasm for the American past. It began with revival forms attached to Queen Anne homes and grew into its own style. The style was an attempt at solidifying American culture against waves of immigration, class turbulence, and expanding industrialization. In the South there was an added dimension— an ideal antebellum civilization and the ideals that were represented therein— which led to a highly popular sub-style: Southern Colonial.

The early 20th Century saw unprecedented growth in North Carolina towns as people left farms for more industrialized work. As industrialization continued to rise, new technologies were continuing to change how buildings were built. Commercially produced timber and steel enabled buildings to be constructed cheaply and quickly, and to reach heights not dreamed of previously. The high-paced growth also led to a golden age for small architectural firms because architects began designing every building from city halls and banks to middle- and upper-class houses.

This conversion to industrialization also focused emphasis on city living which created downtowns that housed and inspired the recently rural working classes through government buildings, like courthouses, post offices, and other public spaces, that were large and ornate. The first skyscrapers were also erected during this period in North Carolina by J.A. Jones and Charles McMillen— the *Independ-*

◊ 1878– Cherokee reservation created in Western North Carolina

◊ Late 1800's– Mills grow rapidly

◊ 1880's– Tourism drives growth throughout Western North Carolina

◊ 1903- Wright Brothers take flight

◊ 1917 U.S. Enters WWI

◊ 1920's– Women gain the right to vote; tobacco becomes an important N.C. crop

◊ 1921– State supported highway system established

◊ 1929– The Great Depression begins


THE ASHEVILLE CITIZEN

ICKES' DECISION PLACING ROUTE FOR PARKWAY IN N. C. HAILED AS GREAT VICTORY BY ENTIRE STATE

HIGHWAY WILL TRAVERSE SECTION FAMED FOR ITS FINE MOUNTAIN SCENERY

◊ 1935-Blue Ridge Parkway construction

begins

◊ 1941– U.S. enters WWII

ence Building in Charlotte (1909) and the *Masonic Temple building* in Raleigh (1907-1909).

Since there was a new concentration of labor living in downtown areas, residential suburbs began to spring up so that families could escape the noise, grime, and density associated with downtown areas.

Assembly line technology and increased emphasis on factory-made products soon led to pre-fabricated houses, which appeared in mail-order catalogs. Consumers could select the style they wanted, order it from the catalog, then have it delivered and set up on the lot of their choosing. The *Bungalow*, a style commonly identified by low, horizontal massing, sloping roofs, eaves, and front gables, was popular in North Carolina. Aladdin and Sears and Roebuck were the two best-known companies selling pattern book homes.

The *Bungalow* is the most popular surviving pre-WWII style in the state, and appears in an astonishing variety of forms. In addition to this style the flamboyant *Queen Anne* and imposing *Colonial Revival* homes are widely found throughout the state. These three styles are discussed in further detail in the following chapter.

Chapter Two

Architecture



Fox-Duhling House, Hickory c 1920— Front Gable

CRAFTSMAN/BUNGALOW

The Craftsman Bungalow style is the most commonly found pre-WWII residential style within the state. This is in part due to the rapid growth and expansion of the time, and in part, because the style was similar to vernacular hall-and-parlor and passage plans. The style is pictured here with a variety of roof forms that make up the typical subtypes found throughout the state. This style was popular between 1905 and 1920 however the style continued in North Carolina well into the 1940's.

W.J. Snow House, Elkin c. 1920—Front Gable

This style suited the state as bungalows were cheap and easy to build, ranged in size, scale, and style, and communicated simplicity, unpretentiousness, and modernity. These houses were owned and rented by every class and race present in the state– black or white, merchant, farmer and elite alike embraced the style. Additionally the large overhanging eaves and deep set porches suited the warm, humid climate of the state.

The open floor plans, with living and dining rooms opening into each other, rooms arranged in parallel rows, and small hallways fit nicely with

Agnew-Blackwell House, Wilson c. 1921—Hipped

vernacular plans which may explain its proliferation across the state. The exterior detailing may vary from geometric to oriental to colonial but, common features are exposed rafter tails, knee braces, and porch columns composed of a low masonry pier and a wooden column. These porch supports however run the gamut from full length masonry supports that reach to the ground to wooden columns that rest on the porch.

Residences range from a single-story to two full stories. The larger two-stories versions are

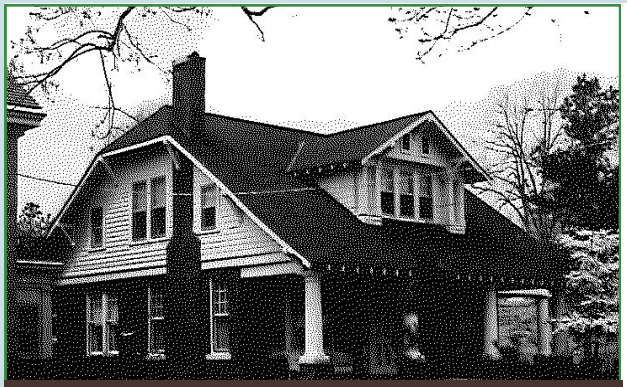
Selby H. Anderson House, Wilson—c 1917 Side Gable

often referred to as semi-bungalows because of their spaciousness, and the way the second story appears as a half-story with a large dormer. These larger bungalows were more common in the budding towns and cities of the period, however some can be found in rural areas. Along with larger scale came more elaborate decoration and detailing like spindlework in the gables or on the porch, a multi-paned sash over a single-paned sash in the windows, curved decoration between porch supports, and window boxes or balconies.

While many residences were built and designed by architects, they were also a very

Mullie Daniel House, Wilson— c. 1926 Cross Gable

Beveridge House, Elizabeth City c. 1926— Side Gable

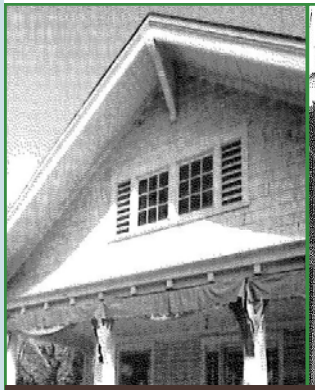


M. Douglas Aycock House, Wilson c 1925— Side Gable

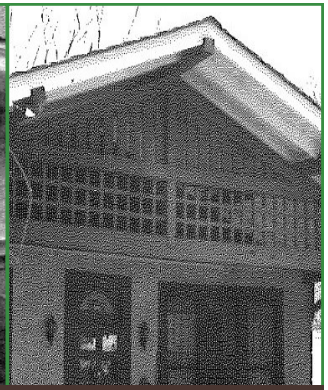
common catalog home. Thousands were brought into the state by rail, and assembled on site in as little time as a day, by companies like Aladdin.

SUSTAINABLE FEATURES

Some of the features that suited this style to the state are the same ones that make it sustainable. These include large overhanging eaves, open plans with ventilation controls, and deep shaded porches. Other features that add to the inherent sustainability of this style are the use of operable awnings, wood slatted doors, vented dormers, and numerous windows.



Fox-Duhling House– Awning



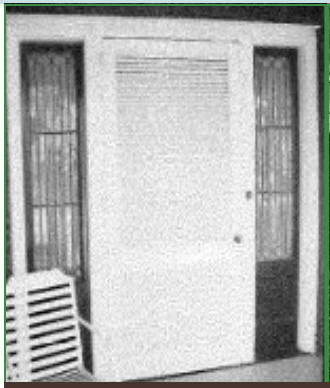
Smith-Bishop House, Wilson c. 1918

The large *overhanging eaves* help shade the home and its fenestration (openings) from exposure to the elements. The shading not only reduces heat gain but also helps to protect the structure from moisture problems by channeling water away from the foundation. To further add to the shading of exposed gable ends many homes— especially two-story homes — added a clipped gable.

The *compact floorplans* also added to the sustainability of the home by requiring less heating and cooling. Many homes also employed interior *French doors*— usually with some glazing— to control ventilation between rooms and as a way to share natural light. Additionally homes often employed *built-in* cabinetry to maximize the efficiency of space within the home. While this is true of many historic homes, Craftsman/Bungalow dwellings took it a step further and added built-in dressers, furniture, and other storage spaces.

Fox-Duhling House– Awning Extended

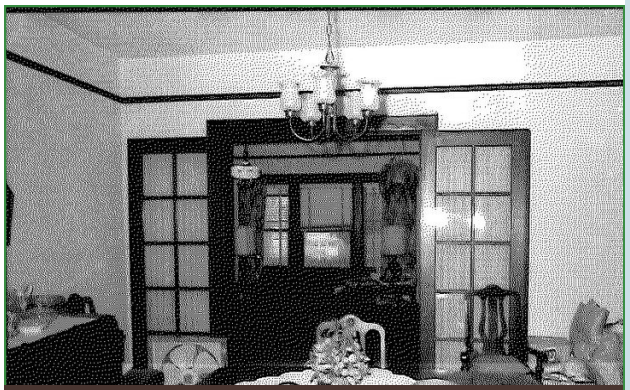
The *deep porches* further shaded the main body of the house from summer heat while providing additional living and social space. To further add to the efficiency of this space some homes employed fabric *awnings* that could be retracted or extended as needed.



Nicholson-Abernethy House Hickory

M.F. Sedgwick House Elizabeth City

Many houses also had *louvered wooden doors*. Similar to screen doors they allowed for the home to take advantage of night time cooling and breezes to ventilate the home. The numerous operable *windows* also helped with ventilation and toke full advantage of natural light throughout the home. Finally the style usually incorporated dormers with window for natural light with *vents* to allow excess heat to escape. Front gable homes don't often have dormers, but instead have a room above the porch which features vents and windows.



Frederick O. Bock House Hickory 1923— Interior French Doors

506 Main St, Columbia— c. 1910

QUEEN ANNE

The highly popular Queen Anne style was representative of the new industrial age, and new construction technologies that allowed for asymmetrical building and elaborate ornamentation. This style is pictured here with the most popular roof forms in the state: hipped and cross-gabled, and in a variety of applications from vernacular to high style. This style was popular within the state from the mid-1880's through the early twentieth century.

Preyer-Cropsey-Outlaw House, Elizabeth City— c. 1894

The growth of the style within the state was mostly due to the rapidly rising wealth of urbanites and industrialists and also expressed mass produced ornamentation that could be added to existing homes to embody new ideas of modern fashion. It was less common to find this style in rural areas as most farmers and agriculturalists didn't have the spare funds to embrace this elaborate style.

Unlike the previous styles, floor plans were no longer confined to simple rectangles with L– or T–shapes and instead incorporated multiple layers of towers, gables, balconies, wings, and

Alexander Martin House, Elkin— c. 1893

porches. The interior room arrangements also varied from central stair halls and formal rooms, to off-center rectangles with an added tower or bay projection. Similarly porches grew to wrap around facades, include gazebos and porte-cochères, and incorporate elaborate spindlework between and around columns.

Other exterior features include steeply pitched roofs of irregular shapes, assorted shingles and other devices to avoid smooth walls such as cut-away bays, cantilevered expansions, false

Suggs-Hicks House, Snow Hill— c. 1890

overhangs, recessed upper porches, and other decorative detailing. Additionally windows usually contain a single pane of glass in each sash or were a single piece of plate glass surrounded by small square panes (called Queen Anne Windows).

Like bungalows, Queen Anne houses were often built and designed by architects but there were also many that were found in pattern books, shipped by rail, and constructed on site. One such house is the Charles T. Holt House, featured in the Introduction to this manual, which is located in

Crutchfield House, Liberty— c. 1900

Lowenstein House, Statesville c. 1890

James A Hadley House, Mt. Airy c 1890

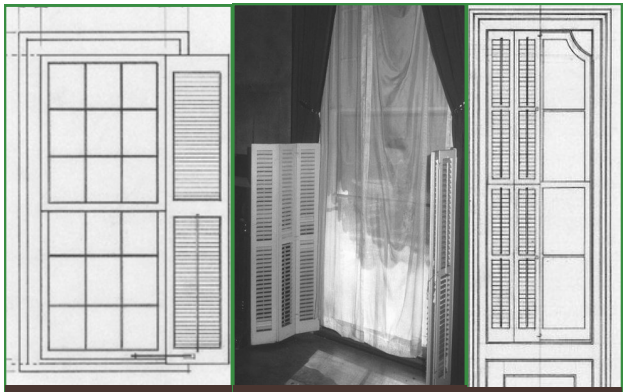
rural Haw River, yet features elaborate detailing which rivals that of homes in urban areas.

SUSTAINABLE FEATURES

The features that make Queen Anne homes sustainable vary somewhat from Bungalow homes. While these homes also have deep porches, built-in cabinetry, operable windows, and interior ventilation controls they also feature interior shutters, side and transom lights, and high ceilings.

Queen Anne *porches* may be some of the most elaborate found in the state and typically wrap-around two or more *facades* (faces) of the building. Some of these incorporate *porte-cochères* (carports), gazebos with seating, or glazed sections. Queen Anne's often have additional second floor porches around towers, recessed above bays, or projecting from bays. Some go further still and incorporate *widows' walks* and *cupolas* (platforms surmounting the structure and enclosed by either balustrades or walls). These structures help to shade the main part of the home from excessive heat gains, as well as providing extra living and social spaces.

Unlike the later Bungalow homes, Queen Annes often had built in *interior shutters*. These would be bi-fold, and were more common in later homes. Earlier homes often used lace for window coverings. Some homes employed *exterior shutters* that were operable from inside like the William Smith house in Ansonville. Others employed *exterior shutters* alone. The prevalence of shutters in the south is due to their ability to provide shade from the sun while allowing breezes to pass through unlike heavy drapery which were often used to block drafts.



William Smith Ansonville | Mistletoe Villa, Henderson | Heck-Lee, Raleigh

506 Main St Columbia— Built-in Cabinetry

Person-McGhee House, Franklinton c 1890

These homes also embraced natural light through the use of copious windows, *side lights*, and *transoms* to share light in interior spaces. Side lights and transoms were most common at entrances to passageways but interior and window transoms also allowed light to reach further into interior spaces.

The relatively *high ceilings* of Queen Anne homes help to remove heat from the occupied space of the home during hot months because it lets hot air rise above the occupants. In winter months *ceiling fans* would be used to push warm air back down to occupants.

The Manor Inn, Asheville c 1898 | Moore-Overby House Snow Hill 1895

Barnes-Bell House Wilson— c. 1927

COLONIAL REVIVAL

In response to the elaborate and fanciful detailing of the Victorian styles, Colonial Revival sought to revive the austere with patriotic enthusiasm for the American past. It began with revival forms being attached to Queen Anne homes in the 1890's and grew throughout the 1920's into its own style and even spawned a few sub-styles like Southern Colonial and Federal-Georgian. Additionally the Colonial Revival style was an attempt at solidifying American culture against waves of immigration, class turbulence, and expanding industrialization. In the South there was an added dimension— an ideal antebellum civilization and the ideals that were represented therein— which led to a highly popular sub-style: Southern Colonial.

This style's main feature is a central portico of massive order with one-story porches to either side. Additionally the floor plans returned to the vernacular form of a central-passage and often to a double-pile. Other characteristics to this style were pedimented side bays, paired columns, projecting verandas, *porte-cochères*, dormers, and rectangular massing. Also, common in North Carolina, was the inclusion of a second level porch incorporated with the entrance portico, or continuing around the home.

Senter House Chalybeate Springs (Dunn)— c. 1910

Traditional colonial revival homes also feature an accentuated front door with a decorative crown, pilasters, fan/side lights, and portico. Additionally homes are usually symmetrical, with double-hung, multi-paned sash windows that commonly appear in pairs. The pediments also often appear broken— as seen in the Senter House— which means part of the pediment is not connected. These homes also feature roofs with little overhang that shade classically detailed cornices.

James Lee House Monroe — c. 1912

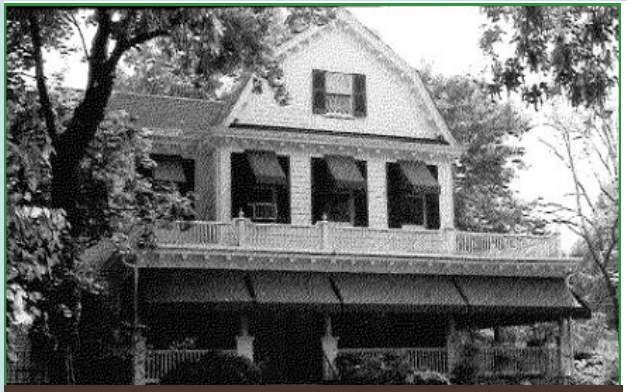
This style is one of the hardest to define as it branches off in style to incorporate Federal Revival, Georgian Revival, Dutch Colonial Revival, Cape Cod, and others, as well as being commonly incorporated with Queen Anne and Craftsman bungalow forms.

Finally these revivals may be hard to tell from their original counterparts but some common signs are heavily elaborated entrances, porticos

Tate House Morganton— c. 1928

Ledbetter House Cool Springs (Forest City)—c. 1914

Charles O. Robinson House, Statesville, 1913



Ridgecroft Eden c 1902— Awnings extended

that are curved underneath, broken pediments, unsupported pediments, and sidelights without fanlights at the entrance.

SUSTAINABLE FEATURES

Colonial Revival homes share sustainable features with both Bungalows and Queen Anne homes. Shared sustainable features include the use of operable windows, awnings, shutters, and interior transoms; built-in cabinetry, French door passages, slatted doors, high ceilings, deep porches, and side lights. The Colonial Revival form has other sustainable features like the massive portico, secondary porches, glazed sunrooms.

While some Revival homes have wrap around porches, the vast majority have a large *portico* at the main— and sometimes side— entrances. This large pillared structure shades the front façade of the home reducing heat gain. Additionally it usually shades a second story *balcony*. These balconies allows for better ventilation and lighting of second floor rooms.

Many Colonial Revival homes also feature *secondary porches* on first floors that are paired with French doors that allow for light to penetrate further into the home as seen in the Annie McDowell Ervin house in Hickory which has interior French doors paired with exterior French doors to capitalize on daylighting and ventilation.

McDowell Ervin House Hickory | Machaven Rocky Mount c 1908

Some homes also incorporated a glazed den or *sunroom*. Sunrooms were designed to allow inhabitants to enjoy the outdoors in adverse weather but could also be used as a *conservatory* (greenhouse) for growing plants during cold months.

Williams-Cozart House Wilson 1903 | Orton Plantation Smithville 1843

One notable interior feature is the use of *louvered doors* for both interior and exterior applications. The use of these doors allowed for additional ventilation while provided shade from the sun and rain.

Ridgecroft Interior Glazing | L.C. Blades House Elizabeth City

Barnes-Bell House Front Entrances

COMMON FEATURES

While all the styles discussed here have their own defining characteristics and features there are some that cross all of the styles. These features are not constrained to North Carolina however they are found on many houses and other styles that aren't covered here. Many of these features were added as a way to adjust to the climate of the region and add to the sustainability of historic homes.

The most prevalent feature may be porches. They range from small entry porches to wrap-around porches to two-story porches with exterior stairwells. The piazza porches of the coastal areas may be the most recognized however. These were grand porches that were 10 or more feet deep,

Lavender-Barrus House, Pollocksville c. 1825

Mistletoe Villa, Henderson— c. 1883

ranged from single to three stories, and in some case wrapped the whole building. They served as exterior living space, social areas for the genteel, sleeping porches in hot months, and shading. While these porches proliferated in the Tidewater and Coastal Plains of North Carolina, as settlement pushed westward these porches became less common as technology advanced and as the climate changed. This isn't to say that large grand porches aren't found in the Mountains of the state but they are usually less deep, and aligned to take advantage of stunning views and mountain breezes which, unlike the coast, usually come from the west.

Another feature found in all the styles covered here is the porte-cochère. The term is French for coach house, and commonly they are referred to as carports today. Unlike modern carports, these were styled to match the house and were structural components. They are usually to one side of the home and were more prevalent after the automobile became common but some houses had them before this time as a way for people to avoid exposure to bad weather when entering or exiting the house. Generally they feature a side entrance to the home for this reason.

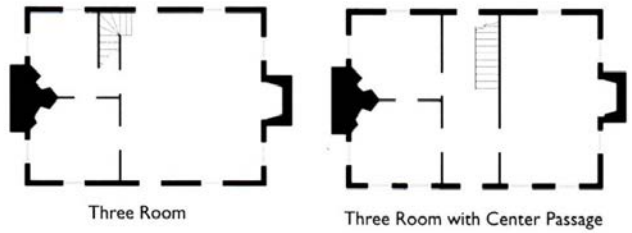
Other features that are common across styles include dormers, deep porches, exterior shutters and awnings, double-hung windows, fan

Lucy Catherine Capeheart House, Raleigh c. 1897

ANATOMY OF A HOME

Common components, floorplans, and terminology

and side lights, gable vents and materials like brick, stone, metal, and wood. These styles also share floorplans, massing, roof forms and interior features like stairwells, chimneys, and transoms.



Adapted from drawings by Carl Lounsbury and Doug Swaim

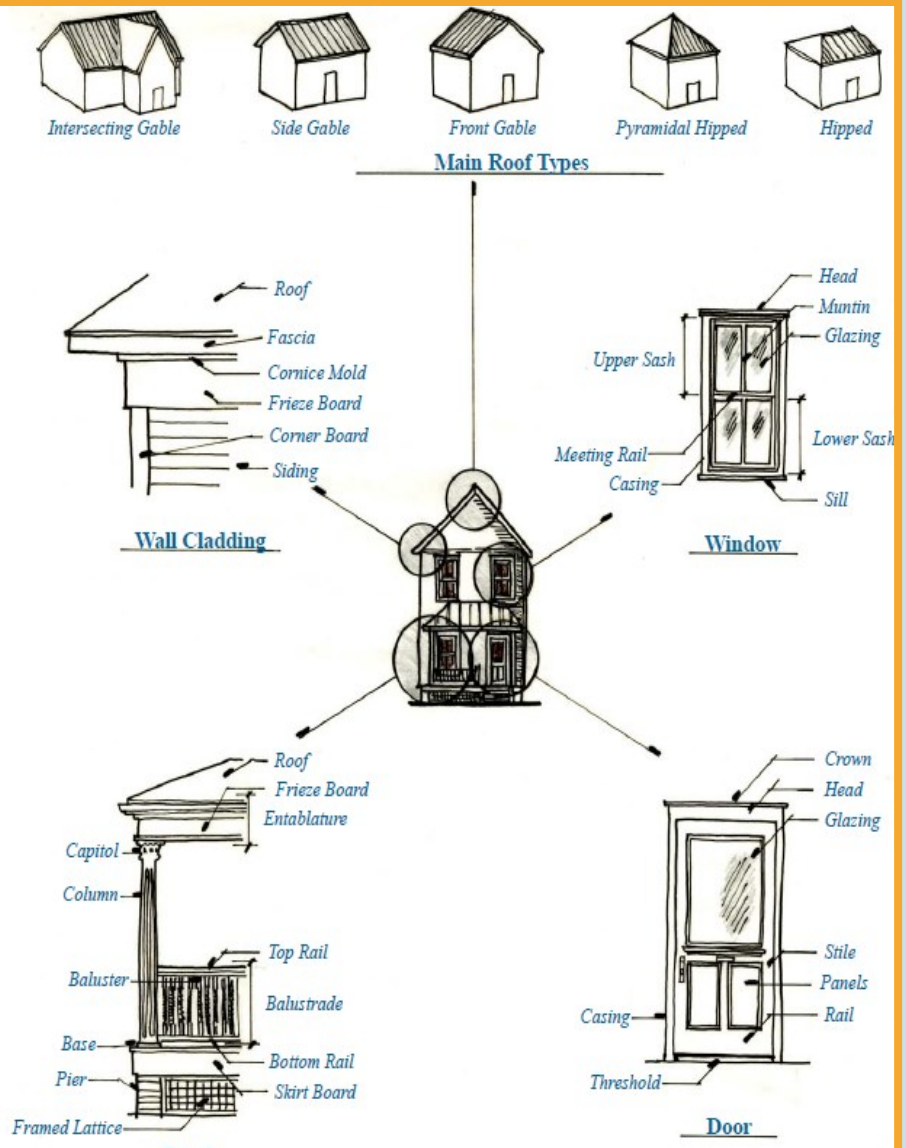


Diagram courtesy of The Roanoke Pattern Book

Perhaps the most important common feature of these styles is the use of *vernacular* floorplans. Often these floorplans— which have been used through generations— would be combined with details added from multiple or various styles. Therefore your home may not have a towering spire, but may still be a Queen Anne. Similarly Bungalow styled homes may not be as open as they are in Western states and instead employ a center passage that is two rooms deep to either side. Finally, Colonial Revivals commonly use center passage plans.

Chapter Three

Sustainability, Care, and Maintenance



NATIONAL NOMENCLATURE

The Secretary of the Interior's Standards and District Designation

What does it mean to be listed on the National Register of Historic Places? It is recognition of your home's significance to our history. It also means that your rehabilitation may qualify for federal tax credits (and in NC, state tax credits), and grants; get special consideration when federally funded projects may impose on your site; and be included in the NR archives— a searchable database and an invaluable research tool. Also you can order a bronze plaque signifying your homes inclusion on the register.

What listing **does not do** is place restrictions on your home and its uses; lead to public acquisition or access; invoke *local* district zoning or regulations; or devalue your property.

Some of the biggest misconceptions regarding historic preservation concern the National Register of Historic Places and the Secretary of the Interior's Standards. For example being listed on the National Register means the government will tell you what you can do with your house and that you must follow their regulations. However, being listed on the National Register is an honorific; meaning that other than recognizing the historic importance of your home, and providing some protection from federally funded projects, inclusion is just a title.

The only time this change is when homeowner's decide to pursue tax credits from the government for the preservation of their homes. This is where the Secretary of the Interior's Standards and Guidelines come into play as they describe the four acceptable treatment methods for historic homes and give examples of appropriate and inappropriate approaches to these treatment methods. It should be noted that the National Park Service recommends that qualified historic preservation professionals be obtained early in the planning of the project because they have experience in working with historic buildings, identifying features, materials, and physical evidence.

The Standards aren't technical or prescriptive; instead they are intended to promote responsible practices and help protect our Nation's unique cultural resources. The Standards do not determine exactly what materials and features are essential to a building's historic character, or what can be changed, but they do provide a framework for how to approach the preservation of your home. Once a treatment approach has been selected the Standards also provide a philosophical consistency. The four treatment approaches are Preservation, Rehabilitation, Restoration, and Reconstruction. The first three are briefly discussed here and then at length, however the last— reconstruction— is not as it addresses the reconstruction of lost resources.

The first treatment, **Preservation**, emphasizes the retention of *all* historic fabric through conservation, maintenance and repair. It reflects a building's lifespan, through continuous occupancies, and changes and alterations that have been made. This treatment allows for limited replacement of historic features and accentuates the repair of these features instead.

The next treatment, **Rehabilitation**, stresses the retention and repair of historic materials, but allows for more replacement because the properties are usually more deteriorated before treatment. Similar to Preservation, Rehabilitation standards focus on the preservation of the materials, features, finishes, and spatial relationships that give a property its historic character.

Finally the treatment, **Restoration** focuses on the retention of specific materials from the *most significant time* in a property's history. Due to its focus this treatment also allows for the removal

of other historic features that are not from this period.

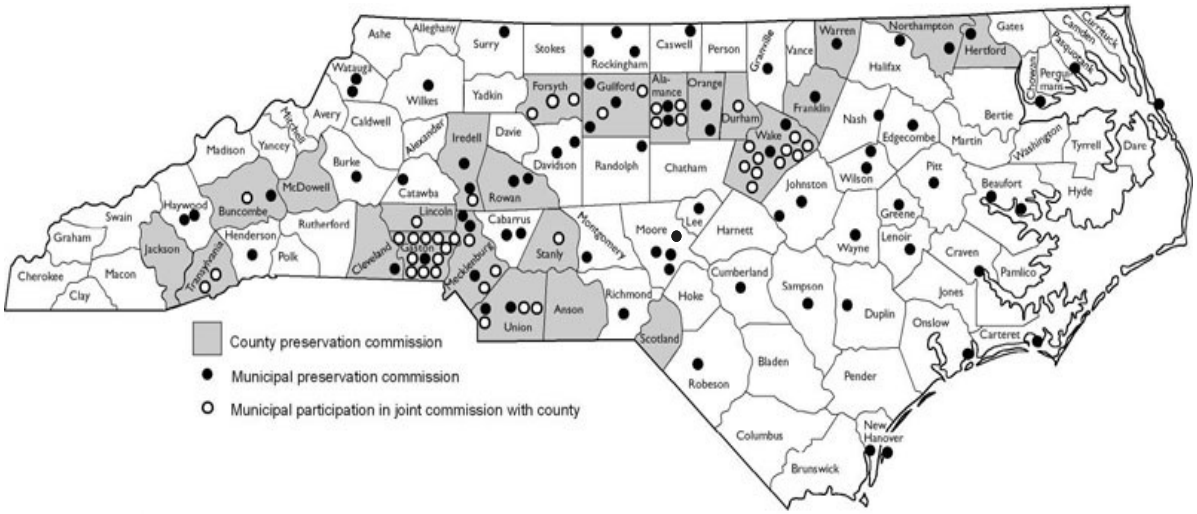
When choosing the most appropriate treatment for your home you should not only consider the building's significance, but also its relationship with in history, its physical condition, and any mandatory code requirements.

The Guidelines were created to assist in applying the Standards to all treatment work; they don't give case-specific advice or address exceptions or rare instances, instead they are necessarily broad to reach their intended goal. The Guidelines pertain to both exterior and interior work on historic buildings of all sizes, materials, and types and are listed as either *recommended* or *not recommended*.

The approaches that are consistent with the **Standards** are listed in the *recommended* column on the left while inconsistent approaches are listed in the *Not Recommended* column on the right. The Guidelines also give a brief historical overview of the primary building materials and their uses over time. This is followed by a discussion of building features made of these materials. Incorporated within this section are special requirements for work to meet accessibility requirements, health and safety code requirements, or improving energy efficiency.

As mentioned earlier, National Register Historic District designation does not automatically invoke *local* historic district designation. In some case the newly designated district will land within a city or municipality that has blanketing guidelines for historic districts like Raleigh, but more likely it will be somewhere that has no local protections.

Local historic districts offer more protection for property values, and buildings because they have an authority that assures repairs, alterations, and additions respect the historic character of not only the home involved but the rest of the neighborhood as well. Similar to covenants in new communities, local guidelines make sure everyone is held to the same standard; unlike covenants there are no pesky association fees!



Map courtesy of the NC SHPO

This authority is known as the Historic Preservation Commission (HPC) which is established through a state certified local government (CLG). The CLG's are started by the State Historic Preservation Office (SHPO) and are created to set into place the reasons and purpose for regulation, the membership duties and powers of the HPC, and provide guidelines for decision making.

Once designated the responsibilities for protecting the districts character goes to the HPC. The commission has nine main functions in this regard: identifying the most important concerns, provide minimum standards for review boards, assure fair treatment of all applicants, promote consistency in decisions, establish evidence of fair and objective criteria to strengthen judicial position, clarify standards of appropriateness for ease of compliance, inform owners of techniques that respect integrity, speed the process of routine alterations, and increase public awareness of architectural character within the community.

There are over 100 active HPC's within the state however, if you are in a locale that doesn't have an HPC and you are interested in starting one please contact the State Historic Preservation Office's Preservation Commission Services/CLG Coordinator. Or to find your local HPC visit the SHPO's website.

PRESERVATION

Standards & Guidelines

1. A property will be used as it was historically, or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property will be protected and, if necessary, stabilized until additional work may be undertaken.

2. The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. The existing condition of historic features will be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of a distinctive feature, the new material will match the old in composition, design, color, and texture.

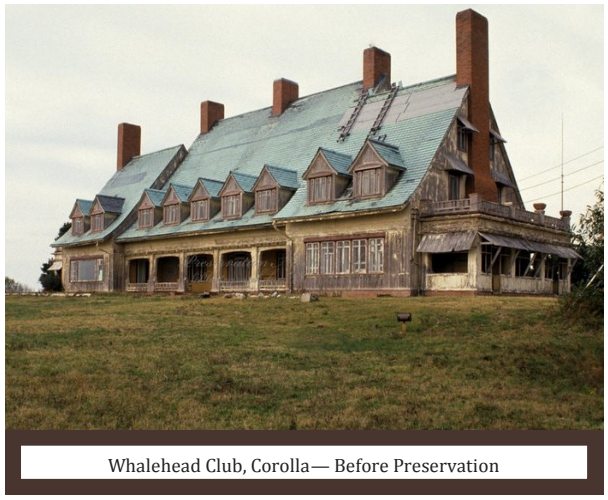
7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

In the Preservation treatment it is assumed that building materials and character-defining features are basically intact. The goal of this approach is retention of the building's existing form, features and detailing— without removing later additions. This may be basic maintenance of materials and features or may involve in-depth analysis with the aid of preservation professionals. The following are the main principles of the Preservation approach.

◊ Identify, Retain, and Preserve

Begin by identifying the form and detailing of the important architectural materials and features that help define the building's character and must be retained in order to preserve it. This character may be defined by the form and detailing of exterior materials and features; interior materials and features, room configuration and spatial relationships; structural and mechanical systems; and the building's site and setting.



Whalehead Club, Corolla— Before Preservation

◊ Stabilize

Deteriorated portions of a historic building may need to be protected thorough preliminary stabilization measures until additional work can be undertaken. Stabilizing includes structural reinforcement, weatherization, or correction of unsafe conditions. Although it may not be necessary in every preservation project, stabilization is an integral part of the Preservation treatment.

◊ Protect and Maintain

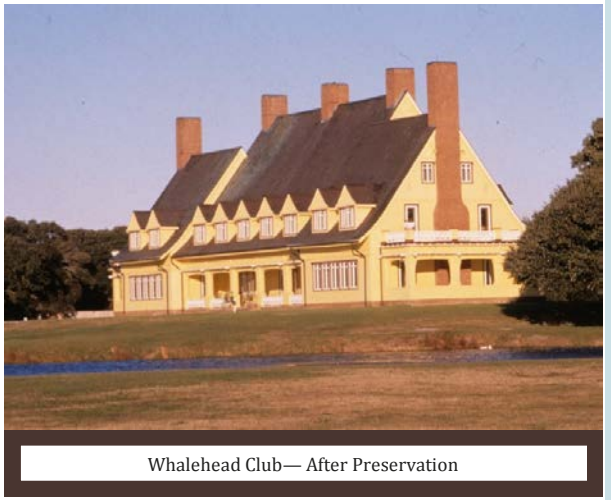
The materials and features identified earlier are protected and maintained after deteriorated ones are stabilized. Protection is a preparatory stage that generally involves the least degree of intervention. For example, protection includes treatments such as rust removal, caulking, limited paint removal, cleaning gutter systems or installation of fencing, or other temporary protective measures. Since more extensive work is usually necessary for historic buildings this is also the appropriate time to conduct an assessment of the buildings overall condition.

◊ Repair (Stabilize, Consolidate, and Conserve)

The Preservation approach focuses on retention of existing materials and features while using as little new material as possible. Repair of a historic material, such as masonry, always begins with the least degree of intervention possible such as strengthening fragile materials through consolidation. Repairing features includes patching, splicing, or other forms of reinforcement. All work should be both physically and visually compatible, identifiable upon close inspection and documented for future generations.

◊ Limited Replacement

If repairs prove unsuccessful or inadequate, replacement in kind of deteriorated or missing features is acceptable if the replacement matches the old. Additionally, with the exception of hidden structural reinforcement and new mechanical system components, substitute materials are not appropriate within this type of treatment.



Whalehead Club— After Preservation

REHABILITATION

Standards & Guidelines

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.

2. The historic character of a property will be retained and preserved. The removal or alteration of distinctive materials. features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development will not be undertaken.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement , the new feature will match the old in design, color, texture, and, where possible, materials.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

9. New additions, alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing.

10. New additions and adjacent or related new construction will be undertaken in a such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

In Rehabilitation, the existing historic fabric has become damaged or deteriorated over time and needs more repair and replacement. Of the four treatments, only Rehabilitation includes the opportunity to make an efficient reuse through alterations and additions.

◊ Identify, Retain, & Preserve

Begin by identifying the form and detailing of the important architectural materials and features that help define the building's character and must be retained in order to preserve it. This character may be defined by the detailing of interior and exterior materials and features; room configuration and spatial relationships; structural and mechanical systems; and the building's site/setting.

◊ Protect & Maintain

Protection of materials and features is a preparatory stage that generally involves the least degree of intervention like rust removal, caulking, limited paint removal, and cleaning gutter systems. This is also the appropriate time to conduct an assessment of the buildings overall condition.

213 S. Driver St, Durham– Before Rehabilitation

◊ Repair

As with other treatments repair of historic materials always begins with the least degree of intervention possible such as patching, piecing-in, splicing, consolidating, or reinforcement according to recognized preservation methods. Repairing also includes the limited replacement in kind--or with compatible substitute material --of extensively deteriorated or missing parts of features when there are surviving prototypes.

◊ Replace

If the essential form and detailing are still evident so that physical evidence can be used to re-establish the feature then its replacement is appropriate. The preferred option is always replacement of the entire feature, with the same material. While the NPS recommends the replacement of an entire feature that is extensively deteriorated, they *never* recommend removal and replacement with new material that when the existing may be repaired and preserved.

◊ Design for the Replacement of Missing Historic Features

When an entire feature is missing, it can be accurately recovered in form and detailing through historical evidence. Although accepting the loss is one possibility, its replacement is always recommended. Another option for a replacement feature is a new design that is compatible with the remaining character-defining features of the building. The new design should be *clearly* differentiated as to not give a false sense of history.

◊ Alterations and Additions of New Features

Some alterations to a building are needed to assure its continued use, but such should not destroy defining characteristics. New additions should be designed and constructed to be differentiated from the historic building so that the character-defining features are not changed, damaged, or destroyed.

213 S. Driver St, Durham— After Rehabilitation

RESTORATION

Standards & Guidelines

1. A property will be used as it was historically or be given a new use which reflects the property's restoration period.

2. Materials and features from the restoration period will be retained and preserved. The removal of materials or alteration of features, spaces, and spatial relationships that characterize the period will not be undertaken.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate and conserve materials and features from the restoration period will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

4. Materials, features, spaces, and finishes that characterize other historical periods will be documented prior to their alteration or removal.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize the restoration period will be preserved.

6. Deteriorated features from the restoration period will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials.

7. Replacement of missing features from the restoration period will be substantiated by documentary and physical evidence.

8. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

9. Archeological resources affected by a project will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

10. Designs that were never executed historically will not be constructed.

Rather than maintaining and preserving a building as it has evolved over time, this treatment seeks to make the building appear as it did at the most significant time in its history. Unlike other treatments, Restoration includes the removal of features from other periods and emphasizes the use of *only* designs that can be documented as having been built at the site so as not to construct a false sense of history.

◊ Identify, Retain, and Preserve

Begin by identifying the form and detailing of the important architectural materials and features that help define the building's character from historical research. This character may be defined by the form and detailing of exterior and interior materials and features; room configuration and spatial relationships; structural and mechanical systems; and the building's site and setting.

Mistletoe Villa, Henderson— Before Restoration

◊ Protect and Maintain from the Restoration Period

Protection of materials and features is a preparatory stage that generally involves the least degree of intervention. For example, protection includes treatments such as rust removal, caulking, limited paint removal, cleaning gutter systems or installation of fencing, or other temporary protective measures. Since more extensive work is usually necessary for historic buildings this is also the appropriate time to conduct an assessment of the buildings overall condition.

◊ Repair from the Restoration Period

As with other treatments repair of historic materials always begins with the least degree of intervention possible such as patching, piecing-in, splicing, consolidating, or reinforcement according to recognized preservation methods. Repairing also includes the limited replacement of extensively deteriorated or missing parts of features when there are surviving prototypes which should be discreetly dated.

◊ Replace from the Restoration Period

If the essential form and detailing are still evident so that the physical evidence can be used to re-establish the feature, then its replacement is appropriate. Like the guidance for repair, the preferred option is always replacement of the entire feature, with the same material.

◊ Remove Features from Other Periods

Most buildings represent change over time, but using this treatment, the goal is to show the building as it appeared during the most significant period of its history. Therefore, work includes removal or alteration of existing historic features that do not represent the restoration period.

◊ Re-create Missing Historic Features

Most projects involve re-creating features that were significant to the building, but are now missing such as a balustrade, a porch, or storefront. Without sufficient documentation of these features an accurate depiction cannot be achieved, so each missing feature should be substantiated by documentary and physical evidence. Using traditional materials for lost features is the preferred approach; but, using substitute materials is an acceptable alternative.

Mistletoe Villa, Henderson— After Restoration

SUSTAINABILITY

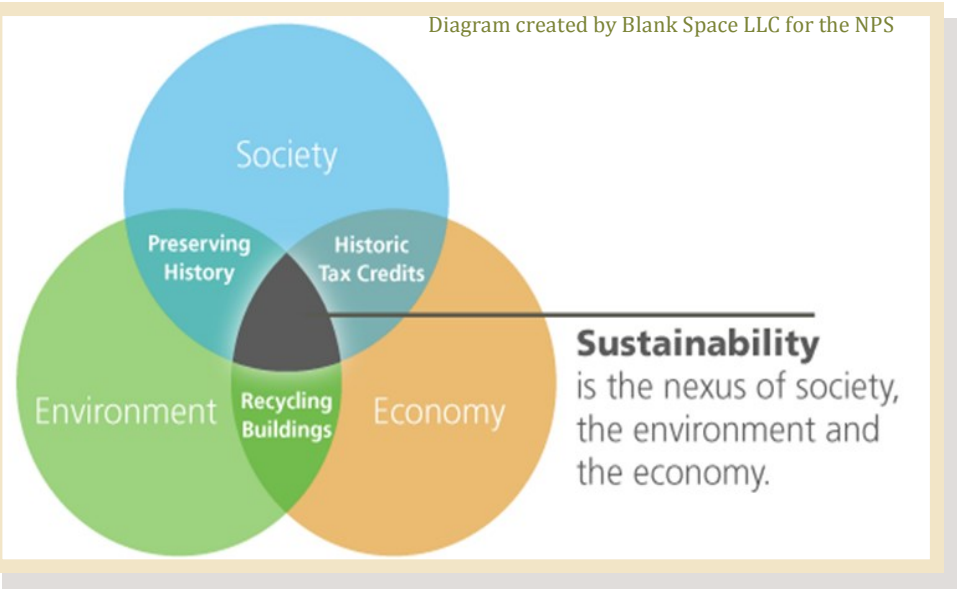
Where Society, the Environment, and the Economy Meet

Sustainability is the newest face on a generations old idea: the need to protect our resources and our identities. While sustainable ideas have been noted for centuries—millennia in some cases—the focus here is on Modern Environmentalism and Sustainable Design beginning with environmentalism in the 1960's, the energy crises and the responses of the 1970's, and the evolution through today.

Sustainability is a commonly used term in today's world, but it is also one that has a very broad— and not fully understood— meaning. It has generally been accepted that sustainability is the ability to meet the needs of current generations without compromising the ability of future generations to meet theirs.

The Environmental Protection Agency also asserts that "everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment." It is this reasoning that continues to drive a desire to incorporate sustainable practices within our everyday lives, but this idea did not spring up overnight. Instead, it grew out of a number of groups mainly concerned with hazardous environmental practices, to include cultural, social, and economic activists as well; all of whom realized that sustainability goes beyond the purely natural world.

Diagram created by Blank Space LLC for the NPS



Green preservation is the intersection of historic preservation and sustainability. Blank Space created a diagram that identifies this concept of sustainability as the overlap of society, the economy and the environment. The diagram, created for the National Park Service, explains how Historic Preservation is sustainable by reusing historic buildings with new causes, while preserving our cultural history, and aiding owners through tax credits.

However it leaves out the fact that the preservation of historic structures furthers sustainability through job creation and material reuse. The repair and preservation of historic buildings adds to sustainability in the surrounding community by creating skilled jobs in disappearing historic trades, supporting the use of locally created and sourced materials (as these were the materials commonly used in original construction), advocates repair before replacement, and keeps money in often economically depressed areas.

INVESTIGATE AND PLAN

The Whole Building Approach and Audits

To ensure proper care and maintenance it is best to get know your home by taking a **Whole Building Approach**. This approach takes into account all aspects of the building, the interaction of its elements, the project goals, and potential solutions to achieve these goals. This approach has several objectives that create a high performance, sustainable building. Additionally it allows for the project to be broken into manageable sections such as the building envelope, the elements, the interior, the exterior, and new additions. The objectives of the WBA are described below:

- **Accessible**: Applies to the building elements, heights and clearances to address the specific needs of disabled people.
- **Aesthetics**: Is the physical appearance and image of the building's elements and spaces. Additionally it refers to the integrated design process.
- **Cost-Effective**: Requires selecting building elements based on life-cycle costs as well as basic cost estimating and budget control.
- **Functional/Operational**: Pertains to functional programming— such as spatial needs and requirements, system performance and durability, and efficient maintenance building elements.
- **Historic Preservation**: The actions affecting a historic building where building elements and strategies are classified into one of the four approaches: preservation, rehabilitation, restoration, or reconstruction for the protection of character defining features, and cultural history.
- **Productive**: Pertains to occupants' well-being including building elements such as air distribution, lighting, workspaces, systems, and technology.
- **Secure/Safe**: Addresses the physical protection of occupants and assets from man-made and natural hazards.
- **Sustainable**: Pertains to environmental performance of building elements and strategies.

Diagram Courtesy of the Whole Building Design Guide

The best way to start this approach is by conducting a survey of the building's condition. This is easily done through a visual investigation of the various elements and features. Starting with the site immediately surrounding the structure, look for signs contributing to deterioration like vegetative or biological growths, and standing water. Continue to note and observe any signs of deterioration in the foundation and exterior elements of the building. This includes deteriorated mortar or other material loss, paint loss, areas of discoloration, or possibly stressed areas (evidenced by bulges or cracks). Progress to the interior to note original features like trim details, and hardware. Additionally identify areas of air infiltration such as along built-in cabinetry, baseboards and utility penetrations.

Use the checklist on following page to obtain important information about your home's elements and features to further understand where improvements can be made.

BUILDING CHECKLIST

Foundation/Basement

Structure
- ☐ Frame
- ☐ Wood
- ☐ Solid Masonry
- ☐ Hollow Masonry
- ☐ Other_____

Exterior Finish
- ☐ Masonry
- ☐ Wood Siding
- ☐ Decorative Siding
- ☐ Vinyl Siding
- ☐ Other_____

Insulation Type
- ☐ Batt
- ☐ Blown-In
- ☐ Loose Fill
- ☐ Rigid
- ☐ Other_____

Insulation Material
- ☐ Fiberglass
- ☐ Cellulose
- ☐ Polystyrene
- ☐ Fiberboard
- ☐ Other _____

Interior Finish
- ☐ Plaster
- ☐ Gypsum Board
- ☐ Masonry
- ☐ Wood Paneling
- ☐ Other_____

Notes:

Roof

Structure
- ☐ Frame
- ☐ Wood
- ☐ Steel
- ☐ Other_____

Built-Up Roof
- ☐ Single Ply Membrane
- ☐ Asphalt and Gravel
- ☐ Other_____

Sloped Roof
- ☐ Wood Shingles
- ☐ Tiles
- ☐ Slate
- ☐ Metal
- ☐ Other_____

Insulation Material
- ☐ Fiberglass
- ☐ Cellulose
- ☐ Polystyrene
- ☐ Fiberboard
- ☐ Other _____

Interior Finish
- ☐ Plaster
- ☐ Gypsum Board
- ☐ Masonry
- ☐ Wood Paneling
- ☐ Other_____

Notes:

Exterior Walls

Structure
- ☐ Frame
- ☐ Wood
- ☐ Solid Masonry
- ☐ Hollow Masonry
- ☐ Other_____

Exterior Finish
- ☐ Masonry
- ☐ Wood Siding
- ☐ Decorative Siding
- ☐ Vinyl Siding
- ☐ Other_____

Insulation Type
- ☐ Batt
- ☐ Blown-In
- ☐ Loose Fill
- ☐ Rigid
- ☐ Other_____

Insulation Material
- ☐ Fiberglass
- ☐ Cellulose
- ☐ Polystyrene
- ☐ Fiberboard
- ☐ Other _____

Interior Finish
- ☐ Plaster
- ☐ Gypsum Board
- ☐ Masonry
- ☐ Wood Paneling
- ☐ Other_____

Notes:

Windows

Glazing Material
- ☐ Original
- ☐ Stained/Colored
- ☐ Clear
- ☐ Low-E Coated
- ☐ Thermopane
- ☐ Glass Block
- ☐ Tinted
- ☐ Insulated Panels
- ☐ Other_____

Frame Material
- ☐ Wood
- ☐ Aluminum
- ☐ Steel
- ☐ Vinyl
- ☐ Clad
- ☐ Bronze
- ☐ Other_____

Shutters/Awning
- ☐ Operable
- ☐ Fixed
- ☐ Interior
- ☐ Exterior
- ☐ Metal
- ☐ Fabric
- ☐ Other_____

Storm Windows
- ☐ Interior
- ☐ Exterior
- ☐ Screens

Notes:

Doors

Interior
- ☐ Swinging
- ☐ French Doors
- ☐ Pocket
- ☐ Passage
- ☐ Other_____

Exterior
- ☐ Storm
- ☐ Screen
- ☐ Garage
- ☐ Sliding
- ☐ Other _____

Material
- ☐ Solid Wood
- ☐ Hollow Wood
- ☐ Partial Glazed
- ☐ Glazed
- ☐ Other_____

Material
- ☐ Partial Glazed
- ☐ Wood
- ☐ Aluminum
- ☐ Vinyl
- ☐ Glazed

Features
- ☐ Fanlight
- ☐ Sidelight
- ☐ Operable Transom
- ☐ Original Hardware
- ☐ Other_____

Interior Walls

Interior Finish
- ☐ Masonry
- ☐ Plaster
- ☐ Gypsum Board
- ☐ Paneling
- ☐ Other_____

Notes:

Insulation Type
- ☐ Batt
- ☐ Blown-In
- ☐ Loose Fill
- ☐ Rigid
- ☐ Other_____

Insulation Material
- ☐ Fiberglass
- ☐ Cellulose
- ☐ Polystyrene
- ☐ Fiberboard
- ☐ Other _____

Trim/Molding
- ☐ Crown/Base
- ☐ Chair Rail
- ☐ Wainscoting
- ☐ Windows/Doors
- ☐ Other_____

Trim Profiles:

Systems

Heating
- ☐ Boiler
- ☐ Wood Stove
- ☐ Fireplace
- ☐ Furnace
- ☐ Space Heaters
- ☐ Passive Solar
- ☐ Electric Resistance
- ☐ Radiant Heat
- ☐ Other_____

Cooling
- ☐ Central Unit
- ☐ Window Unit
- ☐ Other_____

Combination
- ☐ Geothermal
- ☐ Heat Pumps
- ☐ Central System
- ☐ Other _____

Ventilation
- ☐ Ceiling Fans
- ☐ Exhaust Fans
- ☐ Other_____

Electrical
- ☐ Historic
- ☐ Updated
- ☐ Mixed
- ☐ Solar
- ☐ Wind
- ☐ Other_____

Notes:

Equipment

Cooking
- ☐ Stove/Range
- ☐ Refrigerator
- ☐ Freezer
- ☐ Microwave
- ☐ Other_____

Entertainment
- ☐ Television
- ☐ Surround Sound
- ☐ Video Games
- ☐ Music/Movie Players
- ☐ Other_____

Office
- ☐ Printer
- ☐ Computer
- ☐ Shredder
- ☐ Scanner/Copier
- ☐ Other_____

Shop
- ☐ Welders
- ☐ Grinders/Sanders
- ☐ Saws
- ☐ Drills
- ☐ Other _____

Lighting
- ☐ Incandescent
- ☐ Florescent
- ☐ Halogen
- ☐ Compact Florescent
- ☐ Other_____

Notes:

INVESTIGATE AND PLAN

Energy Audits

Hiring a specialist to conduct an **energy audit** is an excellent way to find all the sources of in/ex-filtration that are present within the home. Energy auditors conduct blower door tests, inspect ventilation, use thermal imaging to locate areas of air in/ex-filtration, conduct room-by-room inspections and a review of utility bills. There are some steps you can take as a homeowner for a DIY energy audit:

◊ Locate and Seal Air Leaks

Check for indoor air leaks, like gaps along the baseboards or at junctures of the walls, floors and ceilings. Locate any holes from faucets, pipes, outlets, and wiring that can be caulked. Also check for leaks on the outside of your home in areas where two different building materials meet. Next look for cracks and holes in the mortar, foundation, and siding, and look for leaks around windows and doors.

◊ Check Insulation

Historic homes rarely have insulation as it was not common until after 1940, therefore an excellent way to improve your homes efficiency is by adding insulation in the attic and basement. The addition of wall insulation can be problematic and is less effective than insulating between floors. If you already have insulation, check to make sure that it is at least the minimum recommended thickness and add more insulation where necessary.

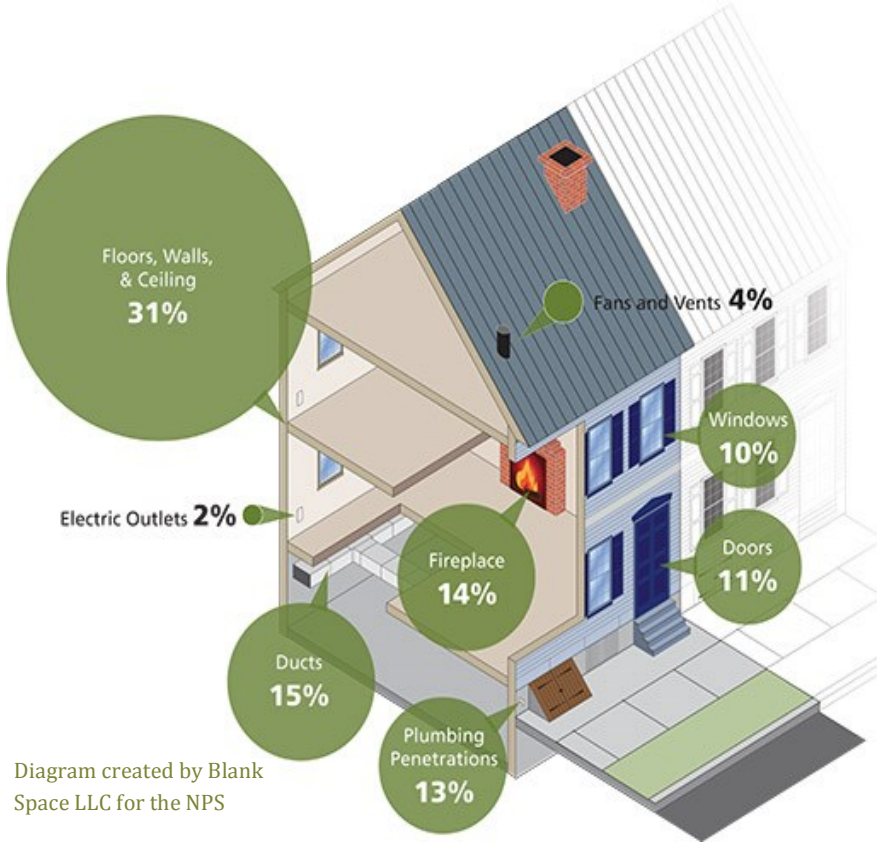


Diagram created by Blank Space LLC for the NPS

Additionally ensure that your water pipes, furnace, ventilation ducts and water heater are all insulated.

◊ Inspect Heating and Cooling Equipment

Check ductwork for dirt streaks, as these may be an indication of leaks. If your HVAC unit is more than 15 years old consider replacing it with a new efficient unit.

◊ Inspect Lighting

Lighting accounts for approximately 10% of your energy bill and simple steps like switching to efficient bulbs, utilizing daylight, and turning off lights when not in use can reduce this expense.

◊ Inspect Electronics

All of the electrical devices in your home effect your energy consumption. To reduce it unplug chargers or other devices that consume energy when not in use, purchase new efficient devices, or change the settings on devices like thermostats when you won't be home or when you are sleeping.The diagram on this page illustrates common areas of heat loss in historic homes.

SEASONAL CHANGE

Seasonal Care and Owner Rituals

One of the easiest ways to improve the efficiency of your home is through seasonal care and owner rituals. **Remember to change your air filters!**

SPRING

- ◊ Check for water leaks that may worsen with spring rains
- ◊ Clean out all gutters, check for clogs, and make sure gutters are secured to home
- ◊ Inspect grade around house to ensure it slopes away from the foundation
- ◊ Remove storm windows and install screens

SUMMER

- ◊ Close windows and shutters during the day to prevent heat infiltration
- ◊ Open windows in the evening at either end of the house to allow cool breezes through
- ◊ Repair any holes or tears in window screens
- ◊ Spray for termites

FALL

- ◊ Clean out all gutters, check for clogs, and make sure gutters are secured to home
- ◊ Hire a professional to inspect your chimney and fireplace
- ◊ Repair roofing materials to prevent leaks
- ◊ Repoint and repair grout in masonry

WINTER

- ◊ Remove window air-conditioning units or install a tight fitting cover to prevent heat exfiltration.
- ◊ Remove screens and re-install storm windows
- ◊ Remove any snow accumulation that could permeate your home's historic materials
- ◊ Turn off and drain outside spigots to prevent freezing

3-5 YEARS

- ◊ Check the roof for punctures, tears, rotting, etc. and hire a professional as needed
- ◊ Assess HVAC equipment for proper function, in needed consider replacing with an efficient unit
- ◊ Evaluate building materials conditions and repair as needed

OWNER RITUALS

- ◊ Know your typical energy use by looking at the past years energy costs to track changes and make habit adjustments.
- ◊ For every 3 degrees you raise your thermostat in the summer or lower it in the winter, you will save 10% on energy bills.
- ◊ Dressing for the season by adding layers is an effective way of adjusting personal temperatures without raising utility costs.
- ◊ Turn off lights and unplug chargers when not in use to prevent "dead-loads."

MATERIALS

Wood, Masonry and Metals

Perhaps the most common building material in North Carolina is **wood**. It is used inside and out on buildings large and small from high-style to vernacular and everywhere in between. The following are appropriate maintenance and repair methods.

◊ Inspect surfaces for signs of moisture damage such as mildew or biological growth, and termites or other insects which leave small holes or tunnels.

◊ Make sure there is good drainage so water does not collect on wood surfaces. This commonly occurs on roofs, and at wall junctures.

◊ Properly seal exterior vertical wood joints to prevent moisture penetration.

Wooden members deteriorated by natural forces

Wooden elements deteriorated from neglect

Do not seal horizontal joints, as it can trap moisture within walls.

◊ To slow the deterioration and decay of unpainted wood features treat them with an environmentally-safe chemical preservative such as HempShield.

◊ Maintain a sufficient coat of paint on painted surfaces to protect them from water, wind, and sunlight. This may require scraping off previous paint to ensure good adherence.

◊ Clean painted wood surfaces regularly with mild soap and water, and repaint as necessary.

The second most common building material in historic homes is **masonry** and is usually seen as either brick or stone. In historic homes brick was seen as a sign of wealth and permanence and before industrialization was fairly hard to come by. When properly maintained it lasts hundreds of years.

◊ Clean surfaces if soiled using the gentlest effective method, usually a mild soap and water, to prevent unnecessary damage or moisture infiltration. Sandblasting and harsh chemical treatments are *never* recommended!

◊ Check surfaces for signs of damage such as discoloration, cracks, bulges, loose

Masonry showing signs of moisture damage

units, and deteriorated mortar joints. Cracks may be a sign of settling or structural damage and should be monitored for growth.

◊ Ensure that there is good drainage so water does not collect on masonry surfaces or pool along foundations or piers. Also ensure downspouts move moisture away from the foundation

◊ Remove vegetation that holds moisture against masonry surfaces such as mosses, and ivies.

Always clean with the gentlest means

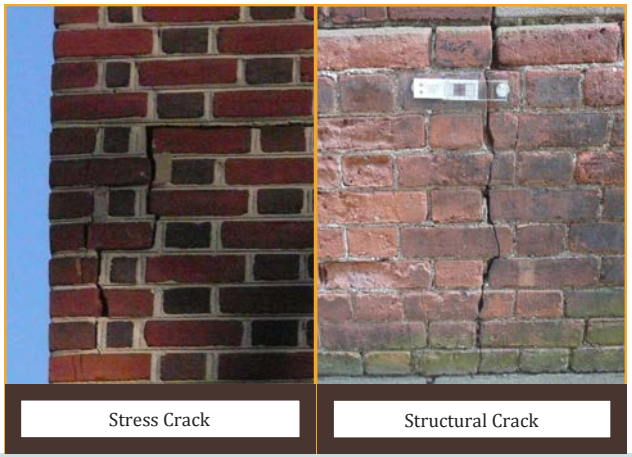
◊ Repoint mortar joints to prevent moisture damage and air infiltration.

◊ Repaint previously painted masonry surfaces as needed.

Traditional mortar was made from lime putty, combined with local sand, in a ratio of 1 part lime putty to 3 parts sand. Often other ingredients, such as crushed marine shells, brick dust, clay, natural cements, and pigments were also added to mortar. New mortar should be specially formulated for each job.

Spalled bricks caused by moisture retention

◊ Preliminary research is necessary to ensure that the repointing work is appropriate to the building. This can be done through analysis of *unweathered* portions of the historic mortar that the new mortar will be matched against for color, consistency, and density.



Stress Crack

Structural Crack

Repointing mortar:

◊ If color additives are needed, chemically pure synthetic oxide pigments are recommended because they are alkali proof and sun fast.

◊ Mortar should be softer than the masonry being repointed because it is intended to act as a sacrificial material and wick water away from the masonry.

◊ Repointing should take place when the temperature is above 45 degrees for three days, otherwise the mortar will not properly cure.

Always match mortar when repointing to avoid damage

For more information on repointing mortar:

Repointing with Virginia Limeworks
http://www.youtube.com/watch?v=lOPe2kIRRsU
This 15 minute video discusses the fundamentals of repointing mortar, from wall prep to placing and finishing the mortar. This video presents a wealth of information on how to repoint your own mortar.

Finally **metals** like copper, brass, cast and wrought iron, and tin were common for all types of applications in historic homes; from hinges and hardware to roofs. Copper was commonly used for gutter downspouts, small roof applications like cupolas, or decorative elements. Brass was often seen on handles and hardware on doors and drawers. Tin and thinly pressed metals were common as roofing materials and for interior applications like ceiling panels. These materials may be more fragile than others as they were often thinner than 1/8" upon creation and may have deteriorated further over time. Iron may be the most common architectural metal as it was used for decorative elements, railings, gates, fencing, and fasteners like nails, screws, and latches. Due to variations in the strengths of metals proper care should be taken in maintenance to avoid damage:

◊ Inspect surfaces routinely for evidence of moisture damage like rust or discoloration; structural failure such as punctures, corrosion, galvanic action, and loss of paint.

Maintaining Protective paint coats prevents deterioration

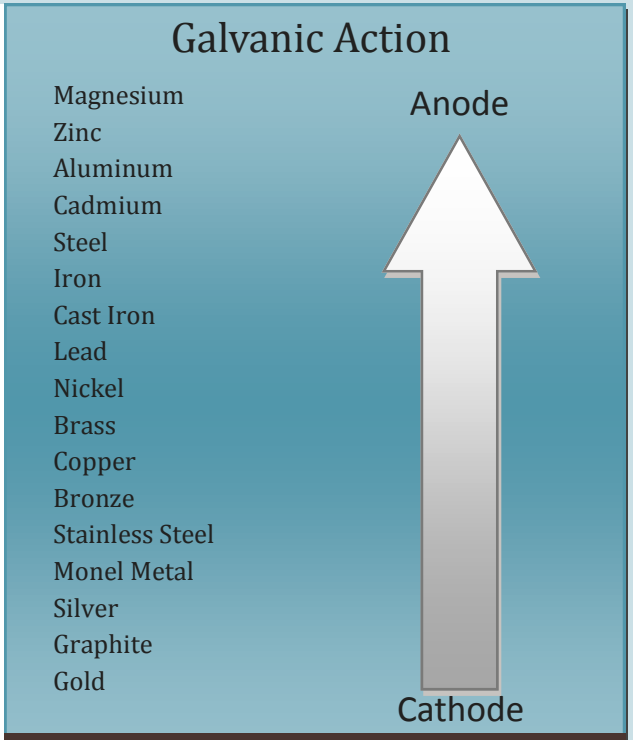
Copper forms a protective patina as it ages

◊ Ensure that there is appropriate drainage so water does not collect on metal surfaces. Standing water will quickly corrode metals, so keep metal roofs, gutters and downspouts cleared of debris.

◊ Maintain protective paint coats on ferrous metal surfaces such as steel, iron, and alloys containing iron to prevent corrosion.

◊ If corrosion is already present clean it with the gentlest means possible, prior to repainting. For steel, iron and hard metals this is usually wire brushes and scrapers while softer metals like are best cleaned with non-abrasive chemical cleaners.

◊ Inspect metal-on-metal contact points for evidence of galvanic action— corrosion caused by the contact of dissimilar metals— usually found between metal pieces and their fasteners.



Corrosion caused by contact between dissimilar metals

◊ Metals should not be sandblasted as this can cause further damage.

◊ Metals can be repaired by splicing, patching, or reinforcing the damaged area.

Brass hardware discolors over time due to use

THE ENVELOPE

Foundation, Walls, and Roof

Foundations and basements are notorious for being damp and drafty, and therefore inefficient. Some problems however can be readily solved by homeowners.

◊ Lookout for significant cracks, bulges, termites, and biological growth such as mold, which is the result of long-term exposure to moisture.

◊ Test for radon before beginning any foundation or basement projects.

◊ Ensure that there is appropriate drainage around the foundation. Moisture problems in basements often reoccur, so you shouldn't finish your basement if you suspect future seepage.

◊ Make sure you have a vapor barrier in place

Maintaining exterior cladding improves energy efficiency

Check foundations for signs of biological or other damage

to help prevent moisture infiltration.

◊ Adding **rigid insulation** behind new wall material is an excellent way to address moisture concerns and increase your home efficiency.

◊ Search out and **seal penetrations** in foundation surfaces like plumbing, electrical and cable lines, and Freon and gas lines.

Upgrading the **efficiency** of **walls** by adding **insulation** can be difficult, and is risky for historic features. Insulation is usually added to historic walls through small holes in the historic fabric, which it is blown into. Often it absorbs moisture in wall cavities due to temperature differences between interior and exterior spaces. Once it has absorbed moisture it will accumulate at the bottom of the cavity and can begin to damage the structure by retaining moisture, and likely causing biological growths. There are other ways to improve your walls efficiency like:

◊ Locate and seal interior cracks in walls, especially junctures of walls, baseboards, and molding.

◊ If built-in cabinetry is present, installing plastic film in the framing members, and sealing interior junctures with silicon caulk, will help seal air leaks.

◊ Similarly check dropped soffits, cove, and other decorative structural areas to ensure all junctures are properly sealed.

Masonry walls covered with Plaster

◊ Check electrical outlets and switches for air-tightness. If you're upgrading the electrical system, now is the time to get receptacles created to be airtight. If not, seal gaps at wall junctures, or use childproof plugs and receptacle gaskets to seal leaks.

There are several common **roof** forms in the state, like hipped, front, side, or cross gabled, pyramidal, and gambrel. The Queen Anne Style predominately features the first five; Bungalows the first four; and Colonial Revival incorporates all of these. Historic Roofing materials include slate, metal, and tile which should be retained because of their distinctive nature and

Clay and tile shingles should be replaced when damaged

because they can last for hundreds of years as long as they are properly maintained:

◊ Inspect roofs regularly for signs of deterioration, moisture or structural damage, corrosion, worn or missing shingles, and paint failure.

◊ Clean gutters and downspouts of debris to provide necessary drainage.

◊ Replace deteriorated flashing as needed to prevent leakage.

Metal roofs were traditionally painted to protect from the elements

◊ Provide adequate **ventilation** of attic space to prevent condensation.

◊ For metal roofs ensure that there is a sufficient coat of paint as exposed areas will rust and create leaks.

◊ New equipment like satellite dishes, skylights, solar panels, etc. should be located on secondary areas of the roof that won't impact the primary view. Alternatively consider placing them elsewhere on the site.

Additionally you can increase your homes **efficiency** by:

Maintaining paint on metal roofs will protect them from corrosion

◊ Create a "**cool roof**." Asphalt shingled roofs, and metal roofs can reach temperatures over 150 degrees in summer months and transfer that heat into your home. Cool roofs reflect more sun and therefore more heat, can reduce electric bills up to 40% and can be accomplished by the homeowner.

◊ Colonial Revival and Craftsman homes are also excellent candidate for installing a "**green roof**" because they have large expanses of roof area that tend to have a lower pitch. If you want to add a green roof you should consider the structural support necessary, only using secondary roof faces, and

Historic roofing materials may be character defining

using flat, instead of sloped, surfaces.

◊ Install low-profile ridge **vents** to improve ventilation if they don't detract from the home's historic character.

◊ Add **insulation** to attic spaces to help with air infiltration.

◊ Add **skylights** to or tubes to bring more natural light into interior rooms.

THE ELEMENTS

Windows, Doors, and Porches

One of the most controversial features of historic homes may be the **windows**. This controversy revolves around replacing historic windows. Windows have a great deal of importance in defining the historic character of structures as they have changed with styles, create depth and shadow from their various projections, and were created with glass that has natural variations in clarity. Many homeowners seek to replace their historic windows with new vinyl windows as a way to increase their energy efficiency. These windows however can't replace historic character, and historic windows can be made as efficient as new windows at a fraction of the cost of replacement. This can be achieved through:

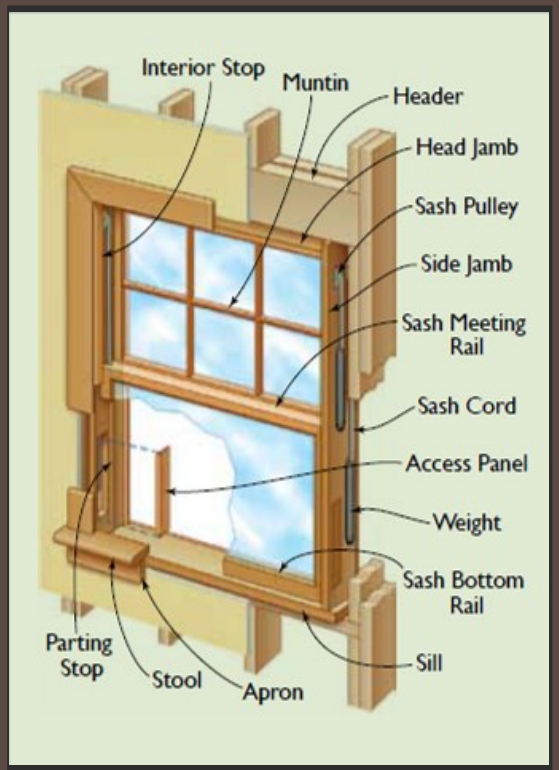
Lowenstein House, Statesville— Stained glass windows

- ◊ Adding interior or exterior shutters or storm windows.
- ◊ Repairing window panes and glazing.
- ◊ Adding operable sash locks and weather-stripping. Sash locks push the sashes firmly into the casing to prevent infiltration.

Windows also provide other opportunities to increase your homes efficiency:

- ◊ Historic homes were often built to take advantage of **natural cooling** through operable windows and breezes. Maintaining operable windows, interior layouts and transoms allows the home to continue to take advantage of natural breezes. Open each sash three (3) inches to let out hot air and humidity while pulling in cooler air. If possible open windows at either end of the house to create a draft.
- ◊ The availability of **natural light** and heat reduces energy consumption, and the use of shading implements like awnings, heavy draperies and shutters reduce heat gain.
- ◊ Many historic **awnings** and **shutters** have been lost. Look for **ghost marks** from earlier hardware for awnings and shutters and reinstall *only* if there is evidence that they are historically appropriate.

Interior Storm Window | Newly glazed window



WINDOW ANATOMY

To maintain your historic windows consider the following.

◊ Ensure windows and sash locks operate properly.

◊ Inspect windows for signs of deterioration, moisture damage, failing paint, infiltration, fungal growth, termite or insect infestation, and corrosion at least twice a year.

◊ Reglaze glass and recaulk joints to prevent infiltration. If panes are cracked, broken, or missing, try to replace them with historic glass from an architectural salvage store.

◊ Maintain paint or stain coatings because they prevent deterioration. Reapply coatings when signs of failure appear such as flaking, peeling, cracking, or exposed areas.

Demonstration of window glazing

◊ Clean all window parts using the gentlest effective method prior to repainting or staining to make sure it adheres properly.

Additionally maintaining historic windows uses less new resources thereby creating less waste and providing a more sustainable option to new windows. The following steps can be taken to repair common historic windows:

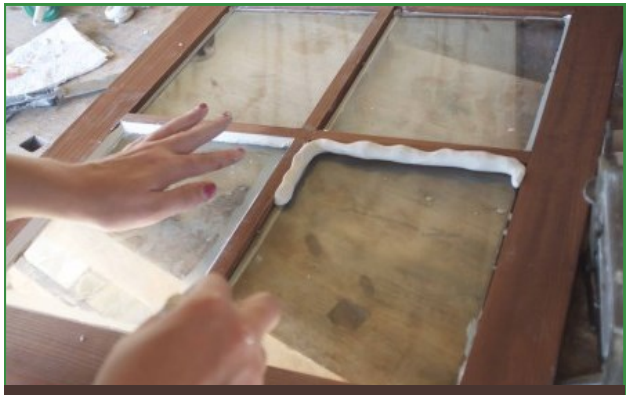
Ghost marks from previous hardware can give insight

◊ Remove damaged, or cracked glazing and points.

◊ Remove and thoroughly clean glass panes then replace and secure with points.

◊ Using a thin roll of glazing reglaze window pane. Finish the juncture at a 45° angle to remove excess and allow water to pass without pooling.

Similar to windows, **doors** and **doorways** also define a building's historic character. Especially true of colonial revival homes, the *entablature* surrounding the front entrance was often detailed and included sidelights and fanlights to add natural light to the entryways. The doors themselves, like windows often had defining panels. Similarly, passageways and doorways may define character by their thickness and detailing of trim-work. To maintain your historic doors consider the following.



Reglazing preserves historic character and increases efficiency

◊ Ensure doors shut completely and install weather-stripping to prevent infiltration. Also check glazing if present.

◊ Inspect doors for signs of deterioration, moisture damage, failing paint, infiltration, fungal growth, termite or insect infestation, and corrosion at least twice a year.

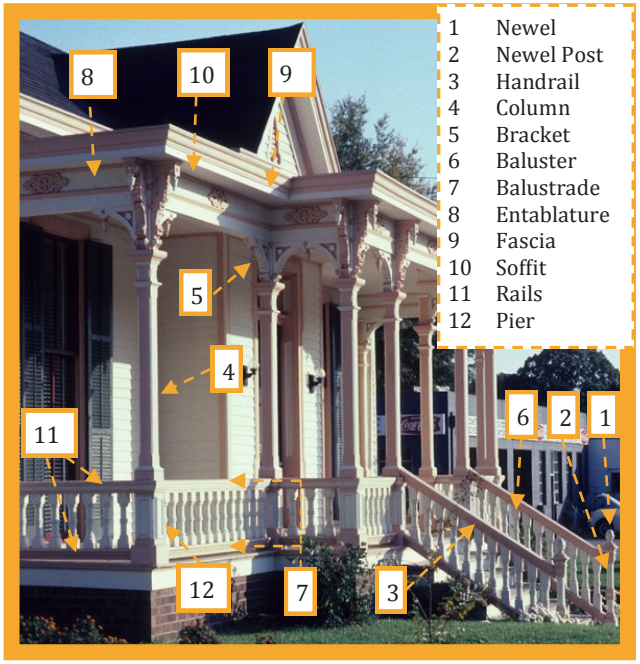
◊ Maintain paint or stain coatings. Reapply coatings when signs of failure appear such as flaking, peeling, cracking, or exposed areas.

Draft snakes won't damage hardwood floors and stop drafts

◊ Clean all door surfaces using the gentlest effective method prior to repainting or staining to make sure it adheres properly.

◊ Interior doors in historic houses were often not trimmed flush with the floors to allow for better ventilation however it also allows unwanted winter drafts. A simple solution are ***draft snakes***. These stuffed snakes go on the interior of a door to stop drafts and don't damage hardwood floors.

Porches are one of the most common feature on houses in North Carolina. They range in size and depth, complexity and ornamentation and can be found on every story of some homes from the ground to the roof. They can be recessed in, cantilevered out, or project from any face. These areas acted as extra **living space** especially in the summer where they could be **shuttered** and serve as sleeping porches. They allowed a reprieve from hot summer sun, but many were angled in such a way as to allow low winter rays to reach and warm the home. They also served as social areas and some would even have external staircases to pass between levels of porches. In fact porches were so loved by early coastal cities that, when laws were passed to remove porches, citizens expressed such widespread outrage that the laws were changed in many cases.



1 Newel
2 Newel Post
3 Handrail
4 Column
5 Bracket
6 Baluster
7 Balustrade
8 Entablature
9 Fascia
10 Soffit
11 Rails
12 Pier

Gaston-Meares House, Monroe

Most porches are detailed in wood—some are done in masonry, or ironwork— and include a number of functional (and decorative) elements.

However many of these porches have been enclosed to make permanent living space as families have grown and room functions have changed. **Reestablishing** these lost **porches** can increase the efficiency of your home by shading areas most exposed to sunlight and **reducing heat gain**. Porches can decay rapidly due to exposure to the elements if not properly cared for. When maintaining your historic porch consider the following.

Dortch House, Raleigh

- In addition to sun and rain porches are prone to infestation of termites, bees, and beetles therefore maintaining a proper coat of protectant or paint is ***imperative.*** Reapply coatings when signs of failure appear such as flaking, peeling, cracking, or exposed areas.
- Inspect porches for signs of deterioration, moisture damage, failing paint, fungal growth, termite or insect infestation, and corrosion at least twice a year.
- Clean all surfaces using the gentlest effective method prior to repainting or staining to make sure it adheres properly.

George W. Wall House, Wallburg

- Make sure balusters are tight and in good repair. Also check piers/foundation; sagging porch decking is usually caused by foundational failure.
- Ensure adequate drainage so moisture doesn't collect on surfaces.
- Refrain from using deicers and salts on masonry features as they increase deterioration of these surfaces. Instead use alternate entrances or use sand/non-clay kitty litter for added traction.

THE INTERIOR

Systems

Your home has a few mechanical systems: electrical, plumbing, and HVAC (Heating, Ventilation and Air Conditioning). Historic homes have often incorporated these systems as they became common to the area. Some systems— like indoor plumbing— weren't introduced into homes until the mid-late twentieth century in many rural areas.

HVAC systems however, have been around for thousands of years. In historic homes heating was provided by wood burning ovens, and fireplaces. This progressed to different fuel types and equipment like natural gas, coal, radiant heat, boilers, and furnaces. Cooling was mainly achieved through proper ventilation and built in features however ceiling fans were a particularly useful invention until conventional air conditioning units were introduced. Historically homes were built with ingenious ways to ventilate the air throughout like interior transoms, pass-thru areas, drafts under doors, operable windows, gable vents, high ceilings, convection flues, shutters, and light wells.

Many of these same features also helped to control light in absence of an electrical system. Additionally clerestories, skylights, transoms, borrow lights, splayed window reveals, and the size and location of windows all contribute to the homes ability to effectively use light.

All of these passive features can add to your homes efficiency however, often they are lost in renovations. Reintroducing these **passive features** to your home and actively using them will reduce your dependence on active features like HVAC systems. Some ways to increase your homes efficiency are:

- ◊ **Understand the use of historic systems.**
- ◊ Install **low-flow fixtures**, and efficient water heaters and appliances as well as **upgrading** plumbing and electrical systems.
- ◊ Inspect water pipers for signs of damage and proper **insulation**.
- ◊ Check for faulty appliances and fixtures like a leaky toilet. Repair or replace as is warranted.
- ◊ Ensure adequate **caulking** around fixtures like sinks, and bathtubs to make sure water doesn't infiltrate the structure.
- ◊ Inspect and **clean radiators** and air registers for proper operation, and change air filters every season.
- ◊ Have your boiler/furnace **cleaned** and checked once a year.
- ◊ Make sure all **ducts** are clean, properly sealed, and well insulated.
- ◊ Introduce new **renewable energy** sources in sensitive ways, on non-primary structures or building facades. If possible make solar panels freestanding.
- ◊ Install a **programmable thermostat**. This will allow you to set the temperature according to when you arrive home, sleep, or leave and thereby reduce your energy expenses.
- ◊ In addition to these treatments the **weatherization** of your home through weatherstripping, insulation, and storm doors and windows will greatly improve it's efficiency.
- ◊ Finally, remember that **clotheslines** are an excellent way to dry clothes and save a good deal of energy!

THE INTERIOR

Finishes

Historic homes come with some very unique **finishes** that should be preserved if possible such as plaster walls with specialized paint techniques like trompe l'oeil and faux marbling. This image shows these specialized painting techniques which are designed to represent wood grains, marble patterns, medallions, brackets, soffits, crown molding, and decorative features.

Often these features have been lost to previous renovations and changes in style and taste over time, but they may be able to be recovered through a **paint analysis**. An analysis is best done by a professional as painting techniques have changed, they are more likely to find a pattern, can identify original features, types of paints, and areas that are prone to change color. These are best done in small, unnoticeable areas in the home (although they can be done in a lab) on original features like trim, door and window parts— commonly on Queen Anne homes the different components of these features would be painted alternate colors— with a microscope and precision work with a scalpel. These are **very sharp** knives and should be used with **caution**. Finding patterns or special detailing however is very difficult and should be left to professionals.

Similarly , hardwood floors and plaster walls have been covered over but may be recovered if desired. However, due to the delicate nature of plaster often times irreparable damage is done when new sheetrock is added on top of it. Hardwood floors are often covered by carpet, but unlike plaster usually stays in decent condition when covered. Hardwoods can be recovered either by a professional or a homeowner but is very labor intensive.

When treating historic finishes consider the following:

- Check for damaged or deteriorated areas of plaster or flooring. Skilled professionals can repair these areas, or in the case of flooring can be found at salvage stores.
- Before removing any materials have the areas checked for hazardous materials like asbestos and lead paint. These need to be treated with appropriate caution and care.
- As always begin cleaning measures with the gentlest means necessary before applying any protective coatings.
- If restoring trompe l'oeil or other decorative

paintings seek out the aid of a professional faux painter because these techniques are very difficult.

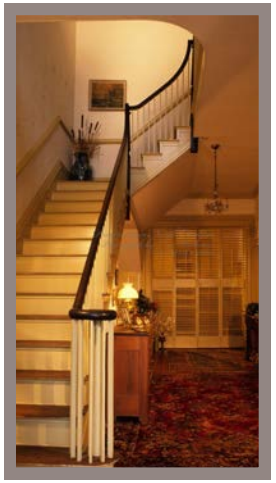
- When selecting new finishes consider **sustainable materials** from **renewable resources** with low emissions to ensure indoor air quality.

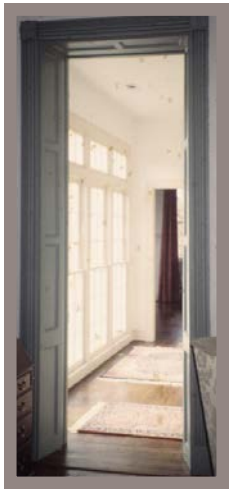
THE INTERIOR

Details

The **details** of a home go a long way in defining its character. These details include door casings, baseboards, crown moldings, fireplace surrounds, doors, locks, knobs and other hardware, built-in cabinetry, stair railings, and other decorations. These details change with each style and as technology changed. Similar to the styles that each home represents on the outside, the interior detailing ranged from simple and plain to elaborate and detailed.

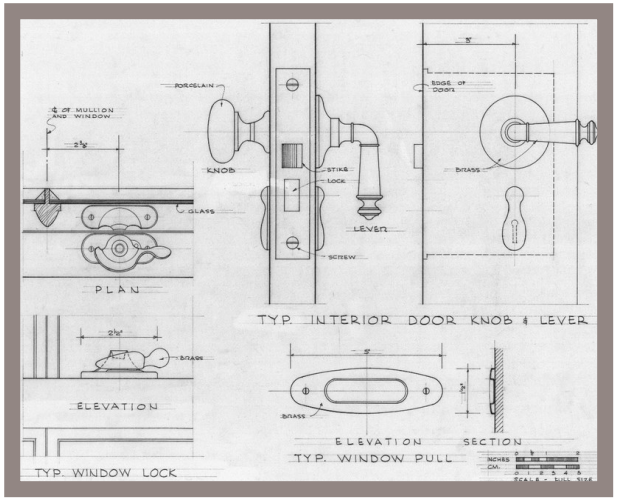
Often in Colonial Revival homes the exterior would be less finely detailed that the interior since the style was in part a response to the extravagance of the Victorian styles. Interiors featured high wainscoting, polished wood floors and features, raised panel woodwork, and classical motifs.





The Queen Anne style on the other hand was more elaborate and heavily decorated. The interiors drew from many styles from Vernacular to Japanese, often included plants as an inexpensive decoration, embossed damask and velour wallpapers, stylized decoration, hand-made tiles, and embroidery. As Colonial Revival started to replace Queen Anne, the Victorian style began incorporating Colonial Revival details. It is not uncommon to see later Queen Anne homes with paired columns, porticos, paneled decorations, and classical motifs painted in Victorian patterns and colors.

Bungalows had an all together different approach to interiors. These homes embraced craftsmanship and simplicity with wood paneled walls to about chair- or plate-rail height. Interiors used soft earth tones, grayed shades, and pastels. Painted softwoods in white Pre-1910, and in colors after 1920, became popular. Another popular trend in Bungalows were built-in spaces like ironing boards, beds, cabinetry, and furniture in many rooms.



Over time many of these features have been altered or lost to subsequent renovations. Many times however evidence of these

original features may be left behind in the form of ***ghost marks***. These are the impressions and areas of residue left by hardware and trim pieces that have been covered by paint or wallpaper. When appropriate evidence can be found of original features their replacement is recommended. When maintaining and repairing these features consider.

◊ Before removing any materials have the areas checked for hazardous materials like asbestos and lead paint. These need to be treated with appropriate caution and care.

◊ As always begin cleaning measures with the gentlest means necessary before applying any protective coatings.

◊ Over the years subsequent coats of paint may have clouded the original profile of details within the home. Removal of this paint should be undertaken with care and gentle measures so as not to damage the feature.

◊ Inspect wooden elements for areas of damage or deterioration and repair with appropriate measures such as consolidates or wood fillers.

◊ For damaged or deteriorated plaster features consult with a professional for the appropriate treatment as plaster has a long and varied history.

◊ When selecting new finishes consider sustainable materials from renewable resources with low emissions to ensure indoor air quality.

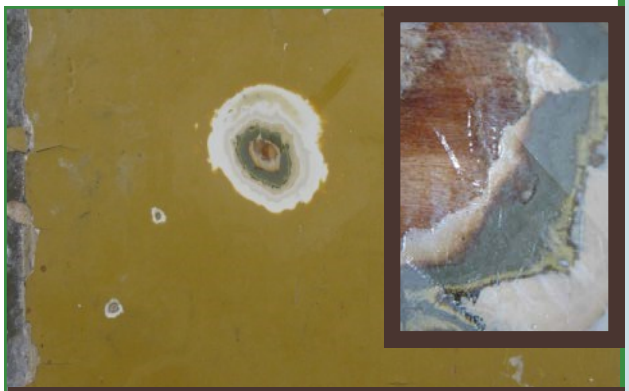
Historically each style had certain color patterns and schemes that were popular. Contrary to modern homes, historic homes were painted an assortment of colors inside and out.

Queen Anne houses are meant to be colorful. Architectural details are highlighted with dark vivid colors and contrasting hues; greens, oranges, reds, maroons, grays, browns, tans, and olives are dominant colors. The walls of a Queen Anne house may be painted one color, while doors, window sashes, trim, and decorative shingles are painted other colors; as many as five separate colors can be painted on a single house. If a Queen Anne has both wood shingles and wood siding, then the shingles should be painted or stained a different color than the siding. It is important to emphasize the many textures of these ornate houses because these features define the home's historic character. The more ornate a house, the more paint colors were usually chosen.

Bungalow houses were less ornate but still had painted exterior features. Wood trim and features were painted or stained colors that harmonized with nature. They used contrasting colors to accent their architectural features such as painting window sashed white and painting the trim contrasting colors such as deep browns or oranges. Greens are also chosen colors for wood trim. Favorite colors for siding, shingles, or stucco were often pale yellows and greens.

Unlike the other two common house types, Colonial Revivals had much less exuberant colors. When painting this style house, softer colors should be used. Trim is typically painted white or ivory since this style reflects the return to classical motifs, and yellowish whites simulate ancient marble. Additionally light yellows, blues, and grays were popular body colors.

Restoring these colors is at the discretion of the homeowner however it is recommended that patterns are kept, such as the way Queen Annes embraced multiple colors on a single feature. Historically unpainted brick or stone should not be painted as it could drastically alter the home's original character and traps moisture inside walls which will damage foundation elements.



Paint Analysis revealing various layers of paint

THE SITE

Landscaping, Alternative Energy, and Site Features

Landscaping features can do a lot to improve your home's efficiency. These include storm water management areas like ponds, drains, and bioswales; and trees, bushes and other vegetation for shading devices. Traditionally large broad leave trees, like oaks and maples, were used to provide shade around homes. These trees have grown for hundreds of years in many cases and their loss is detrimental to the homes character.

Persimmon | Winged Elm

If these have been lost or you would like to incorporate new plantings try the following local plants. These plants are not only drought resistant, they are also appropriate across the state and can grow in most soil types and varying amounts of natural light. Additionally these plants are also beneficial for local wildlife by providing winter food, shelter, nectar or other habitat:

Flowering Dogwood | Red Chokeberry

- For tall (over 30 feet) trees plant Red Maple, Persimmon, Eastern Red Cedar, White, Black or Southern Red Oak, Sassafras, Winged Elm, Green Ash or American Holly.
- For small trees (30-10 feet) try Red Mulberry, Winged or Smooth Sumac, Carolina Willow, Sweetleaf, Hawtorn, or Flowering Dogwood.
- Common small shrubs include Dwarf Huckleberry, Spicebush, Wild Azalea, Lowbush Blueberry, Blackberry, Red Chokeberry, Wild Raisin, or Deerberry.
- If you would like to include climbing plant vines try Virginia Creeper, Greenbrier, Grape or Trumpet Vine. These also provide colorful blossoms.

Spicebush | Virginia Creeper

Blue Phlox | Mountain Mint

- You can add color and fragrance to garden beds by planting Bluets, Blue Lobelia; Carolina, Blue, or Summer Phlox; Hoary Mountainmint and Lyreleaf Sage.
- Finally to add some greenery try Christmas Ferns and Switchcane Grass.

Alternative energy sources are an excellent way to increase your homes sustainability. Some of the more common sources are solar, wind and geothermal.

Solar panels may be the most common and most efficient way to harvest solar energy for a variety of sites. These are most appropriately located on secondary structures or less visible areas of the roof so that they don't detract from the historic nature of the residence. Building Integrated Photovoltaics are a relatively new market item that are used instead

Locate solar panels where they do not impact historic character

of other construction materials in various building elements like the roof or skylights. Due to the young nature of this technology, its affects on historic structures haven't been fully explored.

Wind technologies were historically used in the various regions of the state and may be employed on historic sites as long as they don't impact the primary view of the main structure.

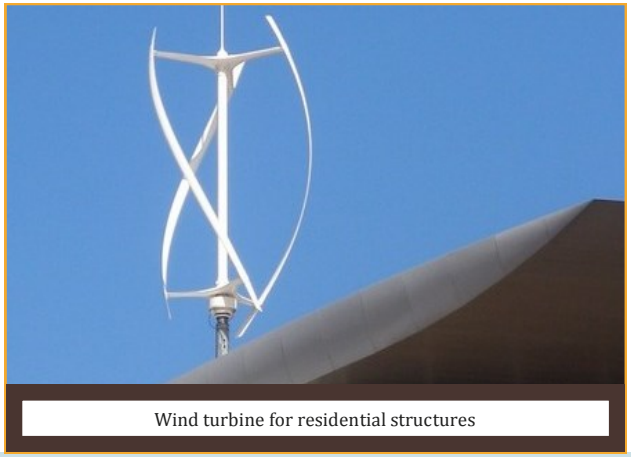
Geothermal heat pumps may be the newest alternative energy source incorporated

Freestanding and secondary structure solar panels

in historic homes. These are minimally invasive systems that can be incorporated in a variety of historic structures.

The biggest consideration for solar and wind technologies is appropriate placement because without this they will not function efficiently. This placement however shouldn't compromise the character of the house. Consider the following when adding alternative technologies.

◊ For solar panels to be efficient they need a clear view of the southern sky. Locate solar collectors on secondary buildings,



Wind turbine for residential structures

or facades of the home or try freestanding panels.

◊ Wind turbines need to be placed in areas with average wind speeds of 10 mph to work effectively (more commonly found in the Mountain and Tidewater Regions of the state). If you would like to incorporate this technology it should be done in such a way as to minimize its effect on the historic character of the building. This can be achieved by placing it away

Geothermal heating system

from the structure in an area that doesn't effect the primary view of the house.

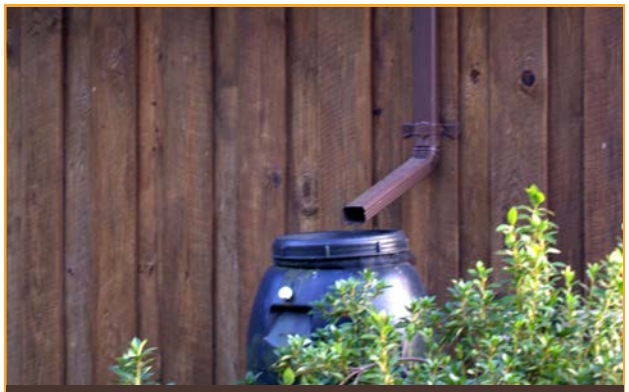
◊ Geothermal heat pumps use the earth's heat as a clean source of energy, and don't need a backup power source like other heat pumps. They use less space, provide better conditioning, and maintain better internal humidity than conventional HVAC systems and are therefore better suited for historic homes.

In addition to landscaping features and alternative energy there are other new technologies that you can incorporate into your historic site to further improve your home's efficiency. Try incorporating the following to improve your water efficiency.

◊ Impervious surfaces don't allow moisture to penetrate to the earth's surface and increases the amount of pollutants and silt that drains into fresh water sources damaging the surrounding ecosystem. Before paving your driveway or creating other impervious surfaces consider using paving stones, porous asphalt, crushed stones, or a grid system with pervious materials.

Paving stones allow moisture to be absorbed into the ground

◊ Create home gardens and composting opportunities. Home gardens also provide a great source of organic produce, help save money, and provide personal satisfaction. Composting is recycling *organic* matter from your home and daily waste and is beneficial to home gardens as it contains loads of nutrients, improves the soils ability to retain moisture, and improves plant growth.



Rain barrels allow water collection for gardens

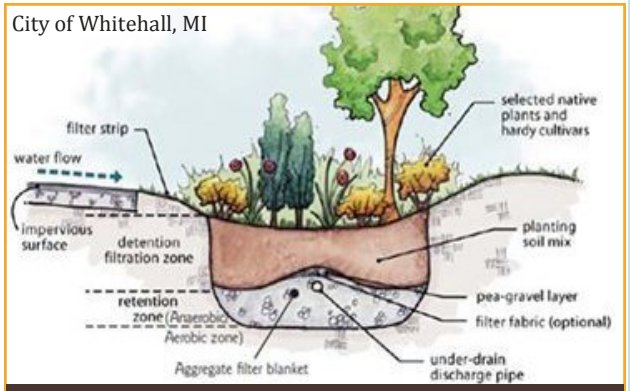
Moisture is a historic home's greatest natural enemy because it can damage a home in a variety of ways. Rain water way cause the most damage to a historic structure because it can infiltrate the structure in a variety of ways such as a leaky roof, clogged gutters, improper drainage, or capillary action. Storm water management is therefore integral to a healthy site and home.

Composting reduces landfill waste and helps gardens

◊ Installing rain barrels at the ends of downspouts to collect rainwater in wet spring months for watering gardens and plants in the dry summer months also helps to reduce ground water. To keep them from detracting from the character of your home, screen the barrels with plantings or avoid them on primary faces of the structure. Additionally add gutters and downspouts to secondary structures for further retention.

◊ Create bioswales to help filter pollutants and silt from storm water runoff. Bioswales are planted drainage ways that can become a site amenity if plants are correctly chosen.

City of Whitehall, MI



Bioswale Diagram

◊ Ensure proper drainage round your structure. Look for areas of biological growth, deteriorated mortar, sagging roof lines, or standing water as these are signs there is not adequate drainage. The best time to identify areas of leakage or poor drainage is during a rain storm because you can see how the rainwater is moving with the site and structure.

NEW ADDITIONS

Sensitively Enlarging Your Space

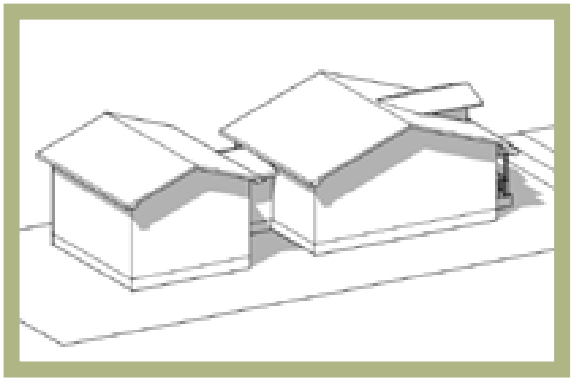
Over time buildings grow and change as room uses and space requirements change, and when new technologies have come about. Historic buildings can be expected to continue to grow and change, therefore being able to enlarge your space sensitively is important. New additions, like rooms, wings, or decks shouldn't lessen the historic characteristics of your home, but instead be identifiable as new and not compromise the primary views of the home. Also additions shouldn't compromise the integrity of the original structure or site. This could be directly through the destruction of historic features and materials or indirectly through changing the location, size, height, or scale of features.

The impact of an addition on the original building can be significantly diminished by locating it on the least character defining elevation and by making it subordinate to the main home. It shouldn't overpower the original building in height or size and the form, design, scale, fenestration, materials, details, colors, and features should be compatible with the original building. While designed to be compatible with the original building, the addition should be differentiated from the original building through subtle differences like change in height, roof pitch, trim, material, or form.

Also consider what kind of impact the building will have on the site. It should be designed and located so that significant site features like relevant outbuildings, mature trees, *porte-cocheres* and fencing or walls are not lost. Similarly the size of the addition should correspond to the site. For example a long narrow lot would be better suited to a long narrow addition than a wide addition would be.

Also consider the following when planning your addition to increase its efficiency:

- ◊ Consider impacts and benefits for both the primary structure and the addition as well as those to adjacent properties.
- ◊ Locate an addition to maximize the potential for natural daylighting and solar energy collection. Make sure new additions don't impede the originals structures access to daylight and ventilation.



- ◊ Position an addition to utilize predominant wind patterns for cross-ventilation.
- ◊ Also consider the shade and wind break benefits of mature trees when positioning the addition.
- ◊ Incorporate traditional building techniques in the addition like operable awnings, shutters, windows and large roof overhangs.
- ◊ Use *green* materials in your addition. These include locally manufactured, easy to maintain materials that have long life spans, are recyclable, are made from recycled materials or rapidly renewable resources and are proven to be durable in the North Carolina's climate.

Chapter Four

Resources and References

OTHER RESOURCES

Sustainable Resources

For more information on Green and Cool roofs:

http://www.epa.gov/heatisland/resources/pdf/GreenRoofsCompendium.pdf

http://www.epa.gov/heatisld/resources/pdf/CoolRoofsCompendium.pdf

http://www.nps.gov/tps/sustainability/new-technology/green-roofs.htm

For more information on Energy Audits and Weatherization:

http://www.nps.gov/tps/sustainability/energy-efficiency/weatherization.htm

http://www.preservationnation.org/information-center/sustainable-communities/buildings/weatherization/#.UnKmUXCsiqc

http://energy.gov/public-services/homes/home-weatherization/home-energy-audits

http://energy.gov/energysaver/articles/professional-home-energy-audits

http://www1.eere.energy.gov/wip/wap.html

For more information on Alternative Energy Sources:

http://www.nps.gov/tps/sustainability/new-technology/solar-on-historic.htm

http://www.epa.gov/statelocalclimate/state/topics/renewable.html

Preservation Resources

For more information on Maintenance and Repair:

http://www.nps.gov/tps/how-to-preserve/tech-notes.htm

http://www.nps.gov/tps/how-to-preserve/briefs.htm

For more information on Historic Windows:

http://youtu.be/WUSGILSfzwE

http://www.preservationnation.org/information-center/sustainable-communities/green-lab/saving-windows-saving-money/120919_NTHP_windows-analysis_v3lowres.pdf

For more information on Federal Tax Credits:

http://www.nps.gov/tps/tax-incentives/taxdocs/about-tax-incentives-2012.pdf

http://www.nps.gov/tps/tax-incentives.htm

For more information on the Secretary's Standards and Guidelines:

http://www.nps.gov/tps/standards/four-treatments/treatment-guidelines.pdf

http://www.nps.gov/tps/standards/rehabilitation/sustainability-guidelines.pdf

http://www.nps.gov/tps/standards/four-treatments/landscape-guidelines/index.htm

For more information on Understanding the Standards:

http://www.nps.gov/tps/standards/applying-rehabilitation/standards-bulletins.htm

State Resources

For more information on State Tax Credits:

http://www.hpo.ncdcr.gov/credits.htm

http://www.presnc.org/Preservation-Answers/Tax-Credits

For more information on State Preservation:

http://www.presnc.org/index.php

http://www.hpo.ncdcr.gov/

For more information on the National Register:

http://www.hpo.ncdcr.gov/nrhome.htm

http://www.nps.gov/NR/

GLOSSARY OF TERMS

Common Sustainable Terms

Appropriate Technology:
Technology that creates minimal environmental impact while serving basic human needs. Uses the simplest level of technology that can effectively achieve the intended purpose in a particular location.

BREEAM:
Building Research Establishment Environmental Assessment Method is an assessment tool that sets the standard for best practice in sustainable building design, construction and operation and has become one of the most comprehensive and widely recognized measures of a building's environmental performance in the world.

Composting:
A waste management option involving the controlled biological decomposition of organic materials into a product that can be handled, stored, and applied to the land without adversely affecting the environment.

Daylighting:
The use of controlled natural lighting methods indoors through skylights, windows, and reflected light.

Embodied Energy:
The sum total of the energy necessary - from raw material extraction, transport, manufacturing, assembly, installation plus the capital, environmental and other costs - used to produce a service or product from its beginning through its disassembly, deconstruction and/or decomposition.

Green Building:
Construction that increases the efficiency with which buildings use resources — energy, water, and materials — while reducing building impacts on human health and the environment. May be accomplished by applying these requirements to siting, design, construction, operation, maintenance, and removal — encompassing the entire building life cycle.

Impervious Surfaces:
A ground cover that does not allow water to pass through it to the soil below; creates storm-water runoff and resulting non-point source pollution.

Indoor Air Quality:
Refers to the content of interior air that could affect health and comfort of building occupants. IAQ may be compromised by microbial contaminants (mold, bacteria), chemicals (outgassing from building materials and finishes, carbon monoxide, radon), allergens, or humidity levels that are too high or too low.

Insulation:
A material which effectively slows down the movement of heat, installed around a living space to improve comfort and reduce heating and cooling bills. Measured by R -value: the higher the R-value, the more insulating the material.

LEED:
Leadership in Energy and Environmental Design is a green building rating system developed by the U.S. Green Building Council that promotes a whole-building approach to sustainability. It recognizes performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

Life Cycle Assessment (LCA):
Assesses the environmental performance of a product or building over its life cycle. This includes raw material extraction, manufacturing, transportation, use, recycling and disposal. Green Seal is a well known non-profit organization that utilizes life-cycle analysis to evaluate and certify products and services that have a lesser impact on the environment and human health.

Locally Sourced Materials:
Materials obtained from a defined radius around a project site, helping to support the local economy and reducing transportation costs and energy.

Natural Building:
Uses a range of techniques, building systems and materials that place major emphasis on sustainability. Focus is on durability and the use of locally available, minimally-processed, renewable, recycled or salvaged resources, as well as those which produce healthy living environments and maintain indoor air quality. Natural building tends to rely on human labor, more than technology.

Offgassing:
The emitting of fumes into the air. Most new paints, carpeting, and many other building materials typically offgas chemical compounds which are unpleasant to breathe and may be hazardous to occupant health. Leads to Sick Building Syndrome.

Operating Costs:
Costs directly related to the operation, maintenance, repair, and management of a property and the utilities that service it. Includes insurance, property taxes, utili-

ties, maintenance, and management expenses.

Passive Solar:
Means of using sunlight for energy without active mechanical systems. Converts sunlight into usable heat (water, air, thermal mass), causes air-movement for ventilating, stores heat for future use without the assistance of other energy sources. Passive solar systems have little to no operating costs, often have low maintenance costs and emit no greenhouse gases in operation. Requires careful site planning, selection of building materials and building features. Energy conservation reduces the needed size of any renewable or conventional energy system, and greatly enhances the economics, so it must be performed first.

Permaculture:
Design system and philosophy that uses land in a way that integrates human dwellings and activities with local natural ecologies. Loosely formed network of training in alternative cultural ideas and permaculture gardening

Post-Consumer Recycled Content:
A reclaimed waste product that has already served a purpose to a consumer, and has been diverted or separated from waste management collection systems for recycling. Example: used newspaper that is made into cellulose building insulation.

Pre-Consumer Recycled Content:
A material that is removed from production processes (including scrap, breakage, or by-products) and reused in an alternative process before consumer distribution. Example: mineral (slag) wool, a by-product of the steel blast furnace process, used for mineral fiber acoustical ceiling panels.

R-Value:
A unit of thermal resistance used for comparing insulating values of different materials; the higher the R-value of a material, the greater it's insulating properties.

Renewable Resources:
Natural resources qualify as renewable resources if they are replenished by natural processes at a rate comparable or faster than their rate of consumption by users (solar radiation, ocean tides, wind). Renewable resources may also include commodities such as wood, bamboo and crop waste.

Resource Efficiency:
Using less energy or water to perform the same tasks. A device is energy efficient if it provides comparable or better quality of service while using less energy than a conventional technology. Building weatherization or high efficiency showerheads are efficiency technologies.

Sick Building Syndrome:
Often caused by flaws in heating, ventilation and air conditioning (HVAC) systems. Contaminants produced by outgassing of some types of building materials, volatile organic compounds, molds, improper exhausting of light industrial and cleaning chemicals have also been attributed to SBS.

Sustainable Development:
Development that meets the needs of the present without compromising the ability to meet the needs of the future. Encompasses three parts: environmental sustainability, economic sustainability and social-political sustainability.

Vapor Barrier:
A material which prevents or drastically reduces the passage of water in vapor form. Building materials are rated by permeance—their ability to let water vapor pass through them. Whether or not it is desirable to install a vapor retarder material on an exterior wall and where to place depends on the climate where a building is located. In cold climates, vapor retarders are typically installed on the inside of the wall frame. In hot humid climates, they are installed on the outside, or preferably omitted entirely. In hot dry climates they are not needed.

Volatile Organic Compounds (VOC):
Chemicals that contain carbon molecules and have high enough vapor pressure to vaporize from material surfaces into indoor air at normal room temperatures (a process known as off-gassing). While most VOCs are relatively inert at typical indoor concentrations, they can react with oxidants such as ozone and possibly nitrogen oxide and nitrogen dioxide to form reactive species and possibly strong irritants, including various acids and aldehydes. VOCs may cause eye and upper respiratory irritation, nasal congestion, headache, and dizziness. Examples of building materials that contain VOCs include, but are not limited to, solvents, paints, adhesives, carpeting, and particleboard.

Weatherization:
Protecting a building and its interior from sunlight, precipitation, and wind, through modifying a building by adding weather-stripping, insulation, airsealing, and other activities to reduce energy consumption and optimize efficiency.

GLOSSARY OF TERMS

Common Terms

Adaptive Reuse:
The reuse of a building or structure, usually for a purpose different from the original. The term implies that certain structural or design changes have been made to the building in order for it to function in its new use. Examples might include a factory building now used for loft apartments, or a house now used as a funeral parlor.

Asphalt Shingles:
Roofing material composed of layers of felt, cloth or paper and coated with tar or asphalt and granules.

Architectural Details:
The small details like moldings, carved woodwork, etc. that add character to a building.

Artisans:
Persons whose vocation consists of manufacture by hand of pottery, textiles, woodwork, or the like.

Balcony:
A platform projecting from a wall of an upper story enclosed by a railing with an entrance from the building and supported by brackets, columns or cantilevered.

Baluster:
A short, upright column or urn-shaped support of a railing.

Balustrade:
A row of balusters and the railing connecting them; often used as a stair or porch railing.

Bargeboard:
A projecting board, often decorated, that acts as trim to cover the ends of the structure where a pitched roof overhangs a gable.

Belt Course:
A continuous row or layer of stones, tile, brick, shingles, etc. in a wall.

Bracket:
A supporting member for a projecting element, sometimes the shape of an inverted L or a solid or triangular truss.

Casement:
A window sash that opens outwards by means of a hinge.

Certified Local Governments:
Refers to a local government, certified or approved by the State Historic Preservation Office (SHPO), which has an appointed commission to oversee the survey and inventory of
historic resources, to review areas for historically significant structures, and to develop and maintain community planning and education programs.

Cladding:
A protective, insulated or aesthetic fixed layer added to the exterior walls of a building.

Column:
A slender upright structure, generally consisting of a cylindrical shaft, a base and a capital.

Compact Fluorescent Lamp:
CFL's are a fluorescent lamp designed to replace an incandescent lamp. These use 1/3 less energy and last 10-15 times as long.

Cornice:
The continuous projection at the top of a wall. The top course or molding of a wall when it serves as a crowning member.

Cupola:
A small structure, domed or rectangular, surmounting a roof.

Design:
As related to the determination of the integrity of property, design refers to the elements that create the physical form, site plan, footprint, space, structure and style of a property.

Dormer:
A window set upright in a sloping roof. The term is also used to refer to the roofed projection in which a window is set.

Demolition by Neglect:
Allowing a building to fall into such a state of disrepair that it becomes necessary or desirable to demolish it.

Design Guideline:
Standards of appropriateness or compatibility of building design within a community or historic district.

Easement:
Legal protection (recorded in a property deed) for distinguishing features of the interior or exterior of a property

or in the space surrounding a property because such features are deemed important to be preserved.

Elevation:
An architecturally accurate drawing of a face of a building or object, without any allowance for the laws of perspective. Any measurement taken from an elevation will be fixed in proportion and scale to the corresponding measurement on the building.

Façade:
Front or principal face of a building; any side of a building that faces a street or other open space.

False Front:
A front wall that extends beyond the sidewalks of a building to create a more imposing façade.

Fascia:
A flat board with a vertical face that forms the trim along the edge of a flat roof or along the horizontal or eaves (sides) of a pitched roof.

Fluorescent Lamp:
A gas discharge lamp that uses electricity to excite mercury vapor to produce light. These are four times more efficient than incandescent bulbs.

Form: The overall shape of a structure.

Foundation:
Refers to the structure component that serves as the base of a building.

Frieze:
A plain or decorated horizontal part of a wall, typically below the cornice.

Gable:
The portion that is above eave level, on an end wall of a building with a pitched or gambrel roof. In the case of a pitched roof, this takes the form of a triangle.

Galvanic Action:
an electrochemical action that generates electrical current between two metals of dissimilar electrode potential causing deterioration.

Gambrel Roof:
A ridged roof having two slopes on each side, the lower slope having the steeper pitch.

Glazing: Fitting glass into windows and doors.

Halogen lamps:
A special, more energy efficient type of incandescent lamp containing halogen gas to produce a brighter, whiter light than incandescent bulbs.

Hip Roof: A roof having sloped edges and sides.

Historic Districts:
Used only when referring to a neighborhood or region designated by national, state, or local officials as a historic district.

Historic Landmarks:
Used only when referring to a site designated by national, state, or local officials as a historic landmark. Primarily used to refer to National Historic Landmarks.

Historic Registers:
Refers to any local, state, national, or international list of significant sites, districts, buildings, or objects.

Historic Sites:
This term is reserved for use for historic sites related to famous or important events or persons.

Incandescent Bulb:
the most common and least energy-efficient lamp. Electricity runs through a tungsten filament that glows and produces a soft, warm light. Because so much of the energy used is lost as heat, these are highly inefficient sources of light.

Light Emitting Diode:
LED lights are small, long-lasting, efficient lights usually affixed in strips for use as task lighting.

Mass: The physical size and bulk of a structure.

Masonry:
Construction materials such as stone, brick, concrete or tile.

Metalwork:
Practical and decorative use and application of metals to enhance buildings, fences, grills, and so forth.

Mullion: A vertical strip dividing the panes of a window.

Orientation:
Refers to the manner in which a building relates to the street. The entrance location and the “front façade” are determining factors in establishing orientation.

Palladian:
A motif having three openings, the center one being arched and larger than the other two.

Parapet:
A low wall or railing often used around a balcony or along the edge of a roof.

Pediment:
A triangular section framed by a horizontal molding on its base and two sloping moldings on each of its sides. Usually used as a crowning member for doors, windows and mantles.

Pilaster:
A support or pier treated architecturally as a column, with a base, shaft and capital that is attached to a wall surface.

Portico:
A porch that is leading to the entrance of a building, or extended as a colonnade, with a roof structure over a walkway, supported by columns or enclosed by walls.

Reveal:
The side of an opening for a door or window, doorway, or the like, between the doorframe or window frame

and the outer surface of the wall; where the opening is not filled with the door or window, the whole thickness of the wall.

Rusticated:
Stone masonry construction in which the faces of the blocks are rough and the individual blocks are separated by deep joints.

Sash: The moving units of a window.

Scale:
The scale of building is determined by the overall size of the primary building mass in combination with architectural details such as roof form, wall planes, trim, windows, doors and porches.

Setback:
The distance between the property line and the edge of building. Many communities have required setbacks that vary depending on land use and location. A 0'-0" setback implies that the building is located right on the property line.

Shed Roof:
A roof containing only one sloping plane. Has no hips, ridges, valleys or gables.

Site:
The place or parcel of land where a building or proposed project is located.

Spandrel:
The triangular space between the left or right exterior curve of an arch and the rectangular framework surrounding it.

Spindle:
A slender turned baluster, often decoratively used in rows, such as in railings.

Standing Seam Metal Roof:
A metal roof with vertical seams, which are used to attach individual panels. Historically, the panels were fitted together with hand rolled seams.

Streetscape:
The overall character of the street that is determined by street width, building height, location of buildings relative to the property line that abuts the street, style and amount of street furnishings and plant material.

Stucco:
An exterior wall covering that consists of Portland cement mixed with lime, applied over a wood or metal lath. It is usually applied in three coats.

Terrace:
An open, colonnaded platform, such as a porch or promenade. May also refer to narrow strips of land that are contained by a series of retaining walls.

Transom: A window located above a door or larger window.

Truss:
A framework of triangles used to support a roof, bridge or similar structure.

Tuck-Pointed:
To finish the mortar joints between bricks or stones with a narrow ridge of putty or fine lime mortar.

Vernacular:
A building or landscape that contains details associated with local or regional characteristics. Historically, factors influencing structures labeled vernacular were building materials, climate and building form.

Wainscot:
The lower part of an interior wall when finished in a material different from that of the upper part of the wall.

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